January
2022

भाकृअनुप
ICAR

राअस्ट्रैप्रसं
NIASM

Project Coordinator

.... a monthly update

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

Project Coordinator

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From Director's Desk

New Year Greetings from ICAR-NIASM…

The current issue on Project Coordinator highlights the progress made under all the ICAR-NIASM projects during January, 2022 and targets for February, 2022. We made progress in research and development efforts particularly in 1) compiling soil chemical status data set for various states of India, 2) sowing of abiotic stress tolerant germplasms of different rabi crops, 3) recording of seedling trait observations in mutant lines of quinoa and chia, 4) recording of physical and chemical parameters of dragon fruit, 5) vermicompost unit in CIFS, 6) recording of comparative haematological status in different breeds of goat for the month, 7) Conducting quantitative IAA production assay for bacterial isolates under high salt concentration (3.5% NaCl, w/v), 8) optimization of the protocol for study of endophytobiome (microbial community within root and stem), 9) analysis of socio-economic variables and constraints in farmers' adoption level, 10) measurement of growth, yield and post-harvest quality parameters of eggplant rootstocks at fruit stage using LSS, 11) study of drought adaptive traits of soybean genotypes, 12) programming of various sensors using codes compatible with sensor manufacturer, 13) morphological and molecular characterization of sapota leaf spot.

Besides several extension activities such as visit of farmers, state government officials, students and print media persons to ATIC/museaum and research trials were carried out. One day training cum field demonstartion on 'Conservation agriculture for sugarcane and water stress impacts in vegetables crops' was organized by ICAR-NIASM on 20th January 2022. A team of 70 progressive sugarcane farmers and agricultural officials (leaded by Mr RL Larle, Agricultural Officer) from the state agriculture department, Paithan and Phulambri Tahsils of Aurangabad district participated in the field training on conservation agriculture and information on alleviating water stress in eggplant using potential wild rootstocks. The institute also celebrated New year on 1st January, 2022 and 73rd republic day on 26th January, 2022 with scientists, technical, administrative, SRFs, students, young professionals and supporting staff of the institute.

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)

Contents

Contributors

Principal Investigators & Co-Principal Investigators of all the projects

Compiled & Edited by

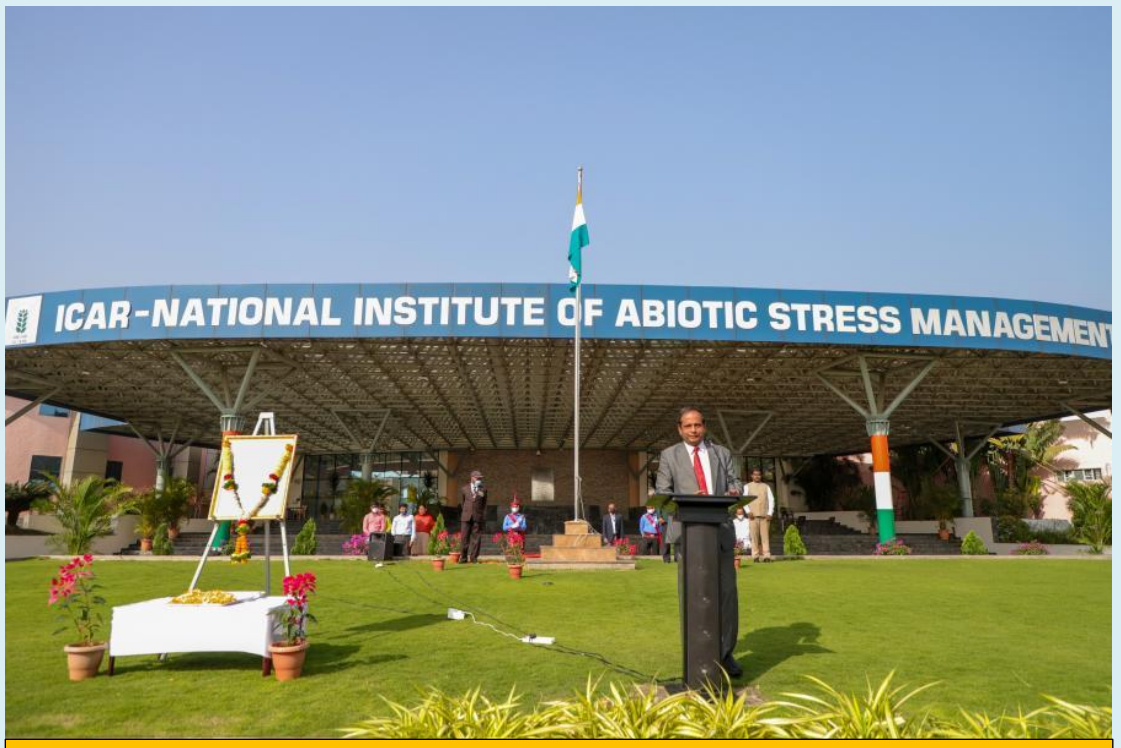
Dr. Aliza Pradhan, Scientist

Technical Assistance

Mr. Pravin Hari More

Published by

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

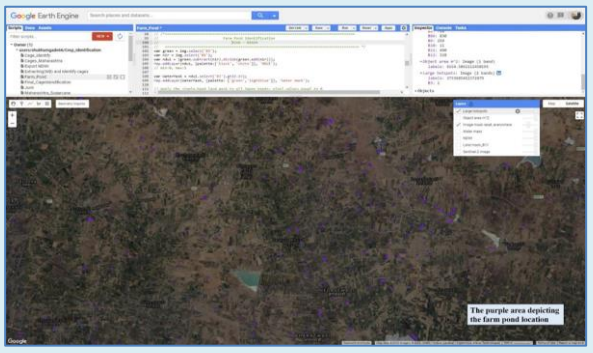


Celebration of 73rd Republic Day at ICAR, NIASM, Baramati

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



Identification of farm ponds using satellite imagery

Outputs

- Compilation of datasets on soil chemical properties for all the states of India.
- Remote sensing method for identification of farm ponds and storage water tanks using satellite imagery.
- Compilation of fire events database for targeting preventive measures in sugarcane growing areas.

Targets for next month

- Continued work on finding soil stress indices for all states of India.
- Continue with dataset collection across web-resource.

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 foxtail millet (118 accessions) and finger millet (77 accessions), & ground nut accessions (181 germplasm).
- 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.

Citrus rootstock 'Succatan'

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


Effect of bio-stimulants in grapes

Outputs

- Second pruning in dragon fruit; pruned biomass mixed with other grasses to prepare silage.
- Irrigation scheduling and collection of RWC data in pomegranate.
- Morphological & molecular characterization of sapota leaf spot; growth and yield data of sapota.
- Observations on PAR, biochemical analysis, biomass at 60 DAS of chickpea in aonla.
- Sea algae based bio-stimulant with mix soil reported highest cane length and girth in grape.
- Recording of morphological and physiological parameters in grape since forward pruning.

Targets for next month

- Fruit quality analysis of guava; post-harvest quality in sapota; canopy management, disease control & root studies in dragon fruit; irrigation scheduling in pomegranate.
- Growth, morphological and physiological observations in grapes & sapota.
- Proximate analysis of dragon fruit silage and feed trials.
- Morphological characterization of stem canker pathogen in dragon fruit.

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


Preparation of vermicompost

Outputs

- Harvesting of red gram, coriander & fenugreek.
- Intercultural operation in groundnut and safflower.
- Quantification of moringa biomass & vermicompost.
- Preparation of jivamrut & dashparni ark.
- Observation on green fodder utilization.

Targets next month

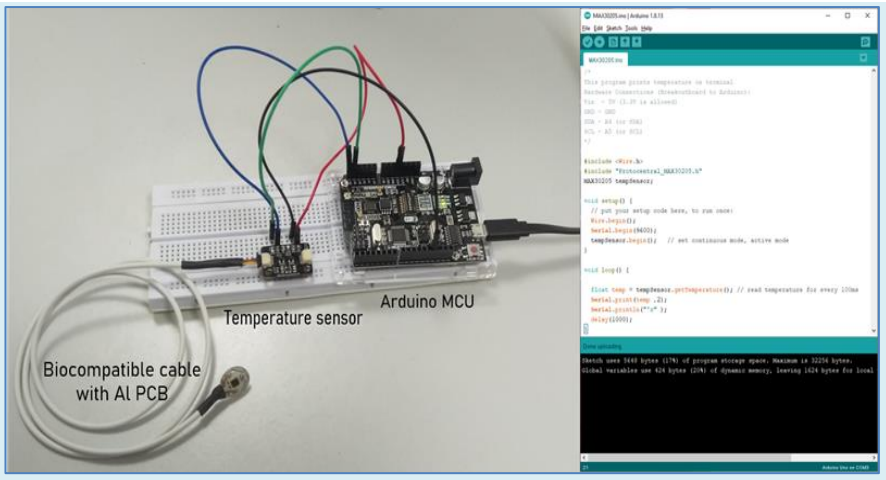
- Sowing, intercultural operations and harvesting of crops.
- Quantification of green fodder from boundary & silvipasture systems.


Weeding in groundnut

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



Trial of sensors integrated with the microcontroller unit

Outputs

- Recording of comparative status of growth, feed & water intake, physiological and haematological parameters in four breeds of goat for January.
- Nutritional analysis of various forage/mixed silage samples.
- Establishment of mass culturing of BSF.
- Assessment of thermal stress in poultry and goat for January.
- Programming of various sensors using codes compatible with sensor manufacturer.
- Evaluation of growth & biophysical analysis of GIFT tilapia to salinity stress.
- Adaptation & rearing of cold water fish Mahaseer in fisheries wet laboratory.

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; DNA isolation from four goat breeds for further polymorphism analysis; amplification of HSP genes from poultry.
- Validation of use of sensors for recording of physiological parameters in livestock; 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

- Thinning, weeding, and gap filling in 30 days old seedlings 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 observations (morphological & physiological) in quinoa.
- Observation at flowering and maturity stage in M_2 mutant lines of quinoa and chia.

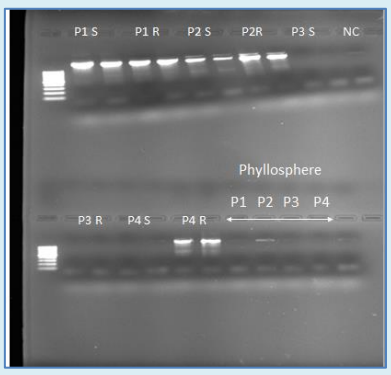
Monitoring Quinoa and Chia M2 populations

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

Sr. No.	Samples	Sample Type collected (Jan, 2022)
1	P1	Plant roots, leaves, & stem and Rhizosphere soil
2	P2	Plant roots, leaves, &stem, Rhizosphere soil
3	P3	Plant roots, leaves, & stem, Rhizosphere soil
4	P4	Plant roots, leaves & stem, Rhizosphere soil



S-shoot endophyte; R – root endophyte

Outputs

- Collection of halophytic plant samples from coastal mangroves vegetation of Diveagar, Konkan region.
- Extraction of the metagenomic DNA for study of shoot, root, and leaf phyllosphere.
- Amplification of 16S rRNA gene for microbiome studies.

Targets for next month

- 16S rRNA amplicon sequencing of metagenomics DNA.
- Pot trials for multiplication of the collected plants.

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

- Majority of the farmers grown Bhagava variety of pomegranate and majority of the orchards grown in murum soil type in Baramati and Indapur Tahsil of Pune district.
- 42.5% of the farmers perceived fruit cracking and sunburning (45%) effect due to high temperature followed by crop loss as major problems in pomegranate.
- Visit of farmers, students and FPO's (215 visitors) to ICAR, NIASM.

Targets for next month

- Field survey and Data collection of Pomegranate farmers and rainfed rabi crop growers.
- Supply of critical inputs to farmers under TSP and SCSP program.
- Coordination of extension activities and visits of farmers/students at NIASM.

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 the real time canopy growth, soil moisture, yield and post-harvest quality parameters at fruiting stage of eggplant rootstocks in water stress using LSS.
- Application of foliar sprays of plant growth regulators and measurement of growth parameters in okra (Cv. Panch Ganga).
- Collection of yield attributes of sapota under different soil treatments.
- Analysis of the two years (2019 and 2020) growth and bulb yield data for assessing the onion responses to water logging stress.
- Draft technology folder on dragon fruit floral biology and pollination.

Eggplant production under water stress using LSS

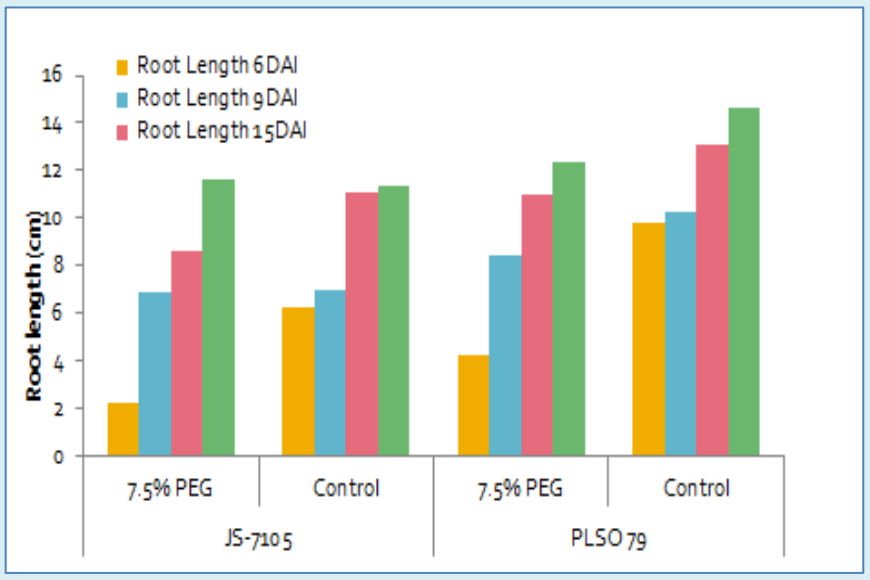
Targets for next month

- Measurement of yields and physico-biochemical quality attributes of eggplant fruits for identifying potential eggplant rootstocks under water stress conditions using LSS.
- Assessing the okra responses to plant bio-regulators in water stress using LSS.
- Measurement of fruit quality parameters of Sapota orchard under different soil treatments.
- Writing draft of MS on effects of plant bio-regulators for alleviating water logging stress in onion.

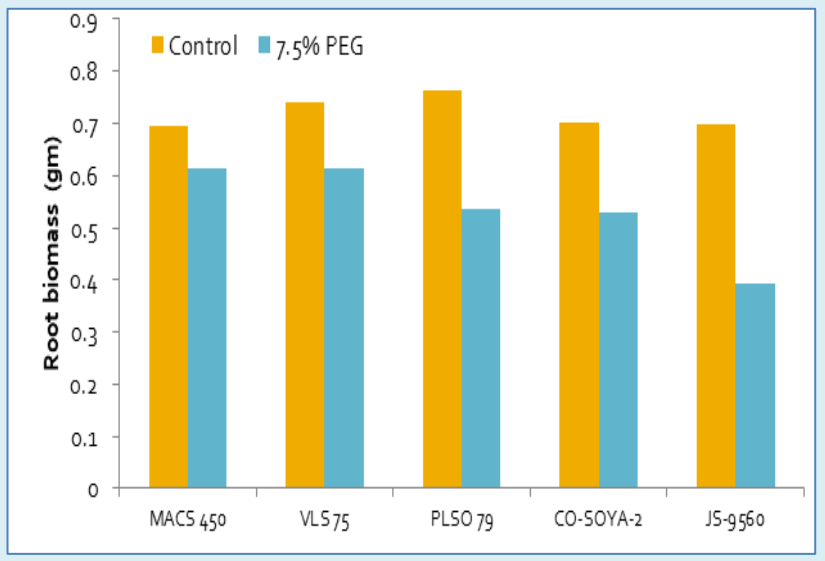
Data compilation/analysis- Draft research article on floral biology in dragon fruit.

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

PI: Ajay Kumar Singh



Screening of soybean genotypes for root traits



Screening of soybean genotypes for root biomass

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

- Root system architecture studies in 50 soybean genotypes under hydroponics conditions.

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

	Seeds per head	Test weight of 1000 seed (g)	Total yield (qa/Ha)	Grain yield (qa/Ha)	Harvest index
Treatment	929.3 ± 80.2	24.1 ± 3.56	65.8 ± 9.18	17.0 ± 2.15	25.9 ± 1.33
Control	897.3 ± 73.9	22.8 ± 4.29	61.1 ± 5.34	15.2 ± 2.18	25.0 ± 4.15

Impact of bio formulation on sorghum yield

Outputs
- Collection and analysis of post harvest data of sorghum.
- Experimental lead on positive impact of bio formulation on the sorghum crop yield and productivity.
- Analysis of the global metabolome data of sorghum.

Targets for next month
- Collection and analysis of post harvest data of pigeon pea bio-formulation trial on IFS field.
- To continue with mapping the identified metabolites on biological pathways.

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
- Measurement of real time soil-water-sugarcane parameters under different CA field experiments.
- Compilation and submission of Annual reports 2021 to consortia leader, IISS, Bhopal.
- Application of bio-regulators and water stress treatments in a newly initiated G x M x E interactions CA experiments in sugarcane cropping system.

Targets for next month
- Measurement of N, P, K and Organic C of soil samples in a CA field experiments
- Measurements yields and post-harvest quality parameters of sugarcane in existing field trials.

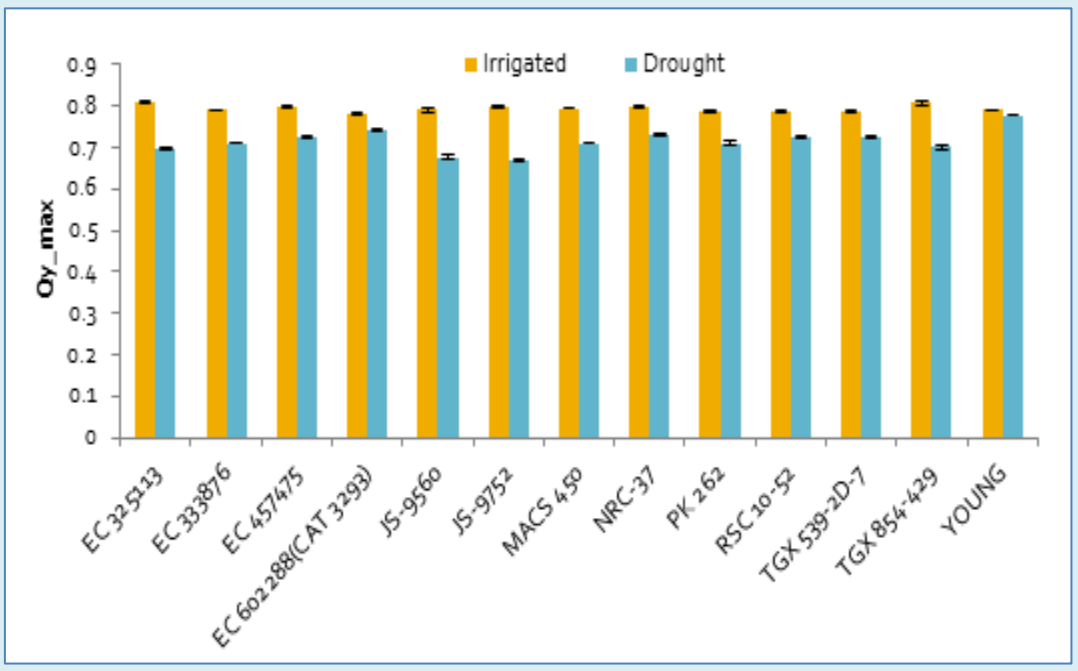
Sugarcane crop ready for harvest in CA

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

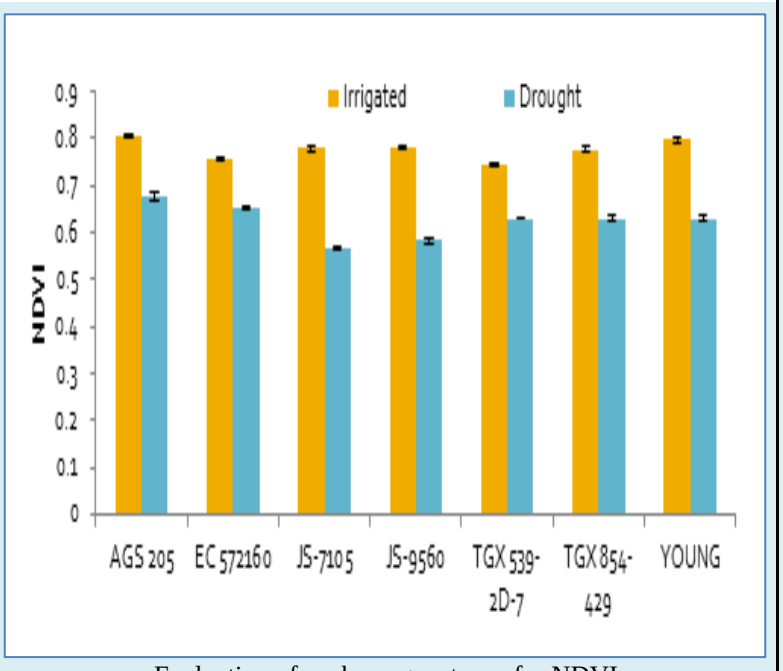
PI: Ajay Kumar Singh; **Co-PI(s):** Mahesh Kumar, and Jagadish Rane

Outputs
- Soybean genotypes Young, TGX539-2D-7, TGX854-429, EC457475 and EC602288 were identified promising for traits like efficient PS-II efficiency as compared to check varieties JS-9560 and JS-9752.
- Promising soybean genotypes AGS 205, EC-572160, TGX539-2D-7, and TGX854-429 having adaptive trait greener canopy as compared to check varieties JS-7015 and JS-9560.

Targets for next month
- Expression profiling of 5 drought responsive genes in 18 promising soybean genotypes under no stress and drought stress conditions.



Evaluation of soybean genotypes for PS-II efficiency



Evaluation of soybean genotypes for NDVI

Crop regulation in Pomegranate

Sonal D Jadhav, D D Nangare, Vijaysinha D Kakade

India is the second largest producer of fruits in world after china. India is rich in fruit diversity starting from tropical, subtropical to temperate region. However, some of the fruits like guava, pomegranate, lemon, mandarin etc., if left without any treatment, give several light harvests of variable quantities and qualities from several flowering flushes throughout the year. In general, there are three distinct flowering seasons i.e. February-March (Ambe Bahar), June-July (Mrig Bahar) and October-November (Hasth Bahar) corresponding with the harvest period of rainy, winter and spring season, respectively. A good quality production can be ensured by regulating the crop in such a way that they could produce only one good quality crop instead of two or three low quality productions within a year.

Principle of crop regulation

The basic principle of crop regulation is to manipulate the natural flowering in desired season that contribute to increased fruit yield, quality and profitability.

Objectives of crop regulation

The main objective of crop regulation is:

- To force the tree for rest and produce profuse blossom and fruits during any one of the two or three flushes in a year.
- To regulate a uniform and good quality of fruits and to maximize the production as well as profit to the grower.
- To reduce cost of cultivation because uninterrupted continuous blossom would produce light crops over the whole year and require a high cost for the monitering and marketing.

The selection of bahar is mainly determined by

- Availability of the irrigation water, Quality of products, Occurrence and extend of the damage by the disease and pests, Market demands, Climate of the area, Availability of fruit in the market, Comparable yields

Methods of crop regulation

In order to get only appropriate season crop, it is necessary to manipulate the flowering. Withholding of irrigation, Deblossoming or Thinning, Root exposure and root pruning, Shoot Pruning, Chemical/PGRs application, Nutrients application, Shoot bending is practiced but withholding of irrigation is commonly practiced in Maharashtra. Withholding irrigation after harvesting of fruit crops, results in the shedding of flowers and making the tree to rest.

Crop Regulation in Pomegranate fruit crop

Pomegranate can blossom continuously upon regular irrigation. The plants under such conditions may continue bearing flowers and bear small crop irregularly at different period of the year, which may not be desirable commercially. In order to avoid this, trees are given bahar treatment. In this treatment, the irrigation is withheld two months prior to the bahar followed by light earthing up in the basin. This facilitates the shedding of leaves. The trees are then pruned to a medium extent at 40-45 days after withholding irrigation. The recommended doses of fertilizers are applied immediately after pruning and irrigation is resumed. This leads to profuse flowering and fruiting. The fruits are ready for harvest 4-5 months after flowering. In tropical condition, there are three flowering seasons, viz., January-February (ambe bahar) June-July (mrig bahar) and September-October (hasta bahar). The fruits of ambe bahar are ready for harvest in the month of June to September. As the fruit development takes place during dry months, they develop an attractive colour and quality, thus suitable for exports. Similarly due to dry weather, the incidences of pest and disease attack are limited. The mrig bahar crop is harvested in December to February and hasta bahar are harvested during the month of March to April. They have very attractive rind with dark coloured arils. Since the availability of the fruits during this season is limited, they fetch high value.

Hasta bahar flowering and fruiting in pomegranate at ICAR, NIASM

"Don't judge each day by the harvest you reap but by the seeds that you plant."

-Robert Louis Stevenson