



Vol. 23. No.02

July- December, 2023

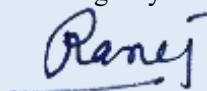
From the Director's Desk



Horticulture is a key avenue for enhancing livelihoods and income opportunities in hot arid and semi-arid regions of the country. Continuous efforts of the Institute are being made to address challenges arising from extreme climatic, soil, and water-related constraints to ensure the sustainable profitability of horticulture in these regions. ICAR-CIAH, Bikaner is actively engaged in research and development, focusing on genetic improvement to enhance yield, quality and resistance to drought, frost, diseases, and pests in horticultural crops. To achieve these objectives, the institute employs advanced plant breeding techniques, biotechnological methods, physiological approaches, and plant health management strategies. Additionally, research on value addition is being conducted to create employment and boost income opportunities among rural populations in hot arid and semi-arid regions of the country. The institute is optimizing technologies for proper handling, maturity standards, processing, value addition, and post-harvest management of arid horticultural crops. The *Thar Desert*, is rich in biodiversity, encompassing economically significant flora. Recognizing the need for conservation, the Institute is also focused on optimizing propagation techniques to support commercialization and sustainable utilization of these valuable plant resources. The dedicated efforts of scientists of the Institute have led to identification and development of promising the drumstick variety “Thar Tejas” and the spine gourd variety “Thar Varsha,” both of which are expected to

gain popularity among farmers in hot arid/semi-arid regions due to their adaptability and promising yield potential. Additionally, some promising lines like Jhaar Karela or Balsam Apple (*Momordica balsamina* L.) has been identified. The institute's emphasis on micro-propagation has resulted in significant advancements in standardizing methodologies for rapid and high-efficiency somatic embryogenesis through suspension culture in the date palm cultivar ‘Barhee’. Further insights have been gained from experiments analyzing root development responsive genes under drought stress in Tumba, a resilient desert plant known for its exceptional ability to withstand extreme drought and high temperatures.

Although, the dissemination of technologies developed by the institute is a regular activity, there has been increasing emphasis on utilization of digital media to enhance the awareness among the farmers and stakeholders. The institute including CHES, Godhra could successfully organize twenty three trainings, nine demonstrations, five technological exhibitions, more than thirty research-extension meet/interactions, celebration of days/weeks/fortnights. During the reported period of time webinars/seminars, workshops, etc. were also organized by the Institute. In addition to above, Krishi Vigyan Kendra working under the Institute at Vejalpur (Godhara), Panchmahal district, Gujarat was also carried out various extension activities like farmers/stakeholders' trainings (31), OFTs (24), , FLDs (7), advisory services (121), diagnostic visits (39), field Day (3), group discussions (7), Kisan Ghosthi (5), training cum workshop(1), Film Show (28), scientists' visit to farmers field (154), method demonstrations (24), celebration of important days (4), exposure visits (2), Radio Talks (3), TV Talk (1), Telephone helpline (345), etc., during the reported period of time. This Newsletter provides a glimpse of various activities carried out at the institute during July- December, 2023.


(Jagadish Rane)
Director

Research Spectrum

(a). At H. Q. , Bikaner.

Evaluation and domestication of *Jhaar karela*: *Jhaar karela* or Balsam apple (*Momordica balsamina* L.) is a neglected and lesser known crop of Cucurbitaceae family known for its medicinal properties. Evaluation of a purified line (CIAHMB-1; IC-0644742) has been done for its domestication and commercialization. The crop was raised on drip system on trellis. It took 35-40 days to produce 50% female flowering on 8-10th node. The number of primary branches ranged from 24-32. The fruit weight, fruit length and fruit diameter ranged from 6.60-8.0 g, 3.0-4.1 cm and 2.0-2.4 cm, respectively. The total fruiting duration varied from 80-90 days. The single plant produced 1.2-1.5 kg marketable fruits. (B.R. Choudhary)



Fig. Jhaar karela or Balsam apple (*Momordica balsamina* L.)

Incidence of bacterial spot in pomegranate variety 'Bhagwa': During the reported period of time, the bacterial spot of pomegranate was observed at pomegranate (variety 'Bhagwa') orchard of this institute during rainy season of 2023. Average disease incidence of bacterial spot was noted 10-25.0% at the Institute. Survey programme of pomegranate orchards variety 'Bhagwa' was conducted in the month of July, 2023 at Naurangdesar village for its incidence. This bacterial spot disease was appeared at pomegranate (variety 'Bhagwa') orchard during survey programme with scientists of National Research Centre on pomegranate, Solapur (Maharashtra) on 19th July, 2023 at village Nourangdesar, Nourangdesar-Napasar Road of Bikaner district. Disease incidence of bacterial spot was found in moderate to severe form in above farmers fields. Its disease incidence was observed from 40.0 to 70.0% (S. K. Maheshwari, Ramesh Kumar and Jagadish Rane)



Fig. Bacterial leaf and fruit spot in pomegranate

Germplasm re-generation and maintenance cycle studies in arid vegetable legumes: During the reported period of time, the Indian bean genotypes were studied for storage behavior with ageing and crop-genotypes evaluated for seed enhancement. Seeds of 52 genotypes (landraces, breeding lines and varieties) stored under refrigerator and deep-freeze (-20 °C) facilities from the year 2002 to 2012 were used as rainy-winter season experiment. Indian bean germplasm and varieties can be stored safely for about 10 years using gene-bank standard packaging and storage under deep-freeze and refrigerator facilities as working germplasm. The seed storage and re-generation results of Indian bean are in close conformity with the studies of cluster bean, cowpea, sword bean and velvet bean germplasm maintenance. However, based on crop-genotypes performance studies for varietal maintenance with most prioritized traits such as early plant vigour, days to first harvest, number of pods/plant and seed quality, regular seed production of arid vegetable legumes (cluster bean, cowpea, velvet bean, sword bean and Indian bean) should be done at 7-8 years interval (D.K. Samadia, A.K. Verma and Hanuman Ram)

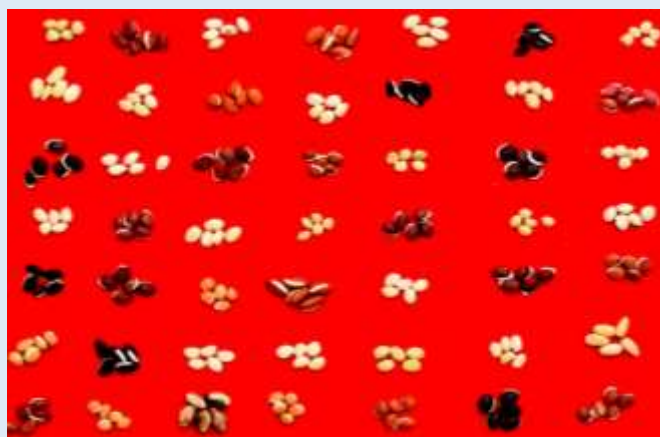


Fig. Germplasm of arid vegetable legumes re-generated and maintained

Adaptive trial on seed spices under hot arid conditions: A preliminary adaptive trial on seed spices has been undertaken in collaboration with NRCSS, Ajmer. A total of eighteen (18) varieties of 09 spices including coriander (03), fenugreek (02), cumin (02) fennel (02), Ajwain (02), Nigella (02), Dill (01), Celery (02) and Anise (02) and thirty (30) fenugreek advanced genotype/lines collected from NRCSS, Ajmer and the adaptive trials of the same were carried which were highly successful (Pawan Kumar, M.K. Choudhary, B.R. Choudhary and Jagadish Rane)



Fig.: Field view of adaptive trial on seed spices

New experimental block development: New experimental block No. - 4 of area about 2.0 ha was developed and initially ridge gourd variety “*Thar Karni*” seed was sown for seed production purpose during rainy season, 2023 which was very successful (Pawan Kumar and M.K. Choudhary)



Fig. Field view of new experimental block for vegetable seeds production

Development of innovative bar-coding system for digital tracking the history of tissue culture date palm (*Phoenix dactylifera* L.): Date palm tissue culture work is like a relay-race, require quite long period and handled thousands of culture and subcultures from explants inoculation to plantlets development. So, record keeping and maintenance of each and every flask/test tube is very tough and labour intensive as well as equally important to know the result history of every experiment/treatment and every hormonal concentration and combination for optimizing the protocol/process at each step. Therefore, an innovative step was taken by the institute to barcode the each and every flask immediate after inoculation/sub-culturing for digital record keeping which require less time, less energy and minimum manpower for record keeping and tracking of culture history at any point of time during process of tissue culture date palm research. (J. Rane, P. Kumar, K. Kumar, D. Singh, Chet Ram, R.P. Meena and R.K. Meena)



Fig. Bar coding of culture flasks for tracking culture history of date palm

Studies on somatic embryogenesis through suspension culture in date palm cultivar ‘Barhee’: Several experiments were conducted on suspension culture using bioreactor and shaker technology by sub-culturing callus culture of date palm

cultivar ‘Barhee’ in different hormonal concentrations and combinations on MS media and agitated culture continuously for 15 days. After that cultures were weighed and plated on semi-solid MS media enriched with NAA+BA and data were recorded on weekly basis. Every time, it was observed that suspension culture in hormone free medium agitated two weeks then plated on MS medium having NAA+BA hormones yielded better results. This methodology has multiplied callus culture at faster rate @ 3.77-9.55 times as compared to routine methodology. Further, there were several pro-embryogenic masses of calli (PEMC) had also been emerged out from culture within 5 weeks after plating/sub-culturing. On an average 13 (4-35) PEMC/bipolar somatic embryos with 4.3 shoot/green leaves structure having 6.4 roots/ flask were noticed after eight weeks which had resulted better and faster shoot/ leaf growth as compared to routine protocol followed earlier (K. Kumar, D. Singh, J. Rane, Chet Ram, R.P. Meena, P. Kumar and R.K. Meena)

Development of callus initiation using immature inflorescence of date palm: Immature spathe/ inflorescence was selected from four commercial date palm cultivars viz., Khalas, Medjool, Barhee, Halawy and two elite genotypes such as ADP-1 and elite male. Explants were sterilized and then inoculated on callus initiation media enriched with different concentrations and combinations of hormones. After few months of inoculation, callus initiation from explants was successfully obtained on callus initiation media supplemented with NAA+BA, NAA+IAA and 2,4-D. Higher concentrations of NAA+BA did not respond well and additionally created harm to explants in form of browning of explants. Thus, obtained callus has been subcultured in to callus multiplication media and direct organogenesis for further process ahead (D. Singh, R.P. Meena, K. Kumar, J. Rane, Chet Ram, P. Kumar and R.K. Meena)

Effect of liquid biofertilizer and soil micronutrient on radish crop grown as an inter crop in ber based cropping system: An observational trial was conducted to evaluate the effects of soil micronutrients and liquid bio-fertilizers on the growth and yield of radish grown as an intercrop during the rabi season. The study observed significant improvements in various growth parameters of radish with the application of soil micronutrients. The parameters measured included the plant height (31.53), root length (24.8 cm), root diameter (5.07 cm) at 45 days after sowing (DAS), and yield at harvest (295.71 q/ha.). In comparison, the control treatment exhibited a plant height (25.39), root length (14.5 cm), root diameter (2.06 cm), and yield at harvest (195.58 q/ha). Similarly, application of liquid biofertilizer as an organic treatment in radish crop resulted in superior growth parameters at 45 DAS mainly plant height (36.28 cm), root length (27.4cm), root diam. (5.10 cm) and yield at harvest (302.18 q/ha). In contrast, the control treatment at 45 DAS showed lower plant height (27.21cm), root length (15.3 cm), root diam. (2.11 cm) and yield at harvest (208.74q/ha.) under control. There is remarkable variation in growth and yield parameters on application of bio-fertilizers and micronutrients which significantly improved growth of plant, root and yield of radish. The application of micronutrients and bio-fertilizers can be used for the higher production of radish crop (Roop Chand Balai, S.R. Meena and Manpreet Kaur)



Fig: A view of observational trial of radish crop grown as an inter crop under based farming system

Providing service to Govt. of Rajasthan for DNA fingerprinting of tissue cultured plantlets of date palm: As providing the services and revenue generation, 90 tissue cultured plantlets of date palm cultivars belonging to Barhee, Medzool, Khuneizi and Ghanami, provided by Commissionerate of Horticulture, Govt. of Rajasthan, Jaipur were characterized for checking the genetic relatedness and clonal fidelity with their corresponding mother plants. By doing DNA fingerprinting of 90 tissue cultured plantlets of date palm cultivars, revenue of Rs. 1,28,478/- was generated at the Institute. (Chet Ram)

Identification of root development responsive genes during drought stress in Tumba: Tumba (*Citrullus colocynthis*) is the wild relative of cultivated watermelon having great potential to sustain against environmental factors due to its deep tuberous root system. However, root development mechanism at physiological and molecular level is not well known in Tumba. Therefore, seventy-seven abiotic stress responsive genes from plant species were analysed by PCR amplification. Out of 77 selected genes, twenty-three genes were positively amplified in Tumba which were further analyzed at expression level using semi-qRT-PCR during drought stress condition under 1, 3 and 6 days interval. All the genes were differentially expressed as compared to corresponding controls. The five genes namely *ClaTLP09*, *ClaTLP19*, *ClaERF84*, *ClaERF100* and *ClaERF115* were expressed in up-regulated manner during drought stress. Furthermore, the expression of these genes found positively correlated with root length during stress treatment in Tumba. Thus, the identified five genes based on their expression also correlation with root length could be the potential candidate genes which may be responsible for root development during drought stress in Tumba plant. (Chet Ram, M.K. Berwal, A.K. Verma, Kamlesh Kumar and Dhurendra Singh)

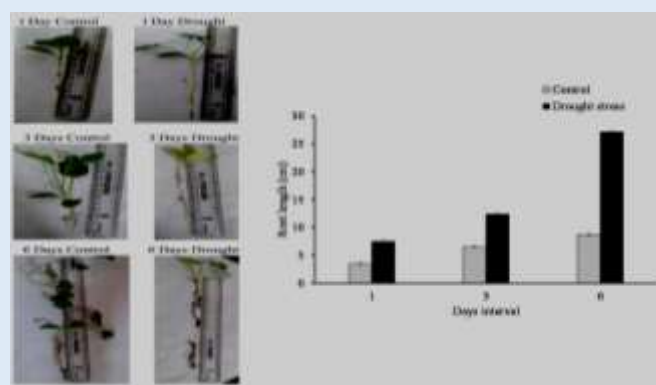


Fig. Positive correlation between gene expression and root length during drought stress in Tumba

Optimizing foliar micronutrient application with various organic fertilizers for coriander crop production in arid regions: In the cultivation of Coriander-1 (ACr-1), the highest yield of 8.28 t/ha was achieved under the treatment of 0.5 EC (dSm⁻¹) salinity + 50% FYM + 50% Vermicompost + micronutrients (foliar spray of ZnSO₄ @ 0.5% + soil application of FeSO₄ @ 0.5%). This treatment excelled over others, demonstrating the beneficial interaction between salinity levels and the application of micronutrients alongside 50% farmyard manure and 50% vermicompost. Significant variations in plant height at harvest (29.03 cm), number of primary branches (4.30), and leaf area (67.95 cm²) at 45 days post-leaf harvest were observed under this application.



Fig. A general field view of coriander production experiment

Optimizing the radish crop production technology under saline irrigation water in arid conditions: Red Radish (*Raphanus sativus*): Despite high salinity (4 EC), vegetative growth and yield were relatively high when supplemented with 100% NPK (inorganic) + FYM (organic) (219.8 q/ha). However, root quality was better under lower EC (0.5) irrigation water combined with 100% NPK + FYM. Ascorbic acid content, an essential nutrient and antioxidant, varied across treatments. The highest content was recorded in the 0.5 EC irrigation water + 100% NPK + FYM treatment (28.73 mg/100 g FW), with notable levels also observed in 2.0 EC (26.28 mg/100 g FW) and 4.0 EC (26.24 mg/100 g FW) irrigation water treatments. (Anita Meena)



Fig. A general field view of radish production experiment

(b). At CHES, Vejalpur, Godhra (Gujarat).

Drumstick variety Thar Tejas identified at institute level:

The plants of Thar Tejas grow up to 265-318 cm and spreads 261.5 cm (East-West) and 287.2 cm (North-South). It recorded 2.74 m plant height, 245 pods per plant, 218 g each pod weight, fruit length 45-48 cm, 9-10 seed per pod and more flesh under rainfed semi-arid conditions. Fruits mature during January-March. It is a comparatively early flowering and early maturing comes to harvest during January-March. The variety recorded highest protein, potassium, iron, and zinc in dry pod powder. It also recorded highest dry matter, protein, calcium, magnesium, iron, manganese, and zinc in dry pod powder.



Fig. : Pods of drumstick variety Thar Tejas

Spine gourd variety Thar Varsha identified at institute level: Thar Varsha have good appearance, fruit weight (15.4-20.6 g), less seeded (16-20), high yield potential (1.6-2.8 kg/plant) with dark-green and round fruits along with small spines attributing to consumer preference. The fruits are rich in ascorbic acid (423.7 mg/100 g). Its vine is thin and spreading which grows very well on 4-line wire-trellis system. Its fruits are 3.5-5.7 cm long and 9.1-9.6 cm diameter with total yield of 5.50 t/ha at spacing of 2 m × 2 m. The plant produces 104-134 fruits in full cropping season (112-118 days) with sufficient pollinators. (Lalu Prasad Yadav)



Fig. Spine gourd variety Thar Varsha

Performance evaluation of cucumber (*Cucumis sativus*) germplasm: The cucumber germplasm (CHES C-1 to 7) was grown in field and evaluated for generating preliminary data at station for their growth, yield and quality parameters. The selfing was done for further multiplication and evaluation of the germplasm in next growing season. The promising lines of cucumber CHES C-1, CHES C-2 CHES C-3 and CHES C-4 were advanced to F2 and F3 generation. (Gangadhara K.)



Fig.-Different views of advanced cucumber elite germplasm

Extension programmes and activities.

(a). At H.Q. Bikaner

❖ Trainings.

- **On/off campus trainings programmes.**
- Conducted 07 days collaborative training programme organized with COA Bawal, CCSHAU Hisar (Haryana) on "Production Technology and Nursery Management of Horticultural Crops from 25.09.2023 to 01.10.2023 at the institute (Jagadish Rane, S.R. Meena, R.C. Balai, A.K. Verma, R.P. Meena, Ramesh Kumar, P.P. Pareek and Sanjay Paril).



- Conducted "Farmers Training- cum- Interaction meet on" Pomegranate cultivation in hot arid regions" (offline & online mode) on 20.07.2023 at ICAR- CIAH, Bikaner in which more than 75 farmers participated (Ramesh Kumar, M. K. Berwal, Jagan Gora, S.R. Meena and R.C. Balai).



- Conducted one day farmers training programme at the CIAH FLDs site entitled as "improved production technologies of kharif season" on the field of Sh. Om Prakash Mali S/o Sh. KanaRam Mali of Khichiya (4KHM), Bikaner district of Rajasthan on 14.07.2023.
- Conducted one day farmers training programme at the CIAH FLDs site entitled as "improved production technologies of cucurbits" on the field of Sh. Govind Lal Pareek S/o Sh.Kisori Lal Pareek of Khichiya (4KHM), Bikaner district of Rajasthan on 15.07.2023. (S.R. Meena, R.C. Balai).
- One Month Orientation Training of Dr. Manpreet Kaur: Dr. Manpreet Kaur, Scientist (Agril. Economics) joined the Institute on 20.07.2023 for which I started the work for her as a Mentor like preparation of her schedule for one month

Orientation Training Programme (OTP), sitting arrangement, etc., (S.R. Meena).

- Imparted knowledge in Orientation Training Programme of Mr. Anil, Scientist on 'Improvement and production of cucurbitaceous crops and DUS test centre on melons' held during 30-10-2023 to 29-11-2023 at ICAR-CIAH, Bikaner (B. R. Choudhary).
- Organized brain storming programme on arid and semi-arid horticulture: developing a roadmap for amritkaal (2047) held at ICAR-Central Institute for Arid Horticulture, Bikaner on 01 October 2023.

➤ Trainings under SCSP & TSP Schemes

- During the reported period of time, eleven training and input distribution programmes were conducted under SCSP Scheme on different topics/aspects related to improved arid horticultural production technologies (S.R. Meena, Roop Chand Balai, K.L. Kumawat, P.S. Gurjar and Manpreet Kaur and Anita Meena)



➤ Trainings conducted for women empowerment

- Trainings programmes for women empowerment and skill development of SC women farmers under SCSP schemes were organized on 15.10.2023 and other different occasion like National women day under SCSP during the reported period (Anita Meena, Roop Chand Balai and S. R. Meena).



➤ Training on Kisan Agri Drone

- Agri Drone Training and demonstrations was conducted off/on campus (Farmers field and institute) during reported period of time. The purpose of this training cum demonstration was to use of Drone in agriculture for efficient use of nutrient and pesticide spraying with minimum time.



❖ Front Line Demonstration (FLDs) /Method demonstration

- Conducted FLDs of ridge gourd (Thar Karani) and veg. cluster bean (Thar Bhadvi) on the field of Sh. Om Prakash Mali S/o Sh. KanaRam Mali of Khichiya (4KHM), Bikaner district of Rajasthan on 14.07.2023.
- Conducted FLDs of snapmelon (AKS-82) and Kachri (AHK-119 on the field of Sh. Govind Lal Pareek S/o Sh. Kisori Lal Pareek of Khichiya (4KHM), Bikaner district of Rajasthan on 15.07.2023.
- Conducted FLDs of improved variety of Khejri (Thar Shobha) on the field of Sh. Om Prakash Mali S/o Sh. Kana Ram Mali of Khichiya (4KHM), Bikaner district of Rajasthan on 18.08.2023.



- Conducted demonstration on "Role of Rootstock in Mandarin: A Technology Demonstration" at ICAR-CIAH, Bikaner on December 07, 2023.
- In addition to above FLDs, more than 30 technological method demonstrations were also performed.
- Surface covering protective vegetable nursery scheme/technology for hot arid climate was demonstrated at KVK, Sardarshahar, Churu on 29 November, 2023. Brinjal variety 'Thar Rachit' was sown on the raised beds for the demonstration purpose. The nursery bed was covered with the structural framework and polythene sheet.



❖ Technological exhibitions displayed.

- Displayed the technological exhibition of the Institute during the national Seminar organized by collage of Home Science, SKRAU, Bikaner during 25.08.2023 to 26.08.2023.



- Participation and displaying the CIAH technological exhibition of the Institute at DGR- RSS, Bikaner on the occasion of Inauguration of New building of DGR-RRS, Bikaner and farmers hostel -cum- training centre , ICAR-CIAH, Bikaner on 27.09.2023.
- Displaying the technological exhibition on the occasion of Celebration of 31st Foundation Day of the Institute on 30.09.2023.
- Exhibited the CIAH technologies at Gudamalani during inauguration of Pearl millet Centre, Gudamalani on 27.9.2023.
- Displayed the technological exhibition during ICAR Zonal meeting held at ICAR-CSWRI Avikanagar on 03.11.2023.

❖ Organization/Celebration of days/ weeks/ fortnights / campaign.

- **Celebration of Independence Day:** The institute celebrated Independence Day on 15th August, 2023.
- **Celebration of citrus day:** Citrus day was celebrated at the citrus block of the Institute on 20 October, 2023.



- **Celebration of Institute foundation Day:** Institute celebrated its 31th Foundation Day 30.09.2023 in which DG, Dr. Himansu Pathak was the chief guest (online mode) of the function.
- **Celebration of Aonla Day:** Organized "Field Exhibition cum Farmer -Scientist Interaction on Aonla" at Fruit based diversified cropping system of the Institute on 14.12.2023.



- **Organization of field day on an intercropping in ber based cropping system:** A field day on "Intercropping in Ber Based Cropping System" was organized at ICAR-CIAH, Bikaner on December 21, 2023.
- **Celebration of Kishan Diwas:** The Kishan Diwas was organized in the institute on 23 Dec., 2023 at the Institute in which farmers of Phooldesar & Pimper village (Block-Lunkaransar), distt. Bikaner participated presented (S.R. Meena, Roop Chand Balai, Manpreet Kaur, D. Singh, Ajay Verma, R.K. Meena, Ramesh Kumar).



- **World Soil Health Day Celebration:** World soil health day was celebrated at farmers' field of Salasar village of Kolayat block of Bikaner district on 05.12.2023.



- Organized/celebrated a Industry meet in the Institute on 30 September, 2023.
- A diagnostic field drive on pomegranate orchards of Bikaner district was conducted by ICAR-CIAH, Bikaner in collaboration with ICAR-NRC on 19th July, 2023 and provided practical solution for management of bacterial blight and nematode to the pomegranate growers.



- The Institute carried out the *Swachhata Abhiyan* under Special Campaign 3.0 on 19-10-2023 to 30-10-2023 at ICAR-CIAH, Bikaner.
- Organized field day entitled "Citrus Day-Prospectus and way forward" on 20 October, 2023 for promotion of citrus in arid regions and acted as Convener.
- Organized field day entitled "Role of rootstocks in mandarin" on 7 December, 2023 and acted as Co-coordinator for promotion of citrus in arid regions.
- Organized one week training programme "Production technology and nursery management of horticultural crops"

at ICAR-CIAH, Bikaner for students of CCSHAU, Hisar, Haryana from 25 September to 01 October, 2023 and acted as Coordinator.

❖ Other extension activities:

More than > 200 farmers, students, field workers, supervisors, SMS, dignitaries/ NGO, etc. were visited to Institute during the reported of time. More than 10 on/off campus Research- Extension - Farmers- Interface- Meetings to inculcate the knowledge and awareness among the farmers about improved production technologies of arid horticultural crops. The activities like visit, meetings/group discussion training, interaction, etc., were also organized for empowerment of farm women, particularly in the field of arid horticulture. Various farmers' programmes and activities like visit, meetings/group discussion training, interaction, Research-Extension - Farmers- Interface- Meetings (REFIM), diagnostic and problem-solving visits, etc., were conducted in adopted villages under MGMG Scheme of the ICAR/Institute. More than > 500 technical folders/literature were distributed among the farmers/ clients during different extension programmes/activities/ exhibitions, occasions. There were made > 10 diagnostic and advisory visits to farmer's fields to solve their problems and provide technical help/suggestions for their better crop production/farming system.

Moreover, various technological advisory work (One line / telephonic/off line discussions/ guidance/Qns.- Ans.) with farmers were also performed during the reported period of time.

❖ Coverage of the Institute in media.

Produced a video film on improved production technologies of the Institute in collaboration DD Kisan New Delhi covering propagation and production technologies of arid fruits and vegetables, cultivation of vegetables under protection/low tunnel technology during off season, etc. structures' on 26-10-2023 to prepare video film of institute for DD Kisan, New Delhi.

- Published a article in Hindi for the benefits of farmers/stakeholders titled as farmers are becoming millionaire from tunnels (in Hindi). *Haldhar Times*, Year 18, No. 5 (18 Dec.-24 Dec., 2023). P. 1.
- Moreover, the Institute tried best to expose the various improved production technologies of arid horticultural crops through the local newspapers, print and media, website, whatsapp groups, social groups, etc., for the popularization of the same and benefits of the farmers/stakeholders/clients.

(b). At CHES, Godhra, Gujarat.

❖ Trainings

- Programme developed and organized 11 days training programme for RAWE students of B.Sc. Ag. (Hons)" as Program Convenor on "Recent advances in dry land horticultural crops for sustainable horticulture production "at ICAR-CHES, Godhra from 17.07.2023 to 27.07.2023.
- An orientation training programme was carried out for Dr Manpreet Kaur (ARS probationer), Scientist, Agricultural Economics at CHES, Godhra from 7-9.08.2023
- Organized 15 days training programme for RAWE students of B.Sc. Ag. (Hons)" on Climate resilient horticultural

crops for hot semi-arid region of western India" at ICAR-CHES, Godhra from 07.08.2023 to 21.07.2023.

- Organized one day training programme "Kitchen Gardening for nutritional security" in collaboration of Horticulture Department, Godhra, Panchmahal in urban horticulture development scheme on 30.10.2023 at CHES, Godhra.
- Conducted student field school/training of Jawahar NavodayaVidyalaya, Panchmahal students at CHES, Godhra on 10.08.2023
- Organized student field school/training on kitchen gardening of Jawahar NavodayaVidyalaya, Panchmahal students at CHES, Godhra Godhra in October, 2023.
- Training to the farmers on nursery raising and its management practices in adopted villages during 2023.
- Organized one week training programme entitle "Technological advancement in semi-arid Horticultural crops" for 7 M.Sc. Horticultural students of RLBCAU, Jhansi, Uttar Pradesh under ICAR-NAHEP, IG Grant organized at CHES, Vejalpur, Godhra during 11.12.2023 to 17.12.2023

❖ Demonstration conducted

- Demonstration was conducted to promote the rainfed horticulture through improved varieties of semiarid fruits and vegetable crops in Undva, Zinzari, Navanagar, and Vyasada villages of Panchmahals during July to December, 2023
- Demonstration was conducted on high-density planting system models of semi-arid horticultural crops at CHES, Vejalpur to create the awareness among the tribal farmers for better utilizing of small holdings during July to December, 2023.

❖ Field visits:

- Field visit was carried out for the B. Tech students at IISWC RC, Vasad on 26.07.2023 under RAWEP programme.

(c). At KVK, Vejalpur, Godhra, Gujarat

On Farm Trials: During January - December, 2024, two OFT were conducted on 24 farmer's field.



❖ Trainings.

During the period of report of time 31 (on/off campus) training programmes were organized on different aspects of agriculture in which > 587 farmers and farm women were participated/benefited.



- **TRAWA Course Training :** There was organized one month teaching course (RAWA) at ICAR-KVK, Panchmahal for the students of Bachelor of Rural studies (BRS) belonged to Mangal Bharati Lokshikshan and Krishi Mahavidhyalay Golagamdi Ta Sankheda, Chhotaudaipur during the reported period of time
- **Trainings on Prakrutik kheti :** There were organized six trainings and two awareness programs on Prakrutik kheti.



- **Other extension activities at KVK:** During January - December, 2023, the following other extension activities like Advisory Services (121), diagnostic visits (39), field Day (3), group discussions (7), Kisan Ghosthi (5), training cum workshop(1), Film Show (28), scientists' visit to farmers field (154), method demonstrations (24), celebration of important days (4), exposure visits (2), Radio Talks (3), TV Talk (1), Telephone helpline (345), etc., were also carried out.

❖ Organization of Webinar/ Workshop /Seminars/ Symposia/ Conference, etc.

- Institute organized a workshop-cum-training programme on pomegranate on 20.07.2023



❖ Participation/ presentation in Webinar/ Workshop / Seminars/ Symposia/ Conference, etc.

- During the reported period of time the scientists/officers of the Institute participated (in online/offline mode) in > 40 in Webinar/ Workshop /Seminars/ Symposia/ Conference, etc.

❖ Visit of VIPs/ Dignitaries at the Institute/ CHES

- Dr. Himanshu Pathak, Secretary, DARE and DG, ICAR, New Delhi visited the Institute and inaugurated the Amrut Sarover (Water Duggi) in the Institute on 27.09.2023



- Dr. S.K. Garg, VC, RAJUVAS, Bikaner visited the Institute on 30.09.2023
- Dr. S.K. Malhotra, Director, ICAR-DKMA, New Delhi visited the CHES (Godhra) on 18.12.2023
- Dr. A.K. Karnatak, Vice Chancellor, MPUAT, Udaipur visited the CHES (Godhra) on 17-18 Aug., 2023
- Dr. Ravi Gopal Singh, BISA Scientific Lead & Cropping System, Jabalpur, MP visited the CHES (Godhra) on 17-18 Aug., 2023
- Dr. M.R. Dinesh, Former Director, ICAR-IIHR, Bengaluru visited the CHES (Godhra) on 17-18 Aug., 2023
- Dr. V. B. Patel, ADG (HS), ICAR, New Delhi visited the Institute 27.09.2023.
- Dr. S.K. Singh, ADR, Dr. Rajendra Prasad CAU, Pusa, Samastipur, Bihar visited the CHES (Godhra) on 17-18 Aug., 2023
- Dr. C.K. Narayan, PS, IIHR, Bengaluru visited the CHES (Godhra) on 17-18 Aug., 2023

❖ Awards/Recognition

- Dr. Lal Prasad Yadav , received Best oral presentation award during the 2nd International Conference held 3 at ICAR-CIARI, Port Blair, Andaman and Nicobar Islands from 18-20 September, 2023.
- Dr. B. R. Choudhary was deputed rapporteur of Brainstorming session on 'Arid and semi-arid horticulture: A road map for Amrit Kaal (2047)' at ICAR-CIAH, Bikaner on 01 October, 2023.
- Dr. M. K. Berwal received Nation Builder Award from Rotary Club Under "Rotary India Literacy Mission during 05.09.2023.
- The team of Kabbadi of the Institute was awarded with silver medal at the ICAR western zone tournament held at ICAR-IGFRI, Jhansi, on 16-19 December, 2023.

- Sh. R.C. Balai, Received IIIst prize in Hindi Nibandh Lekhan Pratiyogita during Hindi Pakhwara 2023 organized in the institute.
- Dr. Vikas Yadav, Best oral presentation “Thar Gaurav: a new high yielding wood apple variety for dryland” in 2nd International Conference on “Prospects and challenges of environment and biological sciences in food production system for livelihood security of farmers (ICFPLS-2023)” at ICARCIARI, Port Blair, Andaman Nicobar Islands, India during 18-20 September, 2023.
- Dr. Gangadhar K, Received Best oral presentation award in 2nd International Conference on prospects and challenges of environment and biological sciences in food production system for livelihood security of farmers (ICFPLS-2023) during 18-20 September, 2023 at ICAR-CIARI, Port Blair, Andaman and Nicobar Islands.

Recognitions

- Dr. Jagdish Rane, Director of the Institute, Honoured as Chief Guest in inaugural session of ICAR-NAHEP sponsored training program at ICAR-NIASM, Baramati and as a Chief Guest in Investiture Ceremony at RNB Global University, Bikaner on 28 August, 2023.
- Dr. A.K. Singh, acted as member of Jury for evaluation of posters presented during the International Seminar on Exotic and Underutilized Horticultural Crops held at ICAR-IIHR, Bengaluru during 17-19 October, 2023.
- Dr. A.K. Singh, acted as coordinator during Industrial meet and Foundation Day Celebration at ICAR-CIAH, Bikaner on 30 September, 2023.
- Dr. S. K. Maheshwari, nominated as member in Editorial Board of Current Horticulture.
- Dr. Ramesh Kumar, acted as Rapporteur in the Brain Storming Session “Arid and semi-arid Horticulture: A road map for Amrit Kaal-2047” organized by ICAR-CIAH, Bikaner and ISAH, Bikaner on 01 October, 2023.
- Dr. Lalu Prasad Yadav, nominated as Editor of Current Horticulture, Editorial board Member of Hort Flora Research Spectrum (Vegetable Science) and Editorial board Member of International Journal of Environment, Agriculture and Biotechnology.
- Dr. Hanuman Ram acted member in Editorial Board of Journal of Agriculture and Ecology.
- Dr. Vikas Yadav received the Certificate of Excellence in Reviewing (2023), International Journal of Environment and Climate Change, UK: Third Floor, 207 Regent Street, London, W1B 3HH, UK.
- Dr. Vikas Yadav worked as convener in National webinar on workshop cum farmer interaction meeting for research activities, issues and challenges in custard apple held on 4 May, 2023 through virtually mode by ICAR-CIAH, Bikaner.
- Dr. Anita Meena worked as Convener organized the webinar “National Women Farmer’s Day” with the theme of Gender equity and empowerment through horticulture technology on 15 October, 2023.
- Dr. Anita Meena worked as a Convener organized the “World Soil Health Day” at Jhajao village, Kolayat Block, Bikaner district with the theme of “Soil and Water: A source of life” on 5 December, 2023.
- Dr. Gangadhara K worked as Course Co-Director in 15 days training programme for RAW students of B.Sc. Ag.

(Hons.) during 7-21 August, 2023 and Co-coordinator organized 11 days training programme for RAW students of B.Sc. Ag. (Hons.) during 17-27 July, 2023 at CHES, Godhra, Gujarat.

- Dr. Gangadhara K worked as Co-Coordinator organized one week training programme entitle “Technological advancement in semi-arid horticultural crops” for 7 M.Sc. (Hort.) students of RLBCAU, Jhansi, UP under ICAR-NAHEP, IG Grant organized during 11-17 December, 2023.

❖ Participated in ICAR-Sports event

The Institute participated in ICAR-Sports event held at ICAR-IGFRI, Jhansi (UP) during December 16-19, 2023.



❖ Important Meetings held/attended:

- RAC Meeting was held at the Institute from 26-27 December, 2023 under the Chairmanship of Dr. V.S. Thakur, Former Vice Chancellor, YSPUHF, Solan (HP)



- Various meetings were held in the Institute time to time related R & D programmes/activities of the Institute.
- Attended SAC Meeting of KVK, Lunkaransar on 08.08.2023 by Dr. Jagdish Rane, Director, Dr. S. R. Meena of the Institute.



- Director attended the standing committee meeting Rabi-2023-24 at CAD officer Chaired by Divisional commissioner, Bikaner.



- During the reported period of time, the scientists of the Institute attended various meetings of District Horticulture Development Committee at Collectrate office, Bikaner or at others line departments to discuss/contributes on aspects related to horticulture/ agricultural development programmes/ activities.

❖ A Success Story

Bahar management technology in pomegranate cv. Bhagwa for hot arid climate: A success story.

Pomegranate is an emerging fruit crop of hot arid regions. Naturally, it bears flowers continuously from February to November in three *bahars* namely *ambe*, *mrig* and *hasta bahars* in a year which results staggered harvesting, low yield, poor quality, and high fruit-cracking incidence. Therefore, ICAR-CIAH, Bikaner standardized “Bahar management technology in pomegranate cv. Bhagwa for hot arid climate conditions” which includes imposition of water stress for one month (June-July) followed by light pruning (removal of terminal growth 10-15 cm) and ethrel 1-2 ml/l + NPK (0:52:34 grade) 5 g/l application for defoliation. It can be pre-poned/ postponed for 20-30 days for early/delayed flowering, fruiting and harvesting according to market demand, frost and pest-disease incidence. This technology resulted in synchronize flowering, stimulate more female flowers, higher fruit yield, improved rind and aril colour with low fruit-cracking incidence. This technology has been popularized among farmers by conducting field demonstrations, trainings and interactions meetings and adopted by farmers.

Among them, Mr. Jai Bhagwan Dahiya of Kanasar village of Bikaner district (Rajasthan) adopted this technology and obtained 12.49 t/ha marketable fruit yield of Bhagwa variety of pomegranate with good red aril and rind colour fruits with lower cracking (<5%). He sold fruits @ Rs. 40-50/kg and gained net profit around Rs. 3,30,000/ha. Another progressive farmer, Mr. Harendra Sihag of Palana village of Bikaner district (Rajasthan) was applied standardized *bahar* treatment and obtained 12.91 t/ha marketable fruit yield of pomegranate cv. Bhagwa with quality fruits and less cracking (< 5%). He sold these fruits @ Rs. 42-65/kg and gained net profit around Rs. 3,60,000/ha (**Ramesh Kumar, Jagan Singh Gora and S. R Meena**).



Fig. Pomegranate orchard of Mr. Jai Bhagwan Dahiya of Village - Kanasar, district Bikaner, Rajasthan



Fig. Pomegranate orchard & harvested fruits of Mr. Harendra Sihag of Palana village of Bikaner district of Rajasthan

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