November 2021





Project Coordinator

.... a monthly update



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



Project Coordinator

.... a monthly update



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Issue 17

November 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 November, 2021 and targets for December, 2021. We made progress in research and development efforts particularly in 1) developing geo-spatial maps on organic carbon nutrient index of India, 2) assessing drought responsive traits in soybean genotypes under drought stress, 3) initiation of field evaluation of different mutant accessions of quinoa and chia, 4) recording physical and chemical parameters of sapota under different planting techniques and soil filling mixtures, 5) recording of comparative status of hematological status in different breeds of goat for the month, 6) harvesting and threshing of *kharif* crops as well as sowing of *rabi* crops (quinoa, chia, wheat, chickpea) as per experiment schedule, 7) modification of tray



method of mass culturing of black soldier fly (BSF), 8) HPLC based detection and identification of cystathionine in the metabolites pool of a halotolerant isolate, 9) initiation of canopy management and biomass estimation experiment in dragon fruit, and 10) measurement of real time soil, water and growth of parameters of eggplant and crops under sugarcane cropping system. The current issue also features an article on the beautiful relationship of obligate mutualism between fig and its wasp.

In a move towards commemorating 75 years of India's Independence, ICAR-National Institute of Abiotic Stress Management observed 'Vigilance awareness week 2021' from October 26 to November 1, 2021 where scientist, administrative, SRF, JRF, YP, students and contractual staff participated in taking integrity pledge as well as in essay and debate competitions held during the occasion.

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.

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Contributors

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(Himanshu Pathak)



Observance of "Vigilance Awareness Week from 26 October-01 November, 2021" at ICAR-NIASM

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, Gopalakrishnan B, Sunil V Potekar and Pravin H More



Outputs

- Compilation of datasets on a) soil chemical properties for the state of Karnataka, Andhra Pradesh & Tamilnadu; b) Compilation of India level Geo-spatial layers of feature boundaries and soil properties.
- Geo-spatial maps on waste lands and nutrient index.
- Geo-spatial maps depicting boundaries of state, district, tehsil, agroecological zones, agro subecological zones, agro-climatic zones, meteorological sub-division, basin, river, sedimentation zones, water bodies.
- **Targets for next month**
 - Climate analogues for Livestock (India basis).
 - Continue with dataset collection across web-resources.

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, Bhojaraja Naik, Gurumurthy S, Pravin B Taware, Aniket More, Rushikesh Gophane and Lalit Kumar Aher

Outputs

- Harvesting & threshing of 118 accessions of foxtail, 77 accessions of finger millet.
- Recording of observation on plant height, no. of branches, no. of mature and immature pods and dry biomass in 181 germplasm of groundnut.

Targets for next month

- Harvesting of different crop varieties in crop cafeteria.
- Sowing of rabi crop varieties/germplasm.
- Data compilation and analysis (finger millet, foxtail millet and groundnut).



Harvesting of groundnut germplasms

UP 3. Model Green Farm (MGF)

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 Wakchaure, 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 and Avinash V Nirmale



Canopy management in dragon fruit

Outputs

- Initiation of canopy management & biomass assessment experiment in dragon fruit.
- Recording of growth parameters in sapota planted with different planting techniques and filling mixtures.
- Molecular characterization of anthracnose pathogen in dragon fruit.
- Collection of native *Trichoderma* strains from medicinal and aromatic plant rhizosphere.
- Recording of data on lemon grass sprouting.
- Canopy management in aonla and sowing of chickpea in aonla based agroforestry.
- Targets for next month
- Canopy management and biomass assessment in dragon fruit.
- Growth and physiological observations in sapota (K7 plot).
- Evaluation of native *Trichoderma sp.* for management of dragon fruit pathogens.
- Collection of data on growth of sandal wood, tamarind and lemon grass.

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

PI: Sanjiv A Kochewad; **Co-PI(s):** Goraksha C Wakchaure, Vanita Salunkhe, Rajkumar, Mukeshkumar P Bhendarkar, Aliza Pradhan, Vijaysinha D Kakade, Sangram B Chavan, Rajagopal V, N Subash, Laxman R Meena, Pravin B Taware and Patwaru Chahande



Outputs

- Land preparation & sowing of sorghum and chick pea.
- Painting of multilayer plot, cow shed, and goat shade fencing.
- Harvesting & threshing of sorghum.
- **Targets next month**
- .Laying of rain-pipes in rabi crops.
- Sowing of groundnut and safflower.
- Intercultural operation as required in sorghum and chick pea.
- Sowing of fodder crop.



Sowing of chickpea and sorghum

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, Gopalakrishnan B, Avinash V Nirmale and Sunil V Potekar



Outputs

- Establishment of length weight relationship of Suckermouth cat fish.
- Recording of comparative status of growth, physiological and haematological parameters in four goat breeds during November, 2021.
- Assessment of thermal stress in poultry and goat for November.
- Survey of goat farmers in Undvadi (Supe) village.
- Fish sampling and water analysis of Dimbhe reservoir and Chakan area.
- Standardization of tray method of mass culturing of black soldier fly (BSF).
- Extraction of genomic DNA from four goat breeds for further analysis. Targets for next month
- Evaluation of stress parameters & parasitic prevalence in goat breeds.
- Survey of goat farmers and haematological analysis of experimental and field goats; Genomic DNA extraction from collected goat blood samples, amplification of heat shock protein genes from poutry birds.
- Biophysical analysis of salinity stress in GIFT tilapia; Improvement of breeding unit of BSF and mass culturing of BSF.

FP 2. New Crops

Exploiting Underutilised Crops for Augmenting Income in Water Scarce Regions

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

Outputs

- First and second date of sowing in quinoa in native murram and black soil.
- Thinning, weeding, and gap filling in quinoa sown in 30 days old seedlings of quinoa.
- Creating novel genetic variability in quinoa and chia through mutation (land preparation,
- layout and sowing of 400 quinoa and 600 chia M2 lines).

Targets for next month

- Observation on germination and seedling traits in mutant lines of chia and quinoa.
- Third and fourth date of sowing in quinoa; calendar of operations in quinoa.

FP 3. Bio-saline Agriculture

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, Amresh Chaudhary and Himanshu Pathak

Outputs

- HPLC based detection and identification of cystathionine in the metabolites pool of a halotolerant isolate 2.
- The chromatograms for standards Kinetin, Salicylic acid and Biotin were generated for their detection in metabolite pool of bacterial isolates from saline habitats.

Targets for next month

- Metagenomic DNA extraction and preparing the samples for 16S rRNA amplicon sequencing.
- To configure the QIIME bioinformatic pipeline on NIASM computational server.
- Procuring the PCR primers for DNA barcoding of plant identification.



Fig: HPLC chromatogram of cystathionine standard compared with that of the halotolerant PGPR isolate 2. Inset indicates the UV spectrum of cystathionine as evident in HPLC-PDA.

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 and Himanshu Pathak

Outputs			Targets for next month	
•	Collection of review on methodology for socioeconomic condition	•	Collection of review on methodology of impact assessment of	
	and adoption of technology.		technologies.	
٠	Survey in farmer's field and collection of data as per interview	•	Field visit and collection of data as per interview schedule for	
	schedule in Baramati tehsil.		field and horticulture crops and livestock.	
•	Compilation of success stories from Tribal Sub Plan (TSP)	•	Compile the information on ITKs related to abiotic stress.	
	programme.	•	Development of ATIC and initiation of activities related to Agro	
•	Publication of two fortnightly agro advisories.		tourism; coordination of extension activities and visits.	

Sowing of 400 quinoa and 600 chia M2 lines

IN-HOUSE PROJECTS

B) School of Water Stress Management (SWSM)

1. Mitigating water stress effects in vegetable and orchard crops

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



Outputs

- Measurement of real time plant-water-soil parameters for assessing the impact of eggplant root stocks to water stress using LSS.
- Assessing the impact of foliar application of plant bio-regulators on fruit size and storage quality of dragon fruit under different soils.
- Study of interactive effects of plant growth bio-regulators (PBR's) and cultivars on PS-II and relative water content of custard apple.
- Collection of fruit yields data of citrus and guava under different experiments.

Targets for next month

- Assessment of real time plant-water-soil parameters of eggplant rootstocks at vegetative stage using LSS.
- Plantation of okra for assessing plant bio-regulators responses under water stress conditions using LSS.
- Measurement of fruit quality parameters of sapota orchard under different soil treatments.

EXTERNALLY-AIDED PROJECTS

EAP 1. 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

- LC-MS based global metabolome profiles of the leaf and juvenile grains of sorghum plant treated with microbial formulation have been acquired in collaboration with NRC Grapes.
- Active component of the bioformulation derived from 8 bacterial cultures decoded using HPLC gradient elution.

Targets for next month

- To deposit the cultures used for developing bioformulation at NAIMCC, NBAIM, Mau.
- To analyse the global metabolome data and mapping the identified metabolites on biological pathways.

bacterial cultures and its putative active components detected through HPLC.

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 and Himanshu Pathak

Outputs

- Initiation of new experiments to study the interactive effects of intercropping, crop residue and bio-regulator for alleviating water stress in sugarcane cropping system.
- Measurement of plant growth, water and soil parameters in existing field trials under the CA on sugarcane.

Targets for next month

- Measurement of real time soil-water-plant parameters for sugarcane trials under CA.
- Efficacy of bio-regulators under CA practices towards managing water stress in sugarcane
- SORF demonstration on farmers' field.
- Execution of SCSP activities under CRPCA.



Establishment of experiment for intercropping, crop residue and plant growth regulator study for alleviating water stress in sugarcane

Fig and its wasp: A beautiful story of obligate mutualism

Vijaysinha D Kakade, Scientist (Fruit Science)

Fig being a deciduous and sub-tropical tree prefers areas having arid or semiarid environment, high summer temperature, plenty of sunshine and moderate water. Many of us might have not seen the flowers of fig, Have you? Because, the flowers are actually hidden inside fruit and they are the edible portion of this fruit. The fig flowers and its pollinator, a wasp (*Blastophaga psenes*) have developed a close relationship of mutualism in which neither of species could grow without the other. A flowering fig is not easy to spot by sight. Unlike the bright, colourful flowers you see in a garden. Female wasps are the first to visit the female flowers after receiving the signal of flowers maturity through their smell. The wasp enters fruit through the opening 'ostiole', in that process many of the times wasp loses their wings and antenna. Once female wasp lays the eggs inside the fruit, the wasp larvae feed on pulp of the fruit. Male wasps out of it complete their development first and then move in search of female wasps, fertilize them and die inside the fruits in which they were born because they do not have wings, so they cannot leave. The fertilized female wasps inside the fruit leave their place after few days which coincide with maturity of male flowers borne nearby the ostiole. In order to lay their eggs female wasps seek other fruits and in the process carry large amount of pollens along with them to pollinate other flowers. And this cycle goes on and this is how pollination takes place in figs. Another question may come to mind is what happens with wasps trapped inside the fruit? A wasp that is trapped in a fig will be digested by an enzyme (ficin) in the flower. Nothing remains of the wasp. The whole decomposition process takes about 2 weeks.

Four types of figs found worldwide are mainly Common fig, San pedro, Smyrna and Capri fig. Common figs are parthenocarpic in nature hence doesn't require pollination for fruit setting. The first crop of san pedro (Breba) grows on mature leafless wood sets fruit without pollination but second crop which grows on new wood requires pollination whereas in smyrna figs, pollination is requisite for fruit set and its growth. Capri fig produces inedible figs used by young fig wasps as housing. It produces spring crop (Profichi) which contains male (staminate) flowers and "gall" flowers. Caprifigs are necessary for the production of edible fig fruits which require pollination. Well-developed seeds are very much necessary for crunchy feel we get after eating the fruit is actually the product of successful pollination in figs.



Fig fruit showing ostiole, Pulp having male and female flowers (edible portion) and seeds of fig



Fruit bearing fig plant

the and remain nowers (earbie portion) and seeds of fig					
	Raw figs	Dried figs			
Calories	74 kcal	249 kcal			
Protein	0.75 g	3.3 g			
Lipids	0.3 g	0.93 g			
Dietary fiber	2.9 g	9.8 g			
Sugar	16.26 g	47.92 g			
Calcium	35 mg	162 mg			
Iron	0.37 mg	2.03 mg			
Magnesium	17 mg	68 mg			
Phosphorus	14 mg	67 mg			
Potassium	232 mg	680 mg			
Vitamin C	2 mg	1.2 mg			
Folate	6 mcg	9 mcg			
Choline	4.7 mg	15.8 mg			
Vitamin A	7 mcg	0 mcg			
Beta-carotene	85 mcg	6 mcg			
Lutein and zeaxanthin	9 mcg	32 mcg			
Vitamin K	4.7 mcg	15.6 mcg			

Nutritional value of fig (Source: Medical news today, 2021)

"Land, then, is not merely soil; it is a fountain of energy flowing through a circuit of soils, plants, and animals."