February
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

Greetings from ICAR-NIASM…

The current issue on Project Coordinator highlights the progress made under all the ICAR-NIASM projects during February, 2022 and targets for March, 2022. We made progress in research and development efforts particularly in 1) district level GHG emission from livestock through enteric fermentation for India, 2) collection and conservation of different citrus rootctocks, 3) recording of various trait observations in mutant lines of quinoa and chia, 4) recording of physical and chemical parameters of sapota 5) morphological & molecular characterization of sapota leaf spot, 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) 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, and 13) nursery preparation of red dragon fruit.

Besides several research and extension activities, some important events were organized during the month of February. The institute celebrated its 14th Foundation Day on 21st February, 2022 where Dr. Trilochan Mohapatra, Secretary, DARE and Director General, ICAR, Ministry of Agriculture and Farmers Welfare, Government of India was the Chief Guest; Dr. S.K. Chaudhari, DDG (NRM) Guest of Honour and Dr. T.A. More, former Vice Chancellor of MPKV Rahuri was the Special Guest. ICAR-NIASM also organized The Krushik: Agricultural Technology Week 2022 in collaboration with Krishi Vigyan Kendra, Baramati during 9th-13th February, 2022. Hon'ble Sharad Pawar, Former Cabinet Minister of Agriculture, Govt of India and currently Member of Parliament, Rajya Sabha visited the Institute on February 3, 2022. On the occasion of World Pulse Day, the institute organized a programme on 9th February, 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

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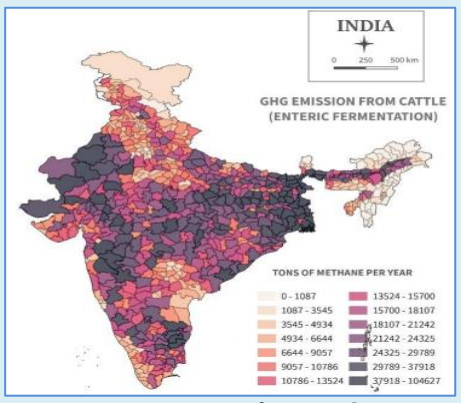
Celebration of 14th Foundation Day at ICAR, NIASM, Baramati

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



GHG emission from cattle

Outputs

- The district level GHG emission from livestock through enteric fermentation for India.
- Compilation of methodologies and datasets for comparative evaluation of sugarcane biomass burnt estimation.

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


Nursery preparation of subtropical fruits

Outputs

- Irrigation scheduling and collection of RWC data in pomegranate.
- Morphological & molecular characterization of sapota leaf spot; collection of yield data of sapota.
- Observations on PAR, biochemical analysis, biomass at 90 DAS of chickpea in aonla.
- Nursery preparation of red dragon fruit and subtropical fruit crops (apple, peach, plum & kiwi).
- Recording of morphological and physiological parameters in grape since forward pruning.

Targets for next month

- Yield and fruit quality analysis of sapota; canopy management, disease control & root studies in dragon fruit; irrigation scheduling in pomegranate as per deficit irrigation treatments.
- Molecular characterization of stem canker pathogen in Dragon fruit.
- Proximate analysis of dragon fruit silage and initiation of feed trials.
- Recording of morphological and physiological traits, yield and quality parameters in grape.
- Recording of yield of aonla at the time of harvest.

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

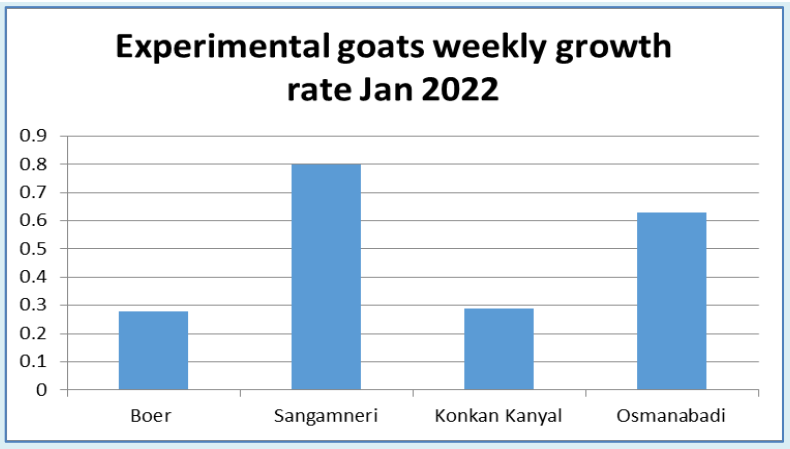
- Sowing, intercultural operations and harvesting of crops.
- Quantification of green fodder from boundary & silvipasture systems.


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



Weekly growth rate (Kg/week) of different breeds of goat

Outputs

- Recording of comparative status of growth, feed & water intake, physiological and haematological parameters in four breeds of goat for February, 2022.
- Evaluation of growth rate revealed that it was better in Sangamneri and Osmanabadi goats during January.
- Continuation of mass culturing of BSF as novel protein for poultry& fish.
- Assessment of thermal stress in poultry and goat for February.
- Programming of various sensors using codes compatible with sensor manufacturer.
- Tissue samples of GIFT Tilapia in response to salinity stress processed for histopathological studies.

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.
- Establishment of Azolla production unit; 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 60 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

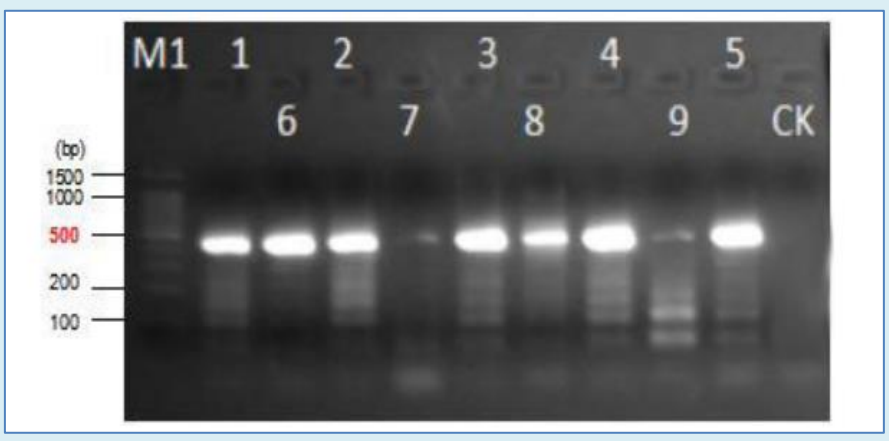
- Recording of observations (morphological & physiological) in quinoa.
- Observation at maturity stage in M_2 mutant lines of quinoa &chia.

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

- The V3-V4 region of 16S rRNA gene is amplified for study of endophytic microbial communities associated with four halophytic plants.
- The Illumina sequencing libraries for all samples have been successfully generated for NGS sequence data generation.

Targets for next month

- NGS Sequence data generation.
- Data analysis using QIIME/DADA2 bioinformatic packages.

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

- Field survey and data collection of pomegranate farmers on socio-economic and bio-physical constraints in Indapur Tehsil of Pune.
- Organization of the Krushik-Agricultural Technology Week 2022 from 9-13 February, 2022.
- Co-ordination of visit of farmers, state agricultural departments students and FPO's (245 visitors) to ATIC/museum, research fields, CIFS model of ICAR, NIASM.

Targets for next month

- Field survey and data collection of farmers regarding bio-physical 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 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.
- Measurement of yields and post-harvest quality parameters of okra under DI and PBRs treatments using LSS.
- Measurement of physical quality attributes for sapota in varied soil treatments.

Targets for next month

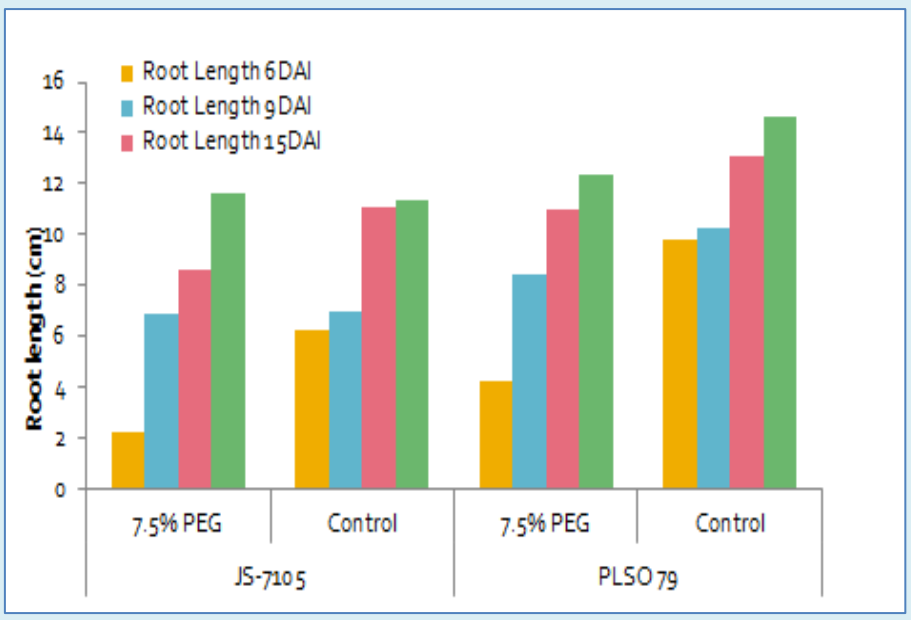
- Physico-biochemical analysis of eggplant, sapota and okra fruits.
- Manuscript preparation on the study of the effects of plant bio-regulators and water logging stress in onion.
- Measurement of real time plant-soil and irrigation parameters under LSS field experiments.

Post-harvest quality analysis of sapota

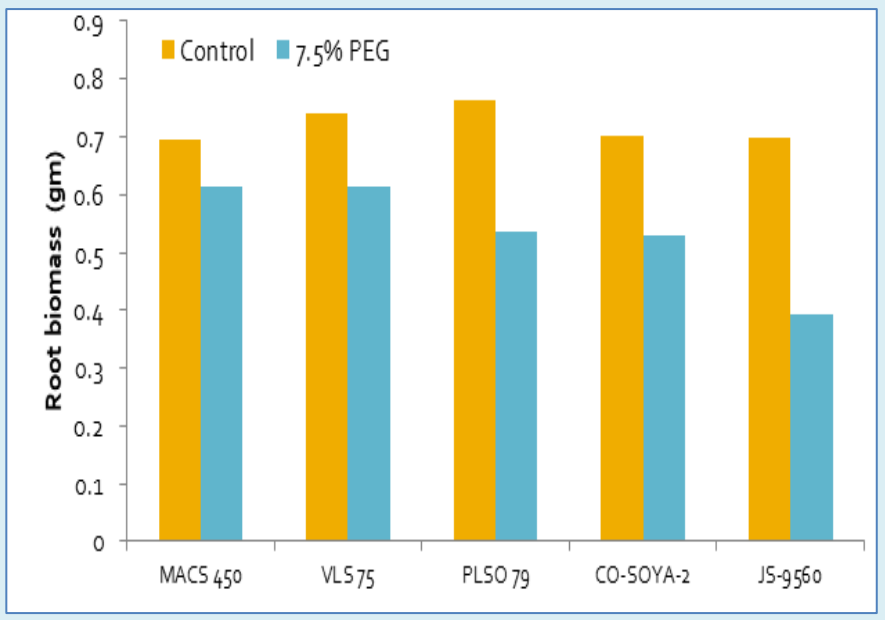
Post-harvest quality parameters of okra

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

PI: Ajay Kumar Singh



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

- Drought related adaptive traits study in 18 promising soybean genotypes.

EAP 1. Evaluation of halotolerant rhizobium and PGPB based biomolecules for alleviation of drought and salt stress (Funded by: AMAAS, NBAIM, Mau)

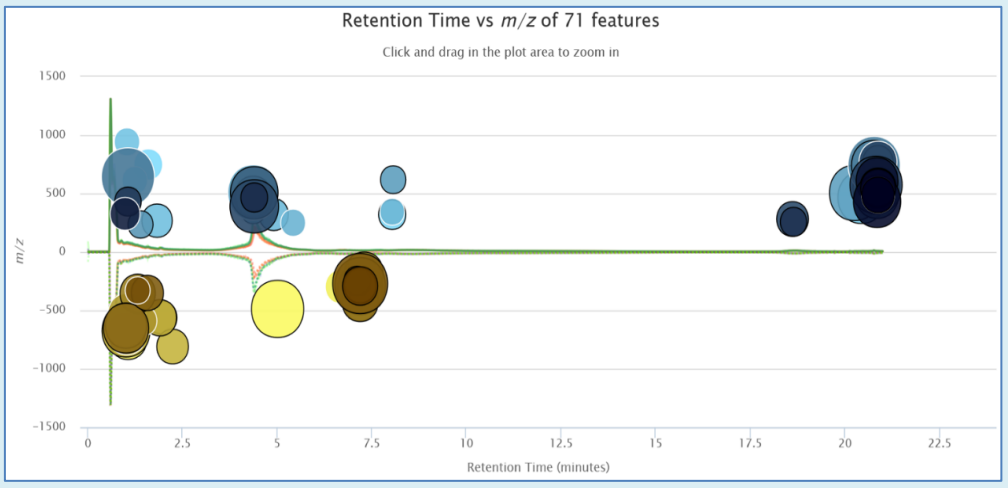
PI: Satish Kumar; **Co-PI:** Goraksha C Wakchaure

Outputs

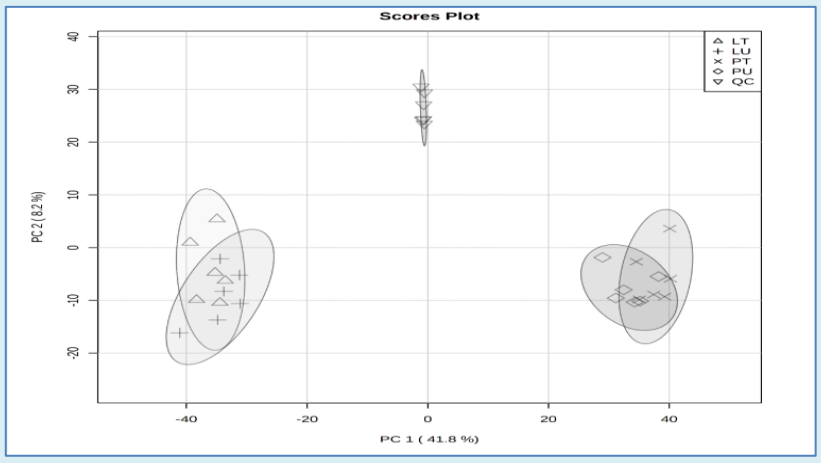
- The global metabolic profile data of the sorghum leaf (treated plants, Bioformulation) and Leaf (Untreated plants) analyzed and PCA analysis resulted in separate clustering.
- Juvenile pods metabolic profiling also showed the change in metabolic profile under treated and untreated conditions.

Targets for next month

- In-depth data analysis of global metabolome and identification of significant metabolites of sorghum plants samples.
- To continue with mapping the identified metabolites on biological pathways



Metabolic Cloud Plots of LT vs LU and PT vs PU pair group comparisons



PCA Plots of (Treated Leaf), LU (Leaf Untreated), PT (Pod Treated), PU (Pod Untreated), QC (Quality Control samples)

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 cane and trash yields and post-harvest quality parameters during harvest.
- Soil and plant sampling for N, P, K and Organic Carbon analysis of the existing field trials.
- Measurement of real time soil-plant parameters under varied bio-regulators and water stress treatments.

Targets for next month

- Establishment of various CA treatments in ratoon sugarcane crops in recently harvested plots.
- Measurement of chemical and biological properties of soil samples collected after harvest.

Harvesting of sugarcane crop in CA

EAP 3. N-(n-butyl) Thiophosphoric Triamide (NBPT) as a urease inhibitor for improving nitrogen use efficiency in sugarcane cropping systems in India (Funded by: CIMMYT)

PI: Aliza Pradhan; **Co-PI(s):** Amresh Chaudhary, Jagadish Rane, Pravin B Taware and Himanshu Pathak

Outputs

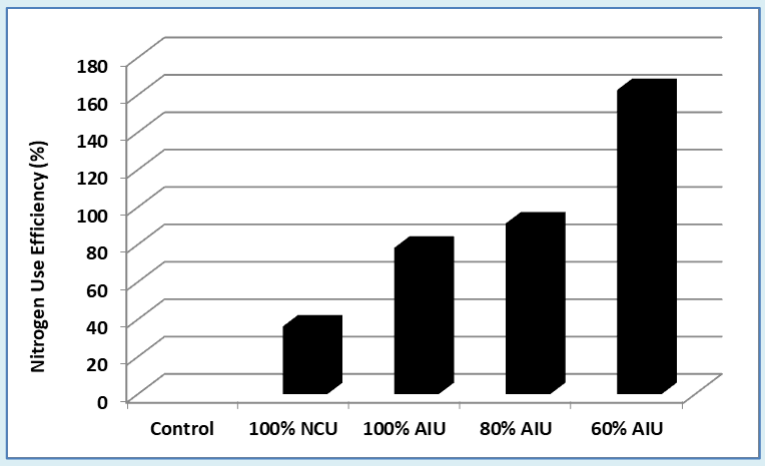
- Delayed urea hydrolysis in agrotain treated plots irrespective of the nitrogen fertilizer application during the sugarcane growth stages.
- Significantly higher yield and nitrogen use efficiency in agrotain treated plots.

Targets for next month

- Data analysis and ratoon sugarcane management.

Treatments	Plant Height (cm)	Cane girth (cm)	No. of nodes	Internode length (cm)	No. of millable canes per stool	Weight of millable canes per m2	Cane yield (t/ha)
Control	271.33	9.24	19.97	11.94	9.75	9.45	94.5 d
100% NCU	275.47	9.43	19.44	11.76	8.25	10.53	105.35 c
100% AIU	251.05	9.00	11.32	11.32	9.75	11.79	117.96 b
80% AIU	264.66	9.42	11.79	11.79	8.75	11.63	116.39 b
60% AIU	265.69	9.40	19.61	11.40	9.75	12.37	123.77 a

Sugarcane yield and yield attributes



Assessment on nitrogen use efficiency

Microclimatic modifications to reduce climatic risks

Sunil Potekar, Sr. Tech. Asst. (Agrometerology)

Microclimatic modifications can be an effective adaptation strategy in reducing the climatic risks and better utilization of available natural resources, result in higher agricultural productivity. Microclimate refers to climatic conditions in a smaller area i.e. a few meters above or below the earth surface or within the crop canopy (Yoshino,1974). It is the local climatic condition near the ground or area around the plants (up to about 2m height) resulting from the general climatic conditions (Maliwal, 2011). Microclimate of the crop varies from top to bottom of the canopy. All the crop management practices namely sowing time, planting method, row spacing, intercropping, tillage practices, mulch application, shelter belts and irrigation management etc. affect the microclimate due to their effect on canopy temperature, wind speed, soil moisture, light interception and rate of water loss etc. In other words, these microclimatic modifications affect the rate of exchange processes within the canopy as well as between the canopy and the surrounding air. Thus, by making some alterations / adjustments in crop management, we can modify the crop microclimate without any significant financial burden.

Major processes of microclimatic modifications include controlling of heat load, water balance, wind speed and modification of temperature and solar radiation. Heat load on crop canopy can be increased (during winter) called heat trapping, or decreased (during summer) called heat evasion. Heat evasion can be achieved by shading the crop, irrigation management or by using anti-transparent, whereas heat trapping can be achieved by adopting appropriate row direction or plant density (Mavi, 1994). Controlling the water balance involves increasing the amount of water stored in the root zone (by strip cropping, contour cropping, ploughing, terracing or bunding), increasing infiltration (by increasing tillage or increasing row spacing), reducing soil evaporation (by using mulches and crop residues, plastic covers or thick cultivation crops), modifying transpiration (by using anti-transparent, substances forming film on leaf surface, stomata closing materials and reflect ants).Whereas, winds can be controlled by applying wind breaks or shelter belts. These protections reduce wind speed on the leeward side and save the plants from freezing injury and mechanical damage. Modification of solar radiation can be accomplished by increasing the surface absorptive power, reflective power of the surrounding objects, exposure through site selection, increasing the radiant energy by fog dissipation and by adopting appropriate row direction. Similarly, soil temperature can be modified by mulch application and soil tillage etc. Mulch helps in reducing the soil temperature in summer and increasing during winter season. Similarly soil tillage by harrowing or inter-cultivation also helps in modifying the soil thermal regime. Similarly, protected cultivation under controlled environment like green houses (for temperature, humidity and CO2 control), poly houses (naturally ventilated or with controlled environment) and shade houses (for crop production in warm climate) provide other means for raising crops under controlled microclimatic conditions.

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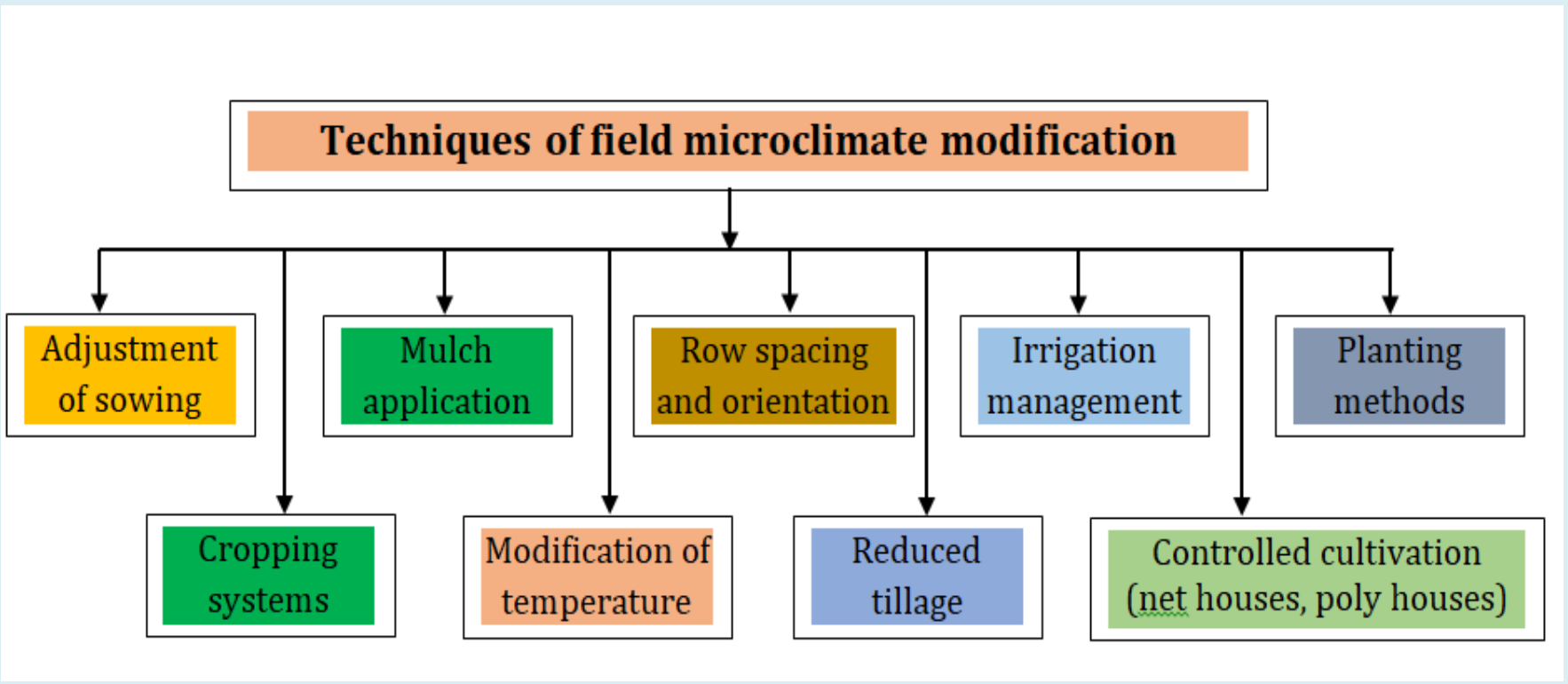

Schematic representation of techniques for field micro-climate modification

"It always seems impossible until it's done."

-Nelson Mandela