

**July
2020**



Project Coordinator

.... a monthly update



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

From Director's Desk

ICAR-National Institute of Abiotic Stress Management (NIASM) was established for management of abiotic stresses in agriculture employing advanced tools of basic and strategic research and developing technologies for the farmers. The institute now has well-developed infrastructure, high end equipments, research farm and laboratories. The research programmes are reoriented to accomplish the vision and goal of the institute and being operative under four project categories viz., Umbrella Projects at inter-Institute level, Flagship Projects at inter-School level, In-house Projects at individual scientist level and Externally-aided Projects funded by external agencies.



Publication of the **NIASM Project Coordinator** was conceptualized in order to provide a brief information on research teams, achievements during last month and targets for the coming month. It also includes sections on 'Insights from global research' and 'A leaf from history' on historical developments in abiotic stress management for reader's interest. I sincerely hope that the bulletin will help the scientists and the farm personnel of NIASM and other research Institutes to improve the coordination among scientists, technical, administrative and farm staff for implementing the planned activities.

I thank Dr. Aliza Pradhan and team for their dedication and sincerity in bringing out this publication and wish that the first issue would be received well by readers across all domains.



(Himanshu Pathak)

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Contributors

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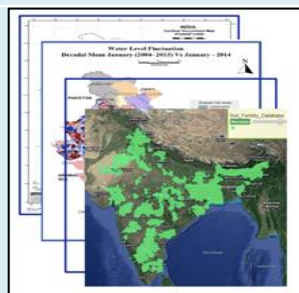
Dr. Himanshu Pathak, Director
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“Words do not create transition. Ideas do.” - Peter Jacobi. The quote aptly describes the reorientation of projects at ICAR-NIASM for accomplishing the vision and goal of the institute. Currently, there are four umbrella projects: a) Abiotic Stress Information System (ASIS); b) Germplasm Conservation and Management (GCM); c) Model Green Farm (MGF); and d) Climate resilient Integrated Farming System (CIFS). Similarly, flagship projects include: a) Atmospheric Stress Management in School of Atmospheric Stress Management; b) New Crops in School of Drought Stress Management; c) Biosaline Agriculture in School of Edaphic Stress Management and d) Technology Targeting and Policy in School of Policy Support Research. In addition, there are three to four in-house projects in each school, being monitored by individual scientists at their level along with few externally aided projects.

During the last month, all the umbrella and flagship project proposals were formulated, revised and submitted to PME cell and activities were initiated regarding procurement, installation, construction and implementation. Several communications for inter institutional collaborations were also made. Preparatory tillage, lay out, fertilizer application and crop sowing activities were completed in projects comprising *kharif* field experiments. Laboratory and green house experiment activities were also initiated.

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 and Mukeshkumar P Bhendarkar, Madhukar L Gubbala, Sunil V Potekar, Pravin H More

Concept of ASIS

Outputs

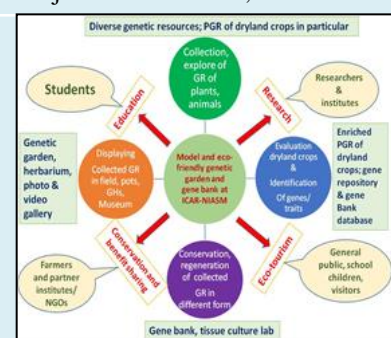
- The freely available datasets related to edaphic and water resources, atmospheric parameters and livestock were searched using Google dataset search engine.
- Communication with potential collaborating institutes.

Targets for next month

- Further exploration of literature/websites/open data sources for stress mapping.
- Collection of data pertaining to past 20 livestock censuses for further compilation.
- Correlating important outbreaks of livestock diseases with climate variations.
- Organization of Webinar on “Geo-Spatial Abiotic stress characterization and management.

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, Jagadish Rane, Pravin B Taware, Aniket More, Rushikesh Gophane, Lalitkumar Aher

Concept of GCM

Outputs

- Communications for inter-institutional collaboration requesting seed/planting material of different crops.
- Identification and allotment of land for genetic garden.
- Collection of soybean germplasm for multiplication and maintenance.

Targets for next month

- Sowing of collected germplasm.
- Planning, designing & layout of genetic garden.
- Planting border trees/plants in the garden.
- Multiplication of plants/saplings for garden.

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):** Goraksha C Wackchaure, Bhaskar B Gaikwad, Vanita Salunkhe, Rajkumar, Paritosh Kumar, Aliza Pradhan, Amresh Chaudhary, Mukesh kumar P Bhendarkar, Pravin B Taware, Rushikesh Gophane, Noshin Shaikh, Santosh Pawar, Avinash V Nirmale, Himanshu Pathak

Installation of parapheromone traps for fruit fly in dragon fruit

Outputs

- Preparation and submission of Project proposal.
- Installation of automation system in the farm.
- Installation of 10 parapheromone (Methyl eugenol) traps for monitoring of fruit flies (FF) in dragon fruit.

Targets for next month

- Data collection on water requirement of different crops under surface and drip irrigation.
- Monitoring disease pest attack in dragon fruit; isolation & purification of pathogenic fungi.
- Collection and analysis of soil samples of each research plot in the farm.
- Monitoring progress of automation system installation in field.

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

Intercropping of groundnut in pomegranate orchard

Outputs

- Collection of baseline soil samples (48 in no.).
- Application of available vermi-compost.
- Land preparation and sowing of crops.
- Communication for inter-institutional collaboration.

Targets next month

- Lining of geo-membrane HDPE sheet in fish pond.
- Planting of horticulture and agro-forestry plants.
- Design & construction for multilayer farming.
- Analysis of collected soil samples.
- Appropriate intercultural operations.

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):** Manoj P Brahmane, 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

Lining of ponds with HDPE sheets

**Outputs**

- Comparative impact of climatic variations/ thermal stress in four different breeds (Osmanbadi, Sangamneri, Konkani Kanyal and Boer) of goats.
- Fish stocking (density) stress experiment with 500, 750 and 1000 fish seed stocking rates for GIFT.
- 650 bp cytochrome c oxidase gene amplified from the fin samples of cold-water fish *Hypselobarbus kolus* for the species identification through DNA sequencing.
- Collection and analysis of district wise rainfall data for Maharashtra.
- Nine small HDPE lined ponds construction completed and filled with water for experiments.

Targets for next month:

- Collection & analysis of goat blood & fecal samples.
- Procurement of temperature humidity recording systems for animal sheds.
- Survey and sampling of fishes in Krishna river.
- DNA extraction and PCR amplification for species identification & fish stock variability assessment.
- Procuring, stocking & rearing of GIF Tilapia.
- Stocking management, acclimatization and conditioning of fish seed.
- Live feed culture unit.
- Post-stocking management of ponds.
- Procurement of materials for detection of acoustic signals in poultry birds.

FP 2. New Crops:

Exploiting Underutilised Crops (ex. quinoa) for Augmenting Income in Water Scarce Regions

PI: Jagdish 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

E brochure for webinar on underutilized crops

Outputs

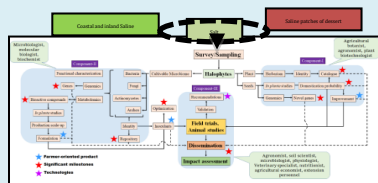
- Project formulation and submission.

Targets for next month

- Conducting National webinar on “Augmenting underutilized crops for farmers income in abiotic stress regions” on 10th August, 2020.
- Preparation of review article on research progress on underutilized crops in India.

FP 3. Bio-saline agriculture:

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

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

Conceptual Framework of Biosaline Agriculture

Outputs

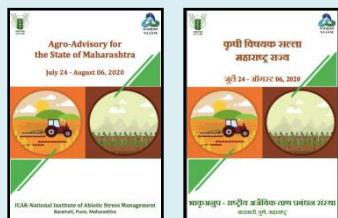
- The project has been proposed, formulated, revised as per suggestions of the experts and submitted.

Targets for next month

- Literature search and preparation of status review article on the halophytes and associated microbiome for ameliorating the saline soil of semi-arid region of the country.

FP 4. Technology targeting and policy:

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

PI: Manoj P Brahmane; **Co-PI(s):** Dhananjay D Nangre, Sachinkumar S Pawar, Sanjiv A Kochewad, Bhaskar B Gaikwad, Boraiah K M, Kartikeyan N, Rajkumar, Mukeshkumar P Bhendarkar, Himanshu Pathak

Agro advisory for Maharashtra

Outputs

- Data collection on the farm pond resource available in Maharashtra.
- Publication of agro advisory both in English and Marathi.
- Preparation of technical report on “Farm Ponds of Maharashtra”.

Targets for next month

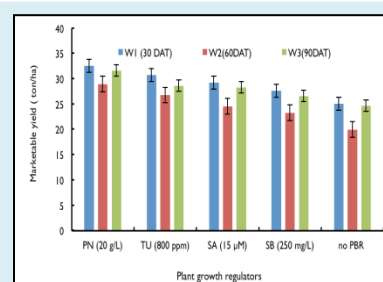
- Completion of the technical report on Farm ponds of Maharashtra.
- Compilation of ITK's for abiotic stress resilience in agriculture, livestock and fisheries.

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:** Nitin P Kurade**Outputs**

- Recording of environmental parameters for heat stress in poultry.

Targets next month

- Preparation of poultry shed for starting new batch of experimental birds.
- Procurement of experimental poultry birds.
- Recording of environmental parameters for heat stress for August.

B) School of Drought Stress Management (SDSM)**1. Mitigating water stress effects in vegetable and orchard crops: Exploring Potential to obviate Water and Temperature Stress in onion (*Allium Cepa* L.) for Enhancing Productivity and Post-harvest Storage Quality****PI:** Goraksha C Wackchaure; **Co -PI(s):** Dhananjay D Nangare, Satish Kumar, Aliza Pradhan, K M Boraiah, Karthikeyan N, Jagadish Rane

Effect of PGR on Onion Marketable yield (PN: 20 g L⁻¹ KNO₃ ; TU: 600 ppm thiourea; SA: 15 µM salicylic acid; SB: 250 mg L⁻¹ sodium benzoate)

Outputs

- Data analysis of the field experiment conducted to evaluate impact of water logging and Plant growth regulators (PGR) on bulb yield and quality of kharif onion (Cv. Bhima Kiran).
- Bulb initiation i.e. at 60 DAT was found to be the most sensitive growth stage to water logging stress.
- PGRs, particularly PN and TU found to most effective in alleviating water logging stress as well as significantly improving the postharvest quality parameters.

Targets for next month

- Determination of real time post-harvest storage quality of onion as affected by different sulphur and water stress regimes.
- Green manuring and field preparation for assessing impact of the sulphur and water stress regimes on onion using LSS.
- Preparation of nursery for onion seedlings.

2. Exploring cropping system approaches for enhanced water productivity and income: Evaluating performance of soybean based cropping systems in response to deficit irrigation**PI:** Aliza Pradhan; **Co-PI(s):** Jagadish Rane, Amresh Chaudhary, Karthikeyan N

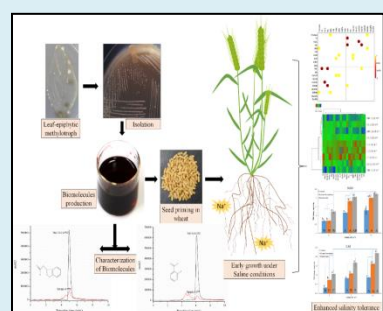
Sowing of crops

Outputs

- Land preparation, layout and basal dose of fertilizer application done.
- Sowing of crops viz., soybean, maize and pigeon pea as per the treatment combinations were completed.

Targets next month

- Gap filling or thinning (as applicable) followed by one hoeing and weeding in all the treatments.

C) School of Edaphic Stress Management (SESM)**1. Isolation and Characterization of Biomolecules Producing Methyl-trophic Bacteria for Salt Stress Alleviation in Crop Plants****PI:** Kamlesh K Meena**Outputs**

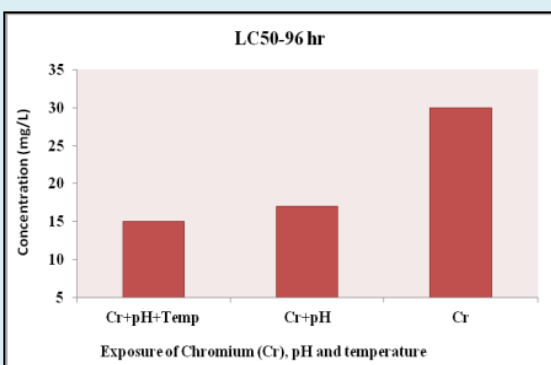
- Data analysis on impact of microbial inoculation of a halotolerant methylotrophic actinobacterium (*Nocardioides* sp. NIMMe6; LC140963) and seed coating of its phytohormone-rich bacterial culture filtrate extract (BCFE) on wheat seedlings grown under saline conditions.
- The study suggested that although microbial inoculation offers stress mitigation in plants, the phytohormone-rich BCFE from *Nocardioides* sp. NIMMe6 has potential implications for defense against salinity stress in wheat.

Targets for next month

- To submit the final technical report of the project.

2. Assessment and detoxification of heavy metals in aquatic water bodies using nutritional approaches

PI: Neeraj Kumar; **Co-PI:** Paritosh Kumar



Outputs

- An experiment was conducted to evaluate the toxicity of chromium concurrently with low pH and high temperature.
- The acute test has been performed to assess the lethal concentration of chromium alone and concurrent with pH and high temperature.
- To find out the lethal concentration of above chemical, range finding test was performed to determine the definitive test concentration.
- Based on definitive concentration finding, the lethal concentration (LC₅₀) of chromium alone and concurrently with pH stress and high temperature was calculated.

Targets for next month

- Based on the above results, a chronic experiment to evaluate the toxicity of chromium alone and with pH and high temperature in 1/10th and 1/5th of LC₅₀ in fish will be conducted.

3. Nutrient and gene interaction approaches through nutri-genomics in response to multiple stressors

PI: Neeraj Kumar ; **Co-PI(s):** Kamlesh K Meena, Ajay Kumar Singh, Satish Kumar

Feed Ingredients	Control	Cu-NPs diet
Soybean Meal	35.5	35.5
Fish Meal	20	20
Groundnut Meal	10	10
Wheat Flour	23.47	23.6695
Sunflower Oil	6	5.8
CMC	2	2
Vitamin Mineral Mixture	2	2
Lecithin	1	1
Vit C	0.03	0.03
Cu-NPs	0	0.0005

Outputs

- The feed formulation of copper nanoparticles (Cu-NPs) has been completed with 35 % protein diet.

Target for next month

- Green synthesis of Cu-NPs from fisheries waste.

4. Dynamics of soil organic matter and primary nutrients in sugarcane-based cropping systems of abiotic stressed regions of Deccan plateau

PI: Amresh Chaudhary; **Co-PI(s):** Aliza Pradhan, Ram N Singh

Outputs

- Post harvesting Depth-wise soil sampling has been completed
- Nutrient analysis of soil samples are carried out.

Targets for next month

- Soil aggregation study in different tillage systems.
- Analysis of soil microbial enzymatic activities.

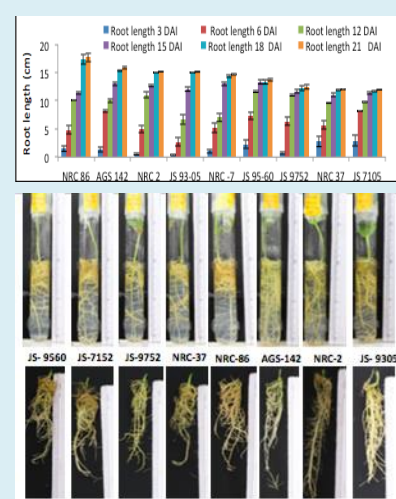


“Agriculture is our wisest pursuit, because it will in the end contributes most to real wealth, good morals and happiness.”

— Thomas Jefferson

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



Genetic variation in root system architecture in soybean genotypes

Outputs

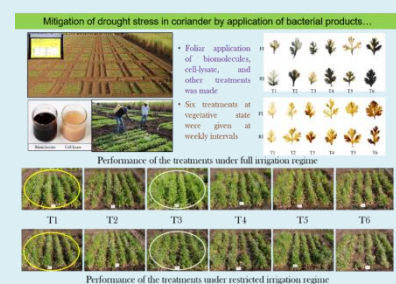
- Thirty six soybean genotypes along with check varieties JS-7105 (drought tolerant), JS-9752 (drought tolerant), JS-9560 (drought susceptible) and NRC-37 (drought susceptible) were inoculated on half-MS medium without any growth regulators (1/2-MS0).
- Soybean genotypes along with check varieties were evaluated for root traits such as root angle, root length at different time intervals, root hairs, root thickness and root biomass.
- Soybean genotypes NRC-86, AGS-142, NRC-2, JS-9305 and NRC-7 showed deeper root system (longer root) and higher biomass as compared to check varieties JS-7105, JS-9752, JS-9560 and NRC-37.

Targets for next month:

- Evaluation of soybean genotypes along with check varieties for drought adaptive traits such as canopy coolness, PS-II efficiency, NDVI value and water status of plants under greenhouse conditions.
- Generation of VIGS plants for ACS silencing gene in soybean using in vitro transcripts inoculation.
- Evaluation of soybean genotypes along with check varieties under waterlogging stress conditions for traits such as canopy coolness, PS-II efficiency, NDVI value, shoot and root biomass.

EAP 2. Evaluation of halotolerant rhizobium and PGPB based biomolecules for alleviation of drought and salt stress (Funded by: AMAAS, NBAIM, Mau)

PI: Kamlesh K Meena; **Co-PI(s):** Goraksha C Wackchaure, Satish Kumar



Outputs

- Bacterial cell lysate and biomolecules for stress tolerance.
- Data analysis and publication.

Targets for next month:

- Sowing of Maize to minimise the fertility variation in the field.
- Analysis of quantitative nitrogen fixation and phosphate solubilization potential of consortium bacterial strains.
- Quantitation of P solubilization, and N fixation ability of six microbial strains.

EAP 3. Climate Smart Management Practices (Funded by: IRRI)

PI: Mahesh Kumar ; **Co-PI(s):** Jagadish Rane, Amresh Chaudhary, Himanshu Pathak



Pot experiment

Outputs

- Conducting experiment on identification of genotypes for weed suppression in direct seeded rice.
- A total of 18 rice varieties including hybrid line were shown in pot.
- The objective is to capture genetic variation in rice cultivars for their weed suppression ability under direct seeded rice.

Targets for next month

- Weed suppression trait will be phenotyped based on shoot architectural responses captured by phenomics tools.

EAP 4. Conservation Agriculture for Enhancing Resource-Use Efficiency, Environmental Quality and Productivity of Sugarcane Cropping System (Funded by: CA Platform ICAR)

PI: Kamlesh K. Meena; **Co-PI(s):** Goraksha C Wakchaure, Mahesh Kumar, Paritosh Kumar, Amresh Choudhary, Aliza Pradhan, Himanshu Pathak



Installation of sub surface drip irrigation

Outputs

- To prepare the Field layout for planting of sugarcane and input procurement.
- To collect Data for crop phenological data.
- To analyze the soil sample for determination of soil aggregation and aggregate associated carbon.

Targets next month

- Setting field experiment for standardization of best suited planting method and irrigation for mitigation of water stress.
- Installation of sub-surface drip irrigation system.
- Application of basal dose in sugarcane.
- Measurement of phenotypic characteristic (Germination and mortality count, plant height, Number of tillers) in plot B1, A2 and B3.

EAP 5. Phenotyping of pulses for enhanced tolerance to drought and heat (Funded by ICAR-NICRA)

PI: Jagadish Rane; **Co-PI:** Mahesh Kumar



Phenotyping of mung bean

Outputs

- A total of 12 mung bean genotypes were passed through near Infrared and Visible sensors daily to record the response of these genotypes under normal and moisture stress conditions.
- In addition to high throughput phenomics, other non-destructive approach like real time chlorophyll fluorescence imaging, etc. were used to characterize the genotypes.

Targets for next month

- Develop an algorithm for differentiation of the genotypes on thermal imaging based calculated parameters.

EPA 6: Abiotic stress detection from field to landscape scale in different crops using remote sensing tools (Funded by ISRO-SAC)

PI: Jagadish Rane; **Co-PI:** Ram N Singh

Outputs

- Online interactions to strategize and execute ground data analysis.
- Tabulation and analysis of hyperspectral signatures of wheat and sugarcane & thermal images of wheat chlorophyll fluorescence.
- Exploration of nearby farmers' fields for taking observations of sugarcane and wheat for discrimination of healthy and stressed crops using remote sensing data.
- Submission of project technical progress report including budget utilization.

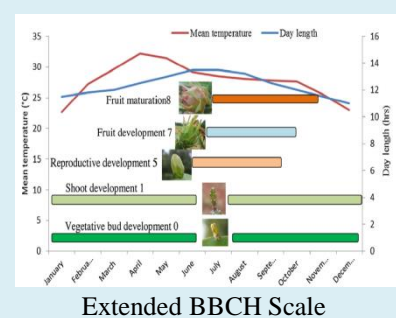
Targets next month

- Literature review for analysis of spectral data to segregate narrow and broad bands to discriminate healthy and abiotic stressed crop.

Insights from Global Research: Extended BBCH scale for defining phenological stages of Dragon Fruit

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

Citation: Kishore K. 2016. Phenological growth stages of dragon fruit (*Hylocereus undatus*) according to the extended BBCH-scale. *Scientia Horticulturae* 213, 294-302.



Dragon fruit

Dragon fruit (*Hylocereus undatus*) is still a new crop to India. There is lot to explore about this fruit crop in order to design research projects and also to make technically sound recommendations for the growers. In this line, systematic documentation of phenological stages is essential to achieve higher productivity and better fruit quality. However there is a dearth of information about its phenology. Against this backdrop, the present paper defines codes and phenological stages of dragon fruit according to the extended BBCH (Biologische Bundesanstalt, Bundessortenamt und Chemische Industrie) scale using three-digit numerical system which contributes to the standardization of its phenological stages. Seven principal growth stages, viz., bud development (0), shoot development (1), vegetatively propagated organ development (4), reproductive development (5), flowering (6), fruit development (7) and fruit maturation (8) have been described. A total of 40 secondary growth stages have been described and defined. The extended BBCH scale for dragon fruit is broadly applicable because it describes all the phenophases pertaining to vegetative and reproductive stages and their relative importance in crop management and improvement. The developed scale will act as a useful tool for adoption of effective crop management practices like nutrient management, pollination, plant propagation, timely harvest of fruits and pest management. The scale may also be effectively used for characterization of germplasm and assessment of climatic impact on crop phenology.

A leaf from history:

Remembering Father of Induced Breeding in Fish- Prof. Hiralal Chaudhari

MP Brahmane, MP Bhendarkar and NP Kurade



Prof. Hiralal Chaudhuri
(21 Nov 1921-12 Sept 2014)

The 10th of July every year is observed as the National Fish Farmers Day. It was on this day in 1957, Dr. Hiralal Chaudhuri under the guidance of Dr. K. H. Alikunhi, Head of Pond Culture Division of ICAR-CIFRI at Cuttack (now CIFA) and his team achieved success in induced breeding (hypophysation) of freshwater fish in captivity by administering the carp pituitary extract. The seeds of this research were sowed during his initial success in induced breeding of small mud goby *Gobiopetites chuno*, Hamilton at CIFRI. On 10th July 1957, minor carp *Cirrhinus reba* induced breeding was achieved in aquarium captivity resulting in spawn production within 18 hours of hatching of eggs. Encouraged by these results successful experiments were conducted simultaneously in Indian Major Carps, *Cirrhinus mrigala* (mrigal), *Labeo rohita* (rohu) and minor carp *Puntius sarana*. Induced Breeding technology has been the milestone technology which made India achieve the position of second largest producer of fish in the world. This ushered in the Blue Revolution in the country leading to establishment of commercial aquaculture and research and development.

In 1975, Dr. Kuronuma, an eminent Ichthyologists recognized him as an epithet of the “Father of Induced Breeding” at The Pacific Science Congress at Vancouver, Canada. Internationally he served at FAO, IDRC, ESCAP, The World Bank, SEARCA, SEAGDEC etc. providing impetus to aquaculture at the global level and regionally at the Asian developing countries. Prof. Chaudhuri was highly sought after in the South-East Asian countries for his special expertise in induced breeding of fishes. Prof. Chaudhuri was recipient of Chandrakala Kora awards along with Chandrakala Hora Memorial Gold Medal in 1961, Rafi Ahmed Kidwai Award of ICAR, Gamma-Sigma Delta and Golden Key Award of the Auburn University, US. In 1994 he was conferred the World Aquaculture Award by the University of California-Bodega Marine Laboratory, USA where a colloquium on “Applications of Endocrinology to Pacific Rim Aquaculture” was organized to honour him. In 2002, the Asiatic Society awarded him for his contribution to zoology. He remained associated with the Inland Fisheries Society of India, Barrackpore, Kolkata which remains to be oldest society dedicated to the cause of fisheries in India.

The current fish production of 12.59 million tonnes (Marine, 3.69 and Inland 8.90 million tonnes, 2017-18) aptly signifies the importance of Induced Breeding technology of Prof. Dr. Hiralal Chaudhuri. Government of India honoured the great achievement by declaring the **10th of July as National Fish Farmers Day**. Prof. Hiralal Chaudhuri’s name remains etched in the hearts of students of fisheries the world over. Let us welcome forthcoming year 2021 as birth centenary year of Prof. Hiralal Chaudhuri.

“Taking everything away from land is not good for land. There is a law of return. Whatever you take from the earth, you must return it back.”

Prof. Ratan Lal

World Food Prize Laureate 2020