





Project Coordinator

.... a monthly update



ICAR-National Institute of Abiotic Stress Management Baramati, Pune, Maharashtra-413115.



Project Coordinator

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March 2021

From Director's Desk

Greetings from ICAR-NIASM...

The current issue on project coordinator highlights the progress made under all the ICAR-NIASM projects during March, 2021 and targets for April, 2021. Last month, research and development efforts were made regarding development of thermal stress severity assessment tool for livestock, selection and selfing of mutant plants of chia and quinoa, investigation of salt tolerance potential of newly isolated bacterial strains, screening of rice, wheat, soybean & chick pea genotypes, distribution of inputs to SC and ST beneficiaries. The Institute organized a one-day training program on "Farm pond based Aquaculture: A Business Opportunity" on March 24, 2021 under the Scheduled Castes Sub-Plan 2020-21 where guidance on artificial feed management, Pradhan Mantri Matsya-Sampada Yojana, commercially important fish



species, freshwater aquaculture, management methods for modern aquaculture, GIFT tilapia were provided. The Institute also celebrated International Women's day on 8th March, 2021 where all the women working in the institute viz., farm, office, students and young professionals were felicitated. I sincerely hope that this issue will help the scientists and the farm personnel of NIASM and other research Institutes for better coordination among project staff while implementing the planned activities. I thank Dr. Aliza Pradhan and her team for their dedication and sincerity in bringing out this publication and wish that the issue would be received well by readers across all domains.

(Himanshu Pathak)

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Contributors

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One day training programme on "Farm pond-based aquaculture: a business opportunity" on 24th March, 2021

UMBRELLA PROJECTS

UP 1. Abiotic Stress Information System (ASIS)

Geo-spatial digital maps of multiple abiotic stresses, management options and future scenarios

PI: Bhaskar B Gaikwad; **Co-PI(s):** Amresh Choudhary, Ram N Singh, Dhananjay D Nangare, Nitin P Kurade, Sachinkumar S Pawar, Mukeshkumar P Bhendarkar, Sunil V Potekar, Pravin H More



Outputs

- Spreadsheet model "Thermal Stress Severity Assessment Tool For Livestock" with management options based on forecasted values and 10 year historic data of the selected geo location.
- The Thermal Severity was assessed based on five days forecasted values of selected geolocation.

Targets for next month

• Web app for Suggest management options based on Forecasted values.

UP 2. Germplasm Conservation and Management (GCM) Genetic garden and gene bank for abiotic stress tolerant plants, animals and fisheries for food security and sustainability

PI: Boraiah K M; **Co-PI(s):** Ajay K Singh, Basavaraj, P S, Mahesh Kumar, Satish Kumar, Rajkumar, N Karthikeyan, Paritosh Kumar, Sanjeev K Kochewad, Mukesh kumar P Bhendarkar, Harisha C B, Pratapsingh Khapte, Jagadish Rane, Neeraj Kulakshetran, Pravin B Taware, Aniket More, Rushikesh Gophane, Lalitkumar Aher

Sl.	. No.	Species	Sl. No.	Species
1		Solanum aculeastissinum	8	Solamum <u>mammosum</u>
2		Solanum aethiopicum	9	Solamum <u>melongena</u>
3		Solamum <u>capsicoides</u>	10	Solamum nigrum
4		Solamum gilo	11	Solamım <u>seafortthiamım</u>
5		Solanum indicum	12	Solamum sismbrifolium
6		Solamım <u>insanaum</u>	13	Solanum torvum
7		Solanum macrocarpum	14	Solamım <u>viarum</u>

Outputs

- Communication with ICRISAT for sharing seed material of pigeon pea, foxtail millet, finger millet and groundnut germplasm/accessions.
- Physiological characterization of 14 Brinjal wild species under water stress & regeneration ability after water stress.
 - Harvesting of 16 turmeric genotypes and recorded observation on yield and other post-harvest parameters

Targets for next month

- Letter/communications for collaborations and collections of seed materials to SAUs/ICAR institutes .
- Compilation of data; antioxidant/ enzyme estimations in wild species of Brinjal & estimation of curcumin.

UP 3. Model Green Farm (MGF) Environment friendly, economically via

Environment-friendly, economically viable, state-of-the-art model farm for abiotic stressed regions

PI: Dhananjay D Nangare; **Co-PI(s):** Himanshu Pathak, Goraksha C Wackchaure, Bhaskar B Gaikwad, Vanita Salunkhe, Rajkumar, Paritosh Kumar, Aliza Pradhan, Amresh Chaudhary, Mukesh kumar P Bhendarkar, Sangram B Chavan, Vijaysinha D Kakade, Pratapsingh S Khapte, Pravin B Taware, Rushikesh Gophane, Noshin Shaikh, Santosh Pawar, Avinash V Nirmale



Outputs

- Setting up of methyl eugenol para-pheromone traps in mango orchard for monitoring and management of fruit flies.
- Assigning nodal person for each orchard in north block.
- DNA extraction of *Colletotrichum spp.* & its *in vitro* pathogenicity study in dragon fruit.

Targets for next month

- Recording of yield of Sapota under different treatments.
- PCR studies & sequencing of dragon fruit pathogens.
- Collect and compile the initial information of each fruit crops/plots in the north block.
- Collection and compilation of the information of total water requirement including irrigation water requirement for different experimental plots, drinking water to livestock, poultry and fisheries and other activities.

UP 4. Climate-smart IFS (CIFS) Climate resilient integrated farming system in semi-arid region

PI: Sanjiv A Kochewad; Co-PI(s): Kamlesh K Meena, Goraksha C Wackchaure, Vanita Salunkhe, Rajkumar, Mukeshkumar P Bhendarkar, Aliza Pradhan, Amresh Chaudhary, N Subash, Laxman R Meena, Pravin B Taware, Patwaru Chahande



Outputs

- Completion of harvesting and threshing of pigeon pea, chick pea and sorghum crop.
- Renovation of goat shed and extension of cattle shed completed.
- Designing a plan for efficient water utilization through micro irrigation at CIFS.
- Targets next month
- Laying of micro-irrigation system.
- Purchase of goats.

FLAGSHIP PROJECTS

FP 1. Atmospheric Stress Management

Adaptation and mitigation of atmospheric stress in crops, livestock, poultry and fishes for sustainable productivity and profitability

PI: Nitin P Kurade; **Co-PI(s):** Sachinkumar S Pawar, Sanjiv A Kochewad, Bhaskar B Gaikwad, Rajkumar, Mukeshkumar P Bhendarkar, Ram N Singh, Dhananjay D Nangre, Avinash V Nirmale, Sunil V Potekar



Haematological parameters in different breeds of goat during March

Outputs

- Recording of comparative status of growth, haematological parameters and reproduction in different breeds of goat for March.
- In-silico analysis to identify target HSP polymorphic regions in goats.
- Better performance of neem based bio-pesticide in management of fall armyworm in maize.
- Recording of growth parameters in different salinity levels in GIFT tilapia.
- Collection of black soldier fly larvae for its mass multiplication.
- Collection and compilation of meteorological data.

Targets for next month

- Evaluation of stress parameters and parasitic prevalence in different breeds of goat.
- Amplification of Heat Shock Protein polymorphic region for poultry.
- Setting up of experiment for capturing acoustic signals of poultry subjected to thermal stress.
- Survey on fall armyworm in maize and collection of black soldier fly larvae.
- Collection and analysis of Meteorological data of MH.
- Impact of salinity stress in GIFT Tilapia; development of live fish feed culture unit.

FP 2. New Crops

Augmenting farm income in water scarce regions with alternative crops

PI: Jagadish Rane; **Co-PI(s):** Ajay K Singh, Dhananjay D Nangre, Goraksha C Wackchaure, Mahesh Kumar, Satish Kumar, Karthikeyan N, Boraiah K M, Sanjiv A Kochewad, Aliza Pradhan, Amresh Chaudhary, Ram N Singh, Basavraj P S, Harisha C B



Outputs

- Harvesting & threshing of individual panicle in mutant chia and quinoa and quinoa varieties.
- Recording of percent sterility in mutant lines of chia based on seed set in selected panicles.
- Selection of mutants in chia and quinoa.
- Labelling & storage of Seed material of M1 generation.
- Purification of quinoa accessions: selection based on morphological characters.
- Targets for next month
- Recording observation on yield traits and germination test in harvested crops.
- Data compilation and analysis of harvested quinoa.

FP 3. Bio-saline Agriculture

Harvesting of quinoa

Exploitation of halophytic plant and associated microbiome for amelioration of saline agricultural land of arid & semiarid regions

PI: Satish Kumar; Co-PI(s): Ajay K Singh, Vanita Salunkhe, Sanjiv A Kochewad, Mahesh Kumar, Paritosh Kumar, Neeraj Kumar, Aliza Pradhan, Amresh Chaudhary, Himanshu Pathak



Outputs

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- Determination of IAA production ability of the newly isolated bacterial strains.
- Investigation of growth response of halotolerant bacterial strains under high NaCl regime ranging from 0 to 20% w/v.

Targets for next month

- To determine the growth curve of candidate halotolerant bacterial strains under high NaCl regime.
- To establish the molecular basis of nitrogen fixation among the N2 bacteria using colony PCR approach.

gradient ranging from 0-20% (w/v)

FP 4. Technology targeting and policy

Targeting prospective technologies for abiotic stress resilience in rainfed and dryland regions

PI: Dhananjay D Nangare, Co- PI(s): Sachinkumar S Pawar, Sanjiv A Kochewad, Bhaskar B Gaikwad, Boraiha K M, Kartikeyan N, Rajkumar, Mukeshkumar P Bhendarkar, K Ravi Kumar, Himanshu Pathak



Visit of board of directors from FPOs to ATIC

Outputs

- Demonstration cum training for fish farmers at NIASM and at Jamkhed.
- Visit of the board of directors from FPOs and trainees of input suppliers to ATIC and farm.
- Distribution of inputs (fish feed & seed, sewing machine, flour mill, bicycle etc) to SC beneficiaries.
- Publication of two fortnightly agro advisories.
- Targets for next month
- Preparation of questionnaire for data collection on abiotic stress management of crops.
- Development of ATIC will continue.
- Collection of the information on ITKs related to abiotic stress.
- Fish rearing in different small farm ponds.
- Preparation of action plan under agro tourism.

Project Coordinator

IN-HOUSE PROJECTS

A) School of Atmospheric Stress Management (SASM)

1. Study of immune response and HSP genes polymorphism in relation to heat stress in poultry

PI: Sachinkumar S. Pawar; Co-PI: N P Kurade

Outputs

- Awarded patent for invention entitled "Construction of glycoprotein E (gE) gene-deleted mutant of infectious bovine rhinotracheitis (IBR) virus Indian strain for DIVA-based marker vaccine" vide patent No. 362851.
- Environmental parameters to access stress levels in poultry birds collected and assessed thermal stress risks in poultry for March month.

Targets next month

- Recording of environmental, physiological and haematological parameters in experimental poultry.
- Carry out genomic DNA isolation from experimental Vanaraja birds.





T Max inside shed vs T Max outside



Grant of patent no. 362851

B) School of Water Stress Management (SWSM)

1. Mitigating water stress effects in vegetable and orchard crops

PI: Goraksha C Wackchaure; Co -PI(s): Dhananjay D Nangare, Satish Kumar, Aliza Pradhan, K M Boraiah, Pratap Singh Khapte, Jagadish Rane



Variation in canopy temperature of onion under different sulphur and water stress treatments under LSS

Outputs

- Measurement of growth and canopy attributes of onion (cv. Bhima Kiran) during bulb development stages for investigating impact of sulphur sources and water stress using line source sprinkler system
- Measurement of fruit yield and quality attributes of fresh okra fruit for assessing the impact of plant growth regulators for alleviating the water stress.
- Application of the plant growth regulator (PGR) at fruiting stage.

Targets for next month

• Data recording during harvesting of okra (cv. Singham) and onion (cv. Bhima Kiran) field trials performed using LSS.

EXTERNALLY AIDED PROJECTS (EAP)

EAP 1. Genomics strategies for improvement of yield and seed composition traits under drought stress conditions in soybean (Funded by: ICAR-NASF)

PI: Ajay Kumar Singh; Co-PI(s): Mahesh Kumar, Jagadish Rane

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Outputs

- Gene expression profiling of soybean genotypes under irrigated and drought stress conditions.
- Semi-quantitative RT-PCR was conducted for expression profiling of WRKY-49, WRKY-62 and ARF was checked. Expression of β-Tubulin was used for equal loading of mRNA.

Targets for next month

- Evaluation of 75 soybean genotypes for drought tolerance under greenhouse conditions.
- Root system architecture study in 40 soybeans.
- VIGS construct development for 4 target genes.
- RNAi Construct designing for two genes.
- Gene expression profiling in soybean genotypes.

Semi-quantitative RT-PCR of soybean genotypes

EAP 2. Conservation agriculture for enhancing resource-use efficiency, environmental quality and productivity of sugarcane cropping system (Funded by: CA Platform ICAR)

PI: Goraksha C Wakchaure Co-PI(s): Aliza Pradhan, Amresh Chaudhary, Paritosh Kumar, Himanshu Pathak



Installation of drip system and field layout

Outputs

- Layout and installation of the drip irrigation system for field experiment for optimizing planting geometry, micro irrigation and residue management practices
- Completion of the groundnut sowing as intercrop in fresh sugarcane crop for optimizing planting geometry, micro irrigation and residue management practices
- Completion of stubble shaving, root pruning, off-baring and band placement of fertilizers and sowing of intercrop using SORF machine for establishing 4th ratoon sugarcane crop.
- Recording of real time irrigation and growth parameters data *viz.*, tillers, NDVI, plant eight etc. for tillage and planting system experiment in sugarcane.

Targets for next month

- Measurement of real data time of soil-water-crop parameters in various field trials on conservation agriculture for sugarcane.
- Pooled analysis of last three years sugarcane yield data.

EAP 3. Evaluation of halotolerant rhizobium and PGPB based biomolecules for alleviation of drought and salt stress (Funded by: AMAAS, NBAIM, Mau)

PI: Satish Kumar; Co-PI: Goraksha C Wakchaure

Outputs

- Impact assessment of an ACC deaminase producing bacterial strain on biochemical status of wheat seedlings in terms of antioxidant enzymes – Catalase, Superoxide dismutase and Peroxidase activity.
- Measurement of influence of microbial inoculation on localization of OH- and O. radicals in leaf tissue of salinity stressed wheat seedlings.

Targets for next month

- To determine the effect ACC deaminase producing bacterial strain on biochemical status of wheat seedlings in terms of accumulation of soluble sugars, proteins and phenolic compounds
- To evaluate the influence of different growth regulators and a newly developed bioformulation on root volume of spinach.



Influence of an ACC deaminase producing bacterial inoculation on superoxide dismutase activity in leaf tissues of wheat under saline conditions

-W. H. Auden

Scope for soil health and organic carbon management through integrated farming

Pravin B. Taware , Sr. Technical Officer (Farm)

Conventional agriculture can have devastating effects on soil health as it degrades soil aggregation and water holding capacity, prevents carbon sequestration, and leads to runoff and erosion. Improving soil health is now seen as a cornerstone in many agricultural and climate change initiatives at global levels. There is current trend to promote agricultural practices that improve soil health by reducing tillage, increasing crop diversity, maintaining soil cover and living roots, and integrating crops and livestock. Although management can vary across farms, Tully and McAskill (2020) identified four key practices that are most widely promoted as best management practices (BMPs) to improve soil health on organic farms: (1) cover crops; (2) organic amendment type and rate; (3) crop rotation length and diversity; (4) tillage intensity. Research suggests that combining several soil health building practices (i.e., "stacked practices"), for example, reducing tillage and combining multiple organic amendment sources (e.g. mixing compost and manure) can have enhanced benefits to soil health.

Crystal-Ornelas 2020 carried out meta-analysis to identify the relative impact of different BMPs on soil health outcomes in organic farming systems, in an effort to fill the knowledge gap and inform the policies to target practices with the greatest likelihood to improve soil health. They focused on soil organic carbon (SOC) and microbial biomass carbon (MBC) as measures of soil health that can influence chemical (e.g., alters cation exchange capacity), physical (e.g., aids with aggregation), and biological (e.g., supports microbial growth and diversity) soil health properties. Meta-analysis is often used to compare how soil health differs between organic and conventional farming systems. However, the burgeoning primary literature on organic farming now allows direct evaluation of the BMPs within organic farming systems on soil health improvements. Therefore, the main objective of this meta-analysis was to investigate the effect of BMPs, such as organic amendments, conservation tillage, and cover cropping, on soil health within organic farming systems. They focused on two principal soil health metrics: SOC and MBC concentrations. On average, adoption of BMPs increased depth-weighted SOC and MBC concentrations by 18 and 30 %, respectively, relative to organically-managed control groups. Among BMPs, organic amendments and conservation tillage practices showed net positive effect on soil health with 24 and 14 % increase in depth-weighted SOC concentrations, respectively. Although cover cropping did not have an overall influence on SOC concentrations, we found a temporal trend such that cover cropping significantly increased SOC concentrations after 5 years of its adoption. This indicates that the soil health benefits from BMPs accrue over time and highlights the need of long-term adoptability of BMPs to achieve agricultural sustainability. This meta-analysis confirms the soil health benefits of adopting BMPs within organic farming systems, identifies critical knowledge gaps, and provides directions for future orga



Trampling of green manure crop for soil health management

References:

Crystal-Ornelas, R., Thapa, R., Tully, K., 2021. Soil organic carbon is affected by organic amendments, conservation tillage, and cover cropping in organic farming systems: A meta-analysis. Agric., Ecosys. Environ. 312-107356. https://doi.org/10.1016/j.agee.2021.107356.
Tully, K.L., McAskill, C., 2020. Promoting soil health in organically managed systems: a review. Org. Agric. 1–20. <u>https://doi.org/10.1007/s13165-019-00275-1</u>.

"Thousands have lived without love, not one without water".