





Project Coordinator

.... a monthly update



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



Issue 21

Project Coordinator

.... a monthly update

March 2022

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, 2022 and targets for April, 2022. We made progress in research and development efforts particularly in 1) district level GHG emission from small ruminants through enteric fermentation for India, 2) collection and conservation of different stress tolerant crop germplasms, 3) recording of various trait observations in mutant lines of quinoa and chia, 4) recording of physical and chemical parameters of sapota, guava and grapes 5) sunburn and canopy management in dragon fruit, 6) recording of comparative hematological status in different breeds of goat for the month, 7) the Illumina sequencing libraries for all samples for NGS sequence data generation,8) harvest of sugarcane with measurement of cane and trash yield and other yield attributes as well as soil sample collection for chemical and biological analysis, 9) calculation of



Page 02

soil fertility indices of all the states of India, 10) measurement of yield and its attributes for okra and eggplants, 11) study of drought adaptive traits of soybean genotypes, 12) collection and analysis of secondary data related to weather events occurred in Baramati tehsil, and 13) nursery preparation of red pulp dragon fruit.

Besides several research activities, some important events and extension activities were organized during the month of March. Around 313 visitors comprising farmers, state agricultural departments, students and FPO's visited to ATIC/museum, research fields of ICAR, NIASM during the month. The institute also celebrated International Women's Day on 8th of March, 2022 with the organization of a health camp for all the women staff of ICAR, NIASM. An exposure visit cum interaction meeting of NABARD officials held at ICAR, NIASM on 11th March, 2022. The interaction session between the team of NABARD and Scientist from ICAR-NIASM explored possibilities of collaborative work in the areas of Agroforestry, Geo-spatial data exchange, development activities at Nandurbar District, Climate Smart-Integrated farming Systems (CIFS) and bringing resilience to soybean cotton cropping systems in Vidharba region of Maharashtra, Silage formulations from sugarcane tops in drought stressed areas, and management strategies in salinity stressed sugarcane belt of Kolhapur District of Maharashtra.

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.

Contents	
Page 3	Umbrella Projects
Page 4	Flagship Projects
Page 5	In-house Projects
Page 6	Externally-aided Projects
Page 7	Easy and low cost propagation technique in dragon fruit

Contributors Principal Investigators & Co-Principal Investigators of all the projects

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(Himanshu Pathak)



Celebration of International Women's Day Day at ICAR, NIASM, Baramati

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):** Himanshu Pathak, Amresh Choudhary, Ram N Singh, Dhananjay D Nangare, Nitin P Kurade, Sachinkumar S Pawar, Mukeshkumar P Bhendarkar, Gopalakrishnan B, Sunil V Potekar, Pravin H More



Outputs

- District level Geo-spatial maps of GHG emission from small ruminants through enteric fermentation for India.
 - Calculation of soil fertility indices for all states of India.
- Conceptualization of methodology for better estimates of sugarcane biomass burnt area.

Targets for next month

- Continue with soil data curation based on additional criteria.
- Continue with work on finding Soil stress indices for all states of India.
- Continue with dataset collection across web-resources.

GHG emission from cattle

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

- Threshing & post-harvest observations of accessions of foxtail millet (118), finger millet (77), & ground nut accessions (181).
- General crop management practices like thinning, weeding, irrigation in wheat, chia and quinoa.
- Collection & conservation of different citrus rootstocks.

Targets for next month

- Agronomic crop management practices in wheat and quinoa germplasm.
- Recording of growth rate in different Citrus rootstocks.

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, Hanamant M Halli, Pravin B Taware, Rushikesh Gophane, Noshin Shaikh, Santosh Pawar and Avinash V Nirmale



Sunburn management in dragon fruit

Outputs

- Irrigation scheduling as per deficit irrigation treatments in pomegranate.
- Observations on PAR, biochemical analysis, biomass at harvest of chickpea in aonla.
- An experiment to protect dragon fruit from sunburn, plants have been covered with different colour shade nets (Green, black and white) having different shade factor (35 and 50%).
- Removal of unwanted cladodes and tying of cladodes to the support system was done to promote proper growth of plants in dragon fruit.
- Third pruning was taken under the experiment on Canopy management in dragon fruit to remove new sprouts below the plate and encouraged new sprouts above the plate.
- Nursery preparation of red pulp dragon fruit; collection of yield data of sapota.
- Recording of yield and other physical quality parameters in grape.

Targets for next month

- Post-harvest fruit quality analysis of sapota, grapes and guava; irrigation scheduling in pomegranate as per deficit irrigation treatments.
- Sunburn and canopy management experiment in dragon fruit: observations on plant growth, physiological parameters and disease control.

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



Pollination by honeybees

- **Outputs** • Intercultural operations in cluster bean, maize and okra.
- Sowing and intercultural operation in fodder sorghum.
- Targets next month
 - Organic mulching to fruit and agroforestry trees.
 - Harvesting of safflower and groundnut.
 - Stocking of fish in farm pond.
- Primary tillage operations in C-10 plot.
- Trash management for ratoon sugarcane.



Intercultural operations in cluster bean & maize

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, Gopalakrishnan B, Rajkumar, Mukeshkumar P Bhendarkar, Ram N Singh, Dhananjay D Nangre, Avinash V Nirmale



Outputs

- Recording of comparative status of growth, feed & water intake, physiological and haematological parameters in four breeds of goat for March, 2022.
- Evaluation of biochemical parameters in different breeds of goats using commercially available human kit.
- Continuation of mass culturing of BSF as novel protein for poultry& fish.
- Assessment of thermal stress in poultry and goat for March.
- Establishment of Azolla production unit.
- Analysis of various growth parameters of GIFT Tilapia in response to salinity stress.

Growth parameters of GIFT tilapia fish exposed to various salinity stress

Targets for next month

Evaluation of stress parameters & parasitic prevalence in goat breeds; survey of goat farmers and haematological analysis of field and experimental goats; Acclimatization studies of cold water fish Mahaseer; amplification of HSP genes from poultry; improvement of breeding unit of BSF & mass culturing.

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

Outputs

- Harvesting and threshing of quinoa.
- Monitoring Quinoa and Chia M2 populations to identify the desirable mutant types for flowering, branching, foliage color etc.
- Labelling the identified lines to observe modifications at post flowering

stage

- **Targets for next month**
- Recording of yield attributes in quinoa.
- Observation at maturity stage in M₂ mutant lines of quinoa &chia.

Monitoring Quinoa and Chia M2 populations

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

- Generation of pair-end Illumina NGS sequencing reads (0.1 Million reads R1 and R2 reads) from three halophytic plants for study of uncultured endophytic microbes from root, stem and leaves.
- Configuration of QIIME2 bio-informatic analysis pipeline for amplicon microbiome data analysis on NIASM server.

Targets for next month

- Microbiome analysis based NGS data.
- Submission of RPP-II to PME.

Representative Phred quality scores of NGS sequence data from root

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

- Collection and analysis of secondary data related to weather events occurred in Baramati tehsil which indicated that this year average rainfall and rainfall intensity was higher than usual average rainfall of the region. However, the period of rainfall was getting shorter.
- Co-ordination of visit of farmers, state departments, students and FPO's (313 visitors) to ATIC/museum, research fields of ICAR, NIASM.

Targets for next month

- Field survey and data collection of farmers regarding biophysical and socio-economic constraints.
- Procurement and distribution of critical inputs to farmers under TSP and SCSP program.
- Coordination of extension activities and visits of farmers/students at/to NIASM.
- Development of ATIC and agro-tourism activities.



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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

- Biochemical analysis of eggplant, sapota and okra fruits.
- Measurement of yield and its attributes for okra and eggplants.
- Completion of first draft of MS on the onion responses to PGRs under waterlogging experiments.

Targets for next month

- Measurements of biomass and fruit yields in eggplant and okra fruits.
- Measurements of biochemical traits of okra.
- Submission of the MS the onion responses to PGRs under waterlogging experiments.





Post-harvest quality parameters of okra

2. Genomics, genetic and molecular approaches to improve water stress tolerance in soybean and wheat

PI: Ajay Kumar Singh



Outputs

- Soybean genotype PLSO-79 revealed longer roots under PEG induced desiccation and also without PEG (Control conditions) as compared to check variety JS-7015.
- Soybean genotypes MACS450, VLS75, PLSO-79, CO-Soyba-2 revealed higher root biomass under PEG induced desiccation and also without PEG (Control conditions) as compared to check variety JS-9560.

Targets for next month

- Drought related adaptive traits study in 18 promising soybean genotypes.
- Morphological, physiological and molecular analyses of EIN2-silenced soybean plants under well-watered and water deficit conditions.

Project Coordinator

EXTERNALLY-AIDED PROJECTS

Page 06

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

- Extraction of the high quality DNA from exo-polysaccharide secreting microbial stain for whole genome sequencing. Finalization and execution of the proposals for whole genome sequencing of the WGS.
- Compilation of the information for AMAAS annual report and submission to nodal Centre.

Continuation of global metabolome data analysis.

Targets for next month

- Genome assembly and annotation of the Whole genome sequencing NGS data.
- 2- Deciphering the genomic basis of hyper-secretion of exo-polysaccharide by the microbial strain.

Extraction of microbial DNA for its integrity on 0.8% agarose gel

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

- Establishment of various CA treatments in ration sugarcane crops in harvested field plots.
- Measurement of N, P, K and organic C of soil samples in CA field experiments. Targets for next month
- Measurement of real time soil-plant parameters under varied bio-regulators and water stress treatments in sugarcane.
 - Soil and plant sampling for N, P, K and org C analysis of the existing field trials.



Establishment of various CA treatments

EAP 3. Genomics strategies for improvement of yield and seed composition traits in soybean under drought stress conditions (Funded by: ICAR-NASF)

PI: Ajay K Singh; Co-PI(s): Amresh Chaudhary, Jagadish Rane, Pravin B Taware and Himanshu Pathak

Outputs

- Evaluation of promising soybean genotypes Co-Soy2, MACS-450, PLSO-79 and VLS-75 were evaluated for root traits under control (without PEG) and induced desiccation (supplemented with 7.5% PEG in ¹/₂- MS medium) employing in vitro techniques.
- Soybean genotypes PLSO-79 had higher biomass and longer root as compared to check varieties JS-7105 and JS-9560.

Targets for next month

- Expression profiling for EIN2 gene in in 18 promising soybean genotypes under no stress and water deficit conditions.
- Yield related attribute study in promising wheat genotypes EC-573623, IC-549394, IC-112051, IC-542040, IC-549526.





Evaluation of soybean genotypes for root length

Evaluation of soybean genotypes for root biomass

Easy and low cost propagation technique in dragon fruit

Sonal D. Jadhav, Vijaysinha D. Kakade, D D Nangare, Sangram Chavan

Dragon fruit (*Hylocereus polyrhizus*) is popular in South East Asia. It is an edible vine cactus species belonging to the family Cactaceae which has received worldwide recognition first as an ornamental plant and then as a fruit crop. It is commonly called as Pitaya. It is one of the newly introduced exotic fruit crop in India. It is well known for its rich nutrient contents specially vitamin C, phosphorus, calcium as well as its antioxidant characteristics. Dragon fruit can either be propagated by seed and/or cutting. The seed propagated plants are not true to type and possess longer juvenile period. The best and fastest way of multiplying the dragon fruit is by cuttings. While making selection of cuttings, few points are to be kept in mind. The cutting should be taken from healthy mother plants. Cuttings should be free from pest and disease. The mature cuttings of 15 to 30 cm or whole segment of cladode with uniform dark green colour should be selected for multiplication. The selected mother plants from where the cuttings are to be taken, are needed to be kept in the shade for at least 2-4 days to avoid any fungal diseases.

Fungicide treatment

SAAF is systemic and contact fungicide that is used to prevent fungal diseases and helps to plant growth. It contains (Carbendazium12%+Mancozeb63%). The cuttings are to be dipped in the solution prepared by mixing 1 gram of SAAF per litre of water.

Raised Bed preparation and planting

- While preparing the nursery, dragon fruit can be planted in nursery bags or on raised beds. Raised bed planting is easy and cost saving. For that raised bed should be prepared e.g. 2-3m x 1m dimensions and mixed with FYM.
- The base of cuttings should be dipped in the SAAF solution for 5-10 seconds followed by their planting in the nursery bags or beds.
- Irrigation has to be given to the cuttings as per requirement.



Dragon fruit (Hylocereus polyrhizus) propagation on raised bed at ICAR-NIASM

"Do not lower your goals to the level of your abilities. Instead, raise your abilities to the height of your goals."

-Swami Vivekananda