SOCIETY FOR FERTILIZERS AND ENVIRONMENT

9TH ANNUAL CONVENTION AND NATIONAL WEBINAR

Feb 25 & 26, 2022

Book of invited lectures and abstracts

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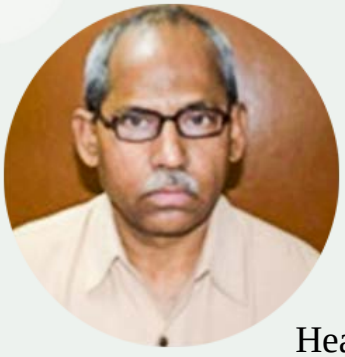
Preface



The Book of Abstracts prepared on the occasion of holding the Ninth Annual Convention of the Society of Fertilizers and Environment and the National Webinar on 'Managing Agro-chemicals for Crop and Environment Health' on 25-26 February, 2022 contains 200+ abstracts submitted by delegates from India, Singapore, Australia, UK and USA. It covers three theme areas, namely (i) Natural resources management for crop and environmental health, (ii) Agro-chemicals for protecting crops and environment, and (iii) Allied agricultural activities *vis-a-vis* food security & environmental health.

The whole world and the human civilization, while reeling over climate change phenomenon under the influence of a large number of factors, different interventions in the field of agriculture through conventional fertilizer and other agro-chemical practices, identified to improve the productivity in a sustainable mode, are known to have eco-toxic effects on soil and human health as well. This calls for identifying non-conventional sources along with protocols of their development and application with minimal eco-toxic effects without sacrificing the productivity. It is hoped the deliberations made on different themes during the Webinar will suggest future directions for eco-friendly research and management of agro-chemicals in the long run.

Biswapati mandal

President

9th Annual Convention and National Webinar

SOCIETY FOR FERTILIZERS AND ENVIRONMENT

16, Ellora Road (Canal Road), Kolkata- 700075

9th Annual Convention and National Webinar on

"Managing Agro-chemicals for Crop and Environmental Health"

February 25 & 26, 2022

The event is organized virtually using Zoom Platform and Google meet

Date 25.02.2022

Time (hrs)	Programme		Speaker
10.30	Welcome address	:	**Prof. Biswapati Mandal,** Secretary, SFE
10.35	Remarks of the President	:	**Dr. H. S. Sen,** President, SFE
10.40	Key points about the presentation	:	**Dr. S. Bhadra Roy,** EC Member, SFE
10.45	About the papers and Jury Members	:	**Dr. F. H. Rahman,** Org. Secretary
Meeting Link : https://us02web.zoom.us/j/84203875864?pwd=Y2pQOSthaVhwWUMyWlFXY1JFTUN1UT09 **Meeting ID: 842 0387 5864; Passcode: 778599**			
11.00	**Technical Session 1: Six Concurrent Sessions**		
Each presentation for maximum of 10 mins			

Abstract No.	Jury Panel	Meeting Link
Theme 1: ***Natural resources management for crop and environmental health,*** **Concurrent Session 1**		
3, 14, 20, 21, 32, 36, 42, 43, 45 49, 53, 56, 60, 67, 74, 77, 80, 111 122, 125, 130, 148, 151, 155, 157 160, 163, 165, 170, 178, 181, 184 189, 194	Dr. K. Sammy Reddy - Chairman, Dr. T. J. Purakayastha – Member Dr. A. R. Saha - Member Dr. Sanjoy Saha - Member Dr. Pradip Bhattacharya - Member	meet.google.com/tuf-jqvh-cqj
Theme 1: ***Natural resources management for crop and environmental health,*** **Concurrent Session 2**		
8, 15, 18, 31, 34, 52, 59, 72, 75 76, 88, 94, 97, 100, 104, 114, 118 120, 126, 129, 134, 138, 140, 143 149, 162, 166, 174, 182, 186, 191 197	Dr. S. S. Singh – Chairman Prof. B. K. Agarwal - Member Prof. D. Mukhopadhyay- Member Dr. U. K. Mandal -Member Dr. Amlan Ghosh - Member	meet.google.com/eft-hsdt-pjc
Theme 1: ***Natural resources management for crop and environmental health,*** **Concurrent Session 3**		
1, 4, 11, 12, 24, 26, 27, 28, 29, 38 39, 40, 46, 48, 71, 79, 81, 90, 93, 113, 132, 139, 141, 169, 172, 173 180, 183, 199	Prof. S. K. Pattanayak- Chairman Dr. Ashish Biswas – Member Dr. Biplab Saha - Member Dr. Anup Das - Member Dr. Pratap Bhattacharya - Member	meet.google.com/pur-nozu-esx
Theme 2: ***Agro-chemicals for protecting crops and environment,*** **Concurrent Session 1**		
2, 5, 10, 19, 30, 35, 41, 50, 54 57, 65, 73, 84, 87, 95, 96, 98, 99 101, 105, 110, 115, 116, 117, 119 127, 133, 136, 147, 167, 176, 188 190, 193, 199	Prof. Apurba Chowdhury -Chairman Dr. Kajal Kumar Biswas- Member Dr. Sanjay Kumar Das- Member Prof. M.R. Khan - Member Dr. Santanu Samanta - Member	meet.google.com/acr-qjdc-ibt
Theme 2: ***Agro-chemicals for protecting crops and environment,*** **Concurrent Session 2**		
16, 17, 22, 23, 58, 62, 64, 69, 70 78, 85, 86, 89, 91, 92, 109, 112 121, 124, 144, 145, 150, 154 159, 175, 185, 192, 198	Dr. Archan Kanti Das- Chairman Dr. Subir Nag- Member Dr. Mohan Biswas-Member Dr. Anirban Roy-Member Dr. Sanjay Naithani-Member	meet.google.com/xqa-evcd-itw
Theme 3: ***Allied agricultural activities vis-a-vis food security & environmental health***		
6, 7, 9, 13, 25, 33, 37, 44, 47 51, 55, 61, 63, 68, 82, 83, 102 103, 106, 107, 108, 123, 128 131, 135, 137, 142, 146, 152 153, 156, 158, 161, 164, 168 171, 177, 179, 187, 195, 196	Prof. Pravat Pal- Chairman Prof. Souvik Ghosh - Member Prof. Soumen Maitra- Member Dr. N. J. Maitra- Member Dr. Subhasish Mandal – Member	meet.google.com/omt-xsmy-ddo
16.00 hrs	Summing up and remarks by Chairman and Jury Members of each Concurrent Session of presentation	Respective link of Concurrent Session
16.30 hrs	Vote of Thanks to Jury Members and participants	

SOCIETY FOR FERTILIZERS AND ENVIRONMENT

16, Ellora Road (Canal Road), Kolkata- 700075

9th Annual Convention and National Webinar on

"Managing Agro-chemicals for Crop and Environmental Health"

February 25 & 26, 2022

Inaugural Session **The event is organized virtually using Zoom Platform**

February 26, 2022

Time (hrs)	Programme		Speaker
10:30	Welcome address	:	**Prof. Biswapati Mandal,** Secretary, SFE
10:35	Comments by the Guest of Honour	:	**Dr. S. K. Malhotra,** Former Agriculture Commissioner, Govt of India & Director, DKMA, ICAR
10:45	Admission of the Elected Fellows of the Society		
10:55	Release of Newsletter and Book of Abstracts	:	**Chief Guest and other dignitaries**
11:00	Inaugural address by the Chief Guest	:	**Dr. Trilochan Mohapatra,** Secretary, DARE and DG, ICAR
11:15	Presidential remarks	:	**Dr. H. S. Sen,** President, SFE
11:25	Declaration of results of Best Paper presentation		
11:30	Vote of thanks	:	**Dr. F. H. Rahman,** Organizing Secretary
Technical Session 2			
11.35	**6th Foundation Lecture** to be Chaired by the President, SFE	:	**Dr. Tapas Bhattacharyya** Former Vice-Chancellor, Dr. BSKKV, Dapoli
12.05	**4th Dr. N. P. Datta Memorial Lecture** to be Chaired by Dr. A. K. Singh, Vice-President, NAAS and Former DDG (NRM), ICAR	:	**Dr. Samar Datta** Division of Soil Science & Agricultural Chemistry, IARI, New Delhi
12.35	**Invited Lecture** to be Chaired by Dr. P. K. Ghosh, Vice-Chancellor and Director, ICAR-NIBSM, Raipur	:	**Prof. A. N. Mukhopadhyay** Former Vice-Chancellor, AAU, Jorhat
13.05	**Invited Lecture** to be Chaired by Dr. D. P. Patra, Former Senior GM, IIFCO	:	**Dr. Anand Gole** General Manager, R&D, Coromandel International Ltd.
13.35	Vote of Thanks	:	**Dr. F. H. Rahman,** Organizing Secretary
	Lunch Break (13.40 to 14.55 hrs)		
15.00	**Annual General Body Meeting of the Society**		

Note: Technical Session 1 Oral presentation of papers on 3 themes in 6 concurrent sessions on Feb. 25, 2022

The Zoom Link: https://us02web.zoom.us/j/86260386256?pwd=NVlqeUNmMlJwYWlFVWkvaE5QczhhZz09
Meeting ID: 862 6038 6256
Passcode: 507292

Invited lectures

26th February, 2022

Meeting ID: 862 6038 6256

Passcode: 507292

Foundation Lecture

Natural Resource Management, Information and Communication Technology (ICT) and New Agricultural Education Policy (NAEP): a Convergence Model

Tapas Bhattacharyya

Vice-Chancellor (Former), Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra (e-mail id: tapas11156@yahoo.com)

Abstract

Where soil is the backbone of agriculture and its allied sciences as the source of food and other essentials as a part of natural resources it is imperative to understand the soil and the natural resource research for its management. In view of modern technologies available with almost everyone in the form of mobile devices, Information & Communication Technology (ICT) is taking its progress by leaps and bounds. This trend of modernisms could be a boon for natural resource managers to spread the knowledge of the importance of soils as a medium of ecosystem service provider to one and all. Lack of manpower in disseminating agricultural technology can be overcome with the active participation of student community as a major power house of human resource. This student force could be armed with latest ICT gadgets to reach the farmers and bridge the gap between state agricultural universities (SAUs) and farming communities. This requires a shift and revision in the new agricultural education policy (NAEP). The present effort tries to find a link between the apparently different issues of soil science research, ICT and NAEP and to put these in the same page.

To fulfil our cherished dream and to make the future programmes effective we need highly motivated, and patriotic teachers and researchers selected by equally dedicated selectors with a strong motivation of nation-building. There is a scope for improved freedom for Vice-Chancellors and Chancellors of SAUs and Indian Council of Agricultural Research (ICAR) research Managers in terms of administrative, financial and developmental decision-making to make our dreams come true. This requires clean, clear and fair selection of the lowest to the highest ranking professionals. For effective extension of agricultural research to the farming community can we think about a completely different type of manpower? It might require fine-tuning the existing ones only.

Key words: Soil science, Information & Communication Technology (ICT), state agricultural universities, new agricultural education policy, Indian Council of Agricultural Research, student force

4th Dr. N.P. Datta Memorial Lecture

Nanoclay polymer composite - a potential control delivery system for agrochemicals

S C Datta

Former ICAR-Emeritus Scientist

Division of Soil Science and Agricultural Chemistry, ICAR-IARI, New Delhi

Nanoclay (montmorillonite) exfoliates during in situ polymerisation/ biopolymerisation reaction of acrylic acid and acryl amide (plus starch) in presence of cross linker, radical initiator and in nitrogen environment and adsorb strongly on polymer matrix. It makes a solid porous hydrophilic structure and when loaded with fertilizer or agro chemicals was found to release sorbed material slowly, rate of which depends on the clay percentage and other factors which can be controlled. Several greenhouse and field experiments have been carried out to show its supremacy over conventional application of agrochemicals.

To quote a few, in a leaching experiment use of fertilizer loaded Nanoclay (montmorillonite) -Polymer Composite (NCPC) was found to recover 62% more P and 38% more N than conventional DAP fertilizer. In a greenhouse experiment with Pearl Millet, use of NCPC enhanced N uptake by 32% and P uptake by 30% more than conventional DAP fertilizer.

In a laboratory incubation experiment application of P-loaded NCPC to soil was found to reduce P fixation. While direct addition of P resulted about 80% P fixation in soil, P-loaded NCPC application resulted as low as 20% P fixation. The effect is more pronounced in red soil and NCPC with 12% clay was most effective to reduce P fixation.

Zincated nanoclay polymer composites (ZNCPCs) having total Zn content 6.6% was prepared where Zn was added as Zn-citrate during polymerization reactions. Soil Zn application through ZNCPCs in comparison with conventional Zn sources ($ZnSO_4.7H_2O$) increased DTPA extractable Zn content in soils and in biomass. ZNCPCs also increased available P content as well as P uptake owing to solubilization of inorganic P through citrate action. It also increased mineralization of Organic-P through increase in acid and alkaline phosphatase activity.

NCPC loaded with herbicide metribuzin was found to release it for longer time than its sole application. Organic acid loaded NCPC @20kg/ha resulted same effect on yield as equivalent to addition of 60 kg P_2O_5/ha in a field experiment. NCPC @ 50% recommended dose of NP resulted statistically same yield as 100% NP through urea and DAP in a field experiment.

Research activities are going on to develop formulations containing optimum amount of nanoclay and using appropriate uploading process which will have crop specific optimum rate of release of agrochemicals.

Nanotechnology in Agriculture: Opportunities and commercial aspects

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Nanotechnology is an enabling technology. It is at the interface of basic sciences and Engineering. The physicochemical and optoelectronic properties of nanomaterials are different from their bulk counterparts. For instance, depending on the size and shape of nano gold, it can have different colors from red, blue to violet. Besides metals, semiconductors show size-dependent tunable band gap by simply changing the particle size and this results in fluorescence emission spanning the entire UV-Vis-NIR range. Besides unusual properties, due to the small size, high surface area and ease of surface modification, nanomaterials find applications in diverse areas such as sensing, imaging, electronics, catalysis, paints, food-nutrition, cosmetics, pharma etc.

While high-tech areas such as electronics and biomedical applications are the first to receive attention, it is equally important to conduct research and contribute to nanotechnology in the areas that have a direct impact on food, water and nutrition. This is especially important for the area of agriculture which faces phenomenal stress due to reducing arable land, increasing population that requires increased food production, soil quality degradation, increased and imbalanced use of Agri inputs, environmental concerns and other such pressing problems.

Some of the open questions that need to be addressed are: Can Nanotechnology provide solution for such problems, and that too at a lower cost (since the end customer is a farmer). Can the principles used for drug delivery be used to deliver nutrients to plants, more effectively? Can Nano Fertilizers and nano pesticides be effective in reducing the bulk fertilizer/pesticide usage? Will the farmer benefit with the use of nanotechnology? Will this technology be safe to use? Will its use have any impact on the environment?

I will briefly touch upon some of the above points, the commercial aspects for nano-Fertilizers, and some of the concerns on the use of nano products-in-Agri.

Abstracts for Webinar

Theme 1: Natural resources management for crop and environmental health

Concurrent Session 1: INM/ SSNM/RCT

Jury members for paper evaluation

Dr. K. Sammy Reddy - Chairman,

Dr. T. J. Purakayastha – Member

Dr. A. R. Saha - Member

Dr. Sanjoy Saha - Member

Dr. Pradip Bhattacharya - Member

meeting link:
meet.google.com/tuf-jqvh-cqj

Zinc availability in soils and its nutrition affected by conservation agricultural practices in rice-maize-cowpea cropping system

Ahana Dey and Sidhu Murmu

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Abstract

Conservation agriculture (CA) which is known as the future of agriculture, imparts soil resilience and also helps to do resource conservation. Despite the fact that conservation agriculture has various opportunities, there are few disadvantages too like- not much significant increase in productivity as compared to conventional agriculture during initial years of adoption. There are no such specific soil fertility management and fertilizer schedules especially for conservation agriculture which makes it harder for its promotion in our country. In this study we made a modest attempt to capture how the availability of zinc is affected by different intensity of conservation agriculture, and how the changes in availability in soil affects the Zn nutrition of crops under rice-maize-cowpea cropping system grown under different regimes of conservation agricultural practices during its initial stages of adoption. We observed that, soil Zn availability became a problem in the initial year of CA practices, particularly with higher addition of crop residue. But, after 3rd year of the experiment, Zn concentration of crops in both maximum vegetative stage and harvest stage did not fall below the critical concentration, like drop down in soils.

Keywords: Conservation agriculture, Soil Zn, cropping system

Conservation agriculture impacts on soil carbon sequestration: bed versus conventional planting

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Abstract

Despite many studies reported conservation agriculture (CA) impacts on soil organic carbon (SOC) sequestration, the impacts of long-term permanent bed planting under CA on SOC sequestration are rarely reported. Hence, this study assessed the permanent bed planted CA impacts on SOC sequestration rates in both surface (0-30 cm) and deep (30-60 cm) soil layers along with SOC pools under a cotton (*Gossypium hirsutum*)-wheat (*Triticum aestivum*) system in the Indo-Gangetic Plains (IGP). There were seven treatments: conventional tillage (CT), permanent narrow bed (PNB) and PNB with residue retention (PNB+R), permanent broad bed (PBB) and PBB with residue retention (PBB+R), zero tillage (ZT) and ZT with residue retention (ZT+R). Labile and recalcitrant C, permanganate-oxidizable C, water soluble C, total SOC concentrations and total SOC stocks were measured. Results indicated that the PBB+R plots had 5% and 9% lower bulk density than CT in 0-5 and 5-15 cm soil layers, respectively. The TOC content was 33%, 30% and 29% higher in residue retained plots (PBB+R, PNB+R and ZT+R) than CT plots in the surface layer. Regardless of the depth, ZT with residue addition improved the C stock of soil while CT had resulted in less SOC stock. In the surface layers (0-30 cm) the residue retained plots had 32%, 31% and 29% more carbon stock than CT plot and in the deep layers (30-60 cm) also these treatments had higher carbon stock compared to that of CT. WBC content of ZT was 16% more than CT in 0-5 cm soil layer but the residue retention had more impact to the carbon in soil, where PBB+R, PNB+R and ZT +R had 32%, 31% and 28% more WBC than CT in 0-5 cm depth. The labile and recalcitrant pools of carbon followed the same pattern, where the CA practices had increased the pools by about 30% in surface layer. The MBC content of PBB+R plot in 0-5 and 5-15 cm soil layers were 52% and 64% higher than CT respectively. Thus, the adoption of raised beds with residue retention has great potential in higher carbon sequestration in deeper layers and can be recommended for sustainable intensification of land.

Effect of site specific nutrient management and pruning intensity on growth and yield of lemon

Arkendu Ghosh*[1] and Koyel Dey[2]

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[2] Food Safety Officer, Lalbagh Sub-division, Murshidabad, Department of Health & Family Welfare, Govt. Of West Bengal

***Corresponding author Email: arkofruits@gmail.com**

Abstract

An experiment was conducted at Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal to study the effect of integrated nutrient management and pruning severity on yield and quality of lemon cv. 'Assam lemon' (*Citrus limon* Burm.). The experiment was laid out in two factorial Randomized Block Design with four levels of pruning, seven levels of nutrient, consisting recommended dose of fertilizers (RDF) and different combinations of organic manure (Vermicompost), inorganic fertilizer, bio-fertilizer (Azotobacter), mycorrhiza (VAM) and their interaction.The investigation revealed that all the vegetative parameters viz. trunk girth (32.74cm, 33.26cm and 33.13cm) and its percentage increase (1.25%, 2.88 % and 4.56%), canopy volume (85.22 m3 , 100.03 m3 and 125.84 m3) and its percentage increase (31.66%, 56.21% and 114.24%), number of laterals per primary shoot (9.53, 11.87 and 10.80) and its percentage increase (31.65%, 63.64% and 98.25%) and leaf chlorophyll content (1.45%, 1.94% and 2.56%) and its percentage increase (48.61%, 98.41% and 172.80%) was recorded best in highest level of pruning with 75% RDF + Vermicompost + Azotobacter + VAM at 6th, 12th and 18th month after pruning. Among the three season of cropping Ambebahar recorded the best result in respect to yield (total number of fruits/plant) followed by Mrig and Hasthbahar.

Keywords: Assam lemon, fruit production, nutrient management, yield.

Impact of integrated nutrient management on disease and pest incidence and Economics of okra (*Abelmoschus esculentus* (L.) Moench), variety Pusa A-4.

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Abstract

Field trial was conducted at the instructional farm of Krishi Vigyan Kendra Jajpur, Odisha during summer 2015 and 2016 to study the impact of integrated nutrient management on disease and pest incidence and economics of okra (*Abelmoschus esculentus* (L.) Moench) variety Pusa A-4. The experiment was laid out in randomized block design (RBD) with three replications and twelve treatments. Treatments involved were T_1 (100% RDF), T_2 (100% RDF + FYM 1.5 t / ha), T_3 (RDF (75%)+*Azotobacter* + *Azospirillum* + PSB (2kg/ha each), T_4 (RDF (75%) + (25%) N through FYM), T_5 (RDF (75%)+(25%) N through vermicompost), T_6 (RDF (75%) + (25%) N through poultry manure),T_7 (RDF (75%)+(25%) N through neem oil cake) ,T_8 (RDF (50%) + (25%) N through FYM+(25%) N through vermicompost) , T_9 (RDF(50%)+(25%) N through FYM+(25%) N through poultry manure), T_{10} (RDF (50%)+(25%) N through FYM+(25%) N through neem oil cake),T_{11} (25% N through FYM + 25% N through vermicompost + 25% N through poultry manure+25% N through neem oil cake),T_{12} (25% N through FYM + 25% N through vermicompost + 25% N through poultry manure+25% N through neem oil cake + sea weed extract 15kg/ha) where RDF was recommended dose of fertilizers (110:50:80 NPK kg/ha.). From the two years trials it was observed that application of RDF (75%) + (25%) N through neem oil cake (T_7) has significant effect on disease incidence and pest population by reducing incidence of YVMV from 31.62% to 18.79%, jassid population from 9.36 to 4.62 nymphs per three leaves, mite population from 9.28 to 5.68 per three leaves, white fly population from 11.21 to 4.53 per three leaves and fruit borer from 16.12 % to 6.16 %. Maximum number of fruits per plant 14.72 was recorded in T_7. Fruit yield per hectare varied significantly and was maximum with T_7 (9.99 ton) and was minimum with T_{11} (6.96 ton). T_7 (9.99 ton) and T_5 (9.44 ton) and T_{10} (9.29 ton) and T_2 (9.19 ton) were at par with each other. Combined use of 75 % RDF as inorganic fertilizer with 25 % RDF through neem oil cake (T_7) recorded highest gross income of Rs.1,39,785/-, net income Rs.80,302 /- per hectare and maximum benefit cost ratio 2.35.

Integrated Nutrient Management in Capsicum Cultivation

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*** ICAR-ATARI, Kolkata**

9th Annual Convention and A Webinar on "Managing Agro-chemicals for Crop and Environmental Health"

Theme: Natural resources management for crop & environmental health

Abstract

An experiment was conducted in the farmer's field of Purulia District in rabi season during 2019-20. The trial was conducted to study the effect of integrated nutrient management on growth and yield of capsicum in open field condition in the red and lateritic zone of Purulia, West Bengal. The experiment was designed with 4 treatments *viz*. T1: Farmer practice; T2: 100 % RDF; T3: Vermicompost @ 10 t/ ha; T4: VC 50% (5t/ ha) + 50% RDF replicated 10 times. Combined application of VC 50% (5t/ ha) + 50% RDF) recorded significantly higher values for fruit length (8.56 cm), fruit diameter (5.94 cm), no. of fruits/ plant (10.48), average fruit weight (95.64 gm) and yield per hectare (167.25 q/ ha). Chemical fertilizers as well as vermicompost when applied alone showed lesser growth and yield in respect to integrated application. Therefore, current study clearly indicates that integrated nutrient management proved to be the best approach for sustainable crop production as well as reducing environmental pollution.

Keywords: INM, capsicum, vermicompost, chemical fertilizers.

Groundnut productivity and different forms of soil acidity as influenced by integrated use of lime, organics, inorganic fertilizers, and bio-fertilizers in acidic soil of Tripura

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Abstract

A field experiment was carried out on acidic soil of Khowai district of Tripura during 2017 and 2018 to study the effect of application of various combinations of lime, farm yard manure (FYM), poultry manure (PM), and rhizobium with the recommended doses of NPK on groundnut (*Arachis hypogaea* L.) productivity and different forms of soil acidity. The experiment was conducted in a completely randomized block design with 13 treatments, each of which was replicated thrice. Soil samples were collected and analyzed to characterize their nature of acidity. The total acidity (TA), hydrolytic acidity (HA) and Exchange acidity (EA) were ranged from 0.87-1.33 cmol (p^+) kg^{-1} , 0.83-1.22 cmol (p^+) kg^{-1} **,** 0.03-0.12 cmol (p^+) kg^{-1} respectively. Results indicated that application of the recommended dose of NPK @ 20:60:40 kg ha^{-1} along with lime @ 1/5th Lime Requirement (LR), PM @ 5 t ha^{-1} and seed treatment with *Rhizobium* @ 20 g kg^{-1} of seed significantly decreased the TA, HA and EA which has resulted in increased seed yield of groundnut compared to the recommended dose of NPK alone as well as other treatments combinations. Thus, the integrated use of a recommended dose of NPK @ 20:60:40 kg ha^{-1} in combination with lime @ 1/5th LR, PM @ 5 t ha^{-1}, and seed treatment with *Rhizobium* @ 20 g kg^{-1} of seed may be recommended to the farmers in achieving higher groundnut productivity with better return in acidic soils of Tripura with reduction of different forms of soil acidity.

Keywords: Groundnut, yield, lime, organic manure, fertilizers, biofertilizers, soil acidity

Effect of Integrated Nutrient Management on Growth, Yield and Quality of QPM (*Zea mays* L.) in Gangetic plains of West Bengal

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Abstract

The field experiment was executed at Agricultural Research Farm, Baruipur, South 24-Pgns West Bengal under University of Calcutta during the R*abi* season of 2018-19 & 2019-20 to find out the 'Effect of Integrated Nutrient Management on Growth, Yield and Quality of QPM (*Zea mays* L.) in Gangetic plains of West Bengal'.The examination was carried out in RBD with three replications and 12 distinct treatments blended with organic & inorganic sources of nutrients under well irrigated alluvial soil.VMH-53 was the selected cultivar with prolific high yielding characteristics and disease resistant capabilities.Two continuous *rabi* season trails uncover that mix of various natural and inorganic wellsprings of supplements expanded the growth, productivity and quality of QPM hybrid.Treatment combination of (75% RDF @140:70:70 kg ha^{-1}) N:P:K + FYM 5 t ha^{-1} + Azotobactor @7.5kg ha^{-1} + PSB @7.5kg ha^{-1}) exhibited most efficient and economic than other treatment variables in terms of growth, quality, yield & yield ascribing characters over other treatments. The result suggest that in maize organic sources like FYM, Vermicompost, Azotobactor + PSB, could be effectively used in combination with chemical fertilizers to benefit the crop and improve soil health and soil fertility status there by increasing productivity, quality ensuring nutrition and food security.

Effect of integrated nutrient management on yield, Nutrient Uptake post- harvest soil properties of Brinjal (*Solanum Melongena*L.)

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Abstract

Afield study was conducted in *Rabi* season of year 2019-20 at experimental plot of KVK, Dhenkanal to study the "Effect of integrated nutrient management on yield, nutrient uptake and post-harvest soil properties of brinjal (*Solanum melongena*L.)" cv. Utkal Keshari. The field was laid out in randomized block design with seven treatments and three replications. The treatment detail is as T_1-Control, T_2-Soil Test Based Fertilizer Recommendation (STBFR),T_3-STBFR+FYM @ 5t/ha,T_4-STBFR + Vermicompost @ 2.5 t/ha, T_5-STBFR +Consortia Biofertilizer@12 kg/ha, T_6-75 % STBFR + Vermicompost @ 2.5 t/ha, T_7- 75%STBFR+Consortia Biofertilizer @12 kg/ha. Obtained result indicated that application of75 %STBFR+ Vermicompost @ 2.5 t/ha provided highest plant ht (80.2 cm), no of clusters /plant (12.0), avg. fruit wt. (45g), no. of fruits/cluster (9.1) respectively. Highest fruit yield of (37.8 t/ha) and Benefit-Cost ratio (3.25) was also obtained from T_6which was at par with T_7, but significantly superior to other treatments. The highest nutrient uptake (48.0 kg/ha, 9.8 kg/ha, 62.0 kg/ha of N, P, K respectively) and post-harvest soil status of 258.0, 12.5 and 168.0 kg/ha of N, P, K are also found to be highest in T_6 which was superior than rest other treatments. As vermicompost contains microsites rich in available carbon and nitrogen and Worm cast injected soils are also rich in water soluble phosphorus and contains two to three tones more available potassium than surrounding soils, it encourages better plant growth and improves the soil physical, chemical and biological properties of post-harvest soil.

Keywords: STBFR, Consortia Bio fertilizer, Vermicompost, Post-harvest soil properties

Influence of different nutrient management practices on soil carbon pools in jute-rice-lentil System

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Abstract

Imbalanced fertilization not only limit crop growth but also affects soil quality, fertilizer use efficiency, nutrient balance, microbial ecology, enzymatic activity and overall sustainability, Fertilizer recommendations based on soil test targeted yield approach is found to be the best as compared to other approaches in maximizing yield and maintaining soil quality with optimum fertilizer application. Hence, the impacts of long term soil test based nutrient management on soil carbon pools under Jute-Rice-Lentil cropping system in sub-tropical India was studied to evaluate the capacity of long term soil test based nutrient prescription management practices on carbon dynamics and soil quality to achieve sustainable crop yield with less environmental costs. Ten different nutrient management treatments were laid out in a randomized block design with three replications. In the present study, the total soil organic carbon (TSOC) content of soil varied from 9.71 ± 0.21 to 11.20 ± 0.12 g kg $^{-1}$ under different nutrient management treatments. Results revealed that treatment where combination of inorganic fertilizer based on soil test and targeted yield approach, organic manure (FYM) and bio-Inoculants were applied recorded highest total soil organic carbon, potassium dichromate oxidizable organic carbon, microbial biomass carbon and potassium permanganate oxidizable carbon ($KMnO_4$,-C) although the highest yield was achieved with precise application of mineral fertilizers based on initial soil test values for achieving the highest target yield . The $KMnO_4$,-C in soil varied from 12.6 to 13.8% of TSOC. The highest CM value (129) was obtained in the treatment with integrated application of balanced fertilizes based on soil test and targeted yield (T6). C sequestration rate in the study varied from 0.015 to 0.16 Mg C ha^{-1} yr^{-1} under different treatments, Results indicated that integrated application of balanced fertilizes based on soil test and targeted yield in intensive cropping system like jute-rice-lentil system could be considered as the sustainable management option for crop production.

Keywords: long-term experiment; carbon management index; carbon sequestration; nutrient dynamics; jute- ripe-lentil

Phosphorus availability in soils and its nutrition affected by conservation agricultural practices in rice-maize-cowpea cropping system

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Abstract

Present scenario of global warming and climate change affects farmers and peoples who are dependent on agriculture for livelihood due to erratic rainfall and temperature changes. Food security is threatened and urges scientists and policy makers for transforming and reorienting agricultural practices so that it provides resilience and resource use efficiency of agricultural systems. Conservation agriculture (CA) which is regarded as the future of agriculture, imparts such resilience and resource conservation. Despite the fact that conservation agriculture has various opportunities, there are few obstacles also. One such obstacle is that there is not much significant increase in productivity as compared to conventional agriculture. There are no such specific soil fertility management and fertilizer schedules specially for conservation agriculture which makes it harder for its promotion in our country. In this study we tried to investigate whether there is starvation for Phosphorus (P) nutrition for rice-maize-cowpea cropping system grown under different regimes of conservation agriculture during its initial stages of adoption. We observed that treatments with partial CA with low to medium level of P addition itself maintained P concentration in soils and crops on par with conventional agriculture. There was significant increase of P content of crops at 3rd year of the experiment. There was also an increase in organic P and P related enzymatic activities with CA practices.

Effect of Integrated Nutrient Management practices on growth and yield of Groundnut

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Abstract

A field experiment entitled "Integrated nutrient management in rabi groundnut (Arachis hypogaea L.)'' was carried out during *Rabi* season of 2019 and 2020. The experiment comprising 8 treatments of nutrient management viz., T1 (control),T2 (100% RDF(20-40-40-45kg N-P_2O_5-K_2O-Sha^{-1}),T3 (100% RDF + BF), T4 (75% RDF+BF), T5 (75% RDF + 25% N through FYM+BF), T6 (50% RDF + 50% N through FYM +Biofertilizer), T7 (75% RDF + 25% N through FYM), and T8 (25% RDF + 75% N through FYM) were evaluated in randomized block design with three replications. The experimental soil was sandy loam in texture, low in N, medium in available P, K and low in S. Groundnut variety 'Kadiri 6' was tested in the experiment. The experimental results revealed that significantly higher values of growth parameters viz., plant height, number of branches plant-1, number of root nodules plant-1 ; yield attributes viz., number of mature pods, pod weight plant-1 and yield viz., pod yield (2325 kgha-1) and haulm yield (2986 kgha-1) were recorded under the application of 75% RDF + 25% N through FYM + Biofertilizer followed by 50% RDF + 50% N through FYM +Biofertilizer and significantly at par results were found out in treatments 100% RDF + BF, 75% RDF+BF.

Keywords: Groundnut, INM, Biofertilizers, Growth, Yield

Effects of Long-term Use of Conservation Agricultural Practices on Crop Yields, Sustainable Yield Index (SYI), Rain Water Use Efficiency (RWUE) and Soil Organic Carbon under Sorghum [*Sorghum bicolor* (L.) Moench] and black gram [*Vigna mungo* (L.) Hepper] System in Rainfed Alfisol

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Abstract

The Alfisol soils of rainfed regions are not only thirty but hungry too. As these soils are low in organic C and soil fertility and poor in overall soil quality, consequently, result in low crop yield and yield sustainability. In order to improve the crop yields and their sustainability, a long-term study comprising of tillage [conventional (CT) and minimum (MT)] and residue retention treatments was conducted under sorghum–black gram system in Semi-Arid Tropical (SAT) Alfisol at Hyderabad, India. The results of the study revealed that when averaged over residue retention, the minimum tillage (MT) recorded 12.32 % and 5.32 % higher sorghum and black gram grain yield and 18.95 % and 25.61 % higher sustainability yield Index (SYI) respectively, over conventional tillage. The Rain Water Use Efficiency (RWUE) in MT was 12.26 % and 5.17 % higher over conventional tillage (CT) in sorghum and black gram crops, respectively. Similarly, when averaged over tillage levels, the 100 % (S2) and 50 % (S1) residue retention recorded 33.16 and 16.16 and 32.18 and 14.88 % higher sorghum and black gram yield respectively and 26.0 and 9.0 and 48.0 and 22.0 % higher SYI over no residue retention (S0) , in sorghum and black gram, respectively. Whereas, the increase in RWUE under S2 and S1 levels over S0 level was 33.19 and 16.23 % in sorghum and 31.41and 14.53 % in black gram crop. The order of performance of the residue retention treatments in terms of pooled yield of sorghum was: 100% residue retention (S2) of previous year black gram crop (2039 kg ha^{-1}) > 50% residue retention (S1) (1779 kg ha^{-1}) > no residue retention (S0) (1532 kg ha^{-1}). Similarly, the order of performance of residue retention treatments in terms of black gram pooled yield was: previous year sorghum residue retention at 60 cm height (S2) (382 kg ha^{-1})> retention at 35 cm height (S1) (332 kg ha^{-1}) > no residue retention (S0) (289 kg ha^{-1}). Tillage did not significantly influence SOC at 0-7.5 cm soil depth; however, the SOC at this depth under minimum and conventional tillage was 5.02 and 4.80 g kg^{-1}, respectively. The higher level (100%) of residue retention maintained significantly higher amount of SOC (5.33 g kg^{-1}) followed by low (50%) residue retention (4.84 g kg^{-1}) and control (4.56 g kg^{-1}). However, at 15-30 cm soil depth, tillage and residue application both significantly influenced the SOC.

Keywords: Alfisols, conventional and minimum tillage, residue retention, sustainable yield index, rainwater use efficiency, SOC.

Study on effect of fertilization & vine plantation on pollination, fruit setting, growth and yield of pointed gourd cv. Local grown in terai zone of West Bengal

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Abstract

The present investigation was carried out at farmer's field of KVK Jalpaiguri, Ramshai, West Bengal during the period 2018-20 to study the effect of different balanced fertilization along with proper Vine plantation to improve the pollination, fruit setting, growth, yield and productivity of pointed gourd in Terai zone of West Bengal. The experiment were laid in Randomized Block design with three treatments and eight replication each viz. FP (Farmer's practice): Improper ratio of male: female vine in the field with no recommended fertilizer scheduled, TO (Technology Option) 1: Proper maintenance of male: female vine ratio (1:9) + RDF (NPK 120-60-60 kg/ha) and TO (Technology Option) 2: Proper maintenance of male: female vine ratio (1:9) + Enriched vermicompost (15 q/ha) along with NPK (19:19:19) spray in ten demonstration units. Results from the experiment revealed that the average yield of pointed gourd obtained under TO 2 was 153.40 q/ha which was 26% higher than yield achieved under farmers practice (113.45 q/ha). Proper vine ratio of 1 male for 9 female along with Enriched Vermicompost application and spray of liquid N:P:K resulted in better pollination and fruit setting which improved the productivity and yield attributes for pointed gourd with a B:C ratio was 2.66 while under farmers practice B: C ratio was 2.20. Thus, it can be concluded that treatment TO 2 can improve the fruit setting, yield, economics of production of pointed gourd cv. Local and also increase the vine longevity and fertility status of soil under Terai zone of West Bengal.

Keywords: Pointed gourd, Fertilization, Vine planting, Pollination, Yield, Economics, Terai

Precision nitrogen management in maize under conservation agriculture-based maize-wheat: A step towards improving crop performance and productivity

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Abstract

Without effective and need-based implementation of a fourth principle i.e., 4R-nutrient management stewardship, the success of conservation agriculture (CA) is limited (Vanlauwe et al., 2014). In recent years nutrient and water management through sub-surface drip fertigation (SSDF) in cereal crops have provided excellent opportunities for improving resource use efficiencies as well as crop performance. Therefore, a field experiment was conducted in maize under medium-term CA-based maize-wheat system at BISA-CIMMYT, Ladhowal, Punjab in *Kharif* 2018 and 2019 to investigate potential complimentary benefits of bundling CA with SSDF (CA+) on crop performance and productivity. Altogether four treatments comprising of two CA+ treatments: residue retained permanent bed (PB) coupled with SSDF at two N rates 120 and 150 kg ha^{-1}, namely CA+-N120 and CA+-N150 were compared with CA [i.e., residue retained-furrow irrigated (FI)-PB with 120 kg N ha^{-1}] and a conventional tillage (CT) [CT using FI without crop residue-120 kg N ha^{-1}]. CA+ treatments recorded significantly higher photosynthetic nitrogen use efficiency (PNUE) than the CT both at both knee-high and silking stage while at only silking stage in CA plots. Highest grain nitrogen uptake (112 kg ha^{-1}) was recorded in CA+-N150 followed by CA+-N120. Almost similar N uptake (~ 81 kg ha^{-1}) was recorded in CA and CT plots which was 18% lower than CA+-N120. Highest grain yield (GY) was recorded in CA+-N150 (8.20 t ha^{-1}) followed by CA+-N120 (7.46 t ha^{-1}). The GY of CA+N120 was 15 and 18% higher than CA and CT, respectively. Therefore, CA coupled with SSDF [CA+ technology] provides tangible benefits in terms of PNUE, N uptake and GY.

Keywords: Conservation agriculture, N uptake, PNUE, Precision N management, Subsurface drip Fertigation,

Effect of Different Sources of Nutrient and Nutrient Levels on soil health in a Vertisol

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Abstract

Aim- Determine the effect of different sources of Nutrient and Nutrient Levels on soil health parameters viz. soil organic carbon, very labile, labile and less labile organic carbon, dehydrogenase activity, soil microbial biomass carbon, CO_2 evolution in a Vertisol.

Methodology- Field experiments were conducted during *Rabi* season of 2018-19 and 2019-20 with three sources of nutrient *viz.,* inorganic, organics (FYM, VC and biofertilizers) and integrated source (50% inorganic + 50% organics) of nutrient as main treatments and five levels viz. control (0-0-0 kg NPK ha^{-1}), 100% NPK (120-60-40 kg ha^{-1}), 150% NPK (180-90-60 kg ha^{-1}), 200% (240-120-80 kg ha^{-1}) and Soil Test based (STV) NPK (149-176-33 kg ha^{-1}) in split plot design with three replications.

Results- The application of organic source of nutrient significantly increased the soil organic carbon, very labile, labile and less labile organic carbon, dehydrogenase activity, soil microbial biomass carbon, CO_2 evolution over inorganic source of nutrient but the organic source was found at par with integrated source of nutrient during both the years.

Among the different levels of NPK the application of 150% NPK significantly increased very labile OC over 100% NPK during second year and less labile OC during both the years. While the application of 200% NPK significantly increased SOC over 100% NPK during second year. However, the application of 200% NPK was found significant over STV based NPK during first year but the levels were found at par during second year for dehydrogenase activity. On the other hand for the soil microbial biomass carbon the application of 150% and 200% NPK were found significant over STV based NPK level during first year. Application of 150% NPK level was found significant over 100% NPK during first year but higher level were found at par among themselves for CO_2 evolution.

Studies on the residual effect of integrated nutrient management of *kharif* rice on lentil in old alluvial zone of West Bengal

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Abstract

A field experiment was conducted during *kharif* season of 2018-19 and 2019-20 at the Instructional Farm of Dakshin Dinajpur Krishi Vigyan Kendra, Uttar Banga Krishi Viswavidyalaya, Majhian, Patiram, Dakshin Dinajpur, West Bengal to study the effect of integrated nutrient management in *kharif* rice and its residual effect on growth and yield of lentil. The experiment was laid out in randomised block design consisted of seven treatments with three replications. Plant height at maturity (38.27 cm) varied significantly with application of 50% chemical fertiliser + 50% vermicompost in preceding crop rice. Dry matter accumulation of lentil was increased progressively from 30 DAS and upto 90 DAS. The highest value of dry matter accumulation (2687 g m-2) was noticed in application of 50% chemical fertiliser + 50% vermicompost. Highest crop growth rate was found between 60-90 DAS (8.97 g m-2 day-1) with application of 50% chemical fertiliser + 50% vermicompost. Seed yield (1368 kg ha-1) and stalk yield (2529 kg ha-1) was recorded highest in application of 50% chemical fertiliser + 50% vermicompost and the result was statistically significant. After two years of field experiment the total gain of soil nitrogen was recorded highest (6.17 kg ha-1) in application of 50% chemical fertiliser + 50% vermicompost. However, considering economics of lentil cultivation highest B:C ratio (2.13) was observed with application of 50% nitrogen + 50% azolla in preceding crop of *kharif* rice.

Integrated nutrient management practice improves the productivity and soil quality in rice in NICRA villages of Ganjam

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Abstract

A field experiment was conducted in farmers' fields of NICRA villages (Nada, Chikili, Chopara and Lepa) of Krishi Vigyan Kendra, Ganjam-I during *kharif* season of 2019-20 in a randomized block design (RBD) taking five number of treatments and seven replications taking each farmer as one replication. Five integrated nutrient management practice treatments i.e. T1- RDF (80-40-40 kg N-P_2O_5-K_2O/ha), T2-100% RDF + 5 t FYM/ha, T3-75 % RDF + green manuring, T4-100 % RDF+ 2.5 t/ha vermicompost and T5-100% RDF (P and K as basal and N as per LCC <4) + 5 t FYM/ha and Pooja as test crop were taken for the experiment. The soil was sandy loam in texture with slightly acidic in reaction(pH 5.82), low in available N (198.6 kg/ha) , medium in available P (18.9 kg/ha) and medium in available K (200.9 kg/ha). From the result, it was concluded that, the treatment receiving 100% RDF (P and K as basal and N as per LCC <4)+ 5 t FYM/ha produced higher number of ear bearing tillers/m^2 (259.0), grains/hill (204.5) being at par with 100% RDF + 5 t FYM/ha. The lowest values were recorded from 100% RDF treatment. Also application of 100% RDF (P and K as basal and N as per LCC <4) + 5 t FYM/ha recorded the highest grain yield (4384 kg/ha), straw yield (4796.5 kg/ha) and harvest index (53.1%) compared the other treatments. This INM practice also improved the soil nutrient status of soil compared to other treatments.

Study of Response of Zinc Application in Medium Land Rice under Sub-Tropical Climatic Condition

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Abstract

A field experiment was conducted during 2019-20 and 2020-21 on rice in KVK adopted villages Bhansar and Achyutadaspur to study the response of Zinc application in rice crop. Two levels of zinc 2.5 and 5 kg ha^{-1} with control were studied with the basal dose of N, P_2O_5, K_2O as 80:40:40 kg ha^{-1} in the form of urea, DAP, MOP and zinc sulphate in rice crop. Rice varieties viz. Swarna Sub-1(IR 05 F 102) and Pooja (IET-12241) were planted in RBD design with three replications. Results concluded that Zn application has significantly affected grain yield. Rice yield was significantly increased by Zn application which ranged from 4.5 to 4.8 t ha^{-1} from the farmer practice from 3.9-4.2 t ha^{-1}.The highest yield was obtained from 100% NPK + FYM (5 t ha^{-1}) + 2.5 kg Zn ha^{-1}. Similarly, Zn application was also affected significantly to the yield parameters of rice like the number of effective panicles m^{-2}, number of effective panicles $hill^{-1}$, panicle length, plant height and 1000 grain weight over control from the above said treatment. The concentration of zinc in soil was significantly affected by the application of zinc in rice, ranged from 0.41- 0.93 mg kg^{-1}. The highest concentration in soil was recorded by the cumulative application of 100% NPK + FYM (5 t ha^{-1}) + 2.5 kg Zn ha^{-1} while lowest from control. The direct application of 100% NPK +5 kg Zn ha^{-1} and 100% NPK + FYM (5 t ha^{-1}) + 2.5 kg Zn ha^{-1} gave an increase of 15.38 and 23.07% over control, respectively. The application of 100% NPK + FYM (5 t ha^{-1}) + 2.5 kg Zn ha^{-1} can be recommended for economical production in rice crop.

Keywords: *Rice, zinc, growth, yield*

9th Annual convention and national webinar on "Managing agro-chemical for crop and Environment health"

Theme area: 1. **Natural resources management for crop & environmental health**

Title: Organic farming for sustainable Agriculture and Horticulture crops production

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Abstract

Organic farming is the combination of science and art of growing agronomy crops, fruits, vegetable, flowers, plantation, spice, medicinal and aromatic plants by following the essential principles of organic Agriculture and Horticulture in soil building and conservation, pest-management. In modern era, increasing pollution levels in every sphere of life is the key challenge in sustainable development of our environment. Increasing demands and lavish life style of people causes environmental deterioration by application of huge amount of chemical application; behind this region our Agriculture and Horticulture sector with environment fully affected. Today in Agricultural practices such as use of chemical fertilizers, synthetic pesticides etc. to maximize crop yield contributes in environmental pollution. These formulas ultimately destroy the nutrient balance of soil so, therefore reduce soil fertility and another side it also harmful aquatic animals like fish, livestock animals and human also affected. Organic farming is the one and only way to overcome this problem. Organic farming provides a natural way of crop cultivation by using environment friendly, animal and plant based local organic resources that are highly enriched in nutrients required for crop plants. It enhances the microbial activities and increases soil health. Organic farming is an efficient and promising agricultural approach for environmental sustainability as it provides yield stability, improved soil health, no environmental concerns, organic food and reduction in the use of synthesized fertilizers. Organic farming has several scientific approaches to reduction of environment pollution and restores nutrient balance and food security. Approach of the organic farming is Organic manure, Crop rotation, Vermi-composting, Nitrogen fixing microorganisms, organic residue, crop residue, bio fertilizers, bio pesticides, kitchen waste, sludge and biogas.

Keywords: Organic farming, Agriculture and Horticulture, environment Pollution

Effect of Crop Residues and Phosphorus Fertilization on Soil Phosphorus Fractions under Conservation Agriculture

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Abstract

Phosphorus (P) is one of the most essential plant nutrients, as well as have low use efficiency (15-20%) in soils. Excessive application of P fertilizer may lead to its accumulation in soil and cause environmental problem due to leaching. Significant amounts of P can be present in crop residues and its potential contribution to P nutrition of crops could be significant. Presently, there is no distinct and clear fertilizer guidelines for conservation agriculture (CA) that retains a large amount of crop residues. The present investigation focuses on quantification of the P accumulation from residues and fertilizers and their impact on different P fractions for predicting and optimizing the P fertilizer application rate. A field experiment on CA was started during *kharif* 2013 in the research farm of ICAR-IARI, New Delhi. The experimental field was laid out as a split-plot design with four treatments of residues (R_0: No residue, R_1: 2 tons residue/ha, R_2: 4 tons residue/ha and R_3: 6 tons residue/ha) as main-plots and five combinations of P treatments (P_0: No P fertilizer, P_1: 50% of RDP, P_2: 100% of RDP, P_3: 150% of RDP and P_4: 50% of RDP + AM + PSB) as sub-plots. After five cropping cycles, representative soil and plant samples were collected to perform various chemical analysis. The P accumulation in soil was estimated through P apparent balance (PAB) calculated using total P input (crop residues and commercial P fertilizer) minus total P uptake by crops. The result showed that distribution of soil P fractions showed that the relative abundance was as follows: residual-P (32.1%) > HCl- P (27.8%) > NaOH-Po (22.2%) > $NaHCO_3$-Po (9.06%) > NaOH-Pi (6.28%) > NaHCO3-Pi (1.39%) > WSP (1.11%). The TPi and TPo represented 36.6 and 31.3% of Pt, respectively. In general, all P fractions increased with increasing PAB. Surface residue retention in conjunction with optimum fertilization showed best results. This study improved the understanding of P transformation and buildup in soil and hence can prove useful in rationalizing P management practices under CA based cropping systems.

Methodology

An ongoing field experiment on CA started in *kharif* 2013 in the research farm of ICAR- Indian Agriculture Research Institute (IARI), New Delhi situated at 28° 37' - 28° 39 N' latitude, 77° 9' - 77° 11' E longitude and 228 m above mean sea level was chosen for the present study. The climate is semi-arid, subtropical with average rainfall of 788 mm, mainly received during monsoon months of July to September. The experimental soil represents north-western part of Indo-Gangetic plain of order Inceptisol and taxonomically classified as Typic Haplustept. The soil is alluvial, sandy loam in texture with low CEC, alkaline in reaction (pH- 8.53), non- saline (EC- 0.45 dS m^{-1}) and medium in Walkley-

Black carbon content (0.32%). The experimental field was laid out as a split-plot design with four treatments of residues (R_0: No residue, R_1: 25% residue retention, R_2: 50% residue retention and R_3: 75% residue retention) as main-plots and five combinations of P fertilizers (P_0: No P fertilizer, P_1: 50% of RDP, P_2: 100% of RDP, P_3: 150% of RDP and P_4: 50% of RDP + AM + PSB) as sub-plots. Soil test based recommended dose of fertilizer of N: P_2O_5: K_2O was 150-80-60 kg ha^{-1} for maize. After five cropping cycles, representative soil and plant samples were collected from each 20 plots. The collected soil samples from depth 0-5 cm was air-dried and processed (<0.2 mm) to perform soil analysis. The available soil P content was determined using Olsen (1934). Sequential P fractionation scheme of Sui *et al.* (1999) was used to extract seven soil P fractions *viz*. Water soluble P (WSP), $NaHCO_3$-Pi, $NaHCO_3$-Po, NaOH-Pi, NaOH-Po; HCI-P, and residual-P). The P accumulation in soil was estimated through P apparent balance (PAB) calculated using total P input (crop residues and commercial P fertilizer) minus total P uptake by crops. The data were analyzed as per ANOVA of split plot design using SAS 9.1 software. The least significant difference (LSD) test was used to decipher the effect of treatments at 5% level of significance (p=0.05). The distribution of soil P fractions showed that the relative abundance was as follows: residual-P (32.1%) > HCl- P (27.8%) > NaOH-Po (22.2%) > $NaHCO_3$-Po (9.06%) > NaOH-Pi (6.28%) > NaHCO3-Pi (1.39%) > WSP (1.11%) (Fig.3.1). The TPi and TPo represented 36.6 and 31.3% of Pt, respectively. Residue retention and P fertilization under CA has a prominent effect on soil P fractions, mainly labile pools which contributed mainly to improving soil P supplying capacity and P balance.

Results

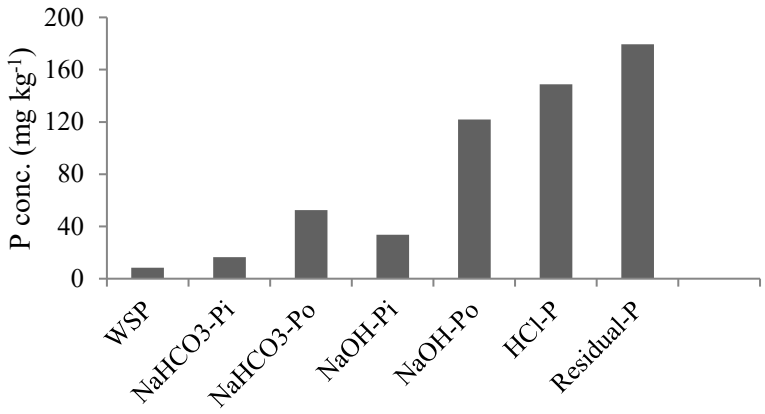
In this study, the application of P fertilizer increased the concentration of all P fractions at surface soil depth. The WSP, $NaHCO_3$-Pi and $NaHCO_3$-Po constituted labile P pool. The WSP ranged between 6.27 and 10.76 mg P kg^{-1}, the sorbed P ($NaHCO_3$-Pi) constituted between 8.9 and 23.84 mg P kg^{-1} and the easily mineralizable Po ($NaHCO_3$-Po) ranged between 42.53 to 63.49 mg P kg^{-1}. The effect of residue retention was apparent with highest labile P (9.87, 21.04 and 61.6 mg kg^{-1} for WSP, $NaHCO_3$-Pi and $NaHCO_3$-Po, respectively) under treatment R_3 with 75% of residue retention. On the other hand, P fertilization also showed prominent effects with higher labile P content under treatment P_3, while P_2 and P_4 remained at par with each other. The NaOH-Pi and NaOH-Po constituted moderately labile pools which are potentially available to crops. Both the NaOH-Pi and NaOH-Po fractions were significantly influenced by residue retention and the concentration of NaOH-Po was greater than NaOH-Pi in all treatments up to 3.5-folds. It showed almost a same trend as labile P pool with highest value under treatment R_3 (41.55 and 139.31 mg kg^{-1}) and P_3 (139.31 and 135.98 mg kg^{-1}) for NaOH-Pi and NaOH-Po, respectively. The HCl-P and residual-P are recalcitrant P fractions considered poorly labile and not easily accessed by plants. These pools also showed a same trend as other P fractions and showed an increase in concentration with increased P application as well as residue retention. The distribution of soil P fractions showed that the relative abundance was as follows: residual-P (32.1%) > HCl- P (27.8%)

> NaOH-Po (22.2%) > $NaHCO_3$-Po (9.06%) > NaOH-Pi (6.28%) > NaHCO3-Pi (1.39%) > WSP (1.11%) (Fig.3.1). The TPi and TPo represented 36.6 and 31.3% of Pt, respectively.

Table 1. Averaged values of P pools (mg kg^{-1}) in soil under effect of residue retention and P management options

Treatments	Labile P	Moderately labile P	Non-labile P	Total P
Main-plots: Residue retention				
R_0	64.01	130.47	283.10	477.57
R_1	71.84	146.75	314.44	533.03
R_2	80.96	163.71	349.39	586.63
R_3	92.51	180.86	380.05	647.12
Sub-plots: P fertilization				
P_0	57.70	132.96	233.41	419.59
P_1	67.03	147.91	274.56	481.36
P_2	81.84	160.70	359.35	625.81
P_3	98.09	175.68	417.25	691.24
P_4	82.00	159.98	366.80	611.22

Fig.3.1. Average distribution of various P fractions in surface soil



Conclusion

Residue retention and P fertilization under CA has a prominent effect on soil P fractions, mainly labile pools which contributed mainly to improving soil P supplying capacity and P balance. Surface retention with residue in conjunction with optimum fertilization showed best results. In general, all P fractions increased with increasing PAB. The results of this study would enhance the understanding of P transformation and buildup in soil and hence prove useful in rationalizing P management practices.

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Soil nutrient balance under of tillage and residue management in Jute based cropping systems

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Abstract

Long-term changes in soil nutrient status were evaluated in important Jute based cropping systems subjected to various tillage systems *i.e.,* conventional tillage (CT), no tillage (NT) and no tillage with additional crop residue retention (NT+R) in Lower Indo-Gangetic plains. Additional crop residues were applied as *Sesbania* spp. during sowing of jute @ 2 t/ha. Available nutrient (N, P and K) contents in soil (0-60 cm soil depth) and crop uptakes were measured at the end of 6 year crop cycle following the standard methodology and nutrient balance were calculated. Higher amount of nutrients was added through no tillage with additional crop residue (NT+R). The highest amount of nutrient availability was found in NT+R (N: 338.01; P: 44.21 and K: 179.24 kg/ha, respectively) as compared to NT and CT. Similarly, the crop uptake was also highest in NT+R (N: 84.72; P: 28.90 and K: 77.28 kg/ha, respectively). The nutrient balance sheet showed that there was a positive nutrient balance in all the tillage treatments with highest positive balance in NT+R (N: 195.89; P: 28/02 and K: 134.17 kg/ha, respectively). Significant positive nutrient balance under NT+R may be attributed with the application of additional crop residues of *Sesbania* sp. having high N, P, K contents. Addition of crop residue improved soil bulk density, soil organic carbon (SOC), particulate SOC content (PSOC) and aggregate stability irrespective of tillage, promoting a better root-zone hydro-physical regime. Thus, no tillage with residue incorporation (NT+R) under Jute-rice-lentil system is highly beneficial in maintaining sustainability and improving soil nutrient status in Lower Indo-Gangetic plains.

Keywords: No tillage, residue management, soil nutrient balance, Jute based cropping, Indo-Gangetic plains

Effect of irrigation scheduling, chemical fertilizers and organic manure on yield and water use efficiency of green gram (*Vignaradiata* L.) in coastal soil of West Bengal.

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Abstract

Green gram have the potential to be included in the present farming system of India for improving soil fertility. The field experiments were carried out at the Instructional Farm, Regional Research Station Kakdwip, Bidhan Chandra Krishi Viswavidyalaya, Kakdwip, South 24 Parganas, West Bengal during the *kharif* season of 2012-13. The topography of the land, where the investigation was carried out was medium in situation endowed with good drainage facility. The soil of the experimental field was sandy loam in texture. Initial composite soil samples were collected from the experimental plot and analyzed.Recommended dose of chemical fertilizers was applied @ 20-40-20 kg of N, P_2O_5, K_2O per ha in the form of urea, single superphosphate and muriate of potash, respectively during sowing. FYM (0.6% N, 0.3% P_2O_5, and 0.8% K_2O) was also applied as basal.The highest seed and stover yield of crop was obtained from irrigation schedules at vegetative, flowering and pod formation stages with 5 cm depth each, but was at par with irrigation schedules at flowering and pod formation stages. Significantly the lowest yield of seed and Stover was recorded with one irrigation applied at flowering stage and was inferior to other two irrigation schedules. Similarly, application of recommended dose of NPK chemical fertilizers and FYM either alone or in conjunction gave the significantly higher yields as compared with control without addition of any mineral or organic fertilizer.The interaction effect between irrigation schedule and nutritional level on seed yield was also significant. However, maximum yield of 784 kg/ha was recorded with irrigation schedule at vegetative, flowering and pod formation stage with combined application of recommended dose of chemical fertilizers and FYM, and it was comparable with the seed yield of 7.32 kg/ha receiving from irrigation schedule at flowering and pod formation stage with application of recommended dose of chemical fertilizers.The higher water use efficiency of crop was obtained at lower amount of water application and vice-versa.However, application of single irrigation at flowering stage of crop provided with recommended mineral fertilizers + FYM registered the maximum water use efficiency of 5.50 kg/ha-mm.

Keywords: Green gram, Irrigation Schedule, Chemical fertilizer

Growth and yield of pointed gourd (*Trichosanthes dioica* Roxb.) as influenced by different levels of fertilizer and plant spacing

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Abstract

Crop Management especially different levels of fertiliser and plant spacing is very important factor for proper growth and development of crop resulting higher yield. To find out the optimum levels of fertiliser and suitable spacing for maximum pointed gourd production, an experiment was conducted during 2019-20. This experiment was laid out in factorial RBD with 16 treatment combinations replicated thrice which are: (T_1)- F_1S_0 : 75% RDF + 1.0m x 0.5m, (T_2)- F_1S_1 : 75% RDF + 1.0m x 1.0m, (T_3)- F_1S_2 : 75% RDF + 1.5m x 1.5m, (T_4)- F_1S_3 : 75% RDF + 1.5m x 1.0m , (T_5)- F_2S_0 : 100% RDF +1.0m x 0.5m, (T_6)- F_2S_1 : 100% RDF + 1.0m x 1.0m, (T_7)- F_2S_2 : 100% RDF + 1.5m x 1.5m (T_8)- F_2S_3 : 100% RDF + 1.5m x 1.0m, (T_9)- F_3S_0 : 125% RDF +1.0m x 0.5m, (T_{10})- F_3S_1 : 125% RDF + 1.0m x 1.0m, (T_{11})- F_3S_2 : 125% RDF + 1.5m x 1.5m, (T_{12})- F_3S_3 : 125% RDF + 1.5m x 1.0m, (T_{13})- F_4S_0 : Control + 1.0m x 0.5m, (T_{14})- F_4S_1 : Control + 1.0m x 1.0m, (T_{15})- F_4S_2 : Control + 1.5m x 1.5m, F_4S_3 : (T_{16})- Control + 1.5m x 1.0m. Among the treatment combinations (T_{11})- F_3S_2: 125% RDF + 1.5m x 1.5m recorded maximum main vine length (9.93m) and maximum (12.45) number of branches per plant. Significantly maximum total fruit yield (31.25 t ha-1) was obtained with the treatment combination of (T_8)-F_2S_3 , whereas (T_{13})-F_4S_0 gave the minimum total yield (6.87 t ha-1).

Keywords: Fertiliser levels, lant spacing, Pointed gourd, Growth and Yield

Effect of Integrated Nutrient Management Practices on Productivity of Short Grain Aromatic Rice-Greengram System

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Abstract

The present field study on 'Integrated nutrient management in short grain aromatic rice-greengram system under *rainfed* condition" was carried out during *kharif* and *rabi* seasons in 2017-18 and 2018-19 at Instructional Farm, College of Agriculture, OUAT, Bhubaneswar. The soil characteristics were sandy loam, slightly acidic in reaction (pH 5.66), low in organic carbon (3.82 g kg^{-1}), low in available nitrogen (199.3 kg ha^{-1}), medium in available phosphorus (17.3 kg ha^{-1}) and medium in available potassium (269.1 kg ha^{-1}). The experiment was laid out in split plot design with six main plot treatments and three sub plot treatments during *rabi*. Pooled analysis revealed that application of 50% RDF + 50% RDN through FYM to aromatic rice recorded significantly higher ear bearing tillers m^{-2} (318.4), filled grains $panicle^{-1}$ (180.6), grain yield (3875 kg ha^{-1}), straw yield (5310 kg ha^{-1}) and harvest index (42.2%) followed by the treatment comprising of 75 % RDF+ green manuring. Significantly higher pods $plant^{-1}$ (16.6), seeds pod^{-1} (10.8), test weight (31.3 g), seed yield (806 kg ha^{-1}), stover yield (1957 kg ha^{-1}) and harvest index (29.1%) in greengram were recorded by application of 50% RDF + 50% RDN through FYM to preceding rice crop and closely followed by 75% RDF + green manuring. Application of 75% RDF + *Rhizobium* + PSB to greengram also produced the highest pods $plant^{-1}$ (14.9), seed yield (697 kg ha^{-1}) and stover yield (1767 kg ha^{-1}) in greengram. Application of 50% RDF + 50% RDN through FYM to rice and 75% RDF + *Rhizobium* + PSB to greengram produced the highest cost of cultivation, gross return, net return and B: C ratio in rice – greengram cropping system.

Nutrient dynamics in Barley genotypes as influenced by Integrated Nutrient Management and Land Management Practices at Northern Transition Zone of Karnataka

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Abstract

Barley has the widest ecological range of adaptation among the cereals, which is grown throughout the temperate and tropical regions of the world. Application of organo inorganic combination is very effective in realization of high yield and high responses to added nutrients, while imbalance use of nutrients has detrimental effect. In view of this, a field experiment was conducted during *rabi* season at UAS Dharwad to study the "nutrient dynamics in barley genotypes as influenced by integrated nutrient management and land management practices" in rainfed condition. The treatments comprised of two land management practices *viz*. broad bed and furrow, farmer's practice, two genotypes *viz*. DWRB – 73, BH - 902 and five integrated nutrient management practices *viz*. Recommended Dose of Fertilizer – RDF (50:25:0 $N:P_2O_5:K_2O$ kg ha^{-1} + 7 t ha^{-1} FYM), 75% N through urea + 25% N through FYM and recommended P through inorganic, 50% N through urea + 50% N through FYM and recommended P through inorganic, 75% N through urea + 25% N through vermicompost and recommended P through inorganic, 50% N through urea + 50% N through vermicompost and recommended P through inorganic. Significantly higher total dry matter production (300.1g), productive tillers (108.5), spike length (11.0cm), grains per spike (29.2) and grain yield(2122 kg ha^{-1}) and higher uptake of nitrogen (70.3 kg ha^{-1}), phosphorus (19.1 kg ha^{-1}) and potassium (88.9 kg ha^{-1}) was obtained with genotype DWRB-73 sown on BBF with the application of RDF compared to rest of the treatment.

Assessing methods for estimating nitrogen availability in soils under conservation agricultural practices

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Abstract

Conservation agriculture (CA) offers a new paradigm for agricultural development to achieve food sufficiency, social security, and environmental sustainability. But, proper nitrogen (N) management in CA, especially after switching from conventional agriculture to CA is one of those challenges, which restrict its worldwide adoption. As CA alters physical, chemical, and biological properties of soils with a greater enrichment in soil organic carbon, we hypothesized that conventional method for measuring soil-N availability (alkaline permanganate method) could not measure the actual soil-N availability status. With this background, we made an attempt to develop a suitable method for assessing N availability for CA soils under a three years old rice-mustard-black gram (RMB) cropping system. Three methods *viz.,* 1/15 M neutral phosphate buffer (PB), 0.01 M calcium chloride (CC), and 0.01 M sodium bicarbonate (SB) were compared with the commonly used method of 0.32% $KMnO_4$ in soils collected after the harvest of *Rabi* crops at 0-20 cm depth for assessing their suitability. Results showed that PB followed by $KMnO_4$ showed significant correlations with different plant parameters, hydrolysable organic-N fractions, and inorganic-N (KCl-N) (r= 0.70** to 0.89**, 0.64** to 0.93**, respectively), while CC and SB could not show such relationships. Overall, we scored and ranked the extractants based on their performance in each of the suitability criteria and the order of suitability of extractants for the assessment of N availability in soils under CA practices was PB > $KMnO_4$ > SB > CC. The finding of the study may help CA farmers to better manage CA soils so far N nutrition is concerned, especially in the early years of its adoption.

Keywords: Nitrogen availability index; Extractants; Available nitrogen; Nitrogen nutrition; Conservation agriculture

Natural resources management for crop & environmental health

Title: Impact of long-term conservation agriculture on soil quality attributes under intensified rice-wheat cropping system

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Abstract

A field experiment (started in 2010) was undertaken in randomized block design on a sandy-clay loam soil at ICAR-Indian Agricultural Research Institute, New Delhi to assess the soil properties after 8-year cropping cycle. ZT treatments were categorized as double ZT *viz*., direct seeded rice (DSR) – wheat (ZTRW) and triple ZT i.e., mungbean (Mb) intensification in R-W (ZTRWMb) systems having additional components of residue retention (+R) and *Sesbania* brown manuring (BM). Conventional till (CT) systems *viz*., puddled transplanted rice – CT wheat (CTRW) /and ZT wheat (CT-ZT) were included as controls. The total organic carbon and wettable biomass carbon under ZTRWMb+R (ZTDSR + mungbean residue – ZTW + rice residue – ZT mungbean + wheat residue) system was 56% and 51% higher respectively compared to the CTRW system. On average the organic carbon under ZT+R systems was ~15% higher compared to ZT–R systems. At 0-5 cm soil depth, maximum 'very labile' pool (fraction I) of C was observed under the ZTRWMb+R (0.42%) being at par with ZTRW+BM+R (ZTDSR + wheat residue + BM – ZTW + rice residue) and ZTRW+R (ZTDSR + wheat residue – ZTW + rice residue) systems. Bulk density (BD) in surface soil (0-15 cm) was lowest under ZTRWMb+R (~1.42 Mg m^{-3}), while at 15-30 cm maximum BD was observed in CTRW system (1.83 Mg m^{-3}). In 0-15 cm soil depth, the ZT with residue systems being comparable with CTRW recorded 17% lower soil penetration resistance (SPR) compared to ZT without residue. Microbial biomass carbon (MBC) under ZTRWMb+R system in rice and wheat crops was 40% and 30% higher respectively compared to CTRW system. Significantly higher fluorescein diacetate activity and dehydrogenase activity was obtained under ZTRWMb+R, ZTRW+R and ZTRW+BM+R systems and was significantly lower under CTRW. Therefore, this study highlights that the CA based triple ZT system i.e., ZTRWMb+R can lead to superior soil quality parameters after long-term practice compared with CT based rice-wheat cropping system, and may be recommended for adoption (higher system productivity and net returns) in the north-western Indo-Gangetic Plains of India.

Potential of various organic nutrient management practices for augmenting growth, yield and yield attributes of Tomato

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Abstract

Organic farming is a holistic production management system which promotes and enhances agro-ecosystem health including biodiversity, biological cycles and soil biological activities. The experiment was laid out in randomized block design with three replications. There were eight treatments *viz*., control (T1), 100% RDF (60:30:30 kg ha-1 N:P2O5:K2O) (T2), 100% N through farm yard manure (FYM) (T3), 100% N through FYM + seedling treatment with biofertilizers (*Azospirillum*+ PSB) (T4), Seedling treatment with beejamruta + soil application of jeevamruta @ 500 l ha^{-1} just after transplanting and at every 10 days interval upto 15 days before harvest (T5), Seedling treatment with beejamruta + foliar application of panchagavya @ 3% foliar spray at every 10 days interval up to 15 days before harvest (T6), T3 + T5 (T7) and T3+ T6 (T8). The test variety of tomato was 'Avinash-2'. The growth and yield attributing parameters *i.e.*, plant height (cm), number of fruits per plant, fruit weight (g), fruit yield per plant (g) of tomato were found to be significantly influenced by various sources of nutrients. In conclusion, the investigation revealed that higher yield of tomato as well as economic returns could be realized with 100% recommended dose of nutrients through fertilizers. Among the various organic sources of nutrients tried, 100% N through FYM + seedling treatment with beejamruta + soil application of jeevamruta @ 500 l ha^{-1} just after transplanting and at every 10 days interval up to 15 days before harvest (T7) was proved to be the most promising integrated organic nutrient management practice for higher yield, economics of tomato along with maintenance of soil biological activity as well as fertility for the sustenance of soil ecology in the present domain of study.

Abstract submitted to National Webinar on "Managing Agro-chemicals for Crop and Environmental Health".

Theme: Natural resources management for crop & environmental health

Conservation technologies for adapting and mitigating the climate change in Agriculture

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Abstract

Climate change is a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates. Since the Industrial Revolution, the Earth has been heating up at a much quicker rate than ever before with the consequences like sea level rise, frequently occurring extreme weather events (floods, droughts, cyclones, lightning etc.) etc.

Sustainable agricultural management has become very challenging under the changing climate. Various adaptation and mitigation technologies can be successfully implemented to achieve targeted food production in the stressed environment.The agriculture sector has potential to reduce its own emissions, and concurrently, can also reduce emissions from other sectors through removing CO_2 from the atmosphere via photosynthesis and storing carbon in plants and soils known as carbon sequestration, as well as by providing bio-fuels to replace fossil fuel use.

Conservation technologies like zero tillage, raised bed planting; DSR etc. minimize unfavourable environmental impacts and can increase the crop yield under increased temperature and water stress. Zero tillage can potentially reduce greenhouse gas emission not only by avoiding the residue burning but also by reducing the machinery and tractor use. Implementation of precision agricultural tools and technologies can enhance the input-use efficiency and reduce the level of emission and loss and thus make the system environmentally friendly and economically profitable also.

Both the mitigation and adaptation technologies can limit the overall impacts of climate change. It is believed that the resource conservation technologies have potential to bring a long-term solution of climate-related concerns.

Keywords: Conservation technologies, Climate change, zero tillage, adaptation, mitigation

No tillage is more of sustaining the soil than a climate change mitigation option

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Abstract

No-till is often referred to as a climate change mitigation option, possibly with a stronger conviction, than as a practice to manage soil organic C (SOC) content. We conducted global meta- and mixed model analyses to evaluate effect of no-till in major crop rotations on SOC concentration (SOC_c, g C kg^{-1} soil) and stock (SOC_s, kg C ha^{-1} land) with the aim to appraise the priority-setting, and to assess the relative abundance of major SOC pools. Compared to conventional tillage, no-till increased 25-33% SOC_c only in surface soil layer of 10 cm with a substantial gain of 38% in 0-5 cm and a much lesser increase of 6% in 5-10 cm layer. The SOC_c remained unchanged in layers below 10 cm. Temperate climate increased twice SOC_c accumulation in 0-5 cm layer, although tropical climate had greater impact on sub-surface layers. Soil texture had no influence, but inclusion of legumes in rotation facilitated greater SOC_c in >10 cm layers in favour of no-till. Duration of no-till had a cumulative impact, with a minimum 11-15 yr period necessary for the greatest SOC_c in the 0-30 cm profile. The microbial biomass C was the most abundant pool with 61% and 23% increases under no-till in 0-5 and 5-10 cm layers, respectively. The top 0-5 cm layer was also characterized by a large difference in aggregate-associated C, attributed to residues addition and physical protection in no-till. Particulate organic matter-C recorded no-change. The benefit of no-till is restricted to the surface layers only which is potentially exposed, and therefore it may be short-lived. Changes in top layers have fundamental importance to soil quality and to cultivation, but have limited relevance to C-sequestration potential. No-till should therefore be promoted primarily as a sustainable agricultural management option, and not as a potential climate change mitigation option.

Keywords: Soil organic carbon, carbon stock, carbon pools, no-till, meta-analysis

Effect of integrated nutrient management practices on growth, yield and soil fertility status in blackgram *(Vigna mungo* L.) under mid central table land zone of Odisha

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Abstract

Black gram (*Vigna mungo* L.) is one of the most important legumes and being drought tolerant and warm weather crop, it is well adopted to the drier regions of the tropics. It has ability to fix about 22.1 kg of atmospheric nitrogen per hectare through its root nodules. In Odisha, it occupies an area of 5.98 lakh hectare having a productivity level of 1447.2 kg/ha. Hence, there is a scope for improving the production potential of this crop by use of inorganic and bio-fertilizers. The field trial to study the effect of nutrient management practices on growth, yield and soil fertility status in black gram was conducted during *rabi* season of 2016-17 in farmer's field at Ragudiapada village of Angul district in Odisha. The experiment was carried out in randomized block design with ten replications. The results indicated that 75% STBFR+FYM @2.0 t/ha incubated with PSB@5 kg/ha + seed inoculation of *Rhizobium culture* @ 20g/kg of seed + sodium molybdate @3g/10 kg of seed recorded significantly higher plant height (43.52 cm), branches/plant (4.85), nodules/plant (22.75), pods/plant (21.2), seeds/pod (6.19), grain yield (645 kg/ha) and harvest index (37.2%) which might be due to application of nutrients in the integrated form led to efficient photosynthetic structural system. With regards to soil fertility after crop harvest, the same treatment resulted in the highest soil available nitrogen (220.8 kg/ha), phosphorus (12.07 kg/ha) and potassium (193.05 kg/ha) which was 14.3, 15.0, 9.7 percent higher over the initial soil status, respectively.

Performance of flood tolerant rice variety CR -1009 sub 1 in Flood Prone Area of Coastal Odisha

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Abstract

A field experiment was conducted at farmers' field at Gajapitha village of Marshaghai block of Kendrapara, Odisha during Kharif 2021 to assess the performance of flood tolerant rice variety CR 1009 sub 1. The village is an adopted village by Krishi Vigyan Kendra, Kendrapara, in which various activities in agriculture are going on under National innovations on climate resilient agriculture (NICRA) programme to combat the flood affected area of the locality. The village is situated on Baghuni river, a branch river of the Mahanadi which causes the flash flood every year resulting the complete damage of the rice crop. Under NICRA demonstration programme field experiment was conducted to assess the performance of flood tolerant rice variety CR 1009 sub 1 which has water submergence tolerance capacity up to 12 days as compared to local variety. The demo variety was compared with the performance of local ruling HYV Pooja which is susceptible to water submergence. Both the variety experienced two flash floods consisting of 8 days and 4 days period of water submergence during vegetative stage of rice. In the present experiment CR 1009 sub1 variety resulted maximum yield (44.6 q/ha) which is 27.8 % higher yield compared to Pooja (34.9q /ha). With respect to economics CR 1009 sub1 realised higher B: C ratio (1.79) compared to Pooja (1.40).

Key words: Flood tolerant, Rice, Yield, economics

Fertilizers for improved crop and soil health: evidences from Long Term fertilizer Experiments

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Abstract

The Long term Fertilizer Experiments (LTFE) and Permanent Manurial Trials (PMT) serve as important tools to understand the changes in soil properties due to intensive cropping and continuous fertilizer/manure application. It is well perceived that long term fertilizer experiments are repositories of valuable information regarding the sustainability of intensive agriculture. Consistent use of chemical fertilizers and manures in soil alters the physical, chemical and biological properties of the soil. The Permanent Manurial Trials- (tall and dwarf) and the All India Co-ordinated Project on Long term fertilizer experiment have been laid out at Regional Agricultural Research Station, Pattambi with the main objective of studying the effect of continuous application of plant nutrients (NPK) in organic and inorganic forms and in combinations on sustainable production in the rice-rice cropping sequence.

The PMT consists of 8 treatments *viz.,* T_1: 90 kg N ha^{-1} as cattle manure, T_2: 90 kg N ha^{-1} as green leaf manure, T_3: 45 kg N ha^{-1} as cattle manure + 45 kg N ha^{-1} as green leaf manure, T_4: 90 kg N ha^{-1} as ammonium sulphate, T_5: 45 kg N ha^{-1} as cattle manure + N:P_2O_5:K_2O 45:45:45 kg ha^{-1}, T_6: 45 kg N ha^{-1} as green leaf manure + N:P_2O_5:K_2O 45:45:45 kg ha^{-1}, T_7: 22.5 kg N ha^{-1} as green leaf manure + 22.5 kg N ha^{-1} as cattle manure + N:P_2O_5:K_2O 45:45:45 kg ha^{-1} and T_8: N:P_2O_5:K_2O 90:45:45kg ha^{-1}. The LTFE consists of 12 treatments *viz.,* T_1: 50 per cent NPK (as per KAU POP recommendation), T_2 : 100 percent NPK, T_3 : 150 percent NPK, T_4 : 100 percent NPK + 600 kg ha^{-1} $CaCO_3$, T_5 : 100 percent NPK, T_6 : 100 percent NP, T_7 : 100 percent N, T_8: 100 percent NPK + FYM @ 5 t $ha^{-1}$to the virippu crop only, T_9: 50 per cent NPK + FYM @ 5 t ha^{-1},T_{10} : 100 percent NPK + *in situ* growing of *Sesbaniaaculeata*(for Virippu crop only), T_{11} : 50 percent NPK + *in situ* growing of *Sesbaniaaculeata*(for Virippu crop only) and T_{12} : Absolute control (No fertilizers or manures).

In PMT, the organic nutrient management (T_1) wherein whole of the mineral N was applied as cattle manure and Integrated Nutrient Management (INM) practice(T_5) where 50 per cent N was substituted by cattle manure were equally superior in growth and productivity to other treatments. INM Treatment T_5 (45 kg N ha^{-1} as cattle manure + N:P_2O_5:K_2O 45:45:45 kg ha^{-1}) was found to be significantly superior with respect to the soil biological properties including dehydrogenase activity and microbial biomass carbon

clearly indicating the positive role of fertilizers on improving biological attributes of the soil. The physiological properties of the plant like stomatal conductance and photosynthetic rate, yield attributes such as panicle length, number of panicles per plant and number of filled grains corroborated the trend in yield. The available primary nutrient status of the post harvest soil was higher in T_8, the fertilizer applied plot and substitution of 50 per cent mineral N by organic manures improved the available nutrient status suggesting the synergistic role of organic manures. The stabilization of soil organic carbon over a range of values in all treatments indicate the chances of carbon emissions on packages of heavy organic manure application in tropical soils.

In LTFE with 20 years history, the carbon sequestration pattern studied, indicated the positive role of fertilizers in sequestering carbon to the soil. Moreover, it was seen that all the carbon pools (active, slow and passive) contributed towards yield whereas in PMT, with 44 years history, it was the slow pool of carbon that showed higher correlation with crop yield. Data on analysis of different carbon pools revealed that slow pool is the most predominant yield determining pool in the long run. An incubation study was conducted at four different temperature regimes (15, 25, 35 and 45^0C) using the soil collected from the plots of LTFE as well as PMT. The values on activation energy and the rate constants provided a good insight on decomposability of organic matter and the pace of mineralization in soil. Treatments with inorganics recorded lowest activation energies indicating the instability of even recalcitrant or passive pools developed under sole application of fertilizers. However, the carbon formed under INM was more stable than the carbon formed under sole application of organic manures.

The study fortifies INM as a stable practice for sequestering soil organic carbon and crop productivity in the context of rising temperature scenario

Interaction studies between zinc and iron in rice growing soils of West Bengal

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Abstract

A field experiment was conducted by growing rice in the Central Research Farm of Bidhan Chandra Krishi Viswavidyalaya at Gayeshpur, Nadia in the year 2015 during Kharif to study the interaction between zinc (Zn) and iron (Fe) in rice soil and plant and its effect on the quality of rice grain. The study area located at 220^0 58.114´N latitude and 880^0 29.543´E longitude was categorized as clay loam texture, with pH of 7.2, available Zn and Fe content being 1.12 and 115.8 mg kg^{-1} respectively. Both Zn and Fe were given at 3 different levels viz. 0, 5.0 kg / ha (soil application), 0.5% (foliar spray). The foliar application of Zn and Fe registered the highest straw (45.8 q ha^{-1}) and grain yield (32.6 q ha^{-1}). The foliar application of Zn and Fe registered the highest straw (45.8 q ha^{-1}) and grain yield (32.6 q ha^{-1}). The sole application of Zn fertilizer enhanced the grain yield to the tune of 20.6 and 22.9%, Zn concentration in rice grains varied from 30.3 to 46.1 mg kg^{-1}. The highest grain and straw Zn concentration was recorded when only foliar dose of Zn was given without any Fe. Foliar application of Zn brought about the lowest Fe concentration in grains of rice (42.1 mg kg^{-1}). The concentration of Fe in rice straw at booting stage was the highest with foliar application of Fe without any Zn (186.0 mg kg^{-1}) and the lowest with foliar application of Zn without any Fe (103.9 mg kg^{-1}). While application of Zn and Fe fertilizers significantly reduced the concentration of each other in the rice tissue at all growth stages of rice indicating an antagonistic relationship of Zn and Fe applications together. The antagonistic relationship between Zn and Fe in soil could not be established.

Keywords: zinc, iron, foliar, antagonistic, interaction

Theme 1: Natural resources management for crop and environmental health

Concurrent Session 2: Soil health/ Soil Chemistry / Fertility

Jury members for paper evaluation

Dr. S. S. Singh – Chairman

Prof. B. K. Agarwal - Member

Prof. D. Mukhopadhyay- Member

Dr. U. K. Mandal -Member

Dr. Amlan Ghosh - Member

Meeting link:
meet.google.com/eft-hsdt-pjc

9th Annual Convention and Webinar on "Managing Agro-chemicals for Crop and Environmental Health" by Society for fertilizers and environment

Oral presentation topic: Effect of varying clay mineralogy on dissolved organic carbon adsorption

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Abstract

Mechanisms of soil organic carbon (SOC) stabilization has received much focus recently due to its relevance in controlling the global C cycle. Clay minerals are known to stabilize SOC through mechanisms such as, ligand exchange, polyvalent cation bridging, electrostatic attraction, H-bonding and van der Waals forces. However, the effect of interactions among pedogenic clay minerals, native organic carbon (OC) and sesquioxides (Fe/Al oxides) on the adsorption- desorption of dissolved organic carbon (DOC) is poorly understood. Keeping that in view, soils of four different clay mineralogy with native OC and sesquioxides were evaluated for their capacity to adsorb dissolved organic C (DOC) and their relationship with specific surface area (SSA) and cation exchange capacity (CEC). The results indicated that the DOC adsorption-desorption varied with the types of soil clay fractions. Smectitic + vermiculite soil clay fractions (SCFs) (Vertisol) adsorbed more DOC followed by kaolinite + Illite mixed SCFs (Mollisol), Illite dominating SCFs (Inceptisol) and kaolinitic SCFs (Alfisol), respectively. Removal of native OC increased the SSA, which had a positive bearing on DOC adsorption whereas CEC had very less effect. The removal of sesquioxides reduced the extent of DOC adsorption and the adsorbed DOC was desorbed more readily than when they were present. This study highlighted the critical role of type of soil clay mineralogy as well as SSA and sesquioxides in stabilizing labile C in soil for a longer period.

Non-exchangeable Potassium reserve in selected soil series of Coochbehar (West Bengal)

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Abstract

The Non-exchangeable potassium (K) reserve and its release pattern is an important issue to optimize the K-fertilization for crops in long-term. Twenty surface soil (0-20 cm) samples from each of the four soil series of Coochbehar district namely Balarampur, Rajpur, Lotafela and Matiarkuthi located in the Himalayan floodplain of the Northern part of West Bengal were analyzed to measure Non-exchangeable K (NEK) release in terms of Step-K and Constant rate-K (CR-K) by repeated extraction of soil with boiling 1 *N* HNO_3. Among the four soil series of Coochbehar district, the mean value of step-K [9.70 cmol (p^+) kg^{-1}] and CR-K [0.48 cmol (p^+) kg^{-1}] were in Rajpur soil series being the highest one and minimum was found for step-K [4.02 cmol (p^+) kg^{-1}] and CR-K [0.46 cmol (p^+) kg^{-1}] in Matiarkuthi soil series. The ratio of Step K and Non-exchangeable K was highest in Rajpur soil series [1.65 cmol (p^+) kg^{-1}] compared to the other series. The release of non-exchangeable pool of potassium was apparent under the different soil series for understanding the K-availability to the crops.

Keywords: Soil series, Potassium, Non-exchangeable K, Step-K, Constant rate-k

Theme: Natural resources management for crop & environmental health

Soil Microbial Diversity under Long term Organic and Conventional Farming: A Review

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Abstract

Soil microbial diversity offer multifaceted benefits to agricultural crops by their participation in ecosystem processes like nitrogen fixation, insoluble nutrient solubilization, SOM mineralization, etc., which in turn determine plant health, crop yield and productivity (Bastida *et al*., 2021). The belowground microbial communities interact among themselves in various ways and are crucial for plant and soil health, and maintenance of agricultural sustainability as well. There is increasing concern, however, that agricultural intensification along with conventional agricultural practices have led to large-scale ecosystem degradation, loss of productivity in long term and deterioration of soil health (Trivedi *et al*., 2016). Microbial communities show variations in agroecosystems owing to management practices, therefore long-term agroecosystem experiments could provide an indispensable resource for evaluation of effects of farming systems on above and belowground biota, productivity and soil quality aspects (Armalyte *et al*., 2019). Higher OM input through application of various organic manures under organic farming practices is the key factor in enhancing the enzymatic activities and soil microbial biomass carbon along with higher growth of microbial populations in soil, which are key components of soil biological quality (Sheoran *et al*., 2018). Overall, organic farming practices increase species richness, decrease evenness, reduce dispersion and help in shifting the structure of soil microbiota when compared with conventionally managed soils under exclusively mineral fertilization (Hartmann *et al*., 2015). Thus, agro-ecosystems receiving organic fertilizer are characterized by specific microbial guilds known to be involved in degradation of complex organic compounds and improve soil health and productivity compared to conventional farming.

Keywords: Soil, microbial, diversity, organic, conventional, farming

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Free ion activity of metals in soils: A key to assess risk in polluted soils

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Abstract

Bioavailability and ecotoxicity of metals in polluted soils depend largely on their free ion activity. Free ion activity of metals in soils can be measured directly by extracting soil pore water *in-situ*. Recently, modeling approaches for prediction of free ion activity of metals in soils have been used extensively by researchers across the globe. However, the use of such data for risk assessment of polluted soils is scarce. In this study, free ion activity of metals in contaminated soils was predicted as a function of pH, organic carbon content and extractable metal concentration. pH dependent Freundlich model based on soil properties could explain the variation in pZn^{2+}, pCu^{2+}, pNi^{2+}, pPb^{2+} and pCd^{2+} to the extent of 84, 52, 73, 60 and 70%, respectively, in the case of data from *Rhizon* samplers coupled with speciation modeling. Subsequently, we assessed the relative efficacy of various forms of 'free ion activity model' for predicting the concentration of metals in spinach, thereby providing an assessment of risk to human health from consumption of this crop. Approximately 91, 81, 75, 94 and 70% of the variability in Cd, Pb, Ni, Zn and Cu content, respectively, of spinach could be described by a FIAM using an estimate of the free ion activity of the metals provided by WHAM-VII. Out of various formulations, the FIAM, based on free ion activity of metals in soil pore water, determined from solution extracted with *Rhizon* samplers, was distinctly superior to the other formulations in predicting metal uptake by spinach.

Comparison of different chemical extractants for estimation of bioavailable zinc in mulberry garden

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Abstract

Zinc (Zn) plays an important role in growth and development of mulberry besides stimulating the metabolic activity in silkworm. Assessment of bioavailable Zn in soil is of prime importance for the proper management of mulberry garden for maintaining the soil with balanced Zn. In the present study different chemical extractants were used for assessing the bioavailable Zn in soil of mulberry garden. The relationships between the amounts of Zn extracted by using Mehlich-3, HCl and AB-DTPA (Ammonium bicarbonate-diethylenetriaminepentaacetic acid) with those extracted by DTPA (Diethylenetriaminepentaacetic acid) were elucidated. Results showed that the amount of Zn extracted by DTPA was lesser than that extracted by Mehlich-3, HCl and AB-DTPA in the experimental soil. On average, AB-DTPA, HCl and Mehlich-3 extracted 0.98, 2.4 and 3.68% of total soil Zn respectively. The extractable Zn content of the experimental soils followed the order of Mehlich-3 >HCl> AB-DTPA > DTPA. The Zn extracted by using DTPA maintained significant positive correlations with the Zn extracted by using AB-DTPA (0.930**), HCl (0.944**) and Mehlich-3 (0.892**) which is testimony to the fact that they were able to extract the said micronutrient from almost same pools. Moreover, the amount of Zn extracted by all the extractants showed significant positive correlations (r) with Zn concentration of mulberry. On average, the relationships (r) were greater with AB-DTPA (0.863**) followed by HCl (0.796**), Mehlich-3 (0.741**) and DTPA (0.728**) extractant for assessing plant available Zn in soils. Based on the correlation result with plant Zn concentration, AB-DTPA extraction method could be utilized as suitable extractant for assessment of available Zn.

Keywords: Zinc, chemical extractants, Zn bioavailability, mulberry

Assessment of soil quality and identification of key indicators under organically grown turmeric in Vertisols of Central India

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Abstract

The evaluation of soil quality is very crucial to monitor the changes occurring in soils as a result of various crop management practices. Previously, a lot of research work had been done to quantify the impact of tillage, crop establishment, integrated nutrient management and residue retention on soil quality; but information on soil quality under organic agriculture specifically nutrient and weed management scenarios is still lacking. To identity the key soil quality indicators under organically grown turmeric, a study was conducted at ICAR-DWR, Jabalpur Research farm, consisting ten treatments namely (i) stale seed bed (SSB) + black gram followed by 1 hand weeding (*fb* HW) (ii) crop residue mulch (CRM) (5t ha^{-1}) + 2 HW, (iii) reduced spacing(45 cm) + CRM *fb* 2HW, (iv) sesbania live mulch (2t ha^{-1}) *fb* 2 HW, (v) glyricidia leaf mulch (GLM, @ 10 t ha^{-1}) *fb* 2 HW (vi) black polythene mulch (BPM) *fb* 1HW, (vii) 3 mechanical weeding (MW) (viii) unweeded , (ix) recommended dose of fertilizers (RDF) + herbicide (atrazine 1kg /ha *fb* quizalofop) and (x) 50% vermicompost (VC) + 50% RDF + herbicide *fb* 2 HW laid out randomized block design (RBD). Soil samples were collected from 0-15 cm soil in June, 2020 after turmeric harvest and total 14 soil parameters (pH, EC, soil organic carbon, available N, P, K, Fe, Mn, Zn, Cu, microbial biomass carbon, dehydrogenase activity and alkaline phosphatase activity and soil bulk density) were analyzed. Results showed that highest SOC (9.49 g kg^{-1}), available K (523 kg ha^{-1}), Fe (6.8 mg kg^{-1}) and lowest BD (1.31 g cm^{-3}) were obtained in T2 (glyricidia live mulch @ 10 t ha^{-1}), where as highest available P (95.73 kg ha^{-1}) was found in T2 (crop residue mulch @ 5t ha^{-1} + 2 HW). Principal component analysis (PCA) was performed to construct minimum dataset (MDS); bulk density, available P, available Fe, dehydrogenase activity and alkaline phosphatase activity were identified as the key indicators. The overall soil quality index (SQI) ranged from 0.38 – 0.78; crop residue mulch @ 5t ha^{-1} registered maximum SQI (0.78) followed by glyricidia live mulch @ 10 t ha^{-1} (0.70) and minimum SQI was obtained under unweeded control. Over all contribution of available P towards SQI was maximum (28.5%) followed by BD (25.9%), available Fe (23%), DHA (11.4%) and ALKP (9.7 %) respectively. Thus our study suggests that soil bulk density, available P, available Fe, dehydrogenase activity and alkaline phosphatase activity are the key soil quality indicators under turmeric based organic agriculture system in Vertisol of central India.

Keywords: Soil quality, Soil quality indicators, Organic agriculture, Vertisol

Dynamics of Plant-derived C into Aggregates of Sandy Soil as Affected by Fertilization

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Abstract

Transformation of the crop residues into soil organic C is an important factor in improving soil fertility and aggregation. Apart from long-term organic matter influence, aggregation is also promoted by soil bacterial and fungal biomass. These effects on soil aggregation in relation to soil organic C content have not yet been well investigated. We studied the long-term effects of 20-years application of mineral and organic fertilizers in an intensive horticultural crop rotation. Treatments: without fertilization or manuring (control soil), nitrogen applied by mineral fertilizer, and manure with low or high application rates. The short-term effect on soil aggregation was simulated by addition of K-polyacrylate to the soil. 14C labelled plant residues were added to all soils and incubated for 2 weeks to know the effect of aggregation on plant residue C sequestration in soil aggregate size fractions.

Added 14C-labelled plant residues retained higher in control soil than the mineral and manure fertilized one. The 14C from plant residues was strongly allocated in microaggregates. This corresponded to high plant derived microbial biomass and ß-glucosidase enzyme activity in microaggregates. However, 42-73% increase of soil organic C by long-term fertilization caused decrease in microaggregates by increasing small macroaggregates proportion of soil. As a result, fertilization effect on soil decreased the rate of decomposition of added plant residue. K-polyacrylate addition increased the large macroaggregate fraction by 14-18% by decreasing small macroaggregates and microaggregates of all soils independent on fertilization. This aggregation effect caused a significant decrease in decomposition rates, which may predict the consequences of fungal aggregation on sandy soil.

Assessment of suitable extractants for determination of available boron in soils of Indo-Gangettic Plains

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The present investigation was conducted to evaluate the suitable extractant for determining available boron (B) in soil based on the soil properties, climatic variables and different boron fractions. Soil samples were collected from fourteen different locations of the Indo-Gangetic Plains (IGP) at 0-0.15, 0.15-0.30 and 0.30-0.60 m soil depths under pre-dominant cropping systems. The available B was extracted by hot-calcium chloride (HCC), mannitol-calcium chloride (MCC), hydrochloric acid (HCl) and salicylic acid (SA). The path coefficient analysis, correlation matrix, multiple regression analysis and sensitivity analysis based on standard deviation (SD) were used to assess the suitable extractant. The order of B extraction with the four extractant was: MCC (0.640 mg kg^{-1}) >HCC (0.595 mg kg^{-1}) >SA (0.527 mg kg^{-1}) >HCl (0.470 mg kg^{-1}). Among the soil properties, the organic C was the most sensitive parameter with highest SD value (1.94) and showed the highest correlation with HCC. Among the extractants, the calculated slope value with contents of organic C, amorphous Fe and Al-oxides and with mean annual rainfall was always higher with HCC and MCC. Different B fraction contributed 73, 63, 53 and 54% variability in HCC, MCC, HCl and SA extractable soil B. The path coefficient analysis between extractable B and B fractions also showed that the lowest residual value was associated with HCC followed by MCC, SA and HCl. The SD value was highest with MCC (0.464) followed by HCC (0.363), HCl (0.272) and SA (0.198). Therefore, among the B extractants, HCC and MCC were the most suitable to assess available B in the soils of IGP.

Soil organic carbon pools as affected by different land use and management practices in north-western Indo Gangetic Plains

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Abstract

This study was undertaken to assess the impacts of different native land use and management practices within north-western Indo Gangetic Plains, India on soil organic carbon (C) pools. The soil samples were taken from ten different land uses viz. rice based agricultural soil, maize based agricultural soil, horticulture (Orchard) based soil, agro-forestry system, natural forest system, grass land soil, sewage irrigated soil, river bed soil, stabilized dumping site, and reclaimed alkali soil from four soil depths (0-15, 15-30, 30-60, 60-100 cm). The result showed that the relative order of Total Carbon (TC) Stock and Total Organic Carbon (TOC) Stock as affected by various land use management practices up to 1 m depth are: River bed soil> Sewage irrigated soil>Maize based soil>Agro-forestry system> Forest> Horticulture based soil>Grassland> Rice based soil> Reclaimed alkali soil> Stabilized dumping sites. Various land use management practices have significant impact on depth wise variation on TC, TOC and TIC stock and their relative order are as follows: 30-60 cm> 60-90 cm> 0-15 cm> 15-30 cm (for TC and TOC stock) and 60-90 cm> 30-60 cm> 15-30 cm> 0-15 cm (for TIC stock). Labile and recalcitrant C pools are significantly affected by various land use and management practices up to 1 m depth and labile C pools decreases with depth (57% to 32%) whereas, recalcitrant C pools increases with depth (67% to 94%). Thereby a thorough research is the need of the hour to understand the mechanisms of OC storage and stabilization at top as well as in deep soil in the north-western Indo-Gangetic Plains.

Theme: Agro-chemicals for protecting crops and environment
Study of nitrogen use efficiency in rice-rice cropping system

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Abstract

Rice–rice cropping system has been prevalent in South-east Asia as it plays a vital role in food security providing 35-80 % of total calorie intake. Out of many nutrients required to sustain rice cultivation, nitrogen (N) is required in quantitatively higher amount for which urea fertilizer is the most widely used source. The major problem associated with the urea fertilizer is the low N efficiency. In this context, an integrated approach to the application of organic and inorganic sources of N is a prudent strategy to ensure judicious fertilizer application. Keeping this in view, neem coated urea (NCU) and polymer sulphur coated urea (PSCU) along with farmyard manure (FYM) and vermicompost (VC) were used by supplementing recommended dose of fertilizer (RDF) in rice cultivation during 2016-17 and 2017-18 at the District seed farm, BCKV, Nadia, West Bengal to find out the nitrogen use efficiency in rice-rice cropping system. The pooled data of two years showed that the growth attributes, yield attributes and yield were recorded maximum in the treatment with 75 % RDF of NPK (N as PSCU) + 25 % through FYM closely followed by 75 % RDF of NPK (N as NCU) + 25 % through FYM during *kharif* rice cultivation whereas *rabi* rice also demonstrated similar result in its growth, yield attributes, and yield except that the treatment with FYM was replaced by VC. Higher agronomic use efficiency, recovery efficiency and partial factor productivity of nitrogen was noted in 75 % RDF of NPK (N as PSCU) + 25 % through organic manure during both the years except the physiological efficiency of nitrogen which was maximum in 100 % RDF of NPK (N as NCU).

Recent Trends in Improving Nutrient use efficiency

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Abstract

In modern agriculture use of essential plant nutrients in crop production is very important to increase productivity and maintain sustainability of the cropping system. The most dominant cropping systems in India are rice-wheat, rice-rice systems. Even though the production is more, the productivity in India is very less as compared to other countries like USA, China majorly due to imbalanced fertilization and more nutrient losses. Overall, nutrient use efficiency by crop plants is lower than 50 per cent under all agro-ecological conditions. The low nutrient use efficiency is not only increase cost of crop production but also responsible for environmental pollution. So, there is a need to improve nutrient use efficiency with the help of different techniques. Nutrient use efficiency may be defined as yield per unit fertilizer input. There are several methods of improving nutrient use efficiency. Use of spectral sensing technology like SPAD meter or chlorophyll meter and green seeker helps in more efficient site-specific nutrient management. Critical or threshold values for these tools are known as those that optimize simultaneously the grain yield and NUE which vary from crop to crop. The decision support system is an easy-to-use, interactive computer-based decision tool that can rapidly provide nutrient recommendation for individual farmers' field in presence or absence of soil testing data. Recommendations for future line of work includes development of new molecules of fertilizers that have more efficiency by low cost manufacturing methods, following precision agriculture techniques, and developing new decision support soft ware that will give recommendations to farmers in offline also.

Keywords: Cropping system, Real-time decision support system, NUE

Impact of Different Pools of Acidity on Soil Ecophysiological Health of Bauxite Mine Over Burden with Reference to Its Trace Elemental Profiling

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Abstract

Assessment of the influence of different fraction of acidity on microbial parameters of soil helps in evaluating the status of soil health. The present study was conducted to investigate the effect of acidity on soil ecophysiological indicators viz. microbial biomass C, FDA activity, microbial respiration, soil enzyme activity with reference to metal availability of an active open pit mine. A total of eighteen samples including mine tailing and soil from three different sites along with four water samples was collected from a bauxite mine, Jharkhand. Different forms of acidities like total potential, exchangeable and total acidity were significantly and positively correlated with each other. Presence of high amount of aluminium (Al^{3+}) and iron (Fe^{3+}) are two major geogenic source of acidity. Different fraction of aluminium is significantly and positively correlated with acidity. Microbial parameters are act as soil indicator which are significantly and positively correlated with soil organic C. The ratio of microbial parameters with organic carbon are significantly and negatively correlated with different acidity and aluminium fraction. Even if the forest soil has higher microbial biomass and activities because of higher organic matter content than other mine overburden and reclaim site soil the ratios of microbial parameters/organic carbon indicated that inhibition of microbial growth and activities had occurred because of acidity stress.

Theme: Natural resources management for crop and environment health

Chemical and instrumental characterization of humic acid of diverse soil orders under paddy cultivation.

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Abstract

Humic acid is a blend of aliphatic and aromatic molecules with a variety of composite structures that are found in the natural world. The fundamental role of humic acid is retaining metal ions and organic pollutant and also in carbon sequestration. The purpose of this study was to characterize humic acids isolated from diverse soil orders such as Entisol, Inceptisol, Vertisol, and Alfisol in a continuously paddy growing area using chemical and instrumental methods. According to elemental analysis, all humic acids have higher carbon content and lower oxygen content representing typical value of humic acid. The Vertisol recorded higher total acidity (6.90 meq. g^{-1}) while lower in the Entisol (3.80 meq. g^{-1}) and the E4/E6 ratio was higher in the Entisol (4.56) indicating that humic acid was less condensed and less matured than humic acids in other soil orders. Humic acids displayed high adsorption peaks in the 1698-1620 cm^{-1} range, indicating prominence of COOH vibrations and Aromatic C-C, strongly H-bonded C-O of conjugated ketones in the FTIR spectra. The reason behind this, as Vertisol being rich in smectite which have high affinity for soil humus, because of larger surface area they can bind organic molecules via-OH groups present on the surface of smectite particles.

Keywords: Elemental analysis, Functional groups, Spectroscopic analysis and Humic acid

Soil spatial variation in relation to land use and topography in a part of Alipurduar district, West Bengal, India

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Abstract

This study aimed to understand the impact of land use and topography on soil properties. Kumargram block of Alipurduar district, West Bengal, which is very diverse in land use and land cover and has vast coverage of forests, tea gardens, croplands and rural settlements, was selected as the study area. Topographically, the area is covered partially by hills and predominantly by floodplains of Himalayan rivers. Results indicated that soils under hill forests had highest sand ($\bar{x}$ 72.29%) while soils of cropland and forest of plains showed highest clay %, possibly due to soil erosion and eluviation of clays from hills to plains. Following the texture, soils of hilly areas (under forest) showed higher bulk density. The entire area had acidic soils; however, cropland soils showed highest pH ($\bar{x}$ 5.65), probably due to the seasonal/ annual application of lime. Soils under forests ($\bar{x}$ 357.5 kg ha^{-1} N, $\bar{x}$ 47.77 kg ha^{-1} P) and tea gardens ($\bar{x}$ 286.36 kg ha^{-1}N, $\bar{x}$ 34.88 kg ha^{-1} P) had more available N and P than the soils of croplands, possibly due to continuous deposition of organic matter (leaf and litter) in these undisturbed soils. Organic matter deposition also caused highest C in soils of hill forests ($\bar{x}$ 50.30 Mg ha^{-1}) while faulty management practices and tillage operations resulted in C depletion in cropland soils ($\bar{x}$ 21.09 Mg ha^{-1}). Soil microbial biomass C followed the similar trend of soil C. However, maximum labile C (per unit total organic C) was found in cultivated soils. Highest soil macroaggregate were found in tea gardens ($\bar{x}$ 68.79%) and hill forests ($\bar{x}$ 68.11%) due to presence of high amount of organic matter as cementing agents and no disturbances while lowest aggregate formation was observed in cultivated soils. Soil textural variation affected the bulk density, cation exchange capacity and aggregation dynamics. Spatial distributions of different soil properties were assessed through the ordinary kriging interpolation technique using spherical model, which demonstrated a good to moderate spatial distribution pattern for all parameters, except soil available N.

Keywords: Land use; Topography; Soil texture; Soil properties; Spatial variation

*Convention presenter

Effect of split application of nitrogen on productivity, profitability and nitrogen use efficiency of drought tolerant rice

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Abstract

Field experiment was carried out at farmer's field of Port Mout village of South Andaman during *Kharif* season under National Innovation in Climate Resilient Agriculture to study the effect of split application of nitrogen on productivity, profitability and nutrient use efficiency of drought tolerant rice. The results revealed that application of four split at 15% 10 DAT, 35% active tillering, 25% panicle initiation and 25% flowering stage recorded higher grain and straw yield of 5428 and 7677 kg/ha respectively which gave 160 and 259 kg/ha of additional higher grain and straw yield respectively as compared to four split of nitrogen at 25% basal, 25% active tillering, 25% panicle initiation and 25% flowering stage. Maximum net return of Rs. 27430/- with B: C ratio of 2.02 and higher agronomic efficiency, partial factor productivity, physiological use efficiency and NPK uptake were obtained with application of nitrogen in four split at 15% 10 DAT, 35% active tillering, 25% panicle initiation and 25% flowering stage as compared to other treatments.

Keywards: Nitrogen use efficiency, nutrient uptake, productivity, profitability

Theme: Natural resources management for crop & environment health

Soil Boron fractions as influenced by selected soil properties and cropping system in Boko block of Kamrup (Rural) district of Assam

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Abstract

The present study was conducted to assess the influence of basic soil physic-chemical properties and cropping system (CS) on soil boron fractions in Boko block of Kamrup (Rural) District of Assam. A total of twenty-four (24) geo-referenced surface soil samples (0-15 cm) were collected from across the block under each cropping system viz., Rice-Rice, Rice- Fallow, Vegetable-Vegetable and Plantation crops. The studied soil samples varied in texture from sandy clay loam (SCl) to clay loam (CL). The ranges for pH, SOC, Av. N, Av. P_2O_5, Av. K_2O, CEC and EC ranged between very strongly acidic to strongly acidic (4.7-5.6), medium to high (0.6-1.6 %), Low to Medium (175.6-326.4 kg ha^{-1}), Low to High (5.93- 57.68 kg ha^{-1}), Medium (130.8-276.2 kg ha^{-1}), Low (2.8-9.6 Cmol (p+) kg^{-1}), Normal range (0.01-0.03 ds m^{-1}) respectively. The selected properties viz., CEC, pH and SOC were chosen based on past research findings to analyze its effect on soil boron fractions. Significant positive correlation has been observed for soil organic carbon with Oxide bound B (r= 0.834**), Organically bound B (r= 0.541**), Specifically adsorbed B (r= 0.505*). Cropping system did not significantly affect the various boron fractions in the present study. The five fractions of boron in soils are in the following order i.e. RS-B< SA-B < Ox-B< Org-B < Res-B. The study reveals the selected soil properties influence on soil B fractions and cropping system being a non-determinant influencing any of the boron fraction studied.

Keywords: Soil Boron fractions, selected, Boko, cropping system, Kamrup

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Organic carbon has elusive role in water retention in tropical and subtropical soils of the Indian subcontinent

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Abstract

Built up of organic carbon (OC) in tropical and subtropical soils is a slow-going process. The availability of materials with high C concentrations on mass basis is uncertain or these have alternate uses, especially to small and marginal farmers. Although water retention is primarily governed by the relative distribution of soil textural components, OC can play role in augmenting the water availability in the soil. An extensive database of tropical and subtropical soils of India was developed from legacy data and published information on soil textural separates, OC content and bulk density (the predictor variables), and water retention at field capacity and wilting point (target variables). Soil texture is essentially dominating the relations, and OC does not appear to be a key variable for prediction of field capacity and available water content, except in coarse texture soils. In fine texture soils with high clay content, water content at field capacity actually decreases with OC, only to bring a reduction in available water content. Predictive equations were developed for water retention parameters, and the ranges of C threshold values were quantified for coarse, medium and fine textural soil groups, wherever applicable. The clay-OC interaction may modify the relations, provided suitable derivatives of their association are identified. It is imperative that the quest for improving soil organic C status must be revisited and specific textural domains should be identified for tropical and subtropical soils of the vast Indian subcontinent.

Keywords: Organic C, soil water retention, machine learning

Determination of critical concentrations of boron in soils and plants of cauliflower (Brassica oleracea var. botrytis L.) using polynomial equation

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Abstract

A novel approach of determination of critical limits of essential plant nutrients in soil and plants may be of interest. An experiment was conducted to understand plant available B status in Entisols and Inceptisols of the Gangetic alluvial plains for cauliflower and to determine critical concentrations of B in soils and plants of cauliflower by using polynomial equations. Soil and cauliflower crop (plant and curd) were collected from 81 cauliflower growing farmers' fields. Soil samples were analyzed for available B by using hot-$CaCl_2$ (HCC), KH_2PO_4 (PDP), tartaric acid (TA) and HCl (HCl) and cauliflower crop samples for B concentration. Hot-$CaCl_2$ and dilute HCl extracted higher amount of B followed by TA and PDP in decreasing order. Better relationships of HCC and HCl with soil properties, cauliflower curd and plant weight and B concentration in crop tissues proved their superiority over TA and PDP for assessing B availability for cauliflower in soil. Critical limit for adequate concentration of HCC and HCl extractable B were 0.53 and 0.54 mg kg^{-1} in Entisols and 0.57 and 0.58 mg kg^{-1} in Inceptisols, respectively. Similarly, critical B concentration in cauliflower plant was 21.5 and 23.8 mg kg^{-1} in Entisols and Inceptisols, respectively. The novel approach of determination of critical limits of B by using polynomial equations was effective. Boron availability in Entisols and Inceptisols were similar and about 20-30% of soils and plants were B deficient, which caused 10% or more reduction in cauliflower curd yield.

Keyword: cauliflower, boron availability, extractant, Entisols, Inceptisols

Balanced fertilization for improved nutrient use efficiency and mulberry productivity

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Abstract

Field experiments were conducted to determine the effects of various combinations of chemical fertilizer on leaf productivity and nutrient use efficiency in mulberry. Four different treatment combinations of chemical fertilizers *viz.,* urea + single super phosphate + complex (NPK @ 10:26:26) + Bentonite sulphur @ 40 kg /ha/year + zinc sulphate @ 5 kg /ha/year (T_1); Urea+ single super phosphate + complex (NPK @ 10:26:26) (T_2); Urea + Di-Ammonium Phosphate + Muriate of Potash (T_3); Urea + SSP + MOP (T_4) as farmers′ practice (FP) were studied in a randomized block design with three replicates. NPK @ 336:180:112 kg/ha/year was used as recommended dose of fertilizers in this experiment. Significant higher leaf yield and quality parameters were observed in T_1 and followed by T_2; T_3 & T_4 respectively. Similarly, there was 17% improvement in T_1 for leaf chlorophyll content against FP. When the nutreints were applied as compound and complex fertilizers, there was an improvement in leaf yield around 8-9% as compared to the T_4 where it was supplemented as straight fertilizers. Moreover, when NPK chemical fertilizers applied in combination with sulphatic and zinc fertilizers resulted in the improvement of leaf yield by 19%. Further, total soluble protein and total soluble sugar also increased by 24% and 17% respectively. Besides, significant improvement in partial factor productivity by 19% and agronomic use efficiency by 35% was recorded in comparison to FP. Therefore, application of recommended N – P – K + S + Zn in the form of Urea-SSP-Complex (10:26:26) along with Bentonite sulphur and Zinc sulphate is found to be a balanced fertilizer combination for mulberry cultivation to enhance nutreint use efficiency and quality leaf productivity.

Keywords: Balanced fertilization; mulberry; leaf yield; nutrient use efficiency

Impact of Mulching on Soil Health and Productivity in Peach (*Prunus persica* L. Batsch)

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Abstract

Crop yield has been boosted by farming strategies that involved use of mulch. The response of peach under different mulches on soil hydrothermal regimes, weed infestation and microbial properties of soil along with change in weather-associated variables from bud development to fruit maturity is documented in study. A field experiment was conducted with use of organic residue mulch, inorganic mulch and treatment comprising supplemented irrigation + recommended practices (RP). The impact of all treatment levels indicated that highest amount of moisture (19.85 and 20 %) and fruit productivity (22.7 t ha^{-1}) was under black polythene mulch and application of irrigation water in treatment RP enhanced fruit diameter and fruit weight that significantly increased fruit yield and fruit productivity (22.5 t ha^{-1}). Black mulch and mulch mat treatments also reported 100 per cent weed control efficiency at pit hardening and fruit maturity stage. The maximum frequency, density, relative frequency and relative density was of *Anagalis arvensis*, whereas abundance and relative abundance was highest of *Biden pilosa*. The impact of grass and pine mulch is also of interest in this study as it moderated soil hydrothermal regimes and significantly enhanced total viable count, microbial activity and microbial biomass carbon that was higher at surface (0-15 cm) over sub surface (15-30 cm). It was also observed that soil moisture and temperature exhibited negative correlation. Air temperature and soil temperature showed positive linear trend. So, mulching will aid farmers to capitalize productivity and profitability of crop.

Keywords: Fruit productivity, Weed control efficiency, Weather variables

Mode of presentation: Poster

Student Presentation: Yes

Assessment of phosphorus adsorption and desorption parameters and their temporal comparison under different long-term nutrient managements

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Abstract

Alfisols are the dominant soils of semi-arid tropics, where crop yields are often limited by low P concentration due to sorption and precipitation reactions with sesquioxide. To investigate the impact of different long-term nutrient management practices on P sorption behaviour, soil samples were collected after the harvest of wheat in 2008 and 2018 from a long-term experiment continuing since 1972 in Ranchi, Jharkhand with a soybean-wheat cropping system. Soils were equilibrated with different levels (5-60 ppm) of P and data was fitted to Langmuir and Freundlich isotherm. The soils from the adsorption run were allowed to desorb in a P-free medium and data was fitted to Freundlich isotherm. Result suggests that in 2008, the treatment 100% NPK+FYM and 100% N showed the lowest and highest adsorption, respectively. The Langmuir adsorption maxima (B) was highest in 100% N, followed by control. 100% NPK+FYM and 100% NPK+Lime reduced the bonding strength coefficient 'k' significantly. On the contrary, maximum desorption was recorded for 100% NPK+FYM, while control and N logged lowest. The treatments 150% NPK and 100% NPK+Lime also elucidated higher desorption than 100% NPK. In general, in 2018, all adsorption parameters decreased over the 2008 level and the percent change ranged from 1.2–25.9%. The maximum P buffering capacity and Freundlich '1/n' showed the highest and lowest change respectively. While, three treatments i.e., 100% NPK+FYM, 150% NPK, and 100% NPK+Lime elucidated a reduction in desorption parameters. To conclude, the addition of FYM and lime with recommended NPK and 150% NPK can reduce P adsorption and increase desorption in these soils.

Keywords: Alfisol, Phosphorus, Adsorption, Desorption, Langmuir, Freundlich, maximum phosphorus buffering capacity, adsorption maxima, bonding strength coefficient

Reducing Stubble burning: A step towards the sustainable agriculture and livelihood Security

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Abstract

Ensuring the food and nutritional security through sustainable agricultural practices has been gaining importance now-a-days all over the world. Stubble burning, the practice of putting fire purposely to the crop residue left in the field after harvesting, is a serious threat to the environment considering its harmful effects on the natural resources and human health.

Stubble burning serves as a source of atmospheric aerosol and gas emissions resulting in air pollution and loss of nutrients present in the stubble. The heat from burning paddy straw penetrates 1cm into the soil and kills the bacterial and fungal populations critical for soil fertility by elevating the soil temperature. Continuous clear sky condition facilitate 45% (wheat) and 25 % (Maize) yield increment under moderate aerosol loading in the atmosphere.

To reduce the ill effects of stubble burning various steps should be taken. In-situ incorporation of the crop residue may be done to escape the burning. A microbe, Pusa (IARI), that hastens decomposition and converts stubble to compost within 25 days can be introduced in the field. Farmers can also manage crop residues effectively by employing agricultural machines like Happy Seeder, Rotavator, Zero till seed drill, Baler, Paddy straw chopper, Reaper Binder etc. Crop residues can also be successfully utilized for mulching and composting. Production of bioenergy from the crop residues is a promising residue management technology. Most importantly, stubble burning can be checked by creating awareness to the farming community and enforcing the government legislation.

Keywords: Stubble burning, air pollution, soil fertility, residue management, Bioenergy

Application of Mid-infrared Spectroscopy for Prediction of soil organic carbon in the middle Indo-Gangetic plains of India

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Abstract

Soil organic carbon (SOC) sequestration provides an opportunity to mitigate climate change impacts, since soils are the largest store of terrestrial carbon. Accurate estimates of SOC content across landscapes are therefore important to monitor and manage efficiently these SOC stocks. Mid-infrared (MIR) spectroscopy has been increasingly applied as a rapid, cost-effective, and accurate method for predictive soil analysis. This study assessed the performance of MIR spectroscopy for SOC prediction at a regional scale in the Indo-Gangetic plains, 280 soil samples were collected covering Inceptisols, Entisols and Alfisols and their spectra recorded. Six preprocessing techniques ((reflectance, absorbance, multiplicative scatter correction (MSC), standard normal variate (SNV), Savitzky–Golay smoothing first derivative (SG-FD) and Savitzky–Golay smoothing second derivative (SG-SD)) and four multivariate methods (partial least-squares regression (PLSR), random forest (RF), support vector regression (SVR) and multivariate adaptive regression splines (MARS)) were evaluated to predict SOC from MIR spectra. The considerable prediction accuracy and robustness were achieved using the PLSR model (R_V^2 = 0.78, $RMSE_V$ = 0.04, and RPD_V = 2.07), RF model (R_V^2 = 0.65, $RMSE_V$ = 0.09, and RPD_V = 1.01), SVR model (R_V^2 =0.65, $RMSE_V$ = 0.09, and RPD_V = 1.12), and MARS model (R_V^2 = 0.67, $RMSE_V$ = 0.09, and RPD_V = 1.20). Findings from this study identified the reliability of SOC determinations by examining how preprocessing techniques and multivariate methods affect spectral analyses.

Keywords: MIR spectroscopy, Prediction, multivariate methods, Preprocessing techniques, Inceptisols.

Soil Health Management in Maize

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ABSTRACT

Maize requires fertile, deep and well-drained soils. Although, it can be grown on any type of soil, ranging from deep heavy clays to light-sandy ones, it is best adapted to well drained sandy loam to silty loam soils. It is, however, necessary that the pH of the soil does not deviate from the range 7.5 to 8.5. Maize plants, particularly in the seedling stage, are highly susceptible to salinity and water-logging. Accordingly, the provision of proper drainage is essential for the successful cultivation of this crop. The light-sandy soils greatly facilitate drainage, but have a relatively poor water-holding capacity; on the contrary, very heavy soils, with excellent water-holding capacity, have relatively poor drainage. Hence, soils ideally suited for maize cultivation should have adequate water-holding capacity and should also provide for good drainage. Over 85 per cent of the maize acreage is sown under rain-fed conditions during the monsoon when over 80 per cent of the annual rainfall is received.. Good quality soil is essential to the successful allotment plot. Without fertile, nutrient-packed soil, your careful efforts at sewing, weeding and tending your garden or allotment will all be in vain. Soil provides the food, water and some air that your plants need for healthy growth and development, so it's worth spending time trying to improve its quality.

Effect of fertilization on soil physico-chemical properties in relation to Zinc-Boron fractions in Broccoli (*Brassica oleracea*) in lateritic soils of West Bengal

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Abstract

The present study was conducted to assess the relationship between soil physico-chemical properties and different fractions of Zinc and boron in lateritic soils as influenced by zinc-boron application in broccoli. The treatments included different methods of zinc-boron application with different doses against control plot viz. T1 (control), T2 (zinc foliar @0.5%), T3 (zinc soil @ 25kg/ha), T4 (boron foliar @ 0.5%), T5 (boron foliar @ 0.5% and zinc foliar @0.5%), T6 (boron foliar@ 0.5% and zinc soil @ 25 kg/ha), T7 (boron soil @ 2kg/ha), T8 (boron soil @ 2kg/ha and zinc foliar @0.5%), T9 (boron soil @ 2kg/ha and zinc soil @ 25kg/ha) in randomized block design replicated thrice. Evaluation revealed all zinc fractions correlated non-significantly and positively for pH and organic carbon content except for crystalline sesquioxide and Mn bound which correlated negatively. Available zinc correlated significantly and positively only for residual zinc (r=0.745) and rest all were non-significant. Zinc fractions mostly correlated significantly and positively with each other (r= 0.990 between water soluble zinc and organic bound, r= 0.997 between water soluble and amorphous sesquioxide, r= 0.996organic bound and amorphous, r=0.765 between crystalline and residual zinc, r= 0.880 crystalline and total zinc, r= 0.933 residual and total zinc) except amorphous sesquioxide and manganese bound. In case of boron fractionation, pH and available boron correlated non-significantly and positively (except oxide bound boron). Organic carbon mostly correlated non-significantly except with organic bound (r=0.695). Boron fractions correlated non-significantly and positively.

Keywords: correlations studies, physico-chemical properties, lateritic soils, zinc fractions, boron fractions.

Bioavailability of potentially toxic element in chromium mines contaminated soils of Jharkhand and their influences on microbial properties.

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Abstract

The study was focusing on the chromite-asbestos mine sites of Roro hills of Chaibasa, West Singhbhum district of Jharkhand, India to determine the concentration of bioavailable forms of heavy metals (Cr, Ni, Cd, Cu and Pb) and their impact on microbial biomass, dehydrogenase enzyme, fluorescein diacetate hydrolyzing activity in mine waste amended soils. The chromite- asbestos mine waste was disposed around the locality surrounding the Roro hill for several years had lead to total destruction of vegetative cover and during the rainy seasons these mine waste washes down to the agricultural fields, forest and river leading to contamination agricultural land and water resources. High concentration of Chromium (Cr VI) in agricultural soil near the chromite-asbestos mines causes severe deterioration of soil health as well as human health problem like cancer and mesothelioma. The sequential extraction approach of mine wastes was indicated that two most labile fractions (i.e. water soluble and exchangeable fractions) was significantly higher in waste contaminated site as compared with natural site. The contents of microbial biomass C, fluorescein diacetate and enzyme activities was significantly decrease with increasing heavy metal content in contaminated site. Also toxicity characterized leaching procedure (TCLP) and DTPA extractable method were used to quantify hazardous element and plant available portion of metals. Significant negative correlation was found between the metal fractions and microbial health parameters of mine waste soils. Therefore, this study indicates thatthe presence of toxic mine wastes in agriculture soil would lead to complete destruction of soil health quality in near future.

Assessment of Water Quality of Dwarka river at Tarapith, Birbhum, West Bengal, by Water Quality Index Method

Sourav Mondal, Snigdha Chandra

Abstract

The present study was intended to calculate the Water Quality Index (WQI) of Dwarka River at Tarapith, Birbhum, West Bengal to assess the quality of water based on human consumption and domestic use. The investigation was carried out at two sample points to study the seasonal variation of eleven water quality parameters namely; pH, Total Alkalinity, TDS (Total Dissolved Solids), BOD (Biochemical Oxygen Demand), DO (Dissolved Oxygen), Calcium, Magnesium, Chloride, Nitrate-N, Sulphate, and Total Hardness during monsoon, post monsoon, and winter seasons. WQI (Water Quality Index) for the two samples was found in the range of 53.01-60.21 in all three seasons and overall water quality was poor during the study period. Water samples at sample point-2 was found to be more polluted than sample point-1. All the parameter values were compared with permissible limits as prescribed by the Indian standard and ICMR.

Keywords: Water quality index (WQI); Surface water quality; Water quality parameters

Assessment of Available Micronutrients in Different Soils of Pathapatnam Mandal , Srikakulam District, Andhra Pradesh

Sourotu Jagadeeswar Rao and Suchhanda Mondal

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Abstract

A study on "Assessment of available micronutrients in different soils of Pathapatnam Mandal , Srikakulam district Andhra Pradesh " was conducted during the year 2020-21. The present experiment was carried out with one hundred forty nine soil samples collected from seven panchyats of the mandal. The collected soil samples were analysed for their pH, EC, soil organic carbon content and contents of available micronutrients, viz., Fe, Zn, Cu and Mn. Soil pH values ranged from 5.47 to 8.56. Most of the soils under study were slightly to moderately alkaline in reaction, Electrical conductivity values ranged between 0.02 and 0.68 dS m^{-1}. The organic carbon content in these soils showed low to medium status, values ranging between 0.02 and 1.28 per cent. Among the micronutrients content in these soils, the available zinc content varied from 0.07 to 5.53 mg kg^{-1} in Pathapatnam mandal. Zinc deficiency was more pronounced in Pathaptnam mandal, where as available iron ranged from 0.41 to 30.06 mg kg^{-1} . The highest available iron content was noticed in Buragam panchyat and lowest available iron content was noticed in Seedi panchyat. Available manganese content ranged from 0.12 to 36.68 mg kg^{-1} and available copper content in soils ranged from 0.54 to 17.97 mg kg^{-1} . Both highest available and lowest available copper was found in AS Kaviti panchyat.

Keywords: Iron, zinc, copper, manganese**,** pH, EC, organic carbon, Andhra Pradesh ,

Quantitative estimation of soil organic carbon using VisNIR hyperspectral data: a case study in the northern districts of West Bengal, India

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Abstract

Environmental monitoring and precision agriculture demand good soil health. Soil organic carbon (SOC) governs majority of soil physico-chemical-biological properties, hence need rapid monitoring to ensure optimal ecosystem services. As a complementary approach to traditional methods, proximal visible-near infrared (VisNIR) reflectance spectroscopy (350-2500 nm) can be used for assessing the heterogeneity of SOC in field condition. In this study, VisNIR hyperspectral data of 120 air-dried surface soil samples were explored using three principal linear multivariate data analysis techniques *i.e.,* Stepwise Multiple Linear Regression (StMLR), Principal Component Regression (PCR) and Partial Least Square Regression (PLSR) to predict SOC status in three northern districts of West Bengal, India. Raw reflectance data was pre-processed and smoothening was done by Savitzky-Golay filter. Student 't' test and levene test was done between calibration and validation data set (3:1) to see the true representative. The samples were also processed for SOC determination by standard Walkley-Black titration method. All the hyperspectral models, StMLR (In validation, R^2_{val} = 0.80, RMSE = 0.17 and RPD = 1.71), PCR (In validation, R^2_{val} = 0.76, RMSE = 0.18 and RPD = 1.58) and PLSR (In validation, R^2_{val} = 0.78, RMSE = 0.17 and RPD = 1.64) yielded acceptable (PLSR and PCR) to excellent (StMLR) prediction performance over study area. The study also identified the sensitive wavebands (830, 1420, 1880, 2190 and 2230 nm) for SOC prediction. Subsequently, the developed models can be used as a rapid and inexpensive means for SOC prediction and monitoring over study area.

Keywords: Soil organic carbon; Proximal sensors; VisNIR reflectance spectroscopy; Multivariate data analysis

*Convention presenter

Critical Concentrations of Boron in Soils and plants of Tomato in agri-export zone of WestBengal

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Abstract

Tomato (*Lycopersicon esculentum*), which is one of the important vegetable crop enriched with vitamins, minerals and antioxidants, is grown extensively in the vegetable agri-export zone of West Bengal particularly Murshidabad, Nadia and North 24 Parganas districts. Vegetables grown in this region shows either through 'hidden hunger' or 'typical deficiency symptoms' of B. Information on B availability and critical limits of B for tomato (*Lycopersicon esculentum* L.) was scarce. An experiment was conducted to understand plant available B status in *Entisols* and *Inceptisols* of the Gangetic alluvial plains for tomato and to determine critical concentrations ofB in soils and leaves of tomato using the second order polynomial equations. Soil and tomato leaf were collected from 92 tomato growing fields. Soil samples were analysed for available B using hot-$CaCl_2$ (HCC) and tomato leaf samples for B concentration. Critical limits of HCC extractable B were 0.51 and 0.52 mg kg^{-1} and of matured tomato leaf B concentration were 40.5 and 37.5 mg kg^{-1} in *Entisols* and *Inceptisols*, respectively. Boron availability in *Entisols* and *Inceptisols* were comparable and more than 50% of soils and plants are deficient.

Behavioural analysis of Soil Carbon Pools and Nutrient Distribution of saline Soils under Seed Spices

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Abstract

Salinity in soil and irrigation water is a major environmental constraint in arid and semi-arid regions affecting soil organic carbon, its pools and distribution of the nutrients. A pot experiment was carried out in Central Soil Salinity Research Institute, Karnal, Haryana to investigate distribution of soil carbon and its dynamic pools and nutrients under saline water irrigation in seed spice crops. Soil samples were collected and analyzed for physicochemical properties (pH1:2, EC1:2), soil carbon (inorganic and organic), its pools (vey labile, labile, less labile and non-labile), and soil nutrients. Soil pH and EC varied between 7.70–8.72 and 0.45–8.25 dS m−1, respectively. Soil organic carbon and total soil carbon were higher by 15.2 and 22.4% with alternate application of saline and fresh water compared with continuous application of saline or fresh water and increased the less labile and non-labile carbon pools. Active and passive pools of carbon were higher under alternate application of saline and fresh water. Calcium carbonate and inorganic carbon were decreased by 35% with the continuous application of saline and fresh water. Similarly, alternate application of saline and fresh water increased carbon stock, carbon management index, and carbon pool index compared with sole application of fresh or saline water. Available nitrogen, phosphorous, and potassium varied from 310 to 629 kg ha^{-1}, 39 to 87 kg ha^{-1}, and 87 to 430 kg ha^{-1}, respectively. Micronutrients were found to be highest with alternate application of saline and fresh water. Zinc, iron, manganese, and copper varied from 2.66 to 5.24, 2.64 to 6.67, 4.60 to 13.07, and 1.36 to 3.66 mg kg^{-1} soil, respectively. Alternate application of saline and fresh water helps in the build-up of soil carbon while maintaining the soil nutrient pools compared to sole application of saline or fresh water application.

Keywords: Saline water; Seed spices; Soil carbon; Carbon management index; Available nutrients

Real Time Nitrogen Management in BT Cotton Through Optical Sensors for Nitrogen Use Efficiency and Soil Health

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Abstract

A real time nitrogen management (RTNM) practice through optical sensors is a need of the hour to break productivity barriers in Bt cotton and to increase nitrogen use efficiency. In light of this a field experiment was conducted at MARS, Dharwad during *kharif* 2019 and 2020 for RTNM through optical sensors. Experiment was conducted in split plot design with sixteen treatment combinations having two genotypes and eight N management practices. Pooled data indicated that non-significant difference in seed cotton yield was observed with genotypes (First Class and Ajeet 155 recorded 3313 and 3159 kg ha^{-1}, respectively). Seed cotton yields varied significantly due to different optical sensor-based N management practices. N supplementation at 1.1 – 1.5 response index (RI) and 81 – 90 % sufficiency index (SI) (4460 and 4412 kg ha^{-1}, respectively) produced higher but on par yields with RDF (4386 kg ha^{-1}) with saving of 15 kg N (10 per cent of recommended dose of nitrogen) through sensors during both the years.. Similarly, N supplementation at 1.1 -1.5 RI and 81 – 90 % SI of Ajeet 155 and First Class recorded significantly highest recovery efficiency (74.09, 79.72 % with Ajeet 155 and 82.95, 78.44 % with First Class, respectively) and internal efficiency (74.09, 79.72 % with Ajeet 155 and 82.95, 78.44 % with First Class, respectively) as compared to rest of the treatments. Similarly, 1.1 – 1.5 RI and 81 – 90 % SI recorded significantly higher gross returns, net returns and benefit-cost ratio, which were found on par with RDF.

Theme 1: Natural resources management for crop and environmental health

Concurrent Session 3: Other management practices

Jury members for paper evaluation

Prof. S. K. Pattanayak- Chairman

Dr. Ashish Biswas – Member

Dr. Biplab Saha - Member

Dr. Anup Das - Member

Dr. Pratap Bhattacharya - Member

Meeting link:
meet.google.com/pur-nozu-esx

9th Annual convention and national webinar on "Managing agro-chemical for crop and Environment health"

Theme area: 1. **Natural resource management for crop and environment health**

Title: Preparation of growing media for seed germination under greenhouse condition

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Abstract

Now a day's Hi-Tech Horticulture technology is more important for sustainable livelihood production of commercially fruit, vegetable, flowers, spice, medicinal and aromatic crops. Hi- tech Horticulture mean crops cultivation throughout the year but without depends on nature. Hi- tech Horticulture technology has several branch such as; greenhouse cultivation, aeroponic, hydroponic, vertical farming, sprinkler watering system, fustigation system, IDM, IPM, IWM also included. Growing media has tremendrious role for better seed germination and healthy seed growth. Naturally farmer seed germination through soil so, many time not expected seed germination due to soil born pathogen, high and low soil ph, high and low amount of salt concentration, high and low amount of nutrient factor also. Now a day's several types growing media use for under greenhouse condition such as; cocopeat, vermiculite, perlite, rockwool, sphagnum moss. In this types of growing media comprise material aimed to provide ideal physical and chemical characteristics for the root environment. These media can also be combined in desired proportions as a recipe or formulation as per requirement of the crop or situation. These are used because soils from the field are often vulnerable to diseases and pests and may not provide healthy growth of plants particularly in containers. Besides, these media in right proportions can provide aeration, drainage, water-holding capacity and nutrient uptake by the plant while also resisting the development of diseases or germination of weeds.

Keywords: Greenhouse, growing media, Hi-tech Horticulture

Theme 1: Natural resource management for crop and environmental health

Effect of deficit irrigation scheduling and Agri-horti system on crop growth and yield attributes of Indian mustard (*Brassica juncea L.*) under semi-arid ecology of India

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Abstract

The status of water resources and growing water crises in many parts of the world, sparked by rising demand because of population growth and erratic climate patterns, have become topics of concerns. To increase water productivity, micro-irrigation especially deficit drip irrigation is a sustainable option. In response, this research experiment was conducted at Indian Agricultural Research Institute, New Delhi, in *Rabi season* 2020-2021. The experiment was carried out in split plot design (SPD) with 5 main-plot treatments and three sub-plot treatments and replicated thrice. The aim of this experiment was to study and understand the effect of Agri-Horti system (AHS) and deficit irrigation scheduling (DIS) on crop growth, yield, moisture dynamics, physico-chemical properties, economics and water productivity in mustard crop. Main plot treatment consists of moringa (*Moringa oleifera* Lam.), phalsa (*Grewia asiatica* L.), karonda or Carandas plum (*Carissa carandas* L.), aonla or Indian gooseberry (*Phyllanthus emblica* L.) and guava (*Psidium guajava* L.) and subplot consist of three deficit-irrigation scheduling level (DIS), viz. rainfed, 0.4 IW:CPE ratio (irrigation water: cumulative pan evaporation) and 0.6 IW: CPE ratio. A significant response of AHS and DIS was observed on growth and yield attributes. The moringa based AHS recorded highest plant height (163.6 cm), LAI (2.94), DMA (74.2 g/plant), number of primary branches (8). Among different treatments of DIS 0.6 IW/CPE recorded the highest value of growth and yield attributes. There was 10.9% and 36.1% higher seed yield recorded with 0.6 IW/CPE over 0.4 IW/CPE and rainfed treatment.

Keywords: Agri-Horti system, Deficit irrigation scheduling, Drip irrigation, Indian mustard.

Influence of sowing time, variety and micronutrient foliar feeding on biofortification of lathyrus

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Abstract

A field experiment was designed during two consecutive *rabi* seasons of 2016-17 and 2017-18 to validate whether foliar application is effective for biofortification of lathyrus seeds in two different rice systems. The experiment was carried out in District Seed Farm, A-B Block, BCKV, Kalyani, West Bengal, India, following split-split plot design taking relay sowing of lathyrus in main plots [S_1: Satabdi (IET 4786), S_2: Swarna (MTU 7029)], three lathyrus varieties in sub plot (V_1: Nirmal, V_2: Prateek and V_3: Ratan) and four foliar sprays at pre-flowering and pod development stages in sub – sub plot (F_1: Control, F_2: 0.5% $FeSO_4$, F_3: 0.5% $ZnSO_4$ and F_4: 0.5% $FeSO_4$ + 0.5% $ZnSO_4$) with three replications. A starter dose of 20:40:20 kg ha^{-1} of N:P_2O_5:K_2O was applied at the time of sowing. Among three varieties better response of Ratan was exhibited in terms of lathyrus seed protein content, seed Fe content, nitrogen content, phosphorus content and potassium content. Whereas maximum grain Zn content was recorded with Prateek followed by Ratan and Nirmal. As far as the foliar spray treatments were concerned, higher crude protein and zinc content of dried lathyrus seeds were recorded with F4 (combined application of $ZnSO_4$ & $FeSO_4$ @ 0.5% at pre flowering and pod development stages) and least with F1 (No spray). Treatment F2 was identified with greater Fe content in seed (5.55 ppm) being statistically significant over F1.

Keyword: Biofortification, Zinc, Iron, Protein, Lathyrus.

Assessment of jute agro-textile as a mulching tool for improving growth and yield of citrus

Asanul Hoque

Malda Krishi Vigyan Kendra, UBKV, Ratua, Malda, W.B.

Abstract

Mulching has become an important in modern field production because of its dimensional positive effectiveness so different mulching material have been used for different agricultural and horticultural species. Citrus play a major role in Indian agriculture by providing food, nutritional and economic security and more importantly, producing higher returns per unit area and time but productivity is unstable due to aberrant weather conditions associated with soil related constraints and water scarcity during Rabi and summer seasons. The present section aims to test the effectiveness of different amount of jute agro textile. A field experiment was carried out conducted at malda krishi vigyan kendra,old Alluvial Zone, Uttar Banga Krishi Viswavidyalaya, Malda, West Bengal. The experimental site is situated at 26º8'N latitude and 78 º E longitudes having an average altitude of 8.75m above mean sea level. From this experiment we get to know The increase in physiological parameters and total water use were found to be the highest in case of 800 gsm of wood compared to 200 and 500 gsm jute agro textile. But the difference value of parameters in percentage increase between 200 and 500 gsm is greater than the percentage difference between 500 and 800 gsm of jute agro textile.That is, the percentage increase in value of parameters shows a declining trend with the increase in strength of jute agro textile. So, a further increase in strength of jute agro textile may results in an increase in value, but with reduced magnitude leading to deceleration in net value which may not be economical considering the additional cost associated with it. From the results we can concluded that among the various strengths of jute geotextiles, 500gms jute agro textile is found to be most efficient to keep the soil in favorable condition towards improving physical and chemical condition, increasing nutrients and water availability in soil thus influencing improvement of crop growth as well as cost effective.

On farm evaluation of rate and schedule of fertilizer application in summer sunflower in North eastern coastal plain zone of Odisha

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Krishi Vigyan Kendra, Bhadrak (OUAT)

Abstract

Sunflower (Helianthus annuus) is proven to be a suitable and profitable alternative for farmers in spring/summer season in north eastern coastal plain zone of Odisha. Within a short period of 90 days this crop offers better opportunities for earning higher net income over the conventionally grown mustard, black gram or green gram. On an average farmers earn a profit of about ₹50,000 per ha by growing sunflower after kharif rice. However, there lies opportunities for optimization of dose of fertilizers and improvement of yield and profit. On farm trial was conducted in sunflower by KVK, Bhadrak, Odisha during summer seasons of 2019-20 and 2020-21 for finding out the optimum rate and schedule of fertilizer application. Farmers' practice characterised by use of NPK doses of 80-120-40 kg/ha with 2 splits of N and the two technology options were NPK dose of 60:90:60 kg/ha with 3 splits of N (TO_1) and dose of NPK 60:90:30 with 3 splits of N i.e 50%+25%+25% (TO_2) and NPK 90:90:60 with 2 splits of N (TO_3). The trial was conducted with 7 different farmers and each farmer was treated as one replication. Soil of trial sites were silt loam soil with available N of 180-258 kg/ha, available P of 31-45 kg/ha and available K of 67-125 kg/ha. Average data in respect of growth, yield parameters and economics were calculated and statistically analysed for drawing inference.

Table 1: Growth, yield and economics of sunflower as influenced by fertilizer dose and schedule (average data of 2 years)

Treatments	Head size of sunflower (diameter cm)	Grain yield (q/ha)	Gross income (₹)	Net return (₹)
Farmers' practice	17.9	18.0	91647	47597
TO_1	16.8	17.5	89072	48072
TO_2	15.3	15.9	81192	40517
TO_3	18.8	19.1	97232	55332
CD (p=0.05)	1.4	1.5		

From the results at Table 1 it is observed, size of sunflower head expressed as diameter in cm is found to be highest due to TO_3 which is at par with at under farmers' practice significantly larger over that under other two recommendations (TO_1 and TO_2). Similar trends observed in grain yield too with TO_3 giving highest yield. Most important observation is obtained in analysis of economics of production for different treatments. Net return earned due to TO_3 is ₹55,332/ha which is 16% higher than that obtained under farmers' practice. Form the results of this trial it is evident that, even though farmers applying

very high doses of P and N (NPK dose 80:120:40) which could produce good yield but it is not economic as compared to TO_3 schedule (NPK dose 90:90:60 with 2 slits of N) which can be considered as the optimum rate and schedule of fertilizer for sunflower cultivation.

Evaluation Of Climate Resilient Rain Water Management System for Tropical Islands of Andaman

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Abstract

A tank cum open dug well system suitable for tropical islands of Andaman have been developed for providing reliable irrigation to croplands. The system comprises of series of tanks with open dug wells in the recharge zone of the tank that reharvest back the seepage water. Thus, the rain water remaining in the tank as well as partial seeped water is used for providing round the year full irrigation. This system was evaluated in the field of South Andaman district of Andaman and Nicobar Islands with nine tanks and as many wells in two villages. The total command area of the system of series of tanks and wells in two villages is 31 ha and the total irrigation potential is 52.8 ha. The total cost of the system is Rs 24.87 lakhs making the cost of irrigation resource creation as Rs 80,226 per ha. The system increased the rice yields from 32.5 q ha^{-1} to a range of 45 to 47q ha^{-1} depending upon the package of practices or the amount of inputs. The farmers went for crops in post-monsoon and summer season and the cropping intensity rose from 128% in the first year to 145% in the sixth year.

Keywords Rain Water Harvesting, Tank cum well system, Cropping intensity, Benefit cost ratio

Theme 1: Natural resources management for crop & environmental health

Title: Modified moisture conservation practices for spring season sweet corn in the *Tarai* regions of Uttarakhand

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Abstract

Experiment was conducted during spring season at Govind Ballabh Pant University of Agriculture and Technology, Pantnagar to investigate the effect of irrigation scheduling, method of establishment and moisture conservation practices in spring season sweet corn. Sweet corn is a remunerative crop because it fetches higher market price than normal maize and enables timely sowing of *rabi* crops in next season. However, high ET owing to high temperature during spring season enforces high irrigation frequency. Thus, an experiment was planned with the following factors: irrigation was applied at three ratios (IW/ CPE of 1.0, 1.2 and 1.4), sowing was done in flat plots and furrows and moisture conservation practices like biochar @ 3.0 t/ha and mulch @ 6.0 t/ha was adopted. Irrigation at IW/CPE 1.4 resulted in 18.5% and 17.8% higher dehusked cob yield over IW/CPE 1.0 during 2017 and 2018, respectively whereas, the respective increase was 14.1% and 11.7% for IW/CPE 1.2 over IW/CPE 1.0. Application of biochar and straw mulch increased dehusked cob yield of sweet corn by ~6–9% over control (no-residue) during both years. Furrow sowing saved 25% irrigation water. IW/CPE 1.2 registered statistically comparable Irrigation water use efficiency (IWUE) with the lower ratio IW/CPE 1.0 but significantly higher (~7%) over IW/CPE 1.4. Furrow sowing improved IWUE over flat method by ~41%. Virtual water content was 6–7% and 7–8% lower under rice straw mulch and biochar, respectively than no-residue control. Furrow method of sowing increased the B: C ratio over flat method by ~14%. Soil properties *viz*., pH, organic carbon, bulk density, microbial activities were improved with biochar followed by mulch application. Thus, considering yield, water use efficiency, virtual water content, economics and soil health, irrigation scheduling at IW/CPE 1.2 +furrow sowing+ mulch/biochar will augment the performance of sweet corn in a sandy loam soil.

Surface Soil Moisture Mapping from Satellite Observation: An Ensemble Approach

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Abstract

Remote sensing offers a great potential for soil moisture retrieval even though continuous mapping at field scale is impeded by the limited availability of high-resolution, all-weather suitable data and model-based complexities. The current study is an attempt to evaluate the synergistic use of microwave and optical/thermal infrared remote sensing and an ensemble-of-all approaches for surface soil moisture (SSM) monitoring over a semi-arid irrigated agricultural farm. The performance of Water Cloud Model (WCM) using Sentinel-1 & -2, Thermal-Optical TRApezoid Model (TOTRAM) and Optical TRApezoid Model (OPTRAM) using Landsat-8 short-wave infrared (SWIR)/thermal infrared sensor (TIRS) data and an ensemble model were evaluated for nine dates covering the entire post-monsoon period. The ensemble model built using Gradient Boosting Machine (GBM) and outputs from the microwave, optical/thermal approaches provided a better SSM estimate over the entire crop season. Although the model performances varied with crop growth stages, the overall lowest RMSE was measured in the ensemble model (0.056 $m^3\ m^{-3}$) followed by OPTRAM (SWIR2) (0.065 $m^3\ m^{-3}$) and highest for TOTRAM (0.09 $m^3\ m^{-3}$). WCM or TOTRAM mapped SSM better during the early phases of crop growth whereas OPTRAM (SWIR 1 or 2) was found more reliable during the latter stages. All the approaches could effectively delineate high and low intensive irrigation zones, although optical and optical-thermal synergy was better towards a dry-moist soil moisture regime. The study highlights the limitations of WCM regarding its calibration requirement for changing vegetation structure using *in situ* data, whereas TOTRAM needs local calibration owing to the sensitivity of land surface temperature to ambient atmospheric conditions. OPTRAM, being simple, low data- and resource-intensive, and surface reflectance-soil moisture relationship independent of local calibration, is advantageous for generating soil moisture maps during the post-monsoon period in semi-arid climate with prevailing clear sky conditions. Overall, the ensemble technique can be recommended for farm-level irrigation mapping over an entire post-monsoon period.

Keywords: Soil moisture mapping; WCM; OPTRAM; TOTRAM; Random Forest; Farm-scale

Spatial Analysis for Salt affected Soil in Coastal Districts of India using Remote Sensing and GIS

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Abstract

India has a large area of coastal boundary covering 73 districts of 9 states. Agriculture in the coastal district are multidisciplinary which is mainly rice-based, horticultural crops, fisheries and dairy. Most of the population is depending on the agriculture products but at the same time facing challenges of increasing salinity in agricultural fields due to climate change, sea water level rise and manmade activities such as misuse of irrigation water, converting agricultural lands into fisheries etc. Increasing salinity affects the food productivity and the economy of local livelihoods. A detailed study of 73 coastal districts of India has been done using Landsat 8 OLI data which has 9 spectral bands (except 10^{th} and 11^{th} bands) with a spatial resolution of 30m for band 1 to 7 and 9, and 15m for panchromatic band 8 from the year 2019 and 2020. Landsat 8 satellite data are very helpful to identify the salt affected soils in agricultural fields by using the reflected spectral bands. The raw satellite data DN values were converted into reflected energy in ERDAS Imagine and then Canopy Response Salinity Index (CRSI= $(NIR \times R) - (G \times B)/(NIR \times R) + (G \times B)$) and Salinity Index ($SI=\sqrt{G * R}$) were calculated taking band 2^{nd} (blue), 3^{rd} (green), 4^{th} (red)and 5^{th} (NIR) using raster calculator in Arc GIS. The salinity map was classified into 3 categories as non-saline, slightly saline and highly saline. India has estimated 13143 sq.km of total salt affected soil in coastal districts and Gujrat (6939.15 sq.km), West Bengal (4286.814) and Maharashtra (916.29 sq.km) identified as top 3 salt affected states.

Bio-Mulches & Sustainable Agriculture

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Abstract

Farmers often need to regulate soil temperature, reduce weeds, and minimize water loss and mulching is a approach to do so. The use of polyethylene mulch in agriculture has increased considerably in the last decade all over the world. This increase is due to multiple benefits such as maintained uniformity in soil temperature, reduced weed population, conservation of moisture, and reduced attack of certain insect pests, improved crop yields, and more nutrient use efficiency. Despite multiple benefits, polyethylene mulch carries long-term environmental consequences. Use of this kind of mulch can degrade soil and water quality; microplastics can even enter the human body via food chain. Removal and disposal of conventional plastic mulches from soil system remains a major agronomic, economic, and environmental constraint. However, this obstinate problem has led to development of biodegradable and photodegradable mulches. Irrespective of the nature, all soil can benefit from a regular boost of organic matter. Bio Mulch is one kind of composted surface mulch, which is rich in organic carbon and living microorganisms. It is a perfectly formulated mulch to increase the fertility of soil and also to provide the water saving benefits alike any surface mulch. In a recent study, researchers tested a more sustainable approach to reduce evaporation from soils. Instead of polyethylene, sand particles coated with soybean oil was used and it resulted up to 96% lower evaporative water loss compared to fallow soil. Bio-based soil coatings (i.e., soybean oil) and biodegradable plastic mulch could be low-impact sustainable alternative if the mulch performs equally to polyethylene mulch and biodegrades completely into ingredients that do not ruin the soil ecological or environmental balance. Reduced labor costs for disposal, and reduced landfill waste add further appeal to its potential to be a sustainable technology in agricultural production systems.

Keywords: Mulching, biodegradable plastic mulch, sustainable agriculture, weed management, organic

Use of Poor Quality Water: Food Security and Soil-Plant Health

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Abstract

Water is a renewable resource but decreasing availability and the generation of a greater volume of wastewater is limiting the replenishment of fresh water. Poor quality water may be a good alternative for fresh water in water-scarce areas. Most of the farmers in the urban/peri-urban areas forced to use poor quality of water for cultivation of crops, found it's a good alternative at cheaper cost. It is need of hour to feed the 1.6 billion Indian population by the year 2050. The accumulation of various pollutants in soil causes a decline in its health in terms of a reduced infiltration rate, a decline in the soil's organic matter decomposition rate, microbial population, and diversity, which leads to a poor crop yield. We studied tannery effluent irrigation and its effect on crop and soil properties. In the finding, long-term application of tannery effluent for crop production enhanced the chromium concentration about 28-30 times more than tubewell irrigated fields. Whereas, increasing concentration of Cr in plant reduce germination, plant growth, uptake of plant nutrient by inhibiting the xylem process. It also reduced the soil microbial activities. Another case studies in sewage irrigated agricultural field showed that soil organic carbon accumulated in lower depth and also reduced the heavy metal toxicity in crop plants and soil properties. Fractions of organic carbon in soil ecosystem may mediate soil process and plant metabolic activities. Both the systems are diverse in nature and need different set of management. Safe use of industrial waste water may be a alternative in water scare areas for sustainable crop production without affecting environmental health.

***Author presenting the work**

Importance of Remote Sensing in Drought Assessment

Abstract

Drought is a natural hazard which is caused due to shortage of rainfall. Drought refers to the situation that arises due to moisture stress in reasonably longer spell. The several meteorological variables (indicators) such as precipitation, temperature, humidity and evapotranspiration are required to calculate drought severity level. Remote sensing (RS) is an effective tool to monitor and assess drought because it provides spatially continuous imageries whereas the rainfall stations are discretely places. The widely used satellite based remote sensing system requires Platform to carry sensor (satellite), Signal to carry the information, Sensor to receive the signal and Processor to process the signal. RS represents the crop stress directly. Furthermore, the RS based analysis is the quick way to monitor drought. Different types of Time series data are available in Remote Sensing that can be used for drought monitoring. In remote sensing based approach the different vegetation indices are used to represent the vigour or stress condition of the vegetation. The vegetation indices are computed from the spectral reflectance or surface temperature (LST) or the combination of both. Some important RS bases indices are – NDVI (Normalized Difference Vegetation Index), NDWI (Normalized Difference Water Index), NDDI (Normalized Difference Drought Index), EVI: (Enhanced Vegetation Index), VCI (Vegetation Condition Index), AVI (Anomaly Vegetation Index), TCI (Temperature Condition Index) etc. These vegetation indices show good relation with the vegetation condition and hence can be used for assessment nof drought. Satellite based observation csapabiliety has advanced remarkably in last few decades. Judicious use of time series data of vegetation indices and LST can help to give quick, unbiased and more representative assessment of drought condition. The MODIS derived vegetation indices available from open source repositories provides options for continuous monitoring of vegetation condition at daily 8 days, 16 days and monthly time scales. The present study was conducted using MODIS data of 13 years time series to delineate drought prone areas for South Bengal districts and to monitor the intensity of Drought using NDVI and AVI.

Keywords: Drought, Remote Sensing, NDVI, AVI, VCI.

Time variable effect of chiselling on soil hydromechanical regime in a sandy loam soil under soybean-wheat rotation

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Abstract

The effect of chiselling is evident that reducing the sub-surface compaction, although the benefit is short-lived as compared to the residual effect. The present study investigates time variable effect of chiselling changes in soil hydro-mechanical regime in a sandy loam soil under soybean-wheat rotation for two years (2013-2014 and 2014-2015) which was conducted at the experimental farm of ICAR-Indian Agricultural Research Institute, New Delhi. The chiselling treatments were: RS; Residual chisel (Chiselling on June 2011), RC; Repeated chisel (Chiselling on May 2011 and again on May 2013), FC; Fresh chisel (Chiselling once in May 2013) and NC; No chisel (Control). Soil bulk density, penetration resistance, steady-state infiltration rate and field-saturated hydraulic conductivity, root growth parameters and grain yields were determined. The time variable effect reduced penetration resistance in the sub-surface (10 to 25 cm) layer and was significantly higher in NC compared to RS and RC plots. The FC plots, which have been freshly chiselled on May 2013, did not show any reduction in PR at the sub-surface. This was due to high rainfall events in June and July, which could be responsible for the re-compaction of the soil at these depths and reduced in subsequent periods. In soybean crop 2013, the penetration resistance 35-38% higher owing to 15% higher moisture content (θ_v) which was significant at 30-45 cm in NC than RS and RC; but the wheat crop of 2013-14, did not show any significant difference in ρ_b or either in θ_v of the sampling or the depths. In soybean 2014, no statistical differences were obtained between the treatments in either of the layers. In the following wheat crop (2014-15) both NC and FC had higher compaction at 16 and 18 cm ($p<0.001$), and 20 cm ($p=0.004$) depths. The steady state infiltration rate (IR) and field saturated hydraulic conductivity (K_{fs}) was significantly higher in soybean crop 2013 and subsequently reduced in wheat crop for both years in NC compared to the FC, RS and RC. The modified soil physical properties improve the root growth parameters and grain yields, treatment differences emerged significantly in soybean 2013 and wheat 2013-14 i.e., during the first year of crop rotation only. The time variable effect of chiselling in improving soil hydro-mechanical properties vis-à-vis root growth were evident through increasing porosity, soil profile water storage in sandy clay loam soil, especially reducing sub-surface compaction.

Keywords: Hydraulic conductivity; penetration resistance; compaction; chiseling; wheat

Effect Of Water Management Practices and Nitrogen Sources On N-Mineralization and Use Efficiency in Rice

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Abstract

A field study was conducted at college farm, College of Agriculture, Rajendranagar, Hyderabad, Telangana during *Rabi* 2015-16 and 2016-17, to investigate the effect of water management strategies and nitrogen sources on N-mineralization and use efficiency. The experiment was laid out in a Split plot design with two major treatments i.e., Continuous flooding (CF) and alternate wetting and drying (AWD) and with five sub treatments *viz*., T_1- N_0:P_2O_5 @ 60 kg ha^{-1}: K_2O @ 60 kg ha^{-1}; T_2- Nitrogen @ 120 kg ha^{-1}: P_2O_5 @ 60 kg ha^{-1}: K_2O @ 60 kg ha^{-1}; T_3- Soil test based Nitrogen fertiliser application; T_4- Nitrogen @ 60 kg ha^{-1} + 60 kg ha^{-1} through green manure and T_5- Nitrification inhibitor Coated Urea. MTU-1010 variety was grown with the recommended management practices. CF plots were kept at a 5cm water level at all times, while AWD plots were irrigated when a hairline fissure emerged on the soil surface.

Significantly NH_4^+-N content increases with time and peaked at 15 DAT under CF as well as AWD. Green manure treatment resulted in faster NH_4^+ -N release and accumulation, in the order of Green manure > PU > STCR > coated urea > control treatments. In comparison to STCR and green manure, NO_3^--N release was low in coated urea, followed by prilled urea. Alternate wetting and drying resulted in 29 percent greater AE than continuously flooded rice. The treatment which receives nitrogen through STCR followed by nitrification inhibitor coated urea treatment had the highest AE.

Keywords: Mineralization, Coated urea, Green manure, Agronomic use efficiency and Rice

Isolation of protease producing bacteria from soil and characterization of protease

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Abstract

Microorganisms are considered as the best source of protease production. Protease is an enzyme that plays a major role in hydrolyzing protein molecules to amino acids and very important for various industrial processes. In this study, two bacterial isolates of *Bacillus* species from soil of organic mulberry garden that has the potential to produce proteases have been isolated and identified. The partial characterizations of crude protease were carried out. Extracellular proteins were separated on 8 % SDS-PAGE and observed few bands with molecular weight ranged from 20-150 KDa. Similarly, two protease isozymes were detected on 8 % NATIVE–PAGE in both the samples. Protease samples showed maximal activity at pH 7.0-7.2 at 30°C and temperature at 30°C to 40°C. Activity of protease increased with increase in substrate concentration and showed maximum activity at 1 % casein. Protease activity was increased with increased in enzyme concentration. The inhibitors such as EDTA (10 mM) and lead acetate (2 mM) at higher concentration inhibited protease activity. Metal ions such as NaCl (2-10 mM) and KCl (2-20 mM) stimulated the protease activity by 10-20 %. Silver nitrate (0.1-20 mM) did not inhibit protease activity at lower concentrations. These bacterial isolates which had produced proteases could be explored for industrial applications.

Keywords: Soil, Bacteria, protease, characterization, SDS-PAGE

Management of Algae in Makhana and Environmental Health

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Abstract

Among different states of India, Bihar alone accounts for more than 85 % of total production of Makhana. Generally, makhana is grown in stagnant water ponds or swampy wastelands. One common difficulty in cultivation of makhana in these water ponds or inland water-area is threatening by the invasion of noxious aquatic weeds. Aquatic weeds especially algae posing serious threats to water availability, productivity of crops, fishing and navigation. Algae is a serious problem in makhana based cropping system, resulting in loss of yield and deterioration of water quality. While algae produce oxygen during the day through photosynthesis, oxygen production ceases at night, as algae continue to use oxygen at night, however, large populations of algae in a pond can deplete the oxygen supply in the water overnight, causing a low-oxygen condition that can be harmful for makhana crop or even fatal to fish and other aquatic life. Compounding this problem is that when large populations of algae die, their decay can further deplete the water's oxygen, impacting the health of water ecosystem. It was therefore, felt necessary to take an experiment for managing algal menace in makhana cultivation. Rice -Straw has been found promising in controlling the growth of algal bloom in makhana growing plots and its application also resulted in maintaining the water quality towards normal, hence maintaining the environmental health.

Keyword- Algae, Makhana, Aquatic Ecosystem, Water Quality

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Effect of weed management practices in yield and economics of Elephant Foot Yam

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Abstract

Elephant Foot Yam (*Amorphophallus campanulatus* (Roxb.)) is an herbaceous crop basically originated from South Eastern Asian Region. In the present scenario of climatic change, its cultivation is commercially gaining more importance due to its higher production potentiality, suitability in intensive cropping system, medicinal property, eco-friendliness due to less use of inputs and popularity as a highly nutritive vegetable in various region of West Bengal over other crops. But weed is potentially major constraint particularly during initial growth stages to the way of higher and quality production. In view of the above context, an experiment was carried out at Sutia village of Gobardanga block in North 24 Parganas district during 2018-19 and 2019-20 at the fields of 8 farmers to find out the effective weed management practices considering the cost effectiveness in EFY. There were three (3) technology options.

TO 1- Farmers practice (Without any mulch,1-2 hand weeding)

TO 2- Cultivation of EFY (with straw mulching)

TO 3- Cultivation of EFY (with poly mulching)

The standard cultural practices were carried out in all the farmers' field. The study revealed that the maximum plant height of 81.2 cm was observed in polymulched plot followed by 75.5 cm in straw mulched field. The pseudostem girth of 19.5 cm was obtained from TO-3 and it is one of the determining factors of yield. The highest yield of 40.70 t ha^{-1} was obtained from polymulched field with B:C ratio of 1.61 followed by TO -2 with 37.50 t ha^{-1} yield and 1.52 B:C ratio. This might be due to the proper weed control at the initial stages as well as moisture conservation and increase in soil temperature which might be resulted to the beneficial microbial population in the soil for proper growth and development.

Standardize the dose of lignin degrading microbial formulation to hasten rice straw composting in eco-friendly manner

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Abstract

In India, the rice straw production is around 126.6 million tones, however, 60% of straw is burnt on field itself. Rice straw burning is spreading rapidly from north-western India to eastern states of the country. Straw burning causes emission of GHGs, obnoxious gases and particulate matters that causes air pollution. Rice straw composting is an effective eco-friendly technology for utilization of straw. However, slow decomposition rate is a challenge of rice straw composting due to higher lignin and silica contents of straw. Microbial mediated rice straw composting is eco-friendly, low-cost technology and easy to handle, however that need to be fine-tuned in site specific condition. The objective of the study to standardize the dose of gum acacia-based microbial formulation by using efficient lignin degrading microbial consortium [Bacillus cereus (MN784664) + Penicillium sp. (MK855473)] for straw composting. The 50 kg of rice straw was treated with four different doses of formulated product (T1-7.5g, T2- 15g, T3- 25g and T4 as control). The temperature, moisture and volume reduction during the composting process were monitored. The volume reduction of compost was highest in T2 (58.3%). The total carbon content of compost after 28 days was highest in T2 (35.7%) followed by T3 (34.4%). However, the total nitrogen content was highest in T2 (87.6%). The lowest C:N ratio (23:1) was found in T2 treatment at 28 days of composting. Therefore, 15g of microbial formulation per 50kg of rice straw (T2) could be recommended for straw composting within 28 days.

(Theme 1: Natural Resource Management for crop & environmental health)

Evaluation of water footprint of barley using CROPWAT 8.0 under elevated temperature regimes

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Abstract

In view of incessant climate change affecting agriculture and farming activities, execution of location specific crop models becomes a very necessary mitigation option these days. Considering this, one decision support irrigation management tool namely CROPWAT (v. 8.0) was implemented in Ludhiana and Gurdaspur region of Indian Punjab for estimation of water requirement and irrigation scheduling in barley crop during *rabi* seasons of 2015-16 and 2016-17. Results revealed that seasonal mean reference crop evapotranspiration was relatively higher for Ludhiana (2.74 mm day^{-1}) as compared to Gurdaspur (2.17 mm day^{-1}). Higher temperature, wind speed, sunshine hours and lower relative humidity at Ludhiana seemed to be the reason for higher ET rates. Radiation use efficiency was also more for Ludhiana (14 MJ $m^{-2}day^{-1}$) than Gurdaspur (12.9 MJ $m^{-2}day^{-1}$), which was directly proportional to ET_o. Temperature increase by 0.5, 1.0, 1.5 and 2.0 ^oC from the existing was found to increase ET_o by 0.72, 1.82, 2.91 and 4.01%, respectively and water requirement by 1.27, 3.10, 4.26 and 5.56% in similar order at Ludhiana. The corresponding simulated departures for Gurdaspur were 0.92, 1.38, 2.30 and 3.33% for ET_o and 2.65, 3.93, 5.43 & 7.10% for irrigation water requirement. Even, correlation study showed FAO-24 Pan method as the superior one in Ludhiana while Jensen-Haise method was found to be optimal in Gurdaspur in case of reference ET estimation when compared with CROPWAT 8.0 outcome. Thus, it may be inferred that current and future warming conditions are very likely to put extreme pressure on already over-utilized water resources at many places increasing the crop water requirements, consequently advocating for an effective and judicious management of available water resources.

Keywords: CROPWAT, Reference ET, Radiation Use Efficiency, Irrigation scheduling.

Influence of Irrigation Regimes and Date of Transplanting on Yield and Water Use Efficiency of Summer Rice (*Oryza sativa*) in Southern Odisha

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Abstract

Rice is the staple food of one-third of world population and the productivity needs to increase to feed the growing population with efficient water management practices and water saving technologies. In this regard, a field experiment was conducted in South Odisha during summer of 2018-19 on sandy clay loam soil which was laid out in split-plot design with three replications. The treatments were comprised of three water regimes in main plot *viz.*, continuous ponding, continuous soil saturation and saturation after hair crack and four transplanting dates in sub plots, namely, transplanting on January 23 and 31, February 6 and 13. Irrigation regimes had the remarkably effect of grain yield and WUE but it had no significant effect on straw yield. Irrigation with continuous ponding produced the highest grain yield (4.57 t ha^{-1}) which was at par with continuous soil saturation (4.30 t ha^{-1}). The WUE was significantly increased with saturation after hair (49.62 kg $ha^{-1}cm^{-1}$). Transplanting on 23rd January significantly recorded the highest grain yield (4.72 t ha^{-1}) and maximum straw yield was obtained in 31st January (7.99 t ha^{-1}) being at par with 23rd January (7.63 t ha^{-1}). Significantly the highest WUE was obtained in transplanting date of 23rd January (47.09 kg $ha^{-1}cm^{-1}$). In interaction effect, the highest grain yield was obtained with transplanting of rice on 23rd January applied with irrigation regime of continuous ponding (5.55 t ha^{-1}) was followed by transplanting of rice on 31st January with supplying the irrigation of continuous ponding. With respect to straw yield transplanting of rice on 31st January produced maximum straw yield when given with irrigation regime of continuous ponding.

Keywords: Date of transplanting, Irrigation regimes, rice, yield, Water use efficiency

Improved management practices of field pea (*Pisum sativum* L.) produced higher yield and economic returns in Lunglei district of Mizoram

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Abstract

The study aimed at assessing the performance of frontline demonstrations (FLDs) in terms of grain yield, extension gap, technological gap, technology index and economic gains in field pea crop in five selected villages during 2019-20 and 2020-21. The selected parameters data of both demonstration and control plots were recorded through experimental designs ('Control-Treatment') of social research. The result revealed that the highest grain yield was obtained in improved management practice with an average of 12.97 q/ha compared to 9.54 q/ha in prevailing farmers' practice. Moreover, TRCP-8 variety under improved management practices recorded higher yield of 33.66 and 38.18 per cent during 2019-20 and 2020-21 and the recommended practice gave higher net returns of Rs 38,730 and 45,000 per ha with B:C ratio of 2.08 and 2.20, respectively as compared to farmers' practice. An additional income (Rs. 16,250/ha and Rs. 19,817/ha) in improved management practice over farmers' practice was recorded during 2019-20 and 2020-21. The technology gap, vary between 5.57-4.50 q/ha with an average of 5.04 q/ha, reflected the farmers' cooperation in carrying out the demonstrations with encouraging results. The extension gap increased slightly during the successive year (3.13 to 3.73 q/ha). The successive decreased value of technology index reflected the feasibility of the variety in farmers' field. The results clearly indicate that the use of improved varieties and crop specific technologies with scientific intervention under frontline demonstration programme contributes to enhance the productivity and profitability of field pea in the district by reducing the yield and technology gaps.

Keywords: Rabi pulse, TRCP-8, frontline demonstration, extension gap, technology index

Root zone soil moisture estimation using TRApezoid models and Landsat 8 satellite data in per-humid terai region of West Bengal

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Abstract

Root zone soil moisture (RZSM) is indispensable for continuous monitoring of soil and crop health. Classical methods of laboratory or field based RZSM estimation are non-green, capital intensive and lack predictability over a large area. Passive remote sensing offers high spatial resolution for field scale study, thus can be used as a rapid and complementary approach defining RZSM status in heterogeneous soils. In the present study, Landsat 8 satellite data was used to retrieve the RZSM status in four community development blocks of Cooch Behar district. This area comes within the per-humid terai region of West Bengal and suffers weather uncertainty and unequal distribution of rainfall. We estimated the RZSM in December, which is considered one of the driest months. Two trapezoid models *viz*. Thermal-Optical TRAapezoid Model (TOTRAM) and OPtical TRApezoid Model (OPTRAM) were selected using both optical (Normalized Difference Vegetation Index and Shortwave Transformed Reflectance) and thermal remote sensing (Land Surface Temperature) data. Dry and wet edges were constructed based on the pixel-cloud distribution within the trapezoid spaces. Both the models showed good agreement with in-situ volumetric (cm^3 cm^{-3}) RZSM data with R^2 value of 0.85 and 0.83 for TOTRAM and OPTRAM, respectively. The results indicated that TOTRAM-based RZSM overestimates in-situ volumetric RZSM value (RMSE = 0.129 cm^3 cm^{-3}), whereas OPTRAM-based RZSM captures a bit more reliable estimate of ground measured soil moisture with RMSE of 0.123 cm^3 cm^{-3}. Both the models showed reasonable accuracy and can be used as a non-destructive surveillance approach in a cloud free day defining RZSM status in the per-humid terai region.

Keywords: Passive remote sensing; Per-humid terai; Surface soil moisture; Trapezoid models

*Convention presenter

Effect of different plastic mulching on performance of pointed gourd (*Trichosanthes dioica* Roxb.)

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Abstract

Pointed gourd is an important perennial cucurbit facing more benefit cost ratio with high demand. Plastic mulching had a beneficial effect to different perennial vegetables. To study the effect of different colour plastic mulching on pointed gourd, an OFT was conducted at Monipur village of Dakshin Dinajpur district of West Bengal during the years 2019-20 and 2020-21. The trail was designed with RBD consisting seven replications. Four technology options of different colour plastic (bare soil, red, silver-black and blue) having 50 micron thickness were evaluated. Results indicated significant variation among the different technology option for yield and its attributes. Heaviest individual fruit weight and highest number of fruits per plant were found in silver-black mulching (36.75 g and 249.57) followed by red (31.91 g and 221.57) and blue (30.18 g and 211.24) respectively. The mulching exhibited significantly more yield per plant compared to bare soil where highest yield per plant was recorded by silver-black colour mulch (7.47 kg). The highest yield per hectare was obtained from silver-black colour mulching (34.93 tonnes) followed by red (28.86 tonnes) and blue (25.48 tonnes). There was no significant difference in storage life of fruit for the different technology option. Highest benefit cost ratio was also found in silver- black colour mulch (3.43) followed by red (3.05) and blue (2.96). The silver-black colour effectively protect sunlight which reduces weeds growth, maintained proper soil temperature and moisture content might be the main cause of its better performance. The present findings concluded that plastic mulching increases yield and its attributes where silver-black colour considered more superior and may be recommended for commercial use.

Keywords: Pointed gourd, Mulching, Colour plastic, Yield

Studies on Carbon and Nitrogen Mineralization from Surface Applied and Incorporated Plant Residues in Soils over the Period of Incubation

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Abstract

Laboratory incubation experiments were conducted on two soils: one collected from University farmland at Pundibari of Cooch Behar (26˚23'53.88" N, 89˚23'22.88" E) and other from Kodalbasti of Alipurduar (26˚38'58.3656" N, 89˚21'15.102" E) district, each belonging to the Terai agro-ecological region of West Bengal, humid sub-tropical eastern India. Above and below ground plant biomass viz. straw and roots each of wheat and lentil were considered as the source of residue for the study. Each experiment comprised of eleven treatments with various combinations of straw and root biomass of wheat and lentil and each treatment applied in two methods viz. surface application and incorporation. The highest CO_2-C flux (mg C kg^{-1} soil day^{-1}) was resulted due to incorporation than surface application and it was so in case of lentil over wheat residue regardless of application methods in both the soils. Patterns of cumulative net C mineralization (%) during incubation were determined following the first order kinetic equation: $C_m=C_o (1-e^{-}kt)$. Exponential model of the nonlinear functions appeared as the best fit to the experimental values for describing C release patterns. A trend of increased ammonification in Pundibari compared to Kodalbasti soil was observed over the incubation period. Incorporation showed higher mineral-N over surface application and effect on changes in mineral-N was more pronounced in case of lentil over wheat residue. The cumulative net N mineralized (%) from residue when compared between two soils, an overall trend of increased N release was noted for Pundibari compared to Kodalbasti soil.

Assessment of surface and groundwater quality suitable for irrigation application in major crops of Odisha

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Abstract

The study was conducted during the pre-monsoon period in the month of April- May, 2019 to monitor the quality of different sources of water for assessing its suitability for irrigation purposes in Odisha. Twenty-seven surface water and twenty one groundwater samples were collected and analyzed for chemical parameters. The suitability of the surface and groundwater for irrigation were evaluated based on pH, RSBC, EC, SAR, Adj. SAR, RSC, soluble sodium percentage (SSP), permeability index (PI), Kelly's ratio (KR), Cl^-, B, NO_3^-, Fe, Mn, Zn, Cu, Cr and Cd. The study results showed that three rivers Mahanadi, Brahmani and Bansadhara were found medium salinity (EC 0.25-0.75 dSm^{-1}) and all the rivers have no sodicity problem with RSC within the permissible limit of 2.5 $meqL^{-1}$, and free of chloride and boron toxicity. All the surface water samples were safe with respect to Zn (2 mgL^{-1}), Cu (0.2 mgL^{-1}), Fe (5 mgL^{-1}), Mn (0.2 mgL^{-1}) and Cr (0.1 mgL^{-1}). Four rivers were exceeded the maximum permissible limit of Cd. Groundwater samples collected from the three farms of OUAT at Bhubaneswar were found pH below the permissible limit of 8.5. Four groundwater sources at Sambalpur, Rourkela, Gajapati and Ganjam were found medium salinity (EC 0.25-0.75 dSm^{-1}) which could be safely used for irrigation with management. In other cases, the salinity level was safe (EC <0.25 dSm^{-1}). The water of Rourkela and Ganjam has RSC more than safe limit but less than the maximum permissible limit (MPL). But RSC in groundwater of Sambalpur exceeded the MPL with KR falling in the bad category and SSP in doubtful category. All the groundwater samples were found below the toxicity level and safe with respect to Cl^-, NO_3^-, B, Zn (2 mgL^{-1}), Cu (0.2 mgL^{-1}), Fe (5 mgL^{-1}), Mn (0.2 mgL^{-1}) and Cr (0.1 mgL^{-1}) where Cd content of three sources exceeded the MPL (OUAT Agronomy Farm 0.011 mgL^{-1}, Putibandh of Sambalpur 0.011 mgL^{-1} and Rourkela 0.010 mgL^{-1}). It can be concluded that all the surface water samples collected from nine different rivers are found good quality and suitable for irrigation purpose except some specific limitations associated with certain sources which could be managed. Among all the groundwater sources, groundwater of Putibandh area in Sambalpur district are found very poor in quality and unsuitable for irrigation.

Keywords: *Surface water, groundwater, quality, irrigation*

Water and nutrients distribution in sweet corn field under different water management and nitrogen management in alluvial soil of West Bengal

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Abstract

A field experiment was carried out during the winter season of 2019-20 to study the effects of four levels of irrigation (gravity drip at 1.0, 0.8 and 0.6 of crop evapotranspiration and surface irrigation) and four levels of nitrogen management (100% inorganic N, 75% inorganic N + 25% inorganic N as vermicompost, 75% inorganic N + 25% inorganic N as FYM and 75% inorganic N + 25% inorganic N as mustard oilcake) on the temporal distribution of water and macronutrients in sweet corn field grown in sandy loam soil. The results of the study showed that amounts of soil water consistently decreased with increase in soil depth; the more so in higher irrigation level than in lower irrigation level and that too under integrated nitrogen management schedule than in chemical nitrogen fertilization only. Higher soil moisture storage was observed in rooting zone depth under drip irrigation scheduling at 1.0 ETc followed by 0.8 ETc as compared with surface irrigation. Higher availability of N, P and K contents in soils at harvest was observed in deficit irrigation regimes than in higher irrigation regimes and that too with integrated N supply than with chemical N fertilization only. Maximum N, P and K uptake by plant was noticed with surface irrigation and drip irrigation at 1.0 ETc each provided with 75% N as fertilizer and 25% N as vermicompost. The deficit irrigation scheduling with different N management resulted in moderate to low uptake of macronutrients from soil by corn plant.

Keywords: Gravity drip irrigation, sweet corn, nitrogen, sandy loam soil

Evaluation Of Technology Demonstration of Short Duration Drought Tolerant Rice Varieties In Drought Prone Areas of Subarnapur District Of Odisha

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Abstract

A study was conducted in farmer's field through technology demonstrations during Kharif season of 2018 and 2019 in Subarnapur district of Odisha to recommend the most suited short duration drought tolerant upland rice variety particular to the locality. Six varieties were taken with four replications for the demonstration in both the year. Technology demonstration included not only the improved short duration varieties but also followed good package of practices *viz*. line sowing, seed treatment, proper fertilization, weeding and plant protection chemicals. The results of demonstration showed that farmers could increase the productivity notably by switching over to improved variety *Sahabhagidhan* and *DRR-44* with adoption of improved production technology. *Sahabhagidhan* and *DRR-44* recorded higher grain yields around 64 % and 46%, respectively, and fetched very good return over farmers' local variety *viz*. *Khandagiri*.

Keywords: Technology demonstration, drought, *Sahabhagidhan*, yield, Subarnapur

Effect of salinity stress on Mungbean[*Vignaradiata* (L.) Wilczek] and its amelioration by beneficial microbes

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Abstract

Mungbean [*Vignaradiata* (L.) Wilczek] is an important short-duration (80–90 days), self-pollinating, warm-season pulse crop having high nutritive value and nitrogen fixing ability. Mungbean grows at optimal temperatures of about 28-30°C and always above 15°C under tropical and subtropical conditions. Salt stress is one of the most severe abiotic stress factors limiting plant growth, development and metabolism resulted in various physiological, biochemical and molecular alterations causing plant death. Salinity stress causes severe yield loss (>70% even at 50 mM sodium chloride) and affects the quality of mungbean. Salinity affects almost all growth stages of plant development as seed germination, vegetative growth and reproductive development, particularly flowering and pod-filling stage. Salinity is a polygenic trait which adversely affected the biometric, morpho-physiological, biochemical and biophysical characters of mungbean. Here one fungal strain *Trichodermaasperellum*(T42) and one bacterial strain *Pseudomonasfluorescens* (OKC) have been selected for seed biopriming of mungbean. To ameliorate the salt stress (150mM NaCl) using of these beneficial microbes left an important impact in recent research. Several parameters were analyzed like shoot and root growth, leaf area, germination percentage and vigour index; biochemical parameters like chlorophyll content and proline content. Besides this antioxidant enzymes activity i.e. Superoxide dismutase and ascorbate peroxidase activity and extent of lipid peroxidation through malondialdehyde content were also studied. In this experiment it has been found a prominent success in mitigating salinity stress (150mM NaCl) through seed biopriming technique by using *Trichodermaasperellum*(T42) and *Pseudomonas fluorescens* (OKC).

Keywords Salinity, Seed Biopriming, Microbes, Amelioration, Antioxidant activity, Sodium Chloride

Rice Production in Water-deficient Environments

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Abstract

To feed a growing population Rice production in Asia needs to increase.Decline in water quality and availability in Asian rice production is posing a great threat, there are signs that the declining quality and availability of water sustainability of the irrigated rice-based production system is having issues these days. Drought is one of the main constraints in rain-fed rice-yield. To produce more rice with less water is essential for food security and sustaining environmental health in Asia water-saving irrigation, such as saturated-soil culture and alternate wetting and drying, can positively cut down the unproductive water outflows and also increase the water productivity. Although these technologies usually lead to some decrease in yield due to current lowland rice varieties. Some new approaches are being included and researched as well to increase water productivity without sacrificing the yield. These includes the incorporation and modifications of the C4 photosynthetic pathway into rice cultivation to increase rice yield per unit water transpired. molecular biotechnology was used to enhance drought-stress tolerance and the development of 'aerobic rice'. These also achieved high and sustainable yields in non-flooded soil. Through the adoption of water-saving irrigation technologies like microsprinkler irrigation in rice land will change from being continuously anaerobic to being partly or even completely aerobic. These shifts or changes will have an incredible changes in water conservation, nutrient dynamics as well as soil productivity and ecology.

Keywords: water productivity, alternate wetting and drying, water savings

Theme 2: Agro-chemicals for protecting crops and environment

Concurrent Session 1: Organic/Bio inputs

Jury members for paper evaluation

Prof. Apurba Chowdhury -Chairman

Dr. Kajal Kumar Biswas- Member

Dr. Sanjay Kumar Das- Member

Prof. M.R. Khan - Member

Dr. Santanu Samanta - Member

Meeting link:

meet.google.com/acr-qjdc-ibt

Effect of biochar compost on growth and yield of brinjal grown in entisol

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Abstract

Biochar is a carbonaceous material obtained by pyrolysis of biomass feedstock. Application of biochar improve agricultural productivity, particularly in low fertile and degraded soils, also reduces the nutrient loss and other important elements as run- off. To study the effect of biochar compost on nutrient management of brinjal, a field experiment was conducted in the sandy loam soil (*fluventic haplustept),* in Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, during *Kharif* 2016. The experiment was laid out in Randomized Block Design with ten treatments *viz.* 100 per cent RDN through inorganic fertilizer (T_2), 25 per cent RDN by BC and 75 per cent through IF without (T_3) and with EM (T_7), 50 per cent RDN by BC and 50 per cent through IF without (T_4) and with EM (T_8), 75 per cent RDN by BC and 25 per cent through IF without (T_5) and with EM (T_9), 100 per cent RDN by BC without (T_6) and with EM (T_{10}) and N control (T_1) and replicated thrice. The experiment results revealed that growth parameters (primary branches, secondary branches and dry matter production), fruit characteristics (fruit length and individual fruit weight) and yield parameters (fruit yield per plant, number of fruits per plant) and yield more significantly influenced by application of 50 per cent RDN by BC and 50 per cent through IF with the soil application of EM (T_8). From the results it can be concluded that nitrogen through BC compost can reduce the quality of inorganic fertilizer application, enriched soil health and productivity.

Keywords: Biochar Compost, Recommended Dose of Nitrogen, Inorganic fertilizer, Effective Microorganisms, Sandy loam soil, Brinjal growth and Yield.

Biofortification of compost by natural sources

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Abstract

It is well established that India has achieved significant success in the field of food production since independence recording a total food grain production of 280 m. ton in 2019-20 as compared to merely 55 m. ton in 1950 immediately after independence (Anon,2019). However, this increase has been mostly fertilizer driven and, owing to the consistently decreasing trend of fertilizer use efficiency, the food production of the country has reached almost a plateau during the last decade. On the other hand, the food production needs to be increased substantially in view of the demand of the escalating population of the country. Since this increment cannot be achieved through continuing dependence on chemical fertilizers, more emphasis is now being given on increased uses of various organic inputs. Among various inputs of integrated nutrient management, vermicompost is now being considered as an important component. While use of vermicompost as an effective organic manure is now well known, beneficial effects of vermicompost leachate as a crop yield promoter has also come up as a recent technology. In addition, numbers of studies have also shown that use of some algal extracts could act as bio-stimulator for various crops. It is hoped that use of such natural sources might be helpful in increasing the food production of the country in an eco-friendly manner.

Effect of different types chemical on the post-harvest life of heliconia flowers

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Abstract

Now a days heliconia is an important cut flower for garden decoration, value added product preparation and organic colour extraction purpose. It also called lobster-claw, wild plantain or false bird-of-paradise and belong to family Heliconiaceae, has 250 to 300 species. I have applied various types chemical with four species of heliconia such as; Heliconiarostrata, Heliconiapsittacorumcv. 'Golden Torch', Heliconia psittacorumvar. 'Choconiana', Heliconia humilis. The experiment was carried to study the "Effect of different types chemical on the post-harvest life of heliconia flowers". The experiment was laid out in randomized block design having three replication and nine different treatments.T1= Control (Distilled water), T2= Standard Preservative (2 teaspoonful of fresh lemon juice, 1 teaspoonful of common sugar, ½ teaspoonful of household bleach in 1 liter of water), T3= 8-HQC @ 500mg/l, T4=8- HQC @500mg/l+ Sucrose 2%, T5= $AgNO_3$ @1500ppm+ 8- HQC @500mg/l+ Sucrose 2%, T6= $Cacl_2$ @ 750mg/l+ 8- HQC @500mg/l+ Sucrose 2%, T7= GA_3 @ 80µM+ 8- HQC @500mg/l+ Sucrose 2%, T8= NAA @ 100ppm+ 8- HQC @500mg/l+ Sucrose 2%, T9= Citric acid @ 200mg/l+ 8- HQC @500mg/l+ Sucrose 2%, T10= BAP @ 50µM+ 8- HQC @500mg/l+ Sucrose 2% Five most important parameter mention here such as; Water uptake, fresh weight of flowers(4^{th}, 8^{th}, 11^{th} days after application of chemical), opening of flowers, catalase activity and vase-life of flowers. Highest water uptake capacity, Flower bract opening, vase life of flower was taken from @ T3, T9, T5 and T6 in H. humilis. Highest water uptake capacity, Flower bract opening, vase life of flower was taken from @ T4, T6, T6 in H. *Heliconia psittacorum*cv.'Golden Torch'. Highest water uptake capacity, Flower bract opening, vase life of flower was taken from @ T7, T7, T5 in *Heliconia psittacorum*var cv.'Choconiana'. Highest water uptake capacity, Flower bract opening, vase life of flower was taken from @ T3, T7,T7 in H. Rostata.

Keywords:- Heliconia, Post-harvest, Chemical

Commercial uses of humic acid and fulvic acid in agriculture

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Abstract

Soil organic matter (SOM) is the most essential property that affects soil fertility, soil formation, soil biology, physical and chemical properties, as well as biotic and hydrothermal properties. The nature, content, composition and behavior of SOM are critical for crop growth in a variety of environmental circumstances. The demand for biostimulants has been growing at an annual rate of 10 and 12.4% in Europe and Northern America, respectively. The beneficial effects of humic substances (HS) as biostimulants of plant growth have been well-known since the 1980s, and they can be supportive to a circular economy if they are extracted from different renewable resources of organic matter including harvest residues, wastewater, sewage sludge and manure. The function and application of biostimulants and biopesticides have garnered considerable interest due to their potential as environmentally sustainable resources for agricultural production. A number of national and international projects on biostimulant material have been launched in the framework of the circular economy by extracting the beneficial material from waste materials across different sectors of agriculture, livestock, water infrastructure, mining and energy. Humic compounds are highly reactive natural polymers found in soil. Dynamic soil properties such as microbial biomass, soil enzymes and soil respiration respond faster to changes in crop management practices and type of cultivation than physicochemical soil properties. Humic compounds are essential for plant nourishment and soil fertility. Humic compounds have important roles in the removal of hazardous metals, anthropogenic organic chemicals, and other chemicals such as herbicides, fungicides, insecticidesand pharmaceutical products from soil and water in environmental applications.

Keywords: Agriculture, Environment, Fulvic acid, Humic acid, Humic substances

Theme Area – 1: Natural Resources Management for Crop and Environmental Health

Effect of Bio-fertilizers on Growth and Flower Quality of China Aster (*Callistephus chinensis* (L.) Nees.) cv. Arka Kamini at Different NPK Levels under Coastal Andhra Pradesh Condition

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Abstract

An experiment had been conducted at the instruction field of the Department of Floriculture and Landscape Architecture, College of Horticulture, Dr. Y. S. R. Horticultural University, Venkataramannagudem, West Godavari, Andhra Pradesh in 2020 to study the effect of biofertilizers in addition to NPK on growth, development and flowering of China Aster cv. Arka Kamini. Two different factors namely %of NPK application (5 levels) along with bifertilizer application (3 levels) were combined together to apply fifteen different treatment combinations following Factorial Randomized Block Design replicated twice. Growth parameters *viz*., plant height (55.30cm), number of branches plant^{-1} (22.74), total chlorophyll content (55.35 SPAD units) and dry weight of the plant (29.11 g) were significantly superior in treatment combination of 100% RDF (recommended dose of fertilizers) with *Azospirillum* @ 4kg acre^{-1} + PSB (Phosphate Solubilising Bacteria) @ 4kg acre^{-1} + KMB (Potassium Mobilising Bacteria) @ 4kg acre^{-1}. Results followed the same trend in respect of floral parameters, like - number of days taken to flower bud initiation (58.37), duration of flowering (31.68) and number of cut flowers plant^{-1} (33.74). Regarding flower quality parameters, like - the maximum flower stalk length (28.15 cm), flower diameter (6.80 cm) and vase-life (11.77 days) were obtained from 120% RDF with *Azospirillum* @ 4kg acre^{-1} + PSB @ 4kg acre^{-1} + KMB @ 4kg acre^{-1}. Though, Nitrogen, Phosphorus and Potassium contents in soil after harvest were found statistically non-significant, still found maximum in treatment combination 100% RDF with *Azospirillum* @ 4kg acre^{-1} + PSB @ 4kg acre^{-1} + KMB @ 4kg acre^{-1}. The nutrient uptake by plant after harvest was also non-significant but found maximum in the same treatment combination. Hence, application of 100% RDF with *Azospirillum* @ 4kg acre^{-1} + PSB @ 4kg acre^{-1} + KMB @ 4kg acre^{-1} was found useful to get more number of flowers per plant but 120% RDF along with same combination of biofertilizers produced good quality blooms.

Keywords: Bio-fertilizer; *Azospirillum*; Potassium Mobilising Bacteria; Phosphate Solubilising Bacteria

Effect of foliar application of botanical extract on Bio-chemical constituents of Mulberry Leaf and silkworm *Bombyx mori* L.cocoon quality

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Abstract

In this study, foliar application of botanical extract sprayed on mulberry leaves for improving in biochemical contents. The foliar application of botanical extract at 1.5 % concentration were increased the total chlorophyll, carbohydrates and protein content in the mulberry leaf when compared with control as water treatment. Treated mulberry leaf was used for silkworm bioassay and it was observed that there was improvement in the larval weight, cocoon weight and shell ratio when compared with control. The results of the study indicates that, the foliar application of botanical extract sprayed on mulberry leaves found better in improving the biochemical constituents of leaf and rearing performance of silkworm. The botanical extract can be used for improvement in leaf and cocoon quality.

Keywords: Foliar application, botanical extract, mulberry leaf, silkworm, biochemical

Effect of bio-fertilizer application on growth, yield and economics of kharif rice (*Oryza sativa* L.) in Red Lateritic Soils of Purulia, West Bengal

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Theme: Natural resources management for crop & environmental health

Abstracts

A field experiment was conducted at farmer's field of Purulia District in *kharif* season 2019-20 to study the effect of bio-fertilizers on growth, yield and economics of *kharif* rice. Bio-fertilizers were applied in two different methods over farmers practice. The treatments comprised of: T1: Farmer practices (FYM 2.5 t/ha + NPK (60:30:30), T2: Farmers practice + Azotobactor & PSB @ 3kg ha^{-1} (seed inoculation) and T3: Farmers practice + Azotobactor & PSB @ 3kg ha^{-1} (root dipping) replicated thrice on rainfed bunded upland. The growth and yield attributing characters were recorded highest in T3. In-situ bio-fertilizer application through root dipping method had a significant effect on growth and yield of paddy. Application of bio-fertilizer through *in-situ* root dipping method was observed best as compared to seed inoculation methods. From this study it is recommended that the application of bio-fertilizers are not the replacement of chemical fertilizers but can supplement plant nutrient requirements and it may increase the yield and finally higher cost benefit ratio. The use of bio-fertilizers with chemical fertilizers should be encouraged to improve agricultural productivity. It is also needed to maintain the soil physical and chemical properties since the micro-organism in the bio-fertilizer are capable of modifying the status of the soils to make it favorable for growth of plants.

Keywords: FYM, Bio-fertilizer, Kharif rice.

Utilizing agricultural waste to enhance food security, conserve the environment and promote entrepreneurship for a self-reliant Bharat: Bihar state perspective

Theme 3: Allied agricultural activities vis-s-vis food security and environmental health

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Abstract

The rapid increase in population coupled by migration has resulted into increased demand for food which in turn led to the huge production of agricultural wastes, although recognized that agro-wastes has enormous ill effects on humans and environment, such wastes, if properly managed could be considered an important bioresource for enhancing food security in the small holder farming communities. India generates about 350 million tonnes of agricultural waste every year. Lack of planning, poor rural awareness of appropriate technology to add value to agro-wastes has pose threat to food security.

This alternate method of removal of these wastes for converting into value added products has led to subsequent reduction on environmental pollution along with improving purchase capacity of farmers. This paper briefly reviews how agricultural wastes used to enhance food security, conserve environment, and promote entrepreneurship by converting wastes from banana, pigeon pea, kitchen wastes, turmeric leaves, litchi seeds and other agro-wastes to wealth. Conversion of agricultural wastes into economic resources has not only increased farmers income but also generated revenue for the organization enhancing food availability for all. Nearly 60 percent of India's 1.3 billion people make a living from agriculture, though the sector accounts for only about 11 percent of economic output. So, it's time to focus on diversity by safeguarding environment.

Assessment of effect of microbially enriched vermicompost on the growth characteristics of maize

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Abstract

The modern agricultural farming practices, along with irrational use of chemical inputs over the past four decades have resulted in not only loss of natural habitat balance and soil health. The continuous use of chemical fertilizers resulted in the decline in organic matter content of the agricultural soil leading to depletion of beneficial microorganisms which in turn reduced the soil productivity. A field experiment was conducted late rabi seasons of 2020 at the instructional farm of Uttar Dinajpur Krishi Vigyan Kendra and Farmers field of Uttar Dinajpur District, West Bengal. The farm is situated at 260 21'18" N latitude and 880 16'36" E longitude. The experiment was carried to study the "Assessment of effect of microbially enriched vermicompost on the growth characteristics of maize". The experiment was laid out in randomized block design having T_{1-} Farmers Practice(80:40:40), T_{2-} Nitrogen 60kg ha^{-1}+ Vermi Compost @ 1500 kg ha^{-1}, T_{3-} Nitrogen 40kg ha^{-1}+ enriched Vermi Compost @ 1500 kg ha^{-1} and T_{4-} Nitrogen 40kg ha^{-1}+ enriched Vermi Compost @ 1000 kg $ha^{-1}$with three replication. Maize variety *Dekalb* 900 m *gold* was taken in the study. Individualplot size of 4 m x 3 m was maintained in the trial. The yield has been highest observed in Technology Option – 4; Nitrogen 40kg ha^{-1}+ enriched Vermi Compost @ 1000 kg ha^{-1} and lowest in Farmers' practice – 1; Farmers Practice(80:40:40) . Other treatments gave significant results in the trial. Similarly two nos on farm trial has been conducted in the two villages of terai and alluvial zones of uttar dinajpur at Sonapur village of chopra block and Machol village of karandighi Village. Both the villages showed their highest yield in Nitrogen 40kg ha^{-1}+ enriched Vermi Compost @ 1000 kg ha^{-1} . Others treatments also gave significant results.

Keywords: Maize, vermicompost, enriched vermicompost and yield.

Comparative assessment of inorganic and organic nutrient solutions for lettuce (*lactuca sativa* l.) Grown inhydroponics system

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Abstract

Hydroponics is the process of growing plants without soil by feeding the nutrients directly to the plant roots, through specially developed nutrient solution. However, very little information is available about the use of organic nutrient solution. In this study, we compared the performance of organic nutrient solution with that of the available inorganic commercial solution for growing lettuce (Lactuca sativa) crops. The experiments were conducted at the Department of Agricultural and Food Engineering, Indian Institute of Technology Kharagpur in 2019 and 2020. The organic nutrient solution i.e. vermi tea and enriched vermi tea were developed and their performance were analyzed against commercial solution on the basis of growth of plant, chlorophyll content, yield, ascorbic acid and antioxidant content. The Nutrient Film Techniques based Hydroponic systems were prepared using PVC pipes and the plants were grown for 40 days. The results showed that the average yield of plants with commercial solution and enriched vermi tea were 655 g/plant and 641 g/plant, respectively, i.e. both were comparable. The Ascorbic acid content was in the range 8-9 mg/100g for all the treatments. In general, the organic nutrient solution 'Enriched vermi tea' could result in similar biomass and quality of lettuce as found in conventional inorganic solution. This study established the scope of further investigation for formulation of organic nutrient solution for hydroponics systems to have better production and quality of leafy vegetables.

Keywords: Organic nutrient solution, Enriched Vermitea, Hydroponics System

Effect of sea weed extracts on the growth, and productivity of Potato (Solanum tuberosum L.) in the red and lateritic belt of West Bengal

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Abstract

A field experiment was conducted during the *rabi* season of 2012-13 at farmer's field in Chella Kamarpara, Birbhum, West Bengal to study the "Effect of sea weed extracts on the growth, and productivity of Potato (Solanum tuberosum L.) in the red and lateritic belt of West Bengal" under the prevailing climatic conditions. The experiment consisted of fifteen treatments with three replications and was laid out in randomized block design (RBD).

The experimental soil was sandy loam in texture, slight acidic in nature with 0.35 % organic carbon. The treatments were T_1 (water + RDF) ,T_2 (2.5 % *Kappaphycus*+ 100% RDF) ,T_3 (5% *Kappaphycus* + 100% RDF) , T_4 (7.5 % *Kappaphycus* +100% RDF), T_5 (10 % *Kappaphycus* + 100% RDF), T_6 (15 % *Kappaphycus* + 100% RDF), T_7 (2.5% *Gracilaria*+ 100% RDF), T_8 (5 % *Gracilaria* + 100% RDF) , T_9 (7.5 % *Gracilaria*+ 100% RDF), T_{10} (10 % *Gracilaria* + 100% RDF), T_{11} (15 % *Gracilaria*+ 100% RDF), T_{12} (7.5 % *Kappaphycus*+ 75% RDF) and T_{13} (7.5 % *Gracilaria*+50%RDF) T_{14} (7.5 % *Kappaphycus* + 50%RDF) T_{15} (7.5 % *Gracilaria*+ 50%RDF). In this experiment, the growth attributes like plant height, leaf area index (LAI), dry matter (DM), crop growth rate (CGR), net assimilation rate (NAR) ,yield attributes like number of Tubers per plant, weight of tubers per plant, tuber yield, were observed. Potato cultivation economies like cost of cultivation, gross return, and net return, return per rupee invested as affected by each treatment were studied. The maximum increase in the above growth attributes was obtained with the application of T_6 (15 % *Kappaphycus* + 100% RDF). The highest number of tubers per plant, tuber weight per plant and tuber yield were obtained from the crop having 15% of *Kappaphycus (K)* + 100 % RDF through chemical sources and was significantly greater than those of all other treatments in most of the cases. Seaweed extract with 100% RDF through chemical fertilizers also increased the yield components of *Potato* as compared to that of the application of water along with RDF. The highest tuber yield was obtained from the crop having15% *Kappaphycus (K)* along with RDF sources and was sufficiently higher than most of the fertility treatments. The highest gross return , net return and return per rupee invested was obtained from the crop receiving 15% *Kappaphycus* along with 100% RDF through chemical sources over that of the water along with RDF applied plots. 7.5% *Gracilaria* + RDF applied plots recorded the lowest Gross return, net return and return per rupee invested. So, it can be concluded that in the red and lateritic belt of West Bengal, the application of seaweed with Kappaphycus *(K)* and *Gracilaria (G)* combined with application of 200 kg N, 150kg P_2O_5 and 150 kg K_2O /ha performed better in terms of growth, quality and productivity in potato than water applied plots.

Keywords- *Gracilaria*, *Kappaphycus*, potato, seaweed, Tubers.

Standardization of Growing Media and Fertilization Method for Cultivation of Celosia under Matric Suction Irrigation

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Abstract

Selection of suitable growing substrate and proper nutrient supply are the major aspects of crop management that decides desirable yield and quality of crop. Keeping in view the wide applicability of soilless cultivation, a greenhouse experiment was conducted with an aim of standardizing the most supportive growing media composition and fertilization method for cultivation of *Celosia.* Locally available growing media substrates of different compositions (1: 1: 1 ratios on weight basis) includes 1) Coir pith, 2) Coir pith: Vermicompost: Pressmud, (3) Coir pith: Vermicompost: Vermicullite, 4) Coir pith: Vermicompost: Fly ash, 5) Standard Potting mixture (sand: soil: FYM). For effective nutrient management, fertilization methods *viz.,* control, surface application, nutrient solution and Fertilizer Pellet Pack (FPP) were compared. Fertilizer pellet is made up of mixture of NPK fertilizers based on per plant requirement in pellet form and encapsulated in a bio degradable polymer coated paper pouch. To ensure water supply to crop, the matric suction irrigation method was followed wherein matric suction gradient act as a driving force which causes upward movement of water due to particle to particle contact. The result showed that among media, water soluble N, P and K was higher in CP: VC and PM. Among fertilization methods, the lowest water soluble nutrient was observed in control and the highest water soluble nutrients were recorded in FPP. The release rate of nutrients in FPP was slow initially up to a period of 1 week after transplanting (WAT) thereafter followed an increasing release rate up to a period of 9 WAT and then attained a steady state of release from 9 to 12 WAT. The highest growth parameters, dry matter production and flower yield was recorded in CP: VC: PM followed by CP: VC: VL. The media with CP: VC: and FA did not perform well under matric suction irrigation. Hence, the growing media with coirpith: vermicompost: press mud coupled with fertilizer pallet pack (FPP) can be well recommended for cultivation of *Celosia* under protected system to achieve higher FUEs and alleviate environmental risks associated with soil-based cultivation systems.

Antagonistic activity of Rhizosphere bacteria against foliar and soil borne diseases of chickpea

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Abstract

Chickpea is one of the earliest cultivated legumes. India is the largest producer of chickpea with the production of 13.12 million tonnes (2nd advance estimates, 2021-22) but, its yield is much lower than expected due to a number of fungal diseases like wilt, dry root rot, collar rot, botrytis grey mold, ascochyta blight, rust etc. Management of these diseases by chemicals is both expensive and harmful to environment. Biocontrol is the best alternative for disease management. The present study was designed to determine the effect of rhizobacterial isolates against fungal pathogens infecting chickpea. A total of sixty-seven bacterial isolates which are having distinct morphological characters obtained from rhizosphere of chickpea fields in different districts of Bundelkhand region and their antagonistic activity against *in vitro* growth of *Fusarium oxysporum* f.sp. *ciceris* and *Botrytis cinerea* were determined. The antagonism of these bacterial isolates was very prominent and ranged from 20 to 75% against both the pathogens. Among them nineteen highly potential isolates were selected which are having more than 50% inhibition and explored for their biochemical characters *viz.,* siderophore production, ammonia production, HCN production, IAA production and found that potential bacteria were exhibiting one or more character which might be associated with disease suppression. Further, three bacterial isolates i.e., 15d, 09c, 14a were identified effective in managing both the diseases under in vitro and pot condition. These were further characterized at molecular level and identified as *Bacillus megaterium* (15d, 09c) and *Serratia marcescens* (14a) after sequencing of the 16s rRNA gene.

Biochar - An agrochemical as soil conditioner and conservator of environment

Abstract

The use of biochar, as a soil conditioner has been suggested as a way to improve the soil properties and crop yield. The main purpose of this study was to determine the effect of rice husk biochar (pyrolysis at 500°C) on the soil properties of sandy clay loam soil (Ultisol) at 0-15 cm depth in a rice-rice cropping sequence. The effect was compared with other organic sources like FYM, *Artocarpus* leaves and daincha. All the organic sources were applied along with fertilizer nitrogen, urea at four levels *viz*., 0, 35, 70 and 105 kg ha^{-1}. Results showed a minimum bulk density value of 1.10 Mg m^{-3} and 11 per cent increase in water holding capacity of the soil at 0-15 cm depth using rice husk biochar compared to the control. These values showed reverse effect with increase in nitrogen content. This increase in WHC over FYM, *Artocarpus* leaves and daincha were accounted to be 5, 7 and 3 per cent respectively. The vast surface area of biochar helped to adsorb higher amount of plant nutrients and release them as and when needed. The liming effect of biochar had profound effect in increasing the microbial activity and soil health, thus preventing the pollution of soil by pesticides. Improved crop yields (3.79 t ha^{-1}) may be due to 'fertilizer effect' of added biochar, supplying important plant nutrients such as K, N, Ca, and P. These results suggest, the biochar has potential to act as agrochemical to protect crop and environment and increase crop yields.

Keywords: biochar, soil conditioner, fertilizer effect, soil properties, crop yield

9th Annual Convention and National Webinar, 2022, Organized by Society for Fertilizers and Environment
(Oral presentation)

Effect of potassium solubilizers and crop residue on potassium uptake by wheat from waste mica treated soil

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Abstract

Ample availability of low grade natural potassium (K) bearing minerals in India can open up avenues for it to be considered as a potential source of K fertilizer after suitable treatments. This is especially important when India depends on imports of K fertilizer to meets it entire K requirement. This research aims to investigate the influence of three K solubilizing bacteria (KSB) and rice residue on yield parameters of wheat grown on waste mica enriched soil. The effects of three factors *i.e.* mica, rice residue and KSB on wheat biomass yield, K uptake, relative agronomic efficiency (RAE) and per cent K recovery from soil were assessed through a pot experiment at ICAR-Indian Agricultural Research Institute, New Delhi. Results reveal that mica application @ 50 and 100 mg/kg soil significantly improved the biomass yield and K uptake by wheat over treatments without mica application. Rice residue incorporation @ 2 g/kg soil had significant role in improvement of biomass yield, K uptake by wheat in soil as compared to no residue treatments. Amongst the three strains of KSB (JHKSB1 and JHKSB4) and one standard strain (*Bacillus* sp.), all were found at par with respect to improving K nutrition to wheat crop from mica mineral. Per cent K recovery and RAE data suggests that though treated mica cannot replace MOP, it can substitute up to 50% of MOP. Thus, inherent K content in mica may be utilized as a potential alterative to costly K fertilizer up to some extent for meeting the K requirement of the crop.

Organic weed and nutrient management practices to reduce the uses of synthetic inputs for increasing the productivity of maize in Western Rajasthan-India

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Abstract

An experiment was conducted during 2019-20 and 2020-21 at College of Agriculture, Sumerpur (Rajasthan-India) comprises 6 organic weed management and 5 organic nutrient management treatments on maize in split plot design with 3 replications. The main aim of study was to evaluate the effect of organics on productivity of maize under organic farming. The two years mean data revealed that the minimum weed infestation (79.08%) and maximum weed control efficiency (93.08%) was recorded in weed free check as against weedy check among various weed management treatments at harvest. The most of the growth attributes, grain yield (3.36 t ha^{-1}) and stover yield (6.26 t ha^{-1}) of maize was significantly affected in weed management and nutrient management treatments and found maximum in weed free check maintained up to 60 DAS closely followed by stale seedbed+ hoeing once at 20 DAS + straw mulch applied @ 5 t ha^{-1} at 30 DAS against weedy check. The application of organic manure viz., vermicompost @ 75% of recommended dose of nitrogen equivalent (RDN i.e. 90 kg N equivalent) in two splits (75% at sowing +25% as top dressing at 30 DAS) along with seed treatment with fermented organic manure i.e. *beejamurt* and two spray of *jeevamurt* significant registered growth parameters under study besides grain yield of 3.17 t ha^{-1} as compared to 100% RDN through FYM. The economic parameters viz., gross return, net return and B:C ratio was significantly affected in various weed and nutrient management treatments computed based om minimum support prices during study.

Organic amendment of soil through Spent Mushroom Substrate (SMS) and its effect against bacterial wilt of tomato caused by *Ralstonia solanacearum*

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Abstract

Oyster mushroom *Pleurotus florida* is a fast growing edible mushroom can complete its crop cycle within 60 days. It can be cultivated easily on various lingo-cellulosic waste materials with minimum efforts. India generates a large quantity of agro-waste which can be converted into edible protein by the enzymatic action of edible fungi. A lot of Spent Mushroom Substrate (SMS) has been generated by the cultivation of edible mushrooms which contains lots microbial consortium ,minerals ,nutrients etc, and can be incorporate in soils for minimizing the soil borne diseases. Amendment of soil through organic waste materials to reduce the addition of fertilizers and fungicides in crop production is highly effective. Experiments were conducted in sandy loam soil with high percentage of sand and low percentage of clay at PSB, agricultural farm Sriniketan, Birbhum,West Bengal. Different nitrogen fixing bacteria viz., *Azotobacter* sp., *Azospirillum* sp. and *Rhizobium* spp. were used to enrich the SMS and their performance were assessed in tomato plants. Maximum height (66.3 cm), average shoot biomass (129g), average root biomass (33.3g) and yield (1.48 kg/plant) was recorded from the SMS enriched with *Azotobacter* spp. and *Azospirillum* spp. (1:1) followed by SMS enriched with *Azotobacter* spp.. *Trichodema viride*, *T. harzianum* and *P. fluorescens* are the three well known biocontrol agents which were mixed for enrichment of SMS. Their efficacy was analyzed on tomato plant under natural environmental condition. Among the treatments of different bio-control agents, the SMS enriched with the combination of *P. fluorescens* and *T. viride* (1:1) showed maximum plant height (61 cm), shoot biomass (137g), root biomass (29g) and yield (1.15 kg) followed by the combination of *P. fluorescens* + *T. harzianum* (1:1) which exhibitted (59.7 cm), (132g), (28g) and (1.133kg) plant height, shoot biomass, root biomass and yield respectively over untreated SMS. Spent Mushroom Substrate enriched with different combination of biocontrol agents were found to be more effective than individual application.

Spent mushroom substrate when bio-converted into vermicompost with the application of earth worm *Eisenia foetida*, cow dung and *Azotobacter*, it gave highest plant height 72 cm, maximum average dry shoot biomass/ plant 136g, highest dry root biomass 43.67g and best yield 1.717 kg/ plant of tomato followed by the vermi-compost prepared by the combination of SMS and cow dung. Vermi-compost produced from soil based combinations were found to be less effective rather than those made from SMS based combinations. Significant reduction in the incidence of bacterial wilt of tomato caused by *Ralstonia solanacearum* was noticed in the field enriched with SMS and vermi-compost. A range of 18.2 % to 67.90 % reduction in the disease incidence was observed from various combinations in comparison to control.

National Webinar on Managing Agro-Chemicals for Crop and Environmental Health, 25th February, 2022 by Society for Fertilizers and Environment
Theme Area-1: Natural Resources Management for Crop and Environmental Health

Title: EFFECT OF ORGANIC NUTRIENTS ON GROWTH AND FLOWERING OF AFRICAN MARIGOLD (*Tagetes* sp) UNDER TERAI REGION OF WEST BENGAL

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Abstract

An experiment had been conducted at the Instructional farm, Department of Floriculture, Medicinal and Aromatic plants, Faculty of Horticulture, Uttar Banga Krishi Viswavidyalaya in 2021 to study the effect of organic nutrients on growth and flowering of African marigold (*Tagetes erecta*) under terai region of West Bengal. The experiment was laid out by adopting factorial experiment with randomized complete block design, consists of two varieties with ten treatments combinations were replicated thrice. Different growth and flowering parameters were recorded at the time of peak flowering stage. Results exhibited that Out of 20 different combinations of treatments with 2 varieties the highest plant height (81.76 cm) was found in Pusa Narangi Gainda X Poultry Manure@2.5t/ha + vermi wash @3%, minimum days taken for first flower full bloomimg (8.93 days) in Pusa Bahar X Vermi compost @5t/ha + vermi wash @3%, maximum size of the flower (6.63 cm) in Pusa Bahar X Vermi compost @5t/ha + vermi wash @3% and more number of flowers per plant (63.27) was found in Pusa Narangi Gainda X Poultry Manure@2.5t + vermi wash @3% whereas, lowest plant height (55.10 cm) in Pusa Bahar X Control (without organic and inorganic fertilizers, maximum days taken for first flower full blooming (17.10 days) in Pusa Narangi Gainda X Control (without organic and inorganic fertilizers), minimum size of the flower (4.51 cm) in Pusa Bahar X Control (without organic and inorganic fertilizers and minimum number of flowers per plant (33.67) were recorded in Pusa Bahar X Control-without organic and inorganic fertilizers. Hence, Pusa Narangai Gainda + T_{10} (Poultry Manure @ 2.5t/ha + Vermiwash @ 3%) showed the best against total number of flowers per plant might be chosen recommended for terrain region of West Bengal.

Keywords: African Marigold, Poultry manure, vermicompost

9th Annual convention and national webinar on "Managing agro-chemical for crop and Environment health"

Theme area: 2. Agro-chemical for Protecting crops and environment

Title: Effect on plant hormone (BA) of African Marigold CV. Pusa Narangi Gainda

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Abstract

A study was conducted at the instructional farm of the Department of Floriculture, Medicinal and Aromatic Plants, Faculty of Horticulture, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal to study the effect of benzyl adenine (BA) on production of African marigold cv. Pusa Narangi Gainda from November, 2016 to March, 2017. Marigold is the one of important loose flower among the other loose flowers. Now a days it is very popular through the India and it also cultivated allover the year. Marigold origin from Mexico and belong to Asteraceae family. Twelve different levels of BA (Benzyladenine) were applied on African marigold and the effect was compared to control plants. The twelve different dose were T1= 25 ppm, T2= 50ppm, T3= 75 ppm, T4= 100 ppm, T5= 125 ppm, T6= 150 ppm, T7= 175 ppm, T8= 200 ppm, T9= 225 ppm, T10= 250 ppm, T11= 275 ppm and T12= 300 ppm along with T13= control. Here I have mention important five parameters which was taken my research work such as; Flower weight, Number of flowers, Carotenoid content, Post-harvest life of flowers and B:C ratio. Among of this twenty treatments maximum flowers weight (87.42g/10 flowers) was observe from T7 treatments and maximum numbers of flowers (44.13/plant) was taken from T2 treatments. T8 treatments gave highest amount of carotenoid (373.99) content from marigold petals. Maximum post harvest life under normal condition (3.67 days) and B:C ratio (3.19) achieved from T1 treatments.

Keywords: Marigold, BA, Carotenoid B: C ratio,

Studies On the Effect of Lime and Compost on The Activity of Micro-Organisms of Some Acidic Coastal Soils of West Bengal

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Abstract

An investigation was conducted to study the effect of different dose of lime with and without vermicompost on two different acidic soils (pH- 4.64 and 4.88) collected from two villages of coastal region of South 24 Parganas district, West Bengal. The soils received the treatment as follows: no lime (T_1), lime requirement of 9.25 t/ha (T_2), ⅔ of lime requirement (T_3), ½ of lime requirement (T_4) and ½ of lime with vermicompost (T_5). Soil physico-chemical properties and soil microbial status were measured at different intervals of time. The results indicate that the lime treated soils showed rapid increment of soil pH towards neutral followed by slightly alkaline condition whereas lime with vermicompost treatment led the pH at 6.5 pH range maintaining neutralizing condition. Though organic carbon content and available potassium content remain unaltered, but phosphorus content was found to be increased slightly. It was observed that microbial population of different beneficial soil microorganisms and microbial respiration were significantly improved in T_5 treatment that might be resulted from the presence of compost material improving soil microbial status significantly. Fluorescein diacetate and dehydrogenase activity were found to be increased significantly (19.6-22.0%) in T_5 treatment compared to T_2 treatment. Considering the whole findings, it might be concluded that the integrated approach of lime in lower quantity coupled with vermicompost successfully ameliorated the acid soils with improved soil microbial ecosystem and high quantum application of lime recommended as LR might be decreased to reduce the cost of cultivation.

Keywords–acid soil, lime, vermicompost, fluorescein diacetate, dehydrogenase

Efficacy of Vermicompost Based Brinjal Cultivation in Red and Lateritic soil of West Bengal

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Abstract

A field experiment was carried out on the efficacy of vermicompost based Brinjal cultivation during Kharif season of 2017 at Srichandrapur village of Birbhum district of West Bengal. The experiment was carried out in a farmer's field with eight treatments and three replications. The yield data of Brinjal revealed that vermicompost alone or in combination with NPK resulted significant yield improvement of Brinjal. Vermicomposts alone @5t ha^{-1}, 7.5t ha^{-1} and 10t ha^{-1} resulted in significant yield improvement over control. It is interesting to note that graded doses of vermicompost along with variable proportion of NPK yielded better yield. However, recommended doses of fertilizers registered highest yield but considering soil health and environment, the organic based brinjal cultivation practices is the best option.

Influence of tea pruning litter biochar amendments on dynamics of copperfrom tea growing soil to tea plant

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Abstract

A field experiment was accomplished in tea growing soils of Dibrugarh district of Assam, India, to discern the dynamics of copper (Cu) accumulation in soil and different parts of the tea (*Camellia sinensis* L.) plant (root, leaf and stem) influenced by tea pruning litter biochar (TPLBC) at 0D (days) and 120D. The TPLBC was prepared from chopped mixed tea pruning litter. Pyrolysis was performed at 400°C at a heating rate of 25°C min^{-1} with a residence time of three hours, and TPLBC was applied at three rates (T0: 0 kg ha^{-1}, T1:100 kg ha^{-1}, T2:150 kg ha^{-1}) to the experimental tea-growing soil. Total Cu concentrations in soil were increased from 23.32 (for T0) to 24.99 (for T2) mg kg^{-1} in 0D. Then the concentrations decreased gradually with an increased TPLBC application at 120D. The increasing dose of TPLBC application significantly increased the Cu concentration in the different parts of tea plants, and the trend of Cu concentrations was found as root> leaves> stem. The present research is an outcome of only 120D field surveillance. Hence it requires long term experimental research to get the most exact outfit about the impact of TPLBC application in tea cultivation.

Keywords: Copper, tea plants, tea pruning litter biochar, tea-growing soil

Effect of organic and inorganic amendments on soil biological properties invertisols under bajra cultivation

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Abstract

Indiscriminate application of synthetic fertilizers in post-green revolution era led to imbalanced fertilization which influenced the microbial activity of soil. The present investigation was conducted to evaluate the effect of different organic and inorganic amendments on soil biological activity at bajra research station, college of agriculture Dhule, Maharashtra during 2018. The experiment was laid out in a Randomized Block Design with eight different treatments of varying sources of nitrogen which were replicated thrice. Organic amendments like FYM, vermicompost and poultry manure were analyzed for biological properties using standard protocols. The biological properties of soil were estimated at 45 days of sowing (DAS) and at harvest stage.

Soil biological properties i.e., soil microbial biomass C and N, carbon and nitrogen mineralization, dehydrogenase activity, fungal, bacterial and actinomycetes population were observed significantly higher at 45 DAS than at harvest stage. The significantly maximum SMBC (Soil microbial biomass carbon) (157.01 µg C g^{-1} soil), SMBN (Soil Microbial Biomass Nitrogen) (48.12 µg N g^{-1} soil), C and N mineralization (18.20 µg C g^{-1} soil d^{-1} and 1.06 µg N g^{-1} soil d^{-1}, respectively), dehydrogenase activity (81.36 µg TPF g^{-1} soil 24^{-1}), fungal (28.00 x 10^4cfu g^{-1} soil), bacterial (57.00 x 10^7cfu g^{-1} soil) and actinomycetes (48.00 x 10^6cfu g^{-1} soil) population were recorded with the application of 50% RDN through fertilizers + 50% N through FYM followed by 100% RDN through FYM.

Keyword ; SMBC, SMBN, C& N Mineralization, Microbial population count, soil enzyme.

Effect of Foliar Spraying of Cow Urine Based Derivatives In Combination With RDF on Growth and Yield Of Rice

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Abstract

Rice (*oryzae sativa*) is a staple food crop in India. Cow urine is rich source of nutrients (especially nitrogen and potassium) enhance the growth of crops. Accordingly, a field experiment was conducted during 2018-2019 at Rajagoplapuram village in farmer's holding, Cuddalore district, Tamilnadu, to study the growth, yield attributes and yield of rice as influenced by foliar spraying of cow urine based derivatives in combination with RDF in sandy loam soil. The experiment was laid out in randomized block design. The experiment consisted seven treatments. The 100 per cent recommended dose of inorganic NPK fertilizers were applied uniformly to all plots. The results revealed that foliar application of cow urine based derivatives as single or double spray significantly increased the growth attributes, yield attributes and yield of rice. The maximum values were recorded with foliar application of 10% cow urine based derivatives at tillering stage (T_3) but this was found to be on par with 15% single and double spray of CUD. The maximum grain yield 3917 $kgha^{-1}$ was recorded with foliar application of 10% (Single spray) of CUD and significantly superior to rest of the treatments. The control (T_1) registered lowest grain yield of 1883 kg ha^{-1}.

Keywords: Cow urine based derivatives, inorganic NPK fertilizers, Growth, grain yield, rice

Selection of potential biofertilizer strain based on their biochemical and physiological characteristics

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Abstract

Biochemical and physiological characteristics of rhizospheric isolates are based on IMViC test and PGPR properties like nitrogen like nitrogen assimilation, phosphorous solubilization etc. The correlation between biochemical tests and PGPR properties is an important aspect. Methyl red test is positively and indole test is negatively correlated with phosphate solubilization. Citrate utilization tests and Vogues Proskeur test have negative correlation with the phosphate solubilization. Phosphate solubilizing bacteria may be identified through these biochemical tests in future. Moreover, a unique group of bacteria was identified by the scatter plot analysis which shows low acid production with high phosphate solubilization.

Keywords: Bacterial isolates, IMViC, phosphorous solubilization, acid-production

[Oral Presentation]

Development of some Botanical EC formulation and their Bio-efficacy against *Helicoverpa armigera* (Hubner).

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Abstract

Development of botanical EC formulations were undertaken at formulation lab of Department of Agricultural Chemicals, F/Ag Bidhan Chandra Krishi Viswavidyalaya. Mohanpur, West Bengal. A combination of emulsifiers was found suitable for development of formulations from the seed extracts of *P. pinnata*, *P. erosus* and *A. squamosa* and *R. communis*. DMSO (Dimethyl sulfoxide) and C9 solvent were found compatible with seed extracts (10% and 20%) and blend emulsifiers of nonylphenol ethoxylates (NP-13), calcium alkyl benzene sulphonates (CABS) and castrox-50 (hydrogenated castor oil ethoxylates). From the results of Bio-efficacy of various Botanical EC formulations against gram pod borer (*H. armigera*) in chickpea it was concluded that among *P. pinnata* 10 EC of three different extracts P. pinnata 10 EC of methanolic extract was most effective in controlling *H. armigera* larval population which was at par with the Chemical check: Emmamectin Benzoate. Among *P. erosus* 10 EC of three different extracts *P. erosus* 10 EC of methanolic extract was most effective in controlling *H. armigera* larval population and recorded the highest mortality (T4 = 1.70 no.s/ plant). Among *A. squamosa* 10 EC of three different extracts *A. squamosa* 10 EC of methanolic extract was most effective in controlling *H. armigera* larval population and recorded the highest mortality (T7 = 1.48 no.s/ plant). Among *R. communis* 10 EC of three different extracts *R. communis* 10 EC of ethyl acetate extract was most effective in controlling *H. armigera* larval population and recorded the highest mortality (T11 = 2.07 no.s/ plant).

Keywords: Botanicals, Formulation Development, Bio-efficacy, *Helicoverpa armigera*

A laboratory study on evaluation of paper mill sludge, calcium silicate and stromatolyte as liming material in an alfisols of Odisha

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Abstract

The present investigation was conducted in laboratory to evaluate the effectiveness of different liming materials including industrial and natural sources in an *Alfisols* (acidic soils) of Odisha. Three different types of liming materials *viz.* paper mill sludge (PMS), calcium silicate (CS) and stromatolyte (ST) were incubated in the acid soil of Malkangiri district of Odisha by taking the six treatments of four replications in 600 ml plastic beakers. The moisture in the beakers was maintained up to 50 per cent. Soil samples were collected from each beaker to evaluate the pH, exchange acidity, acidity due to aluminium (Al^{+3}) and hydrogen (H^{+}) in every 14 days interval. In control treatment, no change occurred but the application of FYM due to buffering property neutralised the exchange acidity, acidity due to Al^{+3} and H^{+}, and also slightly raised the pH. The application of liming materials @ 0.2 LR were neutralized the exchange acidity from 1.10 to 0.62 cmol (P^{+}) kg^{-1} with calcium silicate followed by 1.12 to 0.90 cmol(P^{+}) kg^{-1} with stromatolyte, followed by 1.12 to 0.90 cmol(P^{+}) kg^{-1} with PMS. The acidity due to Al^{+3} 0.61 to 0.42 cmol(P^{+}) kg^{-1} with stromatolyte, followed by 0.61 to 0.50 with calcium silicate, followed by 0.63 to 0.51 cmol(P^{+}) kg^{-1} with PMS. The acidity due to H^{+} 0.48 to 0.45 cmol(P^{+}) kg^{-1} with stromatolyte, followed by 0.46 to 0.38 cmol(P^{+}) kg^{-1} with PMS followed by 0.46 to 0.12 cmol(P^{+}) kg^{-1} with calcium silicate. The raising of pH from 5.0 to 5.9 with stromatolyte, followed by 5.2 to 6.0 with calcium silicate followed by 5.0 to 6.1 with PMS. It can be concluded that application of liming materials @ 0.2 LR with FYM @ 5 t ha^{-1} showed the highest pH and neutralization of H^{+} and Al^{+3} followed by liming materials @ 0.1 LR with FYM @ 5 t ha^{-1}, respectively.

Keywords: Soil acidity, Liming materials, FYM, Odisha

Application of industrial wastes and value-added rice straw to mitigate greenhouse-gases emissions in rice

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Abstract

Rice accounts for 11-13% of GHGs emissions in agriculture. Studies revealed that industrial and agricultural wastes could be used to mitigate GHGs emissions in agriculture. Considering the potential of those wastes to mitigate climate change the objective of the study was to mitigate the GHGs emissions in rice by application of industrial wastes and value-added rice straw (agricultural waste). The industrial wastes, includes basic slags and phosphogypsum, whereas the different forms of rice straw were used. The seven treatments imposed were (i) recommended dose of fertilizer (RDF), 80:40:40:: $N:P_2O_5:K_2O$ kg ha^{-1}, (ii) RDF; nitrogen through ammonium sulphate, (iii) rice straw-biochar (5 t ha^{-1}), (iv) phosphogypsum (2 t ha^{-1}), (v) rice straw-incorporation (5t ha^{-1}) (vi) rice straw-compost (5 t ha^{-1}), and (vii) basic slag (1 t ha^{-1}). The GHGs (methane (CH_4), and nitrous oxide (N_2O)) emissions, soil labile carbon pools (microbial biomass carbon and $KMNO_4$-C) and enzymatic activities were estimated throughout the growing period of rice. The seasonal CH_4 emission was lowest in basic slag (122.2 kg ha^{-1}) followed by phosphogypsum (125.7 kg ha^{-1}) and biochar (128.9 kg ha^{-1}); whereas N_2O emission was lowest in biochar (0.84 kg ha^{-1}) followed by rice straw compost (0.90 kg ha^{-1}) and rice straw incorporation (0.95 kg ha^{-1}). However, the microbial biomass carbon and $KMNO_4$-C and fluorescein di-acetate activities were highest in rice straw incorporation treatments. The results indicated the basic slag and phosphogypsum have the higher potential to reduce methane whereas, the biochar and rice straw-compost could mitigate the nitrous oxide emissions in rice.

Effect of Different Organic Sources of Nutrients on Growth and Flowering of Spray Chrysanthemum

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Abstract

The present study was conducted to identify best organic sources of nutrients for quality flower production of spray Chrysanthemum. The experiment was laid out in RBD (Randomized Complete Block Design) with three replication and fourteen treatments. This included viz; control, FYM, Vermicompost, poultry manures, seaweeds extracts, PSB and *azotobacter* and their combinations. The results revealed that Application of enriched FYM @12.5t/ha+ enriched vermicompost @2.5t/ha + Seaweeds extracts @3 ml/lit (T_{11}) recorded minimum days taken to first flower bud initiation (68.13 days), max field life (16.10 days), maximum number of flowers per plant (35.16).

Keywords: Farm yard manure, vermicompost, poultry manure, seaweeds extract

"External application of organics increases biochemical stabilization of soil organic carbon"

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Abstract

Rising atmospheric carbon dioxide (CO_2) concentrations have increased the interest in soil acting as a potential carbon (C) sink. Utilizing soils as a C sink necessitates identification of suitable management strategies which increase the stability of soil organic C (SOC) and help restraining global warming. In the present study, the long-term role of different forms of organics governing the stability of SOC had been evaluated under a 22 years' rice-rice system at Pattambi, Kerala. The treatments involved in the experiment were unfertilized control (CK), and different combinations of 50% and 100% inorganic (NPK) with green manure (GM) and farm yard manure (FYM) @5 t ha^{-1} $year^{-1}$. Soils under the treatments were measured for biochemical stabilization of SOC in terms of non-oxidisable (Non-OC) and non-hydrolysable (Non-HC) pools. The management practices differed significantly in terms of total organic carbon (TOC), HCl-hydrolysable (HC) and Non-HC, and oxidizable (OC) and Non-OC. Practices receiving conjoint application of inorganics with organics had 42 to 56, 121 to 129, and 87 to 119% higher TOC, Non-OC and Non-HC, respectively. Soils under conjoint application contained 45 to 170% higher proportion of Non-OC and Non-HC than the sole inorganic application. However, the different forms of organics did not show significantly different influences on SOC. The measured SOC pools exhibited significant linear relationship with the TOC (R^2=0.77 to 0.98*). Averaged across the doses and forms of organic application, integrated nutrient management showed 51, 106 and 127% additional annual gain in TOC, Non-HC and Non-OC, respectively, over the inorganic application of nutrients. Conclusively, external application of organics significantly increases the biochemical stabilization of SOC over inorganically managed soils; this strategy may help increasing the C hoarding in soil.

Keywords: Long-term fertility experiment, soil organic C, organic amendments. hydrolysable C, non-hydrolysable-C, oxidizable-C, non-oxidizable-C

9th Annual convention and national webinar on "Managing agro-chemical for crop and Environment health"
Theme area: 3. Allied agricultural activities vis-a-vis food security & environmental health
Title: "Efficacy of Indigenous Plant Products on *Corcyra cephalonica* (Stainton) in Stored Rice Grains"

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Abstract

The present investigation entitled "Efficacy of indigenous plant products on *Corcyra cephalonica* (Stainton) in stored rice grains" was carried out under laboratory condition which was controlled and maintained during 2020-2021, under Department of Entomology, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj (U.P). This experiment was conducted to assess the effect of seven treatments with three replication by the use of Completely Randomized Design methods including untreated control and plant products *viz.,* Neem leaf powder, Tulsi leaf powder, Karanj leaf powder, Marigold flower powder, Eucalyptus leaf powder and chemical coragen on the development and population and larval mortality and grain damage and larval orientation of *C. cephalonica*. The result of studies conducted on efficacy of different plant products against *C. cephalonica* in rice revealed that the highest larval mortality (81.67) % after 30 days of release were recorded in rice grains treated with neem leaf powder and it was concluded that the neem leaf powder was most effective. The minimum larval mortality (33.33) % after 30 days of release were recorded on marigold flower powder. The result of studies conducted on efficacy of different plant products against *C. cephalonica* in rice revealed that the highest grain damage after 15 days (78.33%) and minimum grain damage were recorded in neem leaf powder after 30 days and it was concluded that the neem powder was most effective.

Keywords: *Corcyra cephalonica*, larval mortality, grain loss.

Comparison of different novel engineered biochars in reducing nitrogen leaching from an Inceptisol

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Abstract

Nitrogen leaching, mainly in the form of nitrate (NO_3^-) and partly by ammonium (NH_4^+), from light textured tropical soil often restrains economically sustainable crop production and leads to environmental pollution. Moreover, converting crop residue into biochar can reduce residue burning and also nitrogen leaching. But unmodified biochars have low cation exchange capacity (CEC) and anion exchange capacity (AEC). So, in the present study, washed rice straw biochar (RBC-W) was treated with CEC enhancers (O_3, H_2SO_4-HNO_3, NaOH) and AEC enhancers ($FeCl_3$, $Fe(NO_3)_3$) simultaneously and three promising engineered biochars namely RBC-W treated with O_3-$FeCl_3$-HCl (RBC-OCl), H_2SO_4-HNO_3-$FeCl_3$-HCl (RBC-ACl), and NaOH-$Fe(NO_3)_3$ (RBC-OHFe), selected through a screening experiment, were used for soil column-based leaching-cum-retention study. Biochar was applied at 4.46 g kg $^{-1}$ along with fertilizer N @ 60.6 mg kg^{-1} N in two splits. Soil columns (sandy loam Inception of Delhi) were leached with deionized water and NH_4^+, NO_3^- in leachate were monitored during two months after each fertilization. Result suggested that all the engineered biochars reduced the leaching of NH_4^+-N, NO_3^--N and increased their retention over RBC-W. RBC-OCl and RBC-ACl reduced leaching efficiently, though the former outperformed the later in some leaching events. After the end of leaching experiment, post sorption soil analysis revealed that RBC-OCl emerged as the promising soil amendment for increasing the retention of NH_4^+-N and NO_3^--N by 33.7% and 27.8% respectively over RBC-W. To conclude, engineered biochars could be a potential strategy for mitigation of nitrogen leaching and augmenting nutrient use efficiency in light textured soil.

Keywords: *Engineered rice straw biochar; CEC and AEC; Nitrogen leaching; Nitrogen retention*

Effect of Different Levels of Organic Manure in Combination with Biofertilizers on Chemical Properties of Soil and Yield of Green Gram (*VIGNA RADIATA L*)

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Abstract

A field experiment was conducted on clay loam soil, low in available N (220kg/ha), P_2O_5 (14kg/ha) and K_2O (164kg/ha) at crop research farm of Dryland Agricultural research station Rangreth SKUAST K. The experiment was laid out in 4x2 factorial randomized block design with eight treatments and three replications. The pH of soil was 7.5 and status of organic carbon was 0.85%. the seeds of green gram were sown at 30cm x 15cm spacing. Different levels of organic manure (FYM) @ 0, 5, 10 and 15 tonnes/hac with and without Rhizobium inoculation were applied. It was concluded the application of FYM @ 15 tonnes/ha with Rhizobium inoculation was found to be superior over all treatment for growth and yield of green gram. The yield was found maximum 11.90 q/ha with F_3R_1 (FYM @ 15 tonnes/ha + Rhizobium) in comparison with control F_0R_0 which was recorded 6.50q/ha.

Effect of Mulching and Growth Retardant on Productivity and Profitability of Summer Groundnut (*Arachis hypogeae* L.) in Birbhum district of West Bengal, India.

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Abstract

A short term research was conducted on effect of mulching and growth retardant on productivity and profitability of Summer Groundnut (*Arachis hypogeae* L.) in Birbhum district of West Bengal, India. The research trial was conducted with the following objectives viz. saving of water or number of irrigation by modifying favorable micro-climatic condition in soil through mulching, checking weed growth and economic losses, reducing excessive vegetative growth for better yield, conserving moisture by reducing evapotranspiration loss by increasing sink capacity, increasing in productivity by increasing root growth and numbers of pegs and pods and thereby increasing profitability. The experiment was done with the Groundnut crop variety Dharani (TCGS1043) during summer season of 2020-21. The experiment was laid out in Factorial RBD consisting two factors i.e. i) Mulching and ii) Spraying of growth retardant at 60 DAS. Mulching had 4 levels i.e. No Mulch (M_0), Plastic Mulch (M_1), Straw Mulch (M_2) and Leaf Mulch (M_3). Growth Retardant Spraying at 60 DAS had 3 levels viz. No Spray (G_0), spraying of Cycocel (CCC) (1000 ppm) (G_1) and spraying of Malic-hydrazide (200 ppm) (G_2). Straw mulching and spraying of Cycocel 1000 ppm produced best yield (28.5 q/ha) and higher profit (₹. 58750/-). Plastic mulching produced lower yield than leaf mulching and straw mulching. Spraying of Cycocel 1000 ppm gave better result than Malichydrazide 200 ppm. The cost of cultivation was higher in plastic mulching and spraying of Malichydrazide (₹. 47200/-). All the mulches reduced the number of irrigation. Growth retardant Cycocel also increased water use efficiency. Thus it also saved water by mulching. Mulching also reduced the weed population more effectively than no mulching. However Plastic mulching and straw mulching gave at par effect on weed suppression. Thus this practice will be taken as a good resource conservation method in cultivating groundnut in Birbhum district. Ground nut cultivation with straw mulching along with spraying of Cycocel may be recommended for the farmers of the Birbhum district for getting higher yield and more profits in summer season.

Keywords: Mulching, growth retardant, groundnut yield, profit

Theme 2: Agro-chemicals for protecting crops and environment

Concurrent Session 2: Inorganic crop nutrition/ pesticides

Jury members for paper evaluation

Dr. Archan Kanti Das- Chairman

Dr. Subir Nag- Member

Dr. Mohan Biswas-Member

Dr. Anirban Roy-Member

Dr. Sanjay Naithani-Member

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IIHR Vegetable Special – A Booster Spray for Tomato Growers in Erode District

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Abstract

Tomato is an important vegetable crop cultivated in Erode district over 500 ha area. Farmers are facing various micronutrient deficiency symptoms in tomato which ultimately reduces the fruit yield, size and quality of ripened fruit. To address this problem KVK, Erode undertaken this experiment to overcome the problem and to provide appropriate technical solution by this trial to Tomato farmers. The experiment was conducted in Randomized Block Design (RBD) with five replications. There were four technology options viz., TO1: No application of micronutrients, TO2: Application of Borax alone, TO3: Foliar spraying of IIHR Vegetable special 0.5 % at 30, 45 & 60 DAP and TO4: Foliar spraying of 0.5% Sampoorna KAU vegetable multi- mix at 15, 30 & 45 DAP. The tomato hybrid Saaho is used in this study. The results revealed that among the technological options, TO3 recorded the highest values in all the growth, yield characters and economics parameters viz., number of fruits per plant, individual fruit weight, yield, net income and BC ratio. It was followed by TO4 whereas the TO1 recorded the lowest values in all the characters. TO3 Foliar spraying of IIHR Vegetable special 0.5 % at 30, 45 & 60 DAP registered 22 percent yield increase over the control. In order to make available the product in the locality for the easy adoption by farmers, KVK has established IIHR vegetable special production unit and supplied 5034 kg in last five years.

Keywords: IIHR vegetable special, KAU sampoorna vegetable multi-mix, Foliar application, Yield.

Response of different doses of phosphorus and sulphur on seed yield of chickpea in alluvial soil of murshidabad district of west bengal

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Abstract

Apart from other plant nutrients the Phosphorous and sulphur are able to increase the nodulation, root development, growth and yield of crops. In these regard to assess the response of different level of phosphorus and sulphur application on growth attributes and yield of chickpea (Cicer arietinum L.) a field experiment was conducted in 7 farmer's field at Dakshin Basudebpur village of Murshidabad, West Bengal during Rabi season for two consecutive years during 2019-20 and 2020-21. The experimental fields were selected randomly. The experiment was layout in three different technological options comprising different level of phosphorus and sulphurs namely "Recommended Dose of NPK 20:40:40/ha + 20kg S/ha"; "60kg P+ 10kg S + Recommended Dose of NK/ha"; '60kg P+ 20kg S + Recommended Dose of NK/ha" where as "No use of Sulphur and indiscriminate use of NPK" taken as control. Phosphorus was applied in the form of Single Super Phosphate and Sulphur as Bentonite Sulphur 90%. The application of 60kg Phosphorus and 20kg Sulphur along with recommended dose of N and K significantly increased the number of nodules(78.4 plant^{-1} at 50% flowering) and pod(31.3 plant^{-1}) as well as seed yield of chickpea (22.50 quintal ha^{-1}) over the control. The significant application of Phosphorus (40kg and 60Kg ha^{-1}) and Sulphur (10kg and 20kg ha^{-1}) could able to enhance the performance of crop in terms of nodulation, growth, number of pods and yield.

Keywords: Phosphorous, Sulphur, Chickpea, Alluvial Soil, Yield

Effect of Lime, Sulphur and Boron on Indian mustard under agro climatic condition of Godda, Jharkhand

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Abstract

An on- station trail (OST) conducted at GVT- KVK, Godda during 2020-21 to assess the effect of lime, sulphur and boron on crop productivity and profitability of mustard. The on- station trial comprised 10 treatment *viz.* T1- Control (No fertilization), T2- Farmers practice (N: P: K: 21.4:19.6:5.9 Kg/ha), T3- Recommended NPK (N: P: K: 80:60:40 kg/ha),T4- Recommended NPK + lime @ 4q/ha, T5- Recommended NPK + Sulphur @ 20 kg/ha, T6- Recommended NPK + Boron 1 kg/ha,T7- Recommended NPK + Lime @ 4q/ha + Sulphur @ 20kg/ha, T8- Recommended NPK + Lime @ 4q/ha + Boron @ 1 kg/ha, T9- Recommended NPK + Sulphur @ 20kg/ha + Boron @ 1 kg/ha, T10- Recommended NPK + Lime @ 4q/ha + Sulphur @ 20 kg/ha + Boron @1kg/ha were carried out in randomized block design with three replications. Indian mustard biofortified variety *'Pusa Mustard - 30'* was sown by using seed rate of 5 kg/ha during third week of November during experimentations. Data revealed that application of Recommended NPK + Lime @ 4q/ha + Sulphur @ 20 kg/ha + Boron @1kg/ha were found significantly higher growth attributes *viz*. plant height (171cm), branches/plant (18); yield attributes *viz*. siliqua length (4.2cm), grains/siliquae (13),1000-grain weight (4.9g), grain yield (1105 kg/ha), stover yield (3215 kg/ha), gross returns (INR 55250/ha), net returns (INR 16856/ha), B: C ratio (1.44) over T9, T8, T7,T6,T5, T4, T3, T2, T1 (control) treatments.

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Estimation risk assessment code (RAC) of zinc in tea-growing soil amended with tea pruning litter biochar

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Abstract

A pot experiment was conducted at Upper Assam Advisory Centre, Tea Research Association, Dibrugarh (Assam), India, to study the risk assessment code (RAC) of zinc (Zn) amended with tea pruning litter biochar (TPLBC) in tea-growing soil. For this study, TPLBC was prepared at 350^{o}C, and the treatments were: T0 (control), T1 (100 kg ha^{-1}), T2 (150 kg ha^{-1}), T3 (200 kg ha^{-1}), T4 (300 kg ha^{-1}), T5 (400 kg ha^{-1}), and T6 (500 kg ha^{-1}). Soil samples were collected after one year of the TPLBC amendment and analyses of Zn in six different fractions (F1: water-soluble, F2: exchangeable, F3: bound to carbonates, F4: bound to Fe-Mn oxides, F5: organically bound, and F6: residual fractions) in the soil using atomic absorption spectroscopy. Total Zn in soil was increased with increased TPLBC application in soil. For all the six fractions, Zn in F4 to F6 fractions increased with increasing doses of TPLBC, indicating Zn absorbing properties of TPLLBC from the soil. The RAC of Zn was maximum for the control treatment (14.88%) and found minimum for T6 treatment (6.56%). Therefore, all the soils were low to the medium risk concerning Zn. It can be concluded that the application of TPLBC in tea-growing soil can alter the ecological risks of Zn.

Keywords: Biochar; Ecological risk; Tea-growing soil; Zinc

Assessment of Suitable Management Strategies in Control of Maize Stem Borer in Western Central table land zone of Odisha

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Abstract

An on-farm testing for assessing suitable management strategy for control of maize stem borer was conducted during *kharif* 2017-18 and *kharif* 2018-19 in Randomized block design at seven farmers' field at Kaudia village of Patanagarh block, and Uparghar village of sadar block of Bolangir district, Odisha taking four treatments *viz*. T1: Farmers' Practice (application of Chlorpyriphos after visualisation of symptoms). T2: Application of Triazophos @ 2ml/L at knee height stage, T3: Whorl application of Fipronil 0.3GR @ 4-5 granules/ whorl at knee height stage + application of lamda Cyhalothrin @2 ml/l at 15 days after and T4: Whorl application of Cartap hydrochloride 4GR @4-5 granules/ whorl at knee height stage + application of lamda Cyhalothrin @2 ml/l at 15 days after taking maize variety "VNR 4226" as test crop. From the study it was observed that, whorl application of Fipronil 0.3GR @ 4-5 granules/ whorl at knee height + application of lamda Cyhalothrin @2 ml/l at 15 days after resulted in lowest foliage damage and dead heart with highest yield and return, followed by Whorl application of Cartap hydrochloride 4GR @4-5 granules/ whorl at knee height + application of lamda Cyhalothrin @2 ml/l at 15 days after knee height. It was observed that T3: Fipronil 0.3GR @ 4-5 granules/ whorl at knee height stage + lamda Cyhalothrin @2 ml/l at 15 days after showed highest gross return and B:C ratio, followed by T4.

Keywords: *Chilo partellus, stem borer, cob weight, dead heart*

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Nitrogen Release Pattern as Influenced by Natural Zeolite under Cotton Grown on Salt Affected Soils of Purna Valley

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Abstract

Nutrient imbalance and reduced availability of nitrogen in sodic soil of Purna valley is a serious concern. Accordingly, reducing the heavy use of nitrogen fertilizer and improving in sodic soil of Purna valley. The present study was conducted at shed net house department of Soil Science and Agricultural Chemistry, Dr. PDKV, Akola. The experiment laid out in completely randomized design with eleven treatments consisting of 75% RDF (90:45:45 NPK kg ha^{-1}) and 100% RDF (120:60:60 kg ha^{-1}) for bt cotton in separate treatment combinations with FYM, gypsum and three zeolite levels with three replications.

The results indicated that, the available nitrogen fraction in soil showed a steady state of release with various zeolite levels. The most significant impact on rate of change and steady mineralization of ammonical and nitrate nitrogen in soil were obtained with soil application 100 % RDF + zeolite @ 450 kg ha^{-1} which was found at par with 100 % RDF + Zeolite @150 kg ha^{-1} and 75 % RDF + Zeolite @ 300 kg ha^{-1} . The application of various levels of zeolite were found significantly beneficial in availing the nitrogen in soil for uptake by cotton with improving the release of both nitrogen fractions (NH_4-N and NO_3-N) in soil and minimizing their leaching losses.

Keyword: Natural zeolite, sodic soil, ammonical nitrogen and nitrate nitrogen

Effect of slow/controlled (SRFs/CRFs) release fertilizer on nutrient use efficiency (NUE) and yield of maize and rice crop

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Abstract

Nitrogen (N) fertilizer plays an important role in increasing yield. More than half of all fertilizer applied to the field is not taken up, resulting in environmental damage and substantial economic losses. To avoid the negative impact of excessive nitrogen fertilization on the environment, we propose an approach for assessing the efficiency of coating materials on controlling nitrogen availability to plants. It is based on the use of coated and soluble urea (UR) applied to maize and paddy. Accordingly, the growing of crops of maize and rice combined with forms of soluble UR application were able to characterize the pattern of N release from coated fertilizers, being, thus, a suitable method to evaluate the efficiency of such products. In both aerobic and anaerobic conditions use efficiency of polymer-coated fertilizer is impressive, and a residue study was conducted followed by with wheat crop. SRFs/ CRFs polymer-coated fertilizers increased the use efficiency of fertilizers and synchrony between crop need and release of nutrients from fertilizer. We argue that our practical approach could be used by the industry in fertilizer quality programs and to register fertilizer coating materials by regulatory agencies.

Keywords: SRFs/CRFs, fertilizer use efficiency, nitrogen fertilizer, nutrient uptake.

Effect of Nano-DAP on Growth and Yield of *Kharif* Paddy in Lateritic Soil of Birbhum District.

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Abstract:

An experiment was conducted in the RKVK instructional farm to study the effect of nano DAP on the growth and yield of *Kharif* paddy in lateritic soil of Birbhum district during 2020-21. The experiment consisted of 13 treatments viz, T1-0%P&0%N Basal (no basal DAP); 100% N&K (control), T2-100% NPK (University recommended Practice) 100% Basal DAP, T3-25% Basal DAP (Recommended NPK level to be followed), T4-50% Basal DAP(Recommended NPK level to be followed), T5-T1+ST with nano DAP @2.5 ml/kg seed+FS with nano DAP @2ml/litter of water at 30 das after planting, T6- T1+ST with nano DAP @5 ml/kg seed+FS with nano DAP @2ml/litter of water at 30 das after planting, T7- T3+ST with nano DAP @2.5 ml/kg seed+FS with nano DAP @2ml/litter of water at 30 das after planting, T8- T3+ST with nano DAP @5 ml/kg seed+FS with nano DAP @2ml/litter of water at 30 das after planting, T9- T4+ST with nano DAP @2.5 ml/kg seed+FS with nano DAP @2ml/litter of water at 30 das after planting, T10- T4+ST with nano DAP @5 ml/kg seed+FS with nano DAP @2ml/litter of water at 30 das after planting, T11- T1+S/L T with nano DAP @0.5 %+FS with nano DAP @2ml/litter of water at 30 das after planting, T12- T3+S/L T with nano DAP @0.5 %+FS with nano DAP @2ml/litter of water at 30 das after planting , T13- T4+S/L T with nano DAP @0.5 %+FS with nano DAP @2ml/litter of water at 30 das after planting .(ST-seed treatments;FS-foliar spray;S/L T-Seedling treatments) which were mainly based on different DAP fertilizer doses and also nano DAP spraying on the active growth stage and also seed treatment or seedlings treatment with nano DAP and the treatments were laid out in randomized block design. According to the observation during the experimentation, treatment with 50% basal DAP of normal fertilizer dose along with seed treatment with 5ml/l water with nano DAP and a spray @2ml/l nano DAP performed best (6.06t/ha yield) and second-best was 50% basal DAP with seedlings treatment with nano DAP 5 ml/l water with a foliar spray of 2 ml nano-DAP/l of water at 30DAT (5.69 t/ha yield) and third best was 25% basal DAP with seed treatment with 5ml nano DAP per litre of water and a foliar spray of 2 ml nano DAP per liter of water at 30DAT (5.42t/ha yield). One bad impact of that fertilizer use which was found during the work, was that it attracted more insect pests as plants' growth is more and more greenish but it was not a big problem, since it can be managed with pesticides. Nano DAP is also very easy to apply, easy to carry, and also very much cost-effective product.

Keywords: Kharif paddy nano DAP, seed treatment, foliar spray, seedlings treatments, yield

Effect of potassium and zinc application on fibre yield and quality of jute

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Abstract

The state West Bengal constitutes highest area and production of jute in the country. In contrast, jute fibre production in South 24 Parganas district is very low (only 12.5% of the state production). Farmers are not at all aware of proper nutrient management, and often go for indiscriminate fertilizer application. In view of high requirement and response to applied K by jute crop, interaction of K with micronutrient Zn deserves a special attention for balanced fertilization. The study was conducted in farmers' fields of Ranigachhi village, Bhangar I block, South 24 Parganas. Three different nutrient management practices *viz.* state recommended dose of fertilizer or RDF for jute (60 kg N, 30 kg P_2O_5 and 30 kg K_2O/ha), RDF for N and P_2O_5 + 40 kg K_2O/ha + 4 kg Zn/ha, and RDF for N and P_2O_5 + 40 kg K_2O/ha + 6 kg Zn/ha were performed each in five farmers' fields. Farmers' fertilizer practice (FFP) was recorded from seven different farmers' fields and then averaged. It was observed that the fibre yield of jute, and net return and B:C ratio of jute cultivation increased significantly with application of Zn with elevated dose of K, along with recommended N and P. Combined application of K and Zn significantly increased bundle strength, fineness and colour of jute fibre. Based on the findings, application of 40 kg K_2O/ha along with 6 kg Zn/ha and recommended N and P can be advocated for higher fibre yield, quality and economic return in the study location.

Keywords: Jute, Fibre yield, Potassium, Zinc, Quality

Assessment of different crop management practices to combat with wilt of brinjal in Uttar Dinajpur district

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Abstract

Brinjal is a leading vegetable crop in Uttar Dinajpur district. But due to wilt, high plant mortality and crop loss occurs in the main field. Farmers' frequently sprayed different Agro-chemicals to check plant mortality. The continuous use of chemical pesticides results depletion of beneficial microorganisms which in turn reduced the soil productivity. A field experiment was conducted during Early Rabi season, 2020 at the instructional farm of Uttar Dinajpur Krishi Vigyan Kendra and seven nos farmers field at Karandighi block of Uttar Dinajpur district, West Bengal. The farm is situated at 260 21'18" N latitude and 880 16'36" E longitude. The experiment was carried for **Assessment of different crop management practices to combat with wilt of brinjal.** The experiment was laid out in Randomized Block Design having **T_1**- Farmers Practice (No seed treatment, seedling treatment, no proper crop management); **T_2**- Seed treatment with *Trichoderma viridi* (5 g/l) and seedling treatment with *Trichoderma* (5 g/l) and *Pseudomonas* (5 g/l), then Soil drenching at root zone with *Trichoderma harzenium* (5 g/l) and *Pseudomonus* sp. (5 g/l) two times at 45 days and 60 days after transplanting in main field; **T_3**- Seed treatment with carbendazim (1.5 g/l) and seedling treatment with streptrocyclin (1 g/10 l),then Soil drenching at root zone with Copper oxychloride (4 g/l) and validamycin (2 ml /l) two times at 45 days and 60 days after transplanting in main field and **T_4**- Seed treatment with *Trichoderma viridi* (5 g/l) and seedling treatment with streptrocyclin (1 g/10 l), then Soil drenching at root zone with *Trichoderma harzenium* (5 g/l) and *Pseudomonus sp.* (5 g/l) at 45 days after transplanting in main field followed by Copper oxychloride (4 g/l) and validamycin (2 ml /l) after 15 days of first drenching with three replication. For the experiment Brinjal var Sangram was taken and individual plot size of 4 m x 4 m was maintained. From the result of the experiment, it was revealed that wilt incidence (17%) and plant mortality (17%) was highest in T_1- farmers' practice and lowest in T-$_4$ (i.e. 0.25% and 1.1% respectively). The yield has been recorded highest in T_4 (**748.5q/ha**) and lowest in T_1 i.e.Farmers' practice (**568.3q/ha**). Other treatments also gave significant results in the trial.

Keywords: Brinjal Wilt, Trichoderma, Pseudomonus, Copper Oxychloride, Validamycin, Streptocyclin and yield.

Relative effect of different long term manurial practices on concentration of ammonium (NH_4^+) in ponding water and determination of minimum holding period to reduce N loss in irrigated rabi rice

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Abstract

A long term fertilizer experiment (LTFE) with rice-rice cropping system was conducted since 2005-06 under the aegis of Indian Council of Agricultural Research (ICAR) at Bhubaneswar on a moderately well drained acidic sandy loam soil for studying the relative effect of eight different manurial treatments (T_1=50% NPK, T_2=100% NPK, T_3=150% NPK, T_4=100% NPK+FYM, T_5=100%N, T_6=100% NP, T_7=100% NPK + Lime and T_8=Control) on ammonium (NH_4^+) concentration in ponding water of rice field and relation to the soil available N and plant N uptake. The aim of the experiment was also to determine the minimum holding period of ponded water after application of N fertilizers which were applied in splits (N in 3 splits: ¼ basal + ½ at maximum tillering + ¼ at panicle initiation). The results depicted that the concentration of ammonium (NH_4^+) varied with respect to the time of application during the crop growth period. Concentration of NH_4^+ in ponding water after basal dose application was measured to be higher than midseason application. The concentration of NH_4^+ in ponding water measured after 1 day of N application was 0.29-2.67 mM/l in case of basal, 0.15-0.62 mM/l in case of first top dressing at maximum tillering stage and 0.08 to 0.26 mM/l in case of second top dressing at panicle initiation stage, respectively, indicating much reduced concentration towards later stages of growth which might be due to more root-sink effect. In general, the treatments were in the order 100% NPK+FYM > 100% NPK +lime > 150% NPK > 100% NP > 100% N > 100% NPK > 50% NPK > Control with respect to NH_4^+ concentration in ponding water. NH_4^+ concentration in ponding water in the first and third day after fertilizer applications under all 3 splits were correlated positively and significantly with the available N. But correlation with N-uptake was only significant with the NH_4^+ concentration measured after second top dressing. This indicates soil available nutrients also contributed to NH_4^+ concentration in ponding water. The results also suggested that a minimum 5 days holding period of ponding water should be maintained after application of both N and K fertilizers during basal and panicle initiation stages and minimum holding period of 3 days should be maintained after top dressed N applied at maximum tillering stage.

Keywords: Rice field, Ponding water, NH_4^+ Concentration, Holding period

Effect of zinc application in rice crop under sub-tropical climatic conditions

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Abstract

A field experiment was conducted during 2019-20 and 2020-21 on rice in NICRA village Ratanpur to study the response of Zinc application in rice crop. Two levels of zinc 2.5 and 5 kg ha^{-1} with control were studied with the basal dose of N, P_2O_5, K_2O as 80:40:40 kg ha^{-1} in the form of urea, DAP, MOP and zinc sulphate in rice crop. Rice variety Swarna Sub-1were planted in RBD design with three replications. Zn application, significantly affected grain yield. Rice yield was significantly affected by Zn levels ranged from 4.0 to 4.6 t ha^{-1}. The highest yield was obtained from 100% NPK + FYM (5t/ha) + 2.5 kg Zn ha^{-1} was applied. Similarly, Zn application also affected significantly to the yield parameters of rice like the number of effective panicles m^{-2}, number of effective panicles $hill^{-1}$, panicle length, plant height and 1000 grain weight over control from the above said treatment. The concentration of zinc in soil was significantly affected by the application of zinc in rice, ranged from 0.49-1.02 mg kg^{-1}. The highest concentration in soil was recorded by the cumulative application of 100% NPK + FYM (5t/ha) + 2.5 kg Zn ha^{-1} while lowest from control. The direct application of 100% NPK +.5 kg Zn ha^{-1} and 100% NPK + FYM (5t/ha) + 2.5 kg Zn ha^{-1} gave an increase of 15 and 22% over control, respectively. The application of 100% NPK + FYM (5t/ha) + 2.5 kg Zn ha^{-1} can be recommended for economical production in rice crop.

Keywords: Rice, growth, yield, zinc

Seed Priming in Pea for Improving Productivity and Nutrient Use Efficiency in Acid Soils of Meghalaya, North Eastern India.

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Abstract

Seed priming is a simple, cost-efficient and feasible technique for improvement of seed germination and productivity of the crop. To assess the effect of seed priming substances on pea for germination, crop yield and effect on soil nutrient status an on farm testing was carried out at the farmers field at mid altitude of Ri-Bhoi District of Meghalaya. The on farm testing was conducted on three villages of Ri-Bhoi district during the year 2017-18 and 2018-19 covering 1 ha of land. The treatments consist of two priming substances with seven replications. The treatment combination was found more efficient for enhancing germination and along with yield performance of pea. The results of the study revealed that the seed soaking overnight by nutrients solutions 1% $ZnSO_4.7\ H_2O$ and 1% KH_2PO_4 had recorded significantly higher yield i.e., 32.28 q/ha with B.C ratio of 2.4 followed by farmer's practice (24.7 q/ha yield with B.C ratio of 2.01). Moreover, the soil nutrient status was also significantly improved at the time of harvesting as compared to farmer's practice in both the years.

Keywords: OFT, Seed Priming, Pea, Acid Soil, Soil Health, Nutrient Use Efficiency, Meghalaya, North Eastern India.

Application of Agrochemicals in Agriculture and their Effect on the Ecosystem

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Abstract

The farmers use various agrochemicals include insecticides, herbicides, fungicides, weedicides, etc. for the growth of plants and increase the yield of various crops. The report here mentions the agrochemicals and their types. Advantages and disadvantages of agrochemicals are discussed. The effect of agrochemicals on the ecosystem and their mechanism of action are also focused. The risk and mitigating measures in use of agrochemicals is also included. The future study related to molecular study of mechanism of agrochemicals is necessary to be studied.

Keywords: Eco-friendly, Pesticides, Insecticides, Vertebrates, Ecosystem, Agriculture.

Impact of different new generation herbicides on weed dynamics and growth parameters of urdbean (*Vigna mungo* L. Hepper)

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Abstract

A field experiment was conducted during *kharif* season of 2019 in pulse agronomy (D_6) block of N.E. Borlaug crop research centre of G.B pant University of Agriculture and Technology, Pantnagar (UK) to evaluate the efficacy of different post emergence herbicides application on weeds and growth, yield and quality of urdbean. The experiment comprised of 10 treatment combinations. *Cyperus rotundus* and *Echinochloa colona* were the pre-dominant weeds species in the experiment field contributing 33 and 27 per cent to the total weed density and 28.5 and 23 per cent to total dry matter of weeds respectively. Effective control of weeds (in terms of weed density, dry matter of weeds and weed control efficiency) was achieved in hand weeding, 20 and 40 DAS, followed by pendimethalin 1 kg / ha as PE + fomesafen 220 g + fluazifop -p-butyl 220 g / ha (Ready mix), PoE, 20 DAS. It was computed that hand weeding twice 20 and 40 DAS yielded 111% highergrain yield (kg/ha) over unweeded control while pendimethalin @ 1 kg/ha as PE + fomesafen @ 220 g +fluazifop-p-butyl 220 g/ha as PoE 20 DAS (Ready mix) (T_{10}) increased the grain yield to the tune of 78 % over unweeded control. Hand weeding twice 20 and 40 DAS (B:C ratio 2.0) resulted in higher B:C ratio over unweeded control.

Biochemical Alteration in Soil and Plant in Response to Excess Nitrogen and Penoxsulam 2.67% OD Stress in Rice (*Oryza sativa*. L.)

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Abstract

This study has been designed to assess the biochemical alteration that has been taken place due to excess nitrogen (@ 120, 150, and 180 kg N ha^{-1} at three splits) and penoxsulam (2.67% OD was applied @ 1000 and 2000 ml ha^{-1}) herbicide stress in the rice field. Different plant parameters like chlorophyll (a, b & total), total phenolic content, DPPH scavenging activity and total N, P, K, Fe, Zn were determined at four different phenological stages of rice. Soil parameters such as pH, EC, OC, available N, P, K, Fe, Zn were determined along with important soil enzymes.

The addition of incremental N and penoxsulam considerably enhanced soil available N, P, K, Fe, and Zn. At higher doses of N, all enzymatic activities (DHA, FDA, acid & alkaline phosphatase) were found to be increased. Penoxsulam, in contrast to N, caused a considerable drop in the comparable value when applied at twice the recommended dose. The addition of nitrogen had a good influence on chlorophyll development, but penoxsulam caused a large decrease in the same in the plant. The use of herbicides resulted in an increase in all of the parameters measured in grain as compared to untreated.

It can be concluded that applying 125% of the recommended nitrogen dose combined with the recommended dose of penoxsulam 2.67% OD is the best possible treatment combination in rice in terms of yield, low input cost, and maintaining important soil enzymatic activity, as well as the availability of nutrients.

Effect of Arka Mango Special application on inflorescence development , fruit setting and fruit quality of mango in Malda District, West Bengal.

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Abstract

The mango (*Mangifera indica*) is the most important fruit crop in India and is titled as the king of fruits. It is being cultivated for well over 4000 years in India. Mango is the third most important fruit in the tropics due to its nutritional properties and delicious flavor. Mango is cultivated throughout the tropics and warmer sub-tropics. An On Farm Trial was conducted at Malda Krishi Vigyan Kendra, Uttar Banga Krishi Viswavidlaya, Ratua Malda, India during 2020-21 to study the response of mango variety 'Fazli' through application of 'Arka Mango Special', a foliar micronutrient mixture which was developed by Indian Institute of Horticulture Research (IIHR), Bengaluru for higher fruit quality and yields in mango. The experiment was done in a randomized block design with three treatments, viz., T1: Farmers practice (sprayed with Boron and Zinc application), T2: Micro nutrient Grade V @2g/lit (Twice Before Flowering & Twice After Flowering), T3: Mango Special - 4 times application (Twice Before Flowering & Twice After Flowering) @ 5g/L with 7 replications and 4 nos trees/unit. Treatments were foliar sprayed twice at flower bud differentiation, flower initiation and marble stage of fruit growth. All the two micronutrient treatments significantly improved fruit retention, quality, yield parameters, over the control (T1). Among micronutrient treatments, the treatment Arka Mango Special (T3) recorded the maximum values for no. of fruits/panicle at mature stage (2.71), Fruit weight (262.92kg) and fruit yield (7.72q/ha) Increased yield over control is 3.64 %. The Incremental cost benefit ratio (ICBR) is 1.09 for Arka Mango Special over the Micro nutrient Grade V (T2) mixture which is 1.02. From the present study, it can be concluded that application of Mango special (T3) in mango orchard is very much effective for good mango production than normal farmer practice and application of micronutrient mixture grade V (T2).

Keywords: Mango, IIHR, Micro nutrient Grade V, Arka Mango Special,

Effect of Pesticides on availability of Micronutrients and viable fungi count in soils of different regimes

arkar and is as

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Abstract

The indiscriminant use of pesticides in agriculture causes the contamination of the soil with toxic chemicals and become more harmful to the microorganisms. It is already been established that the activity of micro-flora in soil may plays a great role for maintaining soil health and also helps to availability of plant nutrients. In view of the above, a pot experiment was conducted in laboratory simulated condition to investigate the effect of pesticides-Imidacloprid (Insecticide), Taqat (Fungicide-mixture of Captan 70% + Hexaconazole 5% WP) and 2, 4-D (herbicide) at their field application rates (1.0, 1.5 and 1.0 kg a.i ha^{-1}) and double the field application rates ((2.0, 3.0 and 2.0 kg a.i ha^{-1})), respectively, on the available DTPA (Diethyl Triamine Pentacetic acid) extractable Zinc (Zn), copper (Cu), hot water extractable boron (B) along with viable fungi in Red and Lateritic soils collected from Agricultural Research Farm, Visva-Bharati ($20^0 39^/$ W latitude $87^0 42^/$ E longitude and 58.9m AMSL attitude). The experimental soil was sandy loam having pH 6.1, organic carbon 0.298%, available P_2O_5 28.69 Kg/ha and available K_2O 162.9 Kg/ha. The results reveal that as compared to initial content (2.06 & 4.11 ppm), zinc availability increased by 57.2-87.5% &71.2-77.3%, 12.9-28.3% & 8.5-16.6% and 33.6-41.1% & 21.8-28.2%, in dry & moist regimes irrespective of doses of 2, 4-D, Taqat and Imidacloprid application, respectively at 90 days after application (DAS). Similarly, boron availability increased by 6.9-8.7% and 8.8-14.2% in dry and moist regimes irrespective of doses of 2, 4-D application at 90 DAS in respect to initial content (0.10 and 0.49 ppm) but decreased availability with 3.0-4.4% & 6.7-7.2% and 11.9-25.2% & 17.9-18.4% in dry & moist condition due to Taqat and Imidacloprid application, respectively. The Cu availability decreased by 14.4-21.7% & 22.5-29.2%, 15.2-31.2% & 21.7-25.7% and 8.38-13.39% & 9.4-17.24% as against control (1.08 & 2.17 ppm) at 90 DAS in dry & moist conditions irrespective of doses of 2, 4-D, Taqat and Imidacloprid application, respectively. The results also reveal that as compared to control ($5x10^4$ g^{-1}), 2, 4-D significantly increase the population of total fungi 18.2-27.3% and 23.7-33.7% at 90 DAS in dry and moist regimes irrespective of doses but fungal population decreased to 18.7-26.09% & 11.4-19.38% and 11.31-13.1% & 17.4-19.78% in dry & moist regimes irrespective of doses of Taqat and Imidacloprid application, respectively. So, it may be concluded on the basis of the investigation, the performance of herbicide (2, 4-D) was encouraging in almost every aspect.

Effect of Zinc and Boron on Growth, Yield and Quality of Onion (*Allium cepa L.*) in Alfisols of Tamirabarni Tract

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Abstract

Field experiment was conducted at Agriculture College and Research Institute, Killikulam, Tamil Nadu during rabi season of 2017-18 to study the effect of soil test crop response (STCR) application of N, P and K along with zinc and boron on growth and yield onion. The experiment was laid out in a randomized block design with eight treatments and three replications. The growth and yield were significantly influenced by the soil and foliar application of zinc and boron with STCR dose of NPK. Application of STCR (106:97:54 kg of NPK ha^{-1}) + ZnSO4 @ 25 kg ha^{-1}+ 0.5% foliar spray significantly influenced the growth, yield, quality characters and yield of bulb in onion. Which recorded growth attributes such as plant height (55.2cm), number of leaves $plant^{-1}$ (17.2), fresh leaves weight (21.6g). Yield characters like bulb lets $clump^{-1}$ (6.4), polar diameter (3.35 cm), equatorial diameter (2.98 cm), weight of bulb (85.2g) and bulb yield (16.85 t ha^{-1}) and bulb qualities such as total soluble solids (15.7 ^{o}Brix), ascorbic acid content (13.95 mg $100g^{-1}$), protein (8.46%) and pyruvic acid content (4.82 µmol g^{-1}). The highest net income (2,54,243 ha^{-1}) and B: C ratio (4.07) also recorded by the same. The lowest values registered under control. STCR (106:97:54 kg of NPK ha^{-1}) + ZnSO4 @ 25 kg ha^{-1} with 0.5% foliar spray was found to be the best suitable method and dose for transplanted onion production.

Keywords: STCR, Zinc and Boron, Growth, Bulb yield, Quality of onion.

Effect of Zinc and Boron on Growth, Yield and Quality of Onion (*Allium cepa L.*) in Alfisols of Tamirabarni Tract

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Abstract

Field experiment was conducted at Agriculture College and Research Institute, Killikulam, Tamil Nadu during rabi season of 2017-18 to study the effect of soil test crop response (STCR) application of N, P and K along with zinc and boron on growth and yield onion. The experiment was laid out in a randomized block design with eight treatments and three replications. The growth and yield were significantly influenced by the soil and foliar application of zinc and boron with STCR dose of NPK. Application of STCR (106:97:54 kg of NPK ha^{-1}) + ZnSO4 @ 25 kg ha^{-1}+ 0.5% foliar spray significantly influenced the growth, yield, quality characters and yield of bulb in onion. Which recorded growth attributes such as plant height (55.2cm), number of leaves $plant^{-1}$ (17.2), fresh leaves weight (21.6g). Yield characters like bulb lets $clump^{-1}$ (6.4), polar diameter (3.35 cm), equatorial diameter (2.98 cm), weight of bulb (85.2g) and bulb yield (16.85 t ha^{-1}) and bulb qualities such as total soluble solids (15.7 ^{o}Brix), ascorbic acid content (13.95 mg $100g^{-1}$), protein (8.46%) and pyruvic acid content (4.82 µmol g^{-1}). The highest net income (2,54,243 ha^{-1}) and B: C ratio (4.07) also recorded by the same. The lowest values registered under control. STCR (106:97:54 kg of NPK ha^{-1}) + ZnSO4 @ 25 kg ha^{-1} with 0.5% foliar spray was found to be the best suitable method and dose for transplanted onion production.

Keywords: STCR, Zinc and Boron, Growth, Bulb yield, Quality of onion.

Theme: Agro-chemicals for protecting crops and environment

Enhancing iron, zinc and copper concentration in basmati rice through potassium fertilization

S Vijayakumar[1]* and Dinesh Kumar[2]

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Abstract

Two-year field trials were conducted at the ICAR–Indian Agricultural Research Institute, New Delhi, to know the effect of potassium (K) fertilization on the uptake of cationic micro-nutrients (Fe, Zn, Cu) in basmati rice under an aerobic rice system. Results from the study revealed except the source of K fertilizer, other factors like time of application of K, method K application and rate of K application have a significant role on the uptake and translocation of Fe, Cu, and Zn in basmati rice. All three cationic micro-nutrients concentrations and uptake were higher in straw compared to grain. However, interestingly the concentration of these nutrients in grain improved with increasing the dose of K application upto 60 kg K_2O/ha. Also the split application of K and supplementation of K through foliar sprays in addition to basal K increased the cationic micro-nutrients concentration in grain. The harvest index of Zn (21-26%), Fe (10-13%) and Cu (17-21%) shows only $1/4^{th}$, $1/10^{th}$ and $1/5^{th}$ of the absorbed nutrient is transported to grain respectively. Interestingly, the remobilization of Zn, Fe, and Cu from straw to grain is enhanced by the best potassium fertilization management. The correlation between grain K concentration and grain Fe, Zn, Cu concentration is positive and significant. Thus, optimum K fertilization in aerobic rice system is a win-win strategy to increase nutritional value and yield of basmati rice.

Theme: Agro-chemicals for protecting crops and environment

Enhancing iron, zinc and copper concentration in basmati rice through potassium fertilization

S Vijayakumar[1]* and Dinesh Kumar[2]

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Abstract

Two-year field trials were conducted at the ICAR–Indian Agricultural Research Institute, New Delhi, to know the effect of potassium (K) fertilization on the uptake of cationic micro-nutrients (Fe, Zn, Cu) in basmati rice under an aerobic rice system. Results from the study revealed except the source of K fertilizer, other factors like time of application of K, method K application and rate of K application have a significant role on the uptake and translocation of Fe, Cu, and Zn in basmati rice. All three cationic micro-nutrients concentrations and uptake were higher in straw compared to grain. However, interestingly the concentration of these nutrients in grain improved with increasing the dose of K application upto 60 kg K_2O/ha. Also the split application of K and supplementation of K through foliar sprays in addition to basal K increased the cationic micro-nutrients concentration in grain. The harvest index of Zn (21-26%), Fe (10-13%) and Cu (17-21%) shows only $1/4^{th}$, $1/10^{th}$ and $1/5^{th}$ of the absorbed nutrient is transported to grain respectively. Interestingly, the remobilization of Zn, Fe, and Cu from straw to grain is enhanced by the best potassium fertilization management. The correlation between grain K concentration and grain Fe, Zn, Cu concentration is positive and significant. Thus, optimum K fertilization in aerobic rice system is a win-win strategy to increase nutritional value and yield of basmati rice.

Bio-efficacy and Phyto-toxicity evaluation of Sodium Para Nitrophenolate 0.3 % SL in Black gram

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Abstract

Aim: This study was carried out to determine bio-efficacy and phytotoxicity of Sodium Para Nitrophenolate 0.3 % SL in Black gram.

Methodology: Field experiments was conducted during *kharif* season of 2019 in the sub-humid subtropical climatic condition of West Bengal at Instructional Farm, Jaguli under Bidhan Chandra KrishiViswavidyalaya, Mohanpur, Nadia, West Bengal-741252 and the Research Station is situated at 23.5^0 N latitude and 89^0 E longitude and the elevation of 9.75 m above the mean sea level. The treatment comprised of 8 treatments and replicated thrice in randomized Block Design. The treatments are T1: Sodium Para-Nitrophenolate 0.3% SL (@ 1 ml/L), T2: Sodium Para-Nitrophenolate 0.3% SL (@ 2 ml/L), T3: Sodium Para-Nitrophenolate 0.3% SL (@ 3 ml/L), T4: Sodium Para-Nitrophenolate 0.3% SL (@ 4 ml/L), T5: Sodium Para-Nitrophenolate 0.3% SL (@ 5 ml/L), T6: Sodium Para-Nitrophenolate 0.3% SL (@ 6 ml/L), T7: Untreated Control (Water Spray), T8: Sodium Para-Nitrophenolate 0.3% SL (@ 10 ml/L).

Results: The results of experimentation revealed that the different treatments of testing product of Sodium Para-Nitrophenolate 0.3% SL significantly influenced the seed yield of *kharif* black gram. The highest seed yield (1474.4kg/ha) of *kharif* black gram was obtained from the treatment T_5 (*i.e.*Sodium Para-Nitrophenolate 0.3% SL @ 5 ml/L), where it was applied at 35 DAS (1^{st} spray) and 50 DAS (2^{nd} spray at 15 days after 1^{st} spray), respectively. It was statistically significant and significantly higher than other treatments of this experiment, where Sodium Para-Nitrophenolate 0.3% SL at different doses was applied at 35 and 50 DAS. The lowest seed yield (832.2kg/ha) was recorded from the treatment T_7 *i.e.* untreated control, where water spray was done at 35 and 50 DAS. It was significantly lower than other treatments, except treatment T_8 *i.e*. Sodium Para-Nitrophenolate 0.3% SL@ 10 ml/L.

Keywords- Black gram, Bio efficacy, Phyto-toxicity, Sodium Para Nitrophenolate

Harmful effects of pesticides on the environment

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Abstract

The unintended consequences of pesticides is one of the main drivers of the negative impact of modern industrial agriculture on the environment. Pesticides, because they are toxic chemicals meant to kill pest species, can effect non-target species, such as plants, animals and humans. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, because they are sprayed or spread across entire agricultural fields. Other agrochemicals, such as fertilizers, can also have negative effects on the environment. The negative effects of pesticides are not just in the area of application. Runoff and pesticide drift can carry pesticides into distant aquatic environments or other fields, grazing areas, human settlements and undeveloped areas. Other problems emerge from poor production, transport, storage and disposal practices. Over time, repeat application of pesticides increases pest resistance, while its effects on other species can facilitate the pest's resurgence. Alternatives to heavy use of pesticides, such as integrated pest management, and sustainable agriculture techniques such as polyculture mitigate these consequences, without the harmful toxic chemical application. These undesirable properties of pesticides have led to the search of another option, i.e., sustainable agriculture, which is attracting the farmers and gaining the attention. Environmental modelling indicates that globally over 60% of global agricultural land (~24.5 million km^2) is "at risk of pesticide pollution by more than one active ingredient", and that over 30% is at "high risk" of which a third are in high-biodiversity regions. Each pesticide or pesticide class comes with a specific set of environmental concerns. Such undesirable effects have led many pesticides to be banned, while regulations have limited and/or reduced the use of others.

Keywords: Chemical pesticides, agrochemicals, sustainable agriculture

Synthesis, characterization and release of nano-enabled phosphorus fertilizer in acid soils of assam

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Abstract

A study was undertaken to synthesize and characterize zeolite based nano phosphorus (P) fertilizer and to compare its release pattern with conventional chemical fertilizer (SSP) in three different types of soil representing major soil orders of Assam, taking recommended fertilizer dose applicable for maize. The zeolite was modified using hexadecyltrimethylammonium bromide and subsequently, the nano P fertilizer was synthesized by treating the surfactant modified zeolite with fertilizer (KH_2PO_4). The nano-fertilizer was characterized using X-ray diffraction, scanning electron microscopy, energy dispersive x-ray spectroscopy and transmission electron microscopy. Maximum adsorption of 7.4% added P was found in nano-fertilizer which was 60% higher as compared to unmodified zeolite. The incubation study showed that the treatment receiving recommended dose of P through SSP reached the maximum peak at 32 days of incubation beyond which no further increasing trend was observed. Relatively, the treatment receiving recommended dose of P through nano-fertilizer had a gradual increase of P upto 90 days of incubation. A similar trend was also observed in nano treated P fertilizer receiving 2.5 times reduction, 5 times reduction, and 10 times reduction from the recommended dose. The differences in clay content affected the P release pattern which followed the sequence: Majuli (sandy clay loam) > Jorhat (silty clay loam) > Titabar (clay loam). The parabolic diffusion equation was found to be the best fit for describing the P release as compared to other kinetic models. The results indicate that nutrient use efficiency of phosphatic fertilizers can be significantly improved by nano phosphorus.

Assessment of different chemistries against mango hopper in terai region of West Bengal

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Abstract

A field experiment was carried out to investigate efficacy of different insecticides against mango hopper *Amaritodus atkinsoni* L. during 2018-19 and 2019-20 at Instructional Farm of Cooch Behar Krishi Vigyan Kendra, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar. The treatments were Dinotefuran 20 SG, Buprofezin 25 SC, Thiamethoxam 25 SG, Neem oil 1500 ppm, *Beauveria bassiana* 1 x 10^8 CFU/ml and untreated control. The insecticides were applied at fortnightly interval starting from panicle emergence stage. All the treatments used in the study were found superior in reducing hopper population over untreated control. The treatment with Dinotefuran 20 SG @ 0.2 ml/Litre was found most superior for the management of mango hopper and the efficacy of different chemictries for the management of mango hopper was as follows Buprofezin 25 SC, Thiamethoxam 25 SG, Beauveria bassiana 1 x 108 CFU/ml, neem oil 1500 ppm respectively.

Keywords: hopper, insecticides, management

Theme 1. Natural resources management for crop & environmental health
Title:impact of selected nano particles on plant and microbial growth

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Abstract

The field of nano science is gradually emerging out as a frontier area of research in the field of ***Natural Resource Management,*** because many of the natural components of soil are nano-particulates. Field application of plant nutrient containing NPs through environmentally safe mode is one of the important aspects concerning the utilization of NPs for crop production. SiO_2 and Mo nano particles are one of the major and frequently used engineered oxide nano particles. The potential effects of SiO_2 (10-20 nm) and Mo (<100 nm) nano particles on rice seed germination were studied. SiO_2 nano particles had showed no toxic effect on rice growth, whereas root growth and elongation were arrested with Mo nano particles after 50 mg L^{-1}. In many cases root necrosis was occurred. Impact of copper oxide nano particles (< 50 nm) was assessed by using plate assay method on *Bacillus subtilis and Escherichia coli* using nutrient agar media. *Bacillus subtilis* and *Escherichia coli* showed no growth beyond concentration of 20 mg Cu /kg of normal copper ion using $CuSO_4.5H_2O$. While in case of copper nano through CuO (< 50 nm), *Bacillus subtilis* recorded no growth above 10 mg Cu /kg and *Escherichia coli* with least susceptibility showing no growth above 40 mg Cu /kg. CuO (< 50 nm) affected the gram positive and gram negative bacteria differently. These findings are of great help towards building a comprehensive understanding of the potential impact of nano particles on the environment.

Theme 3: Allied agricultural activities vis-a-vis food security & environmental health

Jury members for paper evaluation

Prof. Pravat Pal- Chairman

Prof. Souvik Ghosh- Member

Prof. Soumen Maitra- Member

Dr. N. J. Maitra- Member

Dr. Subhasish Mandal – Member

Meeting link:
meet.google.com/omt-xsmy-ddo

Biochemical Changes During Seed Development of Okra

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Abstract

A research trail was conducted to assess biochemical changes of Okra genotypes at District Seed Farm "D"Block, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal during summer seasons to assess the post- fertilization bio-chemical changes in seed. All the five genotypes were grown with adequate population in three replications following randomized block design(RBD) for the purpose of developmental studies. Harvesting of developing pods was done at 3, 5 and 7 days after anthesis (DAA) and seven days interval thereafter up to 42 DAA. Harvested pods and seeds were utilized for development programme through chlorophyll, protein content and carbohydrate content.Total chlorophyll content of pod wall was estimated with highest amount, on an average, for Lady Luck in both the years followed by Ramya, ArkaAnamika, JapaniJhar and Lalu over the years. Lowest amount of total chlorophyll was estimated from pod wall of Lalu. Maximum protein content, on an average over the stages of development, was estimated for ArkaAnamika followed by Lalu, Lady Luck, Ramya and JapaniJhar in both the years; the range was 11.58-13.45% in first year and 12.23-13.82% in second year. Accumulation of protein continued, on an average, upto 35 DAA in both the years, after which it was declined at 42 DAA.

Keywords: Okra, Chlorophyll, Protein (%), Carbohydrate (%),

Piloting District Agromet Unit for enhancing the economic benefit of farmers by minimizing the input cost and providing block level weather forecast based agromet advisory: A case study of Cuttack district of Odisha

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Abstract

Present study was conducted during Kharif and rabi season of 2019 and 2020 at villages of Cuttack district which comes under the Mid central table land zone and east and south east coastal plain zones of Odisha to know the effectiveness and usefulness of Block level Agro met Advisory Services (AAS) and quantify the economic benefits through adopting the agromet advisory in their day to day farming operations. For this purpose, two groups of farmers were selected namely, a group adopting the agro met advisories regularly in their operation (AAS farmers) and other group of farmers not aware of agromet advisories (Non-AAS farmers). 20 farmers (both AAS and Non AAS) were identified and AAS information was issued to only 10 farmers during Kharif and rabi season and proper supervision was taken to implement the advisories by this group. Stage wise crop growth and situation of these farmers was compared with nearby fields having the same crops where forecast and agromet advisories are not adopted in non AAS farmers. Further expenditure incurred by the farmers from sowing till the harvest at every stage has been worked out and crop growth and yields were monitored regularly in the farmer's field belonging to both the groups. The crop growth and yield was observed to be good and high in case of farmers who have adopted the AAS information regularly compared to the farmers who have not adopted the AAS information. The net income of AAS farmer's was about Rs. 22,219 in case of Rice and Rs. 9,623 in case of green gram crop against non AAS farmers whose income was Rs.16,203 and Rs 5463, respectively. The farmers who have adopted the Agromet Advisories in their day to day farm operation have realized higher yield of 17.3 % 38.5% in Rice and Green gram respectively as compared to non AAS farmers. The B:C ratio was 2 and 1.11 in Rice and green gram in case of AAS Farmers as where as it was 1.7 and 0.94 in Rice and green gram in case of non AAS farmers Thus, the application of agromet advisory bulletin, based on different spectrum of weather forecast is a useful tool for enhancing the production and income.

Assessing agrometeorological indices and physico-chemical performances of four blackgram cultivars under old alluvial zone of West Bengal

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Abstract

A trial was directed at the Instructional Farm of Malda Krishi Vigyan Kendra, Malda, West Bengal to evaluate the heat indices of ten blackgram varieties during post-kharif season of 2021. Mean cultivar days from sowing to emergence, flower initiation, pod initiation and maturity of blackgram were found to be 4.93, 41.27, 59.58 and 85.40 days, respectively. Among 4 blackgram varieties, number of days to maturity varied between 82.31 days (V1) and 84.67 days (V3 and V4). The average summed GDD, HTU and PTUs for entire life cycle were recorded as 1339.59ºC day, 8542.07ºC hour and 15881.29ºC hour, respectively. Genetic variation in plant height of blackgram was noted between 26.93 and 31.27 cm at 30 DAS, 33.33 and 43.10 cm at 45 DAS, 46.33 and 55.93 cm at 60 DAS; and 47.10 and 62.37cm at maturity in the study. Pant U-31(V1) and IPU-2043 (V2) gave higher seed yield (1244.91 and 1897.22 kg ha^{-1}). The variation in Heat use efficiency was noted between 0.607 kg ha-1p C day^{-1} (Pant U-31) and 0.852 kg ha^{-1}°C day-1 (VBN-11). In case of protein content in seeds, IPU-2043 (V) recorded highest value (23.12%) while PU-31 had lowest protein content (18.07%).

Keywords: Blackgram, Agrometeorological Indices, GDD, Protein Content

Distribution, Abundance, Threats and Possible Conservation Plans of Anurans From an Urban Area of Paschim Bardhaman, West Bengal

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Abstract

The present study was conducted from June 2016 to September 2019 for recording the diversity, site wise occurrence, abundance, anthropogenic threats and conservation strategies of various anuran species from the industrial city of Durgapur. The study sites were divided into four divisions- Human Habitation, Temporal water pools, Permanent Water Body and Agricultural fields. The density and diversity of the anurans were assessed by standard point count method, opportunistic spotting, call analysis and information from local people. Various diversity indices were calculated using statistical software PAST. A total of 13 anuran species belonging to 5 families were observed. Dicroglossidae was recorded as the most diverse family. *Fejervarya spp., Euphlyctis cyanophlytis and Duttaphrynus melanostictus* were most abundant while *Hylarana tytleri* was recorded only once during the present study period. The temporal water pools and agricultural fields are the sites with high number of species and these are the breeding grounds for them. Various anthropogenic interventions have caused a serious effect on these anurans which includes habitat destruction, urbanisation, pollution, use of pesticides and road kill and needs instant action from the concerned authorities. Mass awareness, less use of pesticides in agricultural field and reduction of pollution may serve as conservation strategies for these anurans.

Effect of organic and inorganic tea in alleviating the symptoms of Alzheimer's disease

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Abstract

Tea (*Camellia sinensis)* having anti-inflammatory, antioxidant, and free radical scavenging properties, may be effective to ameliorate the symptoms of neurodegenerative disorders like Alzheimer's disease (AD). The therapeutic properties, however, dependent on the concentrations of various phytonutrients in fresh tea leaves, is highly regulated by field level agronomical management. Field level nutrient management experiments using the high yield tea clone (TV25) were conducted in the research farm of Agricultural and Food Engineering Department, Indian Institute of Technology Kharagpur. The four nutrient management treatments were control; no application of fertilizer, organic fertilizer (OF), inorganic fertilizer (IF), and integration of OF and IF. Tea leaf samples as two leaves and a bud were collected in three replications from all treatment plots in three different commercial harvest seasons (May, July, and September) for the quality analysis and animal experiment. The OF treatment resulted significantly higher Mg and total phenolics content, antioxidant capacity, and acetylcholinesterase inhibitory activity of tea leaves as compared to the IF and control treatments throughout the sampling season. In animal experiment, administration of the organic teat extract to AD rats significantly lowered the Aβ-42 level to 49±1.5 pg mg^{-1} from the value 84±1.7 pg mg^{-1} in brain of untreated AD rats. Feeding the organic tea extract to AD rats reduced the toxic Aβ-42 peptide (up to 41%), COX2 (34%), malonaldehyde (50%), and nitrite (48%) level compared to untreated rats. The results revealed the effectiveness of organic tea as a promising neuroprotective agent in preventing the AD.

Keywords: Alzheimer's disease, Antioxidant activity, Acetylcholinesterase activity, Aβ42 level, Nutrient management, Organic tea.

Effect of substrate substitution on growth behaviour and yield performance of oyster mushroom.

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Abstract

Mushroom consumption and production is getting popular day by day due to their high nutritional, medicinal values, economic growth and environmental sustainability. India has registered twenty-fold increase in production of mushrooms in the last four decades. Oyster mushroom (Pleurotus spp.) cultivation has increased tremendously, throughout the world during the last few decades. This mushroom accounted for 14% of the total world production of edible mushrooms. Oyster mushroom (Pleurotus spp.) has been commercialized since 1992 in Odisha and is gaining popularity at a tremendous pace. Agro-climatic conditions in Odisha are suitable for growing oyster mushroom from the month of November to February (winter season). P. florida and P. sajor-caju (white and grey types, respectively) are the preferred species and mainly used paddy straw as its substrate. The choice of the farmer for growing of any crop variety depends mainly upon the raw material availability and its yielding ability. Due to increased use of mechanization in paddy harvesting mushroom farmers are facing a lot of problem to get suitable substrates used for mushroom cultivation. With the passage of time combine harvesting of rice became popular and consequent decline in straw availability caused rapid rise in its prices. This escalated the cost of production of mushroom and thereby reducing the profitability of the farmers. Conversely, banana leaf, water hyacinths, azola etc. are available in plenty and largely burnt as waste leading to environmental pollution. Hence, the present investigations were carried out to evaluate the efficiency of different substrate with paddy straw on growth behaviour and yield performance of oyster mushroom. The result indicates that treatment T3 (Paddy straw 50%+ Azola 50%) was found to be the best as T3 was taken a minimum number of days (16) for 100% mycelial growth, highest yield was recorded (403g) and Biological Efficiency assessed was more than 80 percent.

Keywords: Oyster mushroom, biological efficiency, yield, substrates, mycelial growth

Climate resilient practices in agroecosystems

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Abstract

A key element required for sustainable and transformational development in agriculture is ensuring that investments are informed by robust evidence about past and future climate risks. Climate resilience is a fundamental concept of climate risk management. In this context, resilience refers to the ability of an agricultural system to anticipate and prepare for, as well as adapt to, absorb and recover from the impacts of changes in climate and extreme weather. Resilience can be enhanced by implementing short and long-term climate mitigation and adaptation strategies, as well as ensuring transparent and inclusive participation of multiple actors and stakeholders in decision-making and management processes. Some hydro-meteorological hazards are slow in their onset, such as changes in temperature and precipitation resulting in long-term altered temperature, rainfall patterns and agricultural droughts. On the other hand, some occur much more suddenly, such as tropical storms and floods. Both require robust risk preparedness informed by the assessment of climate risk.The climate resilient practices in agroecosystems can be multifaceted and multi-storeyed. It includes promotion of crops and/or crop varieties with a higher heat tolerance and/or optimal heat range which aims to enhance yields in areas where temperatures are expected to exceed heat thresholds that are harmful to existing cropping systems (Linn, 2011). The introduction of short cycle varieties to reduce the effect of heat stress at key phenological phases (germination and flowering) and improve final yields. This will also reduce plants' exposure to heat by shortening the growing cycle. Proper agronomic practices such as weeding and defoliation reduce soil water losses from plant transpiration. Growing of cover crops which reduce soil erosion by increasing soil organic matter, water, air, and nutrient availability. Introduction of hydroponics to conventional agriculture with re-circulating water systems can reduce water losses. Another very effective and proven strategy can becovering the soil with crop residues (mulching) in combination with no-tillage thereby reducing the exposure of crops to heat-stress conditions which also increases soil moisture by reducing direct soil evaporation.Crops with low water requirements should be preferred to reduce evapotranspiration losses during photosynthesis by rapidly closing their stomata and maintaining leaf water potential and photosynthetic rate which ensure enhanced food production during the dry season when food insecurity levels are highest. (Lal *et al*., 2011) These simple practices which doesn't require any special investments or technologies but are

very responsive and effective in making the crop more resilient to climate change thereby ensuring food production in tougher times and promising food security.

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Mass media exposure of the farm women on agricultural information network output development

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Abstract

Mass media is the major agricultural information sources and farm women are the major agricultural human resources in India. It is observed from different study that farm women were exposed with different mass media sources. But it is important to know the impact of this mass media sources on agricultural information network output development of the farm women. Keeping this in view a study was conducted on mass media exposure of the farm women on agricultural information network output development in North Bengal region of West Bengal. Ex-post facto research design and both purposive and random sampling methods were used for selection of the sample respondents. It is found from the study that majority of the farm women use mobile phone for agricultural information followed by T.V, poster, exhibition, advt. board and agricultural literature. It is concluded from the study that all the selected mass media sources had positively and significantly influence on agricultural information network output development of the farm women in terms of knowledge.

Keywords: Mass media, farm women, agricultural information network, knowledge

TRANSMISSION OF GEMINIVIRUS BY WHITEFLY(*Bemisia tabbaci*) IN CHILLI

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Abstract

Leaf curl disease of chilli is now a serious problem in India, which is transmitted by whitefly (*Bemisia tabbaci*). ChiLCD was first observed in India by Vasudeva (1954). The silverleaf whitefly*(Bemisia tabbaci)* or B biotype is now abundant in vegetable and field cropping areas. Gemini virus is transmitted by one vector type only and the viruses discussed below are transmitted only by whitefly and cannot be spread by aphids, thrips, leafhoppers or beetles. The whitefly acquires gemini virus while feeding on sap from the phloem tissues of virus infected plants. An experiment was carried out in green house for determining the acquisition period of Chilli Leaf Curl Virus by White Fly. At first, data was taken on the virus –vector relationship of Whitefly and Chilli Leaf Curl Virus in Field level in Bullet Variety of Chilli. The aviruliferous whitefly was allowed to feed on infected twigs for 24hrs and then again allowed to feed on non-infectious or disease free Chilli seedlings of 25 days old. Results showed that seven whiteflies showed 100% transmissibility of geminivirus on healthy chilli seedlings in 5-8 days with 24 hrs of acquisition and inoculation access period.

Keywords- Whitefly, Geminivirus, Chilli, B biotype

A review on Rural Development Programmes in India and their Impacts

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Abstract

In India, majority of the population, resides in rural communities. Rural development involves the building of human life, which includes social, cultural, religious, political and economic conditions. In India, more than 70 percent of the population resides in rural communities.The development of all aspects within rural communities is vital for the effective development of the country. These include, education, employment opportunities, infrastructure, housing, civic amenities and the environmental conditions. The present paper is an attempt to gather and present the reviews of the various researchers, so far has worked on the rural development programme. The paper is descriptive in nature and based on secondary data gathered from various published and online sources. Further ,more, rural individuals need to be aware of all modern and innovative methods and techniques that are vital to augment productivity. Within the country, the rural communities are still in an underdeveloped state. The individuals are residing in the conditions of poverty, they are illiterate and unemployed. Due to these factors, they are unable to sustain their living conditions in an appropriate manner. It is essential to formulate programs, schemes and measures that have the main objective of bringing about improvements in rural communities The main areas that have been taken into account in this research paper include, concept of rural development, approaches to rural development, problems experienced by rural individuals, programs initiated by the Government giving major focus on MGNREGA ,NRLM TSC NSAP IAY for rural development.

Keywords: Approaches, Communities, Programs, Rural Development, Rural Individuals

Increased Growth and Production of Asian Catfish (*Clarias batrachus*) and Asian Stinging Catfish (*Hetropneutes fossilis*) using Probiotics in Small Water Bodies of Tribal Communities in Jalpaiguri District, West Bengal, India

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Abstract

We have carried out first order research work on the effect of pond bottom soil conditioner (using probiotic balanced soil-based organisms) and growth probiotics and gut probiotics with activity enhancer base (incorporated with feed) in small water bodies of tribal fish farming communities of Jalpaiguri district, West Bengal. 11 numbers of ponds of 200 sq. m. each (10 treated + 1 control) were chosen for stocking of Asian catfish (locally called 'Magur') and Asian stinging catfish (locally called 'Singi') @1000 fingerlings (1:1 ratio). Avg. body weight (BW) recorded were 225- 250 g. And, 170- 190 g in case of Magur and Singi respectively in six months (DOC). % of organic C was recorded to be improved to 1.56- 1.78 in treated ponds with respect to % of organic C of 5.37- 5.47 treatment including the control pond (untreated). Physiochemical parameters like pH, alkalinity, hardness and ambient water temperature were also recorded periodically. We conclude that probiotics played a vital role in increased fish production by reducing % of organic C within desired level (1-2.5%). Thus, probiotics may provide double benefits of upgradation of pond environment along with fish growth.

Keywords: Probiotics, prebiotics, pond bottom soil conditioner, magur, singi, cat fish, organic carbon

Predicting the maximum permissible arsenic concentration in Asian paddy soil for rice cultivation using meta-analysis

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Abstract

Through the water-soil-crop transfer mechanism, arsenic (As) contaminated irrigation water increases human exposure. This mode of exposure has serious public health concerns, especially in Asian countries where rice is a staple food. For As in drinking water, a permitted level (also known as a guideline value) has been established. Few attempts to quantify guideline values for soil have been made, however the FAO and WHO have created a 'Codex recommendation' for maximum acceptable inorganic As concentrations in rice grain: 0.35 mg kg-1 (husked rice) and 0.20 mg kg-1 (unhusked rice) (polished rice). The link between As concentrations in rice grain, soil, and irrigation water was studied using meta-analysis, Decision Tree-based machine learning, and logistic regression. Soil As was a better predictor of As in rice grain than irrigation water As. Both the Decision Tree and logistic regression models predicted the soil concentrations above which As in grain would exceed the Codex recommendation. As per the better performing Decision Tree model value for As in soil was 14 mg kg^{-1}. Despite the limitations of modelling difficulties, our findings are useful in determining the maximum permitted As concentrations in rice-growing soil in Asia.

Horizontal gene transfer and its application in soil bioremediation

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Abstract

The healthy ecological fitness of soil and root-related microbial communities existing in the soil system is a critical component for soil fertility status, plant health management, and plant stress acclimation control. Genetic diversity in microbial communities is preserved by genetic alterations, mutations, and gene transfer in soil bacteria. Horizontal gene transfer is accomplished by the processes of microbial conjugation, microbial transformation, and fast transduction in both in vitro and in natural circumstances. Gene dispersion in bacterial communities is aided by genetic elements that are generally mobile in nature, which promote bacterial adaptation, survival, and colonisation capacity in a variety of environments. Plasmids, or extrachromosomal DNA of bacteria, encode resistance genes for environmental stress tolerance and are crucial in the bioremediation process. Bacterial development and growth patterns in biofilm increase bacterial fitness and competitiveness by enhancing gene exchange. Given the importance of horizontal gene transfer, a greater understanding of rhizosphere genetic processes would pave the way for the long-term use of naturally designed bacteria in agricultural research and development.

Evaluation of Nutritive and Mineral value of *Spondias pinnata* Linn. For nutritional & food security

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Abstract

Due to ignorance about importance of fruits and vegetables in their diets, the tribal and marginal people of India are severely malnourished along with multiple nutrient-deficiency disorders. underutilized horticultural crops become a solution to the social problem of health and nutrition insecurity, poverty, and unemployment as they are easy to grow, hardy in nature and possess adequate nutrient composition. Indian hog plum or Amra (*Spondias pinnata* Linn.) is an underutilized fruit crop, popular in the food and nutraceutical industries for its taste and health benefits. This study reports on the physico-chemical constituents at the stages of maturity of Indian hog plum fruits collected from four different sources. This experiment was carried out using CRD with four treatments and five replications. Parameters like fruit weight (35.69 g), specific gravity (1.27), peel/ pulp ratio (0.65), seed weight (13.53 g), TSS (8.12obrix), titratable acidity (0.49%), total sugar (6.56%), reducing sugar (4.42%), non reducing sugar (2.14%), ascorbic acid (22.10 mg/100g pulp), total phenolics (29.19 mg/100g pulp), moisture (78.55%), ash (4.79%), crude fibre (4.09%), food energy value (168.76 kcal/g), calcium (0.84%), iron (1.87%), potassium (1.78%) and sodium (1.51%) etc. were recorded highest in fruits collected from Jalpaiguri source. Nutritional composition of the fruit has been proved to take it in to consideration to meet the nutritional and food security of the rural and marginal people.

Keywords: Indian hog plum; minor fruit; physico-chemical composition; food security.

Horticulture: A promising venture for women empowerment, sustainable livelihood and nutrition security in Andaman Islands

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Abstract

The Andaman and Nicobar group of Islands strewn in Bay of Bengal about 1200 km from the mainland (India). The pristine beauty of this archipelago enshrines with 572emerald Islands, Islets and rocks stretching from Myanmar in the North to Sumatra in the South between 6° and 14° North Latitude and 92° and 94° East Longitudes.The Andaman Island has geographical area of 8249 sq km and has a typical maritime climate endowed with both Southwest and Northwest monsoons with an average rainfall of 3100 mm, temperature ranges from 20-32°C and relative humidity 65-85%. Besides tourism, agriculture, animal husbandry and fishing are the important support of Island economy and livelihood alternatives of the Island people. Horticultural crops being cultivated in about 77% of total agricultural area in Islands. It meets the growing needs of food, nutrition, fibre, fuel and health care of the population. It also ensures balance diet, changing dietary habits and reduces the health risks and malnutrition by providing the protective foods to the growing population and supports in economic development.Horticulture mainly plantation crops and spices are the promising livelihood option of the rural farming community of this Island. Malnutrition is a major problem among different age groups of population in Islands which leads to many disorders. This is probably due to lack of awareness about nutrition and balance diet, cereal dominated diets, low intake of vegetables and fruits in daily diet, social taboos and ignorance of micronutrients in diet.The National Family Health Survey 2015-16 (NFHS-4) reports revealed that 23.3% and 18.9% children under 5 years are stunted and wasted respectively in Andaman Island. However, 21.6% children under 5 years are under weight. About 65.7% of the women in the age group of 15-49 years are anemic (<12.0 g/dl). Women are key for national development and form the most important productive work force in the economy.Women are vital players for achieving food and nutrition security due to their multi-dimensional role as a cultivator, producer, food processors and food providers for their families. About 70% of farm work has been performed by women. Therefore,women empowerment is highly essential to strengthen socio-economic development of the nation. Empowering and training farmwomen, Self-help groups (SHGs), adolescent girls in the villages through information, education and communication (IEC) approach for kitchen gardening, processing and value addition of locally available fruits and vegetables would be helpful in achieving food and nutrition security as well as enhancing the family socio-economic status. Keeping in view, the ICAR-Krishi Vigyan Kendra, Port Blair lauded efforts and provided training to the farmwomen, SHGs and adolescent girls on preparation of balance diet for the women and children, scientific kitchen gardening and value addition of fruits and vegetables. Besides, Front Line Demonstrationson scientific kitchen garden were conducted in 50 farmer's field with an area of 160-200m^2 each in NICRA Villages (Port Mout, Badmash Pahad, Lal pahad, Creekabad) South Andaman and processing and value addition of locally available fruits were conducted amongfour women SHGs for nutritional security and income generation (2018January-2021 January). The Arka vegetable seeds packet for kitchen garden were distributed to the farmwomen. Besides, amaranthus (CARI-AMA-1), Indian spinach, bottle gourd (Tila Lauki), bitter gourd (F1Hybrid), cucumber (F1 Hybrid) and seedlings of brinjal (CARI Brinjal-1), chilies (KA-2), CIARI Broad Dhaniya and cuttings of sweet potato CIARI SP-1were given to the farmers.The seedlings of perennial fruits such as papaya, plantain, banana, pineapple and lemon were alsodistributed. Mint and curry leaves were also included in the kitchen garden as spices and medicinal herbs. The consumption pattern of vegetables and fruits of the household, yieldand contribution of kitchen garden in vegetable demand of household were recorded and data were analyzed for economic parameters.The result showed that theaverage availability of vegetableswas 8.4kg/week/family. Each farm family consists of 2-7 membersincluding children. Scientific kitchen garden full fills 76.20% of vegetables demand of the farm families. The availability of perennial fruits

from kitchen garden was 42g per person. The predominant increase in availability was observed in green leafy vegetables and other vegetables while no significant change was observed in tuber crops. The BC ratio was 2.26. Scientifickitchen garden contributed in family income,reduced the expenditure on food items by avoiding the purchase of vegetables and fruits with well utilization of leisure time of family members and also plays an important role in mitigating malnutrition of the rural households of the Island.

Value addition is the key pillars of nutritional security of the farm family by the dietary diversification of the food and round the year availability. The critical inputs such as fruits, sugar, oils, spices and condiments, preservatives and packaging materialswere provided to the women SHGs for processing and value addition of fruits. They have prepared various value added products from coconut(laddu, burfi, ghujia, chips, delicious cakes, virgin coconut oil), banana (chips), jackfruit (jack chips, cutlets), mango (Amchur powder, pickle, jam, mango bar) bilambi (pickle), carambola (pickle) and lemon (RTS beverage and squash). The value added products were used for home consumption as well as the SHGs sold their produce in the local market, retail shops, ITF Mela and Marina Flea Market promoted by Dept. of Tourism, Andaman & Nicobar Administration. They earned a net profit of Rs.8000-12000 per month by selling their value added food produce.Hence, there is a need to diversify the food processing sector by fully harnessing its potentialities, creating conducive environment for more investments and exports. Horticultural produce has immense potential ineradication of malnutrition, increasing farm income, provide sustainable livelihood to the rural womenand also supports in women empowerment in Island.

Keywords: Malnutrition, women empowerment, food and nutrition security, kitchen garden, fruits and vegetables, value addition.

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Yearling stocking in seasonal pond:-An economically profitable composite pisciculture technique

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Abstract

Culture of different types of compatible and non-competing fishes simultaneously by utilizing different layers (feeding zones) in a pond to increase the total fish production per unit area is proved to be economically profitable. In seasonal ponds where water retention (ideal water depth for pisciculture) is around six months, modifications are made in maintaining proper stocking density, stocking ratio, pond fertilization and supplementary feeding to improve growth rate of fish and hence maximize the production. Also stocking size of fish i.e. Yearling stocking plays an important role in seasonal ponds for faster growth in shorter culture duration. Composite fish farming in pond culture system consists of Indian major carps (IMC) i.e. Catla (*Catla catla*), Rohu (*Labeo rohita*), Mrigal (*Cirrhinus mrigala*) and exotic carps i.e. Silver carps (*Hypophthalmicthys molitrix*), Grass carp (*Ctenopharyngodon idella*) and Common carp (*Cyprinus carpio*). The three IMCs contribute the bulk of production to the extent of 70 – 75 % of the total fish production followed by the exotic carps contributing to the balance of 25- 30%. Composite fish culture by stocking Yearlings was demonstrated in 2 numbers of seasonal ponds (0.2 ha water area) in the village Gajapitha of Marshaghai block under NICRA programme. After pre-stocking pond management practices, 1000 numbers yearlings of IMC and Exotic carps (80-100 gm size) was stocked and floating fish feed @ 1% of body weight applied daily as supplementary feeding. The average body weight was 0.78 kg and production of 7.60 quintal fish was recorded from the two ponds after 6 months of culture duration. The composite culture practice of fish production is ecologically viable and profitable compared to traditional culture practices. As a promising enterprise, the economic benefit of composite fish culture need to be vividly highlighted and awareness to be made among the farmers to adopt the culture practice. This will help to alleviate the poverty of rural youths and bring the livelihood security among them.

Keywords: IMC, Exotic carp, Yearling

Seasonal changes of phytoplankton diversity and physic-chemical characteristics of water of the bakreshwar hot spring

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Abstract

The water samples from hot water springs of Bakreshwar, West Bengal were collected to investigate the seasonal changes of phytoplankton diversity and physicochemical characteristics of the Bakreshwar Hot Springs. Diversity Indices of 31 phytoplankton species and the regulatory effect of the six chemical parameters of the water and their relations were analysed. The Diversity, Dominance of phytoplankton were high in all seasons in all the hot springs of Bakreshwar, but the species richness is low in summer. Correlation between phytoplankton species and water parameter revealed that the growth of species is positively and negatively correlated with the water parameters. That means the seasonal variation of Algal diversity, dominance and richness is depend on the Physicochemical Parameters of each hot springs of Bakreshwar.

Keywords: Bakreshwar, Hot Springs, phytoplankton, diversity indices, water parameter

Design Crop Ideotype: Estimation of 'genetic yield potential' and 'genetic yield gap' to increase crop yield potential towards food security

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Abstract

With an estimated up to 70% increase in food production would be needed for global food security by 2050, with depleting natural resources, ongoing climate change and limited scope to extend the cropping area. Crop 'ideotype' is defined as an ideally adapted cultivar which would deliver maximum yield by utilizing optimal combination of cultivar traits in a target environment. The cultivars based on an ideotype design would capture natural resources efficiently and utilize the local environment better to deliver the highest possible yield in the environment in question. 'Genetic yield potential' (Y_i) is the yield of an optimal genotype that would produce the highest yield in a target environment, resulting from genetic improvement and germplasm development, whereas 'genetic yield gap' (Y_{ig}) is the gap in grain yield due to sub-optimal genetic adaptation. We designed wheat ideotypes across the major wheat producing regions under current and future climatic conditions. Estimated current wheat Y_i varies widely, for example around 10 t ha^{-1} in India to 16 t ha^{-1} in the UK. Similarly, Y_{ig} varies from 30-40% in the UK to up to 60% in India, depending on the irrigation conditions. Wheat yield potential could be increased by closing Y_{ig} through crop improvement and genetic adaptation. We identified the key target traits for genetic improvement to increase wheat yield under future climate *viz*. optimal canopy architecture, stay-green, flowering time, grain filling duration, drought and heat tolerance, improved root water uptake *etc*. Ideotype design, based on the state-of-the-art knowledge in plant physiology and available trait-genetic variation, is a powerful tool for quantifying genetic yield potential and genetic yield gap, along with the potential to accelerate crop breeding by identifying key traits and their optimal combinations under future climate scenarios.

Climate Resilient Farming models for different Farming System Typologies in Sundarbans

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Abstract

Sundarbans, the world's largest contiguous stretch of mangrove forest, is highly vulnerable to tropical cyclones, tidal surges and erratic distribution of monsoon. High storm surge often breaches the river embankment, forcing saline river water to inundate the inland. Intensive rainfall within short period of time leads to prolonged submergence of the ill drained and low lying crop fields where long duration and low yielding traditional rice varieties are the only option. Late onset of monsoon, uneven distribution of rainfall and intermittent dry spells hamper the kharif crops equally. The winter and summer seasons witness acute dearth of freshwater for irrigation, rendering huge areas to remain fallow. To mitigate such climatic vulnerabilities, climate resilient agricultural technologies were demonstrated in a cyclone prone village 'Bongheri". Based on the existing farming system typologies of the area (rainfed lowland, rainfed medium land, irrigated lowland, irrigated medium land and irrigated upland), different modules of climate resilient technologies like mangrove barrier, land shaping, land embankment cultivation, broad bed cum trench system, flood and salinity tolerant crop varieties, animal health management, alternate livelihood options (backyard poultry, Asian catfish hatchery, ornamental bird), community seedbed, custom hiring centre, etc., were implemented. The climate smart village, could withstand the recent climate vagaries when four more cyclones (Fani and Bulbul in 2019, Amphan in 2020 and Yaas in 2021) lashed upon Sundarbans. The mangrove barrier protected the river bund from the storm surge, improved drainage ensured quick recession of flood water and the additional storage structures harvested the excess runoff for irrigation. The farmers this time, were ready with an array of climate smart technologies to outsmart the climatic vagaries, adapt to the changing climate and resilient enough to sustain their livelihood.

Keywords: Sundarban, climate resilient agriculture, land shaping

Quality vegetable planting material production under heavy rainfall Kedrapara district of Odisha

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Abstract

Under National Innovation on Climate Resilient Agriculture (NICRA) Project, KVK, Kendrapara adopted village Gajapitha of Marshaghai block. Demonstration on vegetable seedlings production under low cost poly tunnel was conducted during Kharif 2022. The Poly tunnel of (24'X 12'X 6') was constructed on the pond dike to avoid water logging situation during heavy rain. The poly tunnel was constructed with locally available bamboo and top was covered with 200 micron (2mm) thickness UV stabilized LLDPE sheet to protect the seedlings from heavy shower. Shade net used as side wall and vegetable seeds were sown in raised beds. Whereas in check, vegetable seeds were shown in another side of the dyke of the pond in open condition in raised beds. Vegetable nursery raised under check *i.e*. open condition, was less survivability due to heavy rainfall, whereas as seedlings grown under low cost poly tunnel resulted higher survivability and quicker germination. The germination duration was 3 days earlier in demonstration in comparison to check. In this experiment, 94% survivability was found in treatment whereas 22 % was in check.

Keywords: Vegetable seedling, germination duration, survivability

Assessing the Production and Evaluating the Marketing Channels of Garden Pea in Different Markets underneath assorted Blocks of Hooghly Region, West Bengal

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Abstract

West Bengal has been bestowed with a range of climate over Physio geographical condition and such is most suitable for growing various kinds of Horticultural crops such as fruits, vegetables and flowers. The 1st rank of West Bengal for vegetables production than the other states in India. West Bengal produces 144.25 in thousand tonnes Garden Pea and hold the rank 6th position all over the India according to National Horticulture Board data (2019-'20). As the potential belt of garden pea production and also for the good demand chain from consumers, the districts Hooghly create a phenomenon periphery for producer, buyers and in between of consumer also. The present study has been performed in various markets under different blocks of Hooghly district. The study was carried out to estimate the production and marketing channel of Garden Pea through the various markets of Hooghly district. From the entire study, we find out the overall marketing adaptability, marketing scenario of Garden pea along with socio-economic attributes of the respondents of the Hooghly district. From the study we can revels that all types of farmer's i.e. small, marginal and large farmer taken it with a greater importance because of large scale of adaptively of garden pea. In the survey we find out the farm four types marketing channel and their disposal patterns. We can conclude that marketable surplus was 5.47q in large farmers whereas it contrasted with 2.59q for small and 1.58q marginal farmers. It also showcased that marketed surplus of 5.44q for large farmers. The producers offers customer's share were 97.7%, 59.65%, 43.90% and 42.35% in channel I, II, III, and IV in garden pea individually. The marketing cost was must most worthy in Channel – I (2.30%) trailed by Channel – II (17.15%). From the observation we clearly identified various stages where how much amount post-harvest losses were occurred in the different channels, so the findings of the current investigation is construct with the examination directly by thee crop in different stages too. We can inferred from the study which type of problems were faced by the farmers for marketing of garden pea. Originality of this study is that the viewpoints of farmers-cum-sellers' and the viewpoints of consumers are integrated for strategy formulation to make the vegetable marketing efficient in the current State scenario. So, the managerial implication refers that strategic decisions must be taken by integrating both the viewpoints, not by isolating them. These findings will be helpful for developing a policy framework and relevant guidelines for promoting in the state.

Keywords: Garden Pea, Consumers' Positive Orientation, Consumers' Satisfaction, Farmers-cum-Sellers', Regulated Market, Marketing Efficiency

Adaptation potential of dyke vegetable cultivation to overcome the impact of climate change on island agriculture

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Abstract

Climate change is expected to increase the evaporation rate of water bodies. This study assessed the evaporation reduction potential of dyke vegetable cultivation above the trenches practiced by the intensive vegetable growers of South Andaman district in Andaman & Nicobar Islands. The study revealed that the shade provided by the dyke crops grown over a stretch of 100 m reduces the temperature underneath by 2 to 3°C. Considering an average evaporation rate of 5 mm/day, loss of water from the trench is estimated as 2,500 L/day. Assuming a minimum of 50% saving in the water loss, the saved volume will be 1,250 L/day due to reduced temperature. This strategy has manifold benefits that overcome the constraints of land and water shortage for vegetable cultivation during post monsoon months.

Keywords: Climate change, dyke farming, trellis, vegetable cultivation

Varietal assessment of lentil on yield and yield attributing characters Rabi season in gangetic alluvial soil of West Bengal

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Abstract

The experiments were conducted in five replications for two consecutive years at farmers field of different villages of South 24 parganas district in Rabi season-2019-20 & 2020-21 for determining the suitability of newly released varieties in gangetic alluvial soil of South 24 parganas district. Lentil is a valuable food crop. It has a high nutritional value, traditionally replaces animal protein in the poor groups of the population and is becoming increasingly attractive as a major component of vegetarian diets in developed countries (Sarker et al., 2010; Vandenberg, 2011). Lentil protein contains all essential amino acids (Thavarajah et al., 2011) and also save soil environment through deposition of atmospheric nitrogen through help of Rhizobium. In terms of lysine, phenylalanine, threonine and leucine content, lentil protein is similar to that of hen egg (Zotikov, 2010). Recently, some fortified varieties has been released which is rich in Iron (Fe) and Zinc (Zn). Among the varieties IPL-220 (rich in Fe & Zn) showed significantly higher grain yield (9.15 q/ha), Number. of branches (7.52), Number. of pods per plant (130) and 100 seed weight (2.99g) variety L-4717 (rich in Fe) showed at par results for yield & yield attributing characters in the gangetic alluvial soil of the district. Highest net return (Rs. 28,325.00) recorded by IPL-220 with high B:C ratio (2.29) among the varieties of lentil.

A predictive model for arsenic toxicity in human based on shoot arsenic concentration of standing rice crop

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Abstract

Predicting As toxicity in humans is a way forward, and some attempts have been made by several researchers. Such prediction from estimating the available or total As concentration of soil is challenging because of the complex transformation As undergoes in soils prior to its absorption by rice roots, as discussed in the preceding paragraphs. Arsenic toxicity to human is the function of As content in grain, shoot and root. The correlation study between hazard quotient (HQ) and incremental lifetime cancer risk (ILCR) with shoot As content at different stages showed that HQ and ILCR is highly determined by shoot As content at the maximum tillering stage. This prompted us to make an attempt to construct a simple HQ prediction model for rice. The coefficient of determination of the constructed model was significant at the 0.01 level (r = 0.513**). This implies that the change in shoot As values during the maximum tillering stage was strongly linked (r^2=0.889) with the HQ values of the cooked rice prepared from the grains produced by the plants on maturity. This gives farmers a good scope to produce As benign polished rice from an otherwise potentially contaminated lots undertaking suitable mid-term corrective measures on standing crop.

Agri-horti-silvi culture model an approach of `natural resource management improving socio-economic strata of marginal growers in humid sub-tropical region of india.

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Abstract

The pandemoium of climate change resulting in aberrant monsoon behaviour under rainfed condition in Red and Lateritic zone of West Bengal leads to poor crop yields and unstable crop production, lowering the economic yield of the crop. Monocropping, thus cannot tackle this situation single handedly, an alternate land use system is an important strategy to deal with the current situation. For profitable cultivation an alternate approach is required to be developed for these lands. Fruit-based agro forestry system is an alternative land use system that integrates the cultivation of arable crops, fruit trees and silvi component which provides higher economic returns to the farmers, improves the soil and fill the gap of national forest cover upto 33%.A field experiment was conducted at RRS (Red & Laterite Zone), BCKV, Jhargram which has been started since 2011. The fruit tree(Mango) was planted at a spacing of 10m × 10m and silvi species(*Eucalyptus teretocornis and Gmelina arborea*) were planted within the two fruit plants and the gaps were filled by growing arable crop and the experiment was laid in a randomized block design. Out of the 13 treatments the treatment comprising Eucalyptus + Mango + Lady's finger + Mustard outnumbered other treatments in terms of economic profitability to the farmers.

Keyword: Agroforesty system, Soil health, Organic Carbon, Economic growth, Marginal farmer

National Webinar on "Managing Agro-chemicals for Crop and Environment
Thematic Area: Natural resource management for crop and environmental Health
Title: Assessment of Optimum Planting Material Size for Ginger under Organic Mulch Condition

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Abstract

Ginger is one of the most important crop in Cooch Behar District of West Bengal. It is grown as inter crops mainly in arecanut and other orchards successfully. The main problem of this crop is requires bulk quantity of seed material for planting which very cost effective for farmers. For this reason an experiment was carried out on assessment of optimum planting material size for ginger under organic mulch condition. The treatments were, T I : 30-40g weight along with Double bud rhizome directly planted at main field. T II : 20-25g weight along with bud the rhizome planted at field, T 3 : 5-6 g weight along with Single bud rhizome planted at portray and later transplanted to main field. Raising ginger seedling about 5-6 g sprouting single bud rhizome showed faster vegetative growth, more tillering and large rhizome development in comparison to conventional methods. This may be due to screening of active and vigorous rhizome bud in the early stage and providing congenial growth condition for the seedlings. Sowing of single bud rhizome directly in the field caused poor or no sprouting rhizomes. 5-6 gm micro rhizome along with one bud gave higher yield of 13.9 ton/ha and having large size clump of rhizome in comparison to large size planting materials used in farmers field.The yield of fresh rhizome increased up to 15-20% compared to conventional methods.. Highest BCR was recorded with 5-6 g Single bud rhizome planted at portray and later transplanted to main field (2.35) as compared to lower BCR in case of large rhizome size with double buds directly planted in the main field.

Report on a least trodden trail: Backyard Biodiversity

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Abstract

As we know, biodiversity or biological diversity includes the variability and variation present in the ecosystem and backyard biodiversity is the ground level diversity around our house which usually gets a huge ignorance leading to fast destruction. Present study was conducted in the residential area of Mines Rescue Station, Asansol, West Bengal within an area of 43933.29 m2. The study was done from December 2019 till December 2022 which included the pandemic lockdown helping understand the variation caused by the same. Interaction between birds and plants, butterflies and dragonflies with their host, and nectarine plants and most importantly changed caused due to lockdown is the major aspect of the study. A graph representing plant and its interaction with the number of bird species showed that *Caesalpinia pulcherrima* supports a maximum number of bird species. Subsequently, it is well understood that for birds, the source of food, shelter and protection tops the density of the plant. Different kinds of butterflies and dragonflies prefer distinct nectar and larval host plants. The diversity of butterflies is restricted to three families whereas dragonflies into one. Two nests of *Oecophylla smaragdina*, commonly known as the weaver ant, was spotted weaving nest with the leaves of *Psidium guajava* and *Ixora coccinia*. Banded Peacock, was only spotted during the lockdown including few changes in the community of butterflies. Study mainly emphasized the variety of species residing next to us that we tend to ignore and was a preliminary survey based on visual observation supported by pictorial evidence.

Study on Economic Benefit by following Agromet Advisory Services received from District Agromet Unit in lateritic belt of Birbhum

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Abstract

At present weather change is a burning issue throughout the world. Due to change in climate, the agriculture sector is suffering a lot and farmers are facing various losses due to these changes. India Meteorological Department started the Agro-meteorological Advisory services (AAS) in India to minimize the losses in agriculture due to the climate change. District Agromet Unit (DAMU) in different Krishi Vigyan Kendras plays an important role for disseminating AAS block wise though out the country. The main moto of DAMU is to enhance the farmer's income by minimizing the losses by providing proper management practices against the climate change at block level. The present study was conducted in 10 different villages of red and lateritic zone of Birbhum to get the economic benefit of adopting of AAS in farming operation by the farmers. The study was carried out during the *rabi* season for the year 2020 and 2021. Two groups of farmers were selected. One group, who were regularly following the AAS bulletins provided by DAMU and another group formed who were not following any AAS. The usefulness and economic impact at block level AAS has been assessed through analyzing the data collected from those farmers groups. It was observed in *rabi* season of 2020-21, that Rs. 6000 per ha was saved in a single season of Mustard cultivation due to rainfall forecast from DAMU, Birbhum. In this way the B: C ratio of Mustard cultivation has been increased from 3.16 to 4.60. In 2021-22 *rabi* season farmers harvested the rice earlier as there was cyclone warning and save 60% of crops. Farmers also got Rs. 4300 per ha extra savings in a single season of rice cultivation by minimizing loss on irrigation and spraying operation from non AAS farmers by following AAS.

Keywords:
Agro-meteorological Advisory services (AAS), District Agromet Unit (DAMU), economic benefit, minimizing loss, extra savings.

Is there a drop in mineral-based dietary significance of elite rice and wheat cultivars bred during past 50 years in India?

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Abstract

Cereals, mostly rice and wheat, are the foundation of food and nutritional security of the entire humanity, particularly of the people of India. In the processes of conventional breeding, disruption in crop plants' inherent intricate regulatory mechanisms for balanced uptake and distribution of mineral nutrients may result an altered grain ionome. We tried to unearth the existence and the extent of such a problem of altered ionome with sixteen (16) and eighteen (18) elite, widely cultivated (at least >1.0 m ha) cultivars of rice and wheat, respectively released during the last 50 years since onset of the green revolution in India and its impacts on mineral diet quality (MDQ). The elemental composition (i.e., the ionome) of polished rice and whole wheat grain was determined by an inductively coupled plasma-optical emission spectrophotometer (ICP-OES). The elements (19) included were Ag, Al, As, Ba, Ca, Cr, Cu, Fe, Ga, Li, Mn, Ni, P, Pb, S, Si, Sr, V, and Zn. Afterwards, we summarized the concentration of various minerals, which contribute to the diet quality of those cereals in one number, through algorithm-based models, that can suggest improvement or deterioration in mineral diet quality in past 50 years. Along succeeding decades, we observed that modern cultivars of rice and wheat have tended to reduce essential and beneficial elements but to enhance toxic elements concentrations in grains. Again, in both cereals, MDQ depleted along the succeeding decades and the depletion was intensified in rice than in wheat. Consequently, it dented their dietary significance to the Indian population in the past 50 years or so. To overcome, ionome data before release of a crop variety may be warranted.

Keywords: Cereal; crop variety; diet quality; grain ionome, nutrients

A circular economy approach for sustainable management of water hyacinth

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Abstract

Water hyacinth (*Eichhornia crassipes*) is a large, free-floating tropical macrophyte that is known to improve water quality by absorbing dissolved pollutants. Due to its high reproductive rate, management of water hyacinth (WH) can pose environmental issues and therefore, the contaminant-enriched wet biomass should be properly managed. This study focused on the sustainable management of WH biomass via thermochemical conversion (gasification (300-900˚C)) to high-value products, biochar, bio-oil and syngas, from the perspective of energy consumption, heat reduction and upcycling based on circular economy towards environmental sustainability. The biochar was analysed for elemental composition and FTIR analysis was performed to analyze the surface functional groups. A feed-forward artificial neural network (ANN) model was also developed for the biomass gasification process simulation and optimization to correlate the gasification products with process operating conditions. The economic feasibilities of WH gasification were assessed in terms of the net present value (NPV). Results showed that BET (Brunauer-Emmett-Teller) surface area and pore volume of the biochar was 9.76 m^2/g and 0.0004 cm^3/g respectively. The gasification process was economically feasible and carbon negative and the optimal 15-year NPV was found to be 5.3 million SGD for the WH gasification generated from a 45-hectare water body. Majority of the heavy-metal concentrations in the WH biochar is less than the upper limits as prescribed in Singapore; however, the life-cycle assessment showed that the co-gasification of WH and woodchips resulted in a net negative GHG emission of 506 tonnes, which is 18.3% higher than mono-gasification of WH biomass.

9th Annual convention and national webinar on "Managing agro-chemical for crop and Environment health"

Theme area: 3. Allied agricultural activities vis-a-vis food security & environmental health

Title: Population dynamic of mustard aphid (Lipaphis erysimi Kalt.) on B-9 (Binoy)

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Abstract

Mustard is the 2nd most important edible oil seeds in India after groundnut and accounts for nearly 30% of the total oil seeds produced in the country. Mustard aphid a potentially serious key pest of mustard crop has still been taking away of heavy loss of production. This noxious pest is responsible to inflict 27 to 96 percent yield loss in mustard in India (Bakhetia and Sidhu, 1983). The experiment was carried out during rabi season of 2019-20 and 2020-21in agricultural instruction farm, Uttar Banga Krishi Viswavidyalaya to study the population dynamics of mustard aphid on Binoy (B9).The results revealed that the population of aphid was initiated on mustard in 1st SW i.e., first week of January and reaching a peak population during the 7th SW (3rd week of February) in both the year. The correlation study depicted that among the different weather parameters, only minimum temperature and evening RH showed significant negative relation with aphid population. All other parameters showed non-significant correlation.

Keywords: - Mustard, Aphid, Population dynamic

Music- a nonchemical method of milk production enhancement in dairy cattle

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Abstract

The effect of music therapy has been studied in several areas such as mental health, special education, rehabilitation and social development in human beings. Music when scientifically applied has been shown to relieve human suffering. Literatures revealed that most of the work that has been conducted in animals is on the adoption behavior of dairy animals with Automatic milking system (AMS), the behavioral and physiological response of dairy heifers to tape-recorded milking facility noise with and without a pre-treatment adaptation phase, bioacoustics tools for enhancing animal management and productivity. The present study was conducted to evaluate the effect of music on milk production in dairy cattle and extent of stress relieve. The experiment was carried out in the semi-intensive farming system on 30 numbers of cross breed Jersey animals which were categorized into 3 groups viz. Group I as early lactation phase, Group II as mid lactation phase and Group III as late milking phase. The study was conducted for a total of 90 days - 45 days with light instrumented music and 45 days without any music. All the groups were exposed to this music therapy for 45 days and the effect was also observed without the therapy parameters like milk production, serum cortisol level, Somatic cell count, udder health, economical assessment of effect of music was studied. Music had a direct bearing in increasing milk production, Udder became more healthy and congenial and stress reduced significantly.

Studies on scientific rearing of small ruminants for rural development in sundarbans

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Abstract

Issues related to profitability comparison between goat and sheep to evolve a suitable policy framework for this otherwise neglected sector of the livestock economy especially in Sundarbans areas was studied. Five different villages with goat farming group and sheep farming group were selected each having three subgroups viz control, deworming alone and deworming along with supplementation group. Each subgroup composed of 20 numbers of animals. Present study concluded that indiscriminate supplementation of mineral has got no role on improving production and productivity; Schedule deworming followed by supplementation proves to be an ideal field level technological application to improve the farm output. Strengthening of small ruminant farming will empowered the women folk of society economically, culturally, socially, spiritually. In sheep farming deworming must be proceeded by liver tonic administration. There is no definite advice of choosing any farming, rather, should be selected based on local available sources, marketing facilities etc.

Performance of New Mustard Variety under Front Line demonstration Programme in Red and Lateritic Belt of Birbhum district, West Bengal.

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Abstract

Frontline Demonstration (FLD) programme on a new short duration (105 days) mustard variety NRCHB-101 was carried out during the two successive years of 2019-20 and 2020-21 on the farmer's field. The farmers were selected from different villages of the district Birbhum. The variety NRCHB-101 (Black seed) was used in the demonstration plots at farmers' field where different field operations were carried out according to the package of practices of B9. During the FLD programme the average seed yield of NRCHB-101 was higher (12.85 q/ha and 12.92 q/ha) in the demonstration fields as compared to local check (10.25 q/ha and 10.55 q/ha) respectively in 2019-20 and 2020-21. The average technology gap was found 459 q/ha during both the year and extension gap was 105.75 q/ha and 75.45 q/ha during 2019-20 and 2020-21 respectively. The average technology index was 80% and 84% during 2019-20 and 2020-21 respectively. Higher gross return, net return and benefit cost ratio were found in demonstrated fields as compared to local check. Therefore, the mustard variety NRCHB-101 may reduce the technology gap and fetched more yield in the lateritic belt of Birbhum district.

Keywords: Mustard, NRCHB-101, Technology gap, Extension gap, Technology Index, yield

Integrated Farming System: Opportunities for Food Security and Rural Livelihood Development in South 24 Paganas

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Abstract

Integrated Farming System (IFS) is a reliable way of obtaining high productivity with substantial nutrient economy in combination with maximum compatibility and replenishment of organic matter by way of effective recycling of organic residues/wastes. The study was conducted in the field of Scheduled caste farmers of Nafarganj village, Basanti Block, South 24 Parganas district of West Bengal during 2016 to 2019 to know the socio economic condition before and after technological intervention. The study reveals that the holding size of the farmer was 1.0 ha. The farmers were growing crop and rearing livestock in traditional way. We have introduced farmers' practice (FP) as fish culture with irregular duck grazing and no systematic utilization of dykes with appropriate combination of vegetables, Technology option 1 (TO1) as fish culture with stocking density of 7500nos/ha in the ratio of 4:3:3 (Catla, Rohu and Mrigel) + Khaki Campbell @ 300/ha + round the year dyke vegetables on trellis and on ground and Technology option 2 (TO2) fish culture with stocking density of 7500 nos/ha in the ratio of 1.5:2:1.5:1.5:2:1.5 (Rohu, Catla, Mrigel Common carp, Silver carp, and Grass carp) + Khaki Campbell @ 300/ha + round the year dyke vegetables on trellis and on ground were adopted. Similar training and inputs were given to the farmers for adoption of scientific management practices in the integrated farming system. Average Benefit – cost (B:C) ratio 1: 3.95 significantly higher fish under IFS TO1 as compared to 1: 2.97 and 1: 3.01 B:C ratio in FP and TO2. Technological interventions with improved cultivars, breeds/strains with good management practices coupled with farmer interest with willingness to learn and adopt integrated farming system increased production, thereby fetching higher income and employment opportunities throughout the year.

Keywords: B : C ratio, Egg and Meat production, Fish production, Vegetable production, Farm productivity, integrated farming system.

Response of Green Manuring of *Sesbania aculeata* on yield of Rice in Flood Prone Area of Coastal Odisha

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Abstract

A field experiment was conducted at farmer's field at Gajapitha village of Marshaghai block of Kendrapara, Odisha to evaluate effect of green manuring and other nutrient management on yield and economics of rice. The village is an adopted village by Krishi Vigyan Kendra, Kendrapara, in which various activities in agriculture and allied sector are going on under National Innovations on Climate Resilient Agriculture (NICRA) programme to combat the flood affected area of the locality. The experiment consists of five treatments like green manuring + NPK (60: 30: 30 Kg/ha), green manuring + NPK (80: 40: 40 Kg/ha), green manuring + FYM (2.5 t/ha) + NPK (60: 30: 30 Kg/ha), green maturing + FYM (5 t/ha) + NPK (60: 30: 30 Kg/ha) and farmer's practice *i.e.*, NPK (80: 40: 40 Kg/ha). Results revealed that green manuring of Dhaincha along with application of FYM @ 5t/ha clubbed with application of NPK @ 60: 30: 30 Kg/ha recorded highest grain yield (4.23 t/ha), straw yield (5.21 t/ha) and other yield attributing characters as well as highest economic return *i.e.*, B:C ratio of 1.63.

Keywords: Green manuring, Rice, FYM, Yield, Economics,

Variability among *Fusarium oxysporum* isolates collected from different lentil growing fields of West Bengal, India

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Abstract

Vascular wilt in lentil caused by *Fusarium oxysporum* is considered as one of the major factors of low productivity in lentil. The present study was conducted to determine nine Fusarium strains (W1-W8 and W10) which were isolated from different lentil growing parts of West Bengal, India and were characterized for their physiomorphological, biochemical, and molecular traits in vitro. Pathogenecity test were done to check the aggressiveness of all the nine isolates of Fusarium in three varieties of lentil (Maitri, Hul-56 and BM-6) and variety Maitri showed better germination against most of the strains with less disease severity against W1 and hence variety Maitri taken into consideration for greenhouse and field trials. The mycelia of all the isolates were septate, hyaline and profusely branched. All the Fusarium isolates produced micro- and macro-conidia in pure culture within seven days after inoculation and showed different morphological characters. Identification of molecular variability was performed by sequence analysis of rDNA-ITS region of each isolates for confirmation of molecular variability of the Fusarium isolates.

Keywords: Lentil, *Fusarium oxysporum*, fungal morphology, pathogenicity

Efficacy of different organic fertilizers in survivality of *Clarius batrachus* fry stage in pond

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Abstract

Organic fertilizer plays a very important role in culture practice of *Clarius batrachus* by producing zooplankton which is the primary food for the culture organisms. In actual field condition survivality of fry stage of *C. batrachus* is a major challenge faced by many farmers. In this study an attempt has been taken to study the efficacy of different organic manures in survivality of fry stage of *C. batrachus.* The study was carried out in farmer's pond being dried before the onset of trail with stocking density of 6 fry/ liter having 4.48 ± 0.09 mg & 2.66 ± 0.05 cm overall length (OLA). Different organic manures were utilized as treatment with three replications were untreated pond as (T_1), Raw Cow dung at 10,000 Kg Ha^{-1} $Year^{-1}$ as (T_2), One week old partially decomposed cow dung at 10,000 Kg Ha^{-1} $Year^{-1}$ as (T_3), poultry manure at 6,000 Kg Ha^{-1} $Year^{-1}$ (T_4), Vermicompost at 10,000 Kg Ha^{-1} $Year^{-1}$ as (T_5). One fourth dose was applied while preparing the pond & remaining doses were given in equal amount on fortnightly basis. Different water quality parameters like Dissolved Oxygen (DO), pH, alkalinity, Total Ammoniacal Nitrogen (TAN), H_2S were measured on weekly basis. The trial was conducted for 28 days. During the trial the fishes were fed with live tubifex worm during evening. After the trail it was found that all the water quality parameters were in acceptable range during each & every observation in all treatments except control (T_1). But the survivality was found significantly higher in T_5. The results of other growth parameters are also indicating positive bias towards T_5. Hence, it can be clearly state that Vermicompost is the best organic manure for fry stage rearing of *C. batrachus* as compared to other organic manures used in this study.

A comparative study on yield performance of finger millet varieties under rainfed conditions in kalahandi district of odisha

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Abstract

Finger millet (Eleusine coracana L.) is the most widespread minor millet across IndiIt matures quickly and can withstand extreme climatic conditions. In view of its ability to tolerate extreme climatic conditions, the present study was carried out to evaluate the performance of different finger millet varieties viz. Arjun (OEB-526), Bhairabi, and Kalua (OEB-532) as compared to the farmers variety Nali mandia during kharif seasons of 2021 in two villages Pipalpada (19.7079°N, 83.3652°E) and Kamardha (20.03693°N, 83.42482°E) of Kalahandi district of Odisha. The mean maximum and minimum temperature recorded in the villages during the study year was 35.3°C and 16.4°C respectively. It was observed that Arjun variety matured in 110 days and it exhibited the highest no. of effective tillers/hill (7.27), followed by Bhairabi (5.56) whereas the lowest value was shown by Nail mandia (2.40). Similarly maximum no. of fingers/hill was exhibited by Arjun (OEB-526) (2.76) followed by Bhairabi (2.13) whereas minimum value was recorded by local variety (1.03). Highest grain yield (1.24 t/ha) was recorded in Arjun (OEB-526) followed by Bhairabi (1.19 t/ha) whereas the lowest yield was recorded in Nali mandia (0.76 t/ha) which was significantly lower than other cultivars. Arjun (OEB-526) recorded highest net return of Rs. 21455/ ha with a benefit cost ratio of 2.09 and additional net return of Rs. 9455/ha as compared to farmers practice. The growth and yield performance of Arjun variety was found to be satisfactory in spite of occurrence of frequent dry spells during different crop growth stages.

Key words: Finger millet, Effective tillers/hill, Fingers/hill, Yield, Net return, Benefit cost ratio

THEME : 3 Allied agricultural activities vis-a-vis food security & environmental health Genetic variability analysis in germplasm accessions and land races of wheat

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Abstract

Two hundred wheat genotypes with four checks namely HD 2967, WB 2, UP 2903 and HD 3086 were evaluated for genetic variability in *rabi* 2021 at D-13 farm of Rani Lakshmi Bai Central Agricultural University, Jhansi, U. P. (India).The genotypes were evaluated in augmented design and data were recorded for sixteen quantitative traits *viz*., days to 50% heading, days to maturity, flag leaf length, flag leaf width, awn length, spike length, peduncle length, tillers per meter, plant height, leaf area index, chlorophyll fluorescence, total chlorophyll content, 1000-grain weight, grain yield per row, biological yield per row and harvest index. Analysis of variance revealed significant differences among the genotypes for all the traits except for chlorophyll fluorescence. Genotypes *viz*., VA 18-19-86, VA 18-19-80 and 11HPAN-44 have been found to be promising for grain yield per row on the basis of mean performance. The highest PCV and GCV were recorded for effective tillers per meter followed by, biological yield per row, flag leaf length and grain yield per row. Heritability coupled with genetic advance percent of mean was high for effective tillers per meter, followed by biological yield per row, flag leaf length and grain yield per row.

Keywords: Wheat, Genotypes, Variability, Heritability

Assessing the efficiency of modern training method over traditional training method about transfer of technology of vermicompost to input dealers.

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Abstract

The main purpose of study is to Assessing the efficiency of modern training method over Krishi Vigyan Kendra vocational training centre to DAESI Input dealers. The sudden outbreak of COVID -19 in various parts of the country in 2020 has been severely affected the training centres across different states of India and during lockdown online training -learning modes were adopted by Malda Krishi Vigyan kendra for the training -learning process and subsequently examination and evaluation for the all training season has been conducted. Offline training and evaluation for the same c arried out during unlock period. Hence,The study aims to major the effectiveness of online training over traditional training method about transfer of technology of vermicompost to input dealers in DAESI course.The study carried out in Malda Dristict with 40 respondent of Input Dealers from DAESI course. . After that we trained them one month in which three modes of training such as Online training ,offline training and training through video and social media has been followed,. After receiving training in one mode, Knowledge, attitude and skill of each trainee's tested relation to the particular training method . It is found that the most of the respondent was preferred the offline training mode because of face to face interaction with the scientist or trainers etc. Offline Training method suitable for the rural people because most of the respondents have lack of proper knowledge about internet and mobile. we see that in case of understanding/perception about the training topic 90% respondent said that offline mood is the best medium of training. So, it is concluded that in case of training offline method is more suitable over online training mode.

Keyword: Online training, traditional training ,Input Dealers and Vermicompost.

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Crop response to fertilizer application is in majority of the situations showing declining trend when balanced fertilization has not been practiced. The soils are also getting continuously depleted of secondary plant nutrients and micronutrients. Very recently, some areas of the Punjab, for instance, have been earmarked as hotspots for environmental degradation, a matter of huge concern to everybody, due to inorganic fertilizer abuse, rampant industrial growth, unscientific disposal of domestic effluents, etc. Nutrient management and environmental pollution, in particular, under inevitably fast change of the climate in diverse agro-ecosystems in the country throws up new challenges to the nutrient management scientists and fertilizer technologists. This throws up new challenges to all concerned for higher nutrient use efficiency in the background of environmental degradation in particular. The Society of Fertilizers and Environment has the overall mandate to address these key issues along with other related aspects.

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