January-June 2020 Vol. 1

ICAR-NRCP Newsletter

AN ISO 9001:2015 CERTIFIED INSTITUTE

Contents

Editorial team

Dr. Jyotsana Sharma
Director (Acting)
Dr. P Roopa Sowjanya
Scientist
Dr. NN Gaikwad
Sr. Scientist

Technical Assistance

Mr. Yuvraj Shinde
Technical Officer

Director's message

Introduction of pomegranate cultivation in states of north India, is urged to explore the feasibility of pomegranate cultivation in non-traditional areas that paves the way for enhanced production. This would be a boon in improving economic status of the farmers in these states. Though India is the largest producer of pomegranate, its export share in world trade of pomegranate is lesser (around 14%) in comparison to China (34%) and Iran (29%) with respectively 50% and 33% less area than India. The Centre has a challenging task ahead to improve export through breeding large size variety and pesticide residue free production; work on these aspects is in progress. I am sure ICAR-NRCP will continue to move forward with confidence to achieve new milestones and to fulfill the vision of our Honourable Prime Minster of Doubling farmer's income by 2022. To be a part of the institute that aims to raise the standard of living of pomegranate farmers of the country is a matter of great privilege to the staff of ICAR-NRCP. I place on record my sincere gratitude to Dr. T. Mohapatra, Secretary, DARE and Director General, ICAR for his encouragement. I am obliged to Dr. AK Singh, DDG (HS) for his moral support and guidance, which encourages us to move forward with confidence. The cooperation and support rendered by all the staff members of SMD (HS) to this Centre is thankfully acknowledged. The Centre would not have achieved its milestones without constant support and cooperation of all scientific, administrative, technical and supporting staff as well as senior research fellows, young professionals in various research projects. I am grateful to all for their unflinching support and express my sincere thanks for the help rendered in betterment of this Centre.

Research Achievement

First finished genome assembly of most popular and commercial Indian pomegranate variety "Bhagawa" was completed by ICAR-NRCP, Solapur. Four advanced Next Generation Sequencing technologies were used for the genome assembly and assembled 346.08Mb (98.17%) pomegranate genome of the estimated size 352.54Mb (k=31) based on k-mer genome survey analysis for cv. Bhagawa. The finished assembly consists of ever smallest number of scaffolds (342) with N50 size of 16.12Mb and high GC content of 41.01%, which is much better than the previously assembled genome of Chinese Cultivars *i.e* Taishanhong and Dabenzi which portrayed 274Mb & 296Mb, with an N50 of 2.3Mb and 1.7Mb, respectively using Illumina sequencing platform (Qin et al. 2017 and Yuan et al. 2018). A total, of 31,364 gene models were predicted with an average gene size of 2,991 bp having an average exon and intron size of 288 bp and 389 bp, respectively. All predicted genes were functionally annotated following either known homologous or predictive sequence signatures using COGs, GO, InterProScan, KEGG, Uniport and EggNOG. Out of 31,361 predicted genes, maximum genes 14,902 (47.52 %) got annotated in all four protein databases namely, COGs, InterProScan, UniProt & EggNog & rest of the genes got annotated in at least one of the six databases. The finished genome also represented 93.68% of the 1440 ortholog genes, with 64 missing & 27 fragmented genes through step-wise BUSCO assessment on the Embryophyta lineage. As a result, the majority of genome is masked by LTR 91553321 bp (30.76%), of which Copia and Gypsy elements contributing about 5.03% and 12.77%, respectively. A total length of 24.01Mb (~7% genome) was identified to be SSRs. InDels/ SNPs discovery and Hi-C mapping of assembled genome has been completed. Gene family cluster analysis of the complete gene sets of finished genome of *P. granatum* cv. Bhagawa with previously reported genome of pomegranate cv. Dabenzi, Eucalyptus (E. *grandis*), Cocao (T. *cacao*) and Grape (V. *vinifera*) was also performed. Bhagawa genome shared 967 common gene families with Dabenzi, Eucalyptus, Cacoa & 9,815 families with inclusion of grape genome. However, Bhagawa genome is sharing maximum common gene families 2,935 with Dabenzi. It is interesting to note that Bhagawa and Dabenzi are sharing 63 and 64 gene families with the Eucalyptus genome, respectively. Whole genome phylogenetic analysis showed that pomegranate & *Eucalyptus grandis* got diverged after 64 (60-70) million years ago (MYA), after the paleotetrapoidy event (109 MYA) identified in the E. *grandis* genome (Myburg et al.,2014). Apart from this the LTR Assembly Index (LAI) index was calculated for all the three publicly available pomegranate genomes, Bhagawa (LAI=10), Taishanhong (LAI=8) & Dabenzi (LAI=2.5). These results also proved our genome is of reference quality with high standard compared to other draft genomes of pomegranate. Genome sequence data of cv. Bhagawa was submitted to NCBI data, obtained accession nos. SRR6917658, SRR6917659, SRR6917660.

Farmer's Corner

Flower Regulation, Fruit Setting Issues and Remedies

~K. D. Babu and Shilpa P.

- In Pomegranate there are three flowering seasons viz, June-July (*mrig bahar*), February-March (*ambe bahar*) and September- October (*hasta bahar*). It is however desirable to take just one crop a year depending upon market requirement for better price and availability of water.
- Areas having assured rainfall where precipitation is normally received in June and continues up to September, flowering in June is advantageous, where monsoon normally starts in august with erratic pattern, flowering during august is beneficial, the areas having assured irrigation potential during April-May, flowering during January can be taken.
- The flowering habit of pomegranate is influenced by the prevailing climatic conditions of the geographical region where it is being grown.
- In tropical climates, pomegranate flowers almost throughout the year whereas in subtropics, once a year. In temperate regions, during winter, the plant is deciduous, but in tropical conditions, it is evergreen and flower throughout the year.
- There are three kinds of flowers borne on the same plant viz., staminate, hermaphrodite and intermediate types.
- The male flowers are companulate (bell – shaped) whereas the hermaphrodite flowers are urcerate (vase – shaped) and intermediate ones are tubular in shape.
- If fruit set takes place in intermediated flowers, they may drop before reaching maturity, even if some fruits which reach maturity tend to be misshaped.
- The fruit set in pomegranate depends upon hermaphrodite flowers.
- For getting normal flowering and fruit set in *mrigbahar*, treatment with withholding of irrigation from March-May depending on soil condition results suppression of growth during this period. Trees will shed their leaves and will remain dormant. Shallow ploughing followed by application of the recommended doses of manure and fertilizers followed by one or two light irrigation prior to the onset of monsoon rains will put forth new growth of trees followed by bloom in June and will bear a good crop.
- During mrig bahar flower and fruit drop is major concern which occurs due to heavy rainfall or incidence of insect pests and diseases. To address these problems farmers are suggested to spray 2, 4-D @ 10ppm and to follow IDIPM schedule developed by ICAR-NRCP, Solapur.
- During *Hasta bahar*, irregularity in flowering is a major issue which occurs due to lack of proper water stress to the plant. To

overcome this light pruning followed by two sprays of Planofix @ 23ml/100lit water at 15days interval is recommended. Fruits comes to harvest during the month of February-March. Fruits produced during this season are of high quality as compared to other *bahars*.

- In irrigated areas, *Ambe bahar* is also taken. Crop from this *bahar* will mature in July-August. Irrigation is stopped once rain commence during monsoons. Following monsoon period, when trees shed their leaves in October-November, shallow ploughing is done. Manures and fertilizers are applied in the months of December-January, subsequently in January, first light irrigation is given and flowers will appear in a month after irrigation.
- Application of uracil @ 50 ppm has reported to increase number of hermaphrodite flowers, fruit yield and fruit number per tree.
- Application of Cycocel @ 1000 ppm in combination with Uracil @ 25 ppm per plant has reported to enhance fruit weight.
- To overcome premature shedding of male flowers and impaired pollen tube development leading to poor fruit set, spray solubor (20% B) or boric acid (17% B) @ 0.05-0.1% B during pre-bloom period and followed by two post bloom application (one at 7-10 days after petal fall and other at 30days after petal fall)
- To reduce fruit cracking and distorted growth of fruit, boron spray [solubor (20% B) or boric acid (17% B) @ 0.05-0.1%B] is recommended.
- Poor flowering, poor fruit set, production of small fruits with poor quality can be addressed by soil application of copper based fertilizers is recommended. Ex: Calcium nitatre @12.5kg/ha/application (2 applications at 15 days interval)
- If reduction in flowering and fruit setting is observed, it is suggested to go for foliar sprays of Zinc Sulphate @0.30-0.50% before bud opening.
- Generally, it is recommended to give 3 foliar sprays of micronutrients during crop season. First spray each of ZnSO4 @ 0.3%, MnSO4 @ 0.6%, Boric Acid (17% B) @ 0.6% or Solubor (20% B) @ 0.5% should be given before flower and bud initiation i.e. 15-20 days after defoliation when new flush of leaves has come. The second and third spray of $ZnSO_4$ @ 0.3% and Mn SO_4 0.6% should be given at 30 to 60 days after full bloom. It will improve quality, size, color and taste in pomegranate.

फूल नियमन, फल सेटिंग मुद्दे और उपचार

~के. डी. बाबू और शिल्पा पी.

- अनार में फूलों के तीन मौसम होते हैं, जून-जुलाई (मृग-बहार), फरवरी-मार्च (अंबे-बहार) और सितंबर-अक्टूबर (हस्त-बहार)। हालाँकि, पानी की उपलब्धता और बेहतर कीमत के लिए बाजार की आवश्यकता के आधार पर साल में सिर्फ एक फसल लेना वांछनीय है।
- सुनिश्चित वर्षा वाले क्षेत्र जहां सामान्यतः वर्षा जून में होती है और सितंबर तक जारी रहती है, जून में फूल आना फायदेमंद होता है, जहां मानसून आमतौर पर अनियमित रूप में अगस्त में शुरू होता है, अगस्त के दौरान फूल आना फायदेमंद होता है, अप्रैल-मई के दौरान सुनिश्चित सिंचाई क्षमता वाले क्षेत्र में, फूल जनवरी के दौरान लिए जा सकता है।
- अनार की फुलधारणा की पद्धति उस भौगोलिक क्षेत्र की प्रचलित जलवायु परिस्थितियों से प्रभावित होती है जहाँ इसे उगाया जा रहा है।
- उष्णकटिबंधीय जलवायु में, अनार फुलधारणा लगभग पूरे वर्ष रहती हैं जबकि उपोष्णकटिबंधीय क्षेत्र में, वर्ष में एक बार होती हैं। समशीतोष्ण क्षेत्रों में, सर्दियों के दौरान, पौधे पर्णपाती होते हैं, लेकिन उष्णकटिबंधीय परिस्थितियों में, यह पूरे वर्ष सदाबहार रहते हैं और फूलते हैं।
- एक ही पौधे पर तीन प्रकार के फूल पैदा होते हैं, नर फूल, उभयलिंगी और मध्यवर्ती प्रकार।
- नर फूल घंटी के आकार के होते हैं जबकि उभयलिंगी फूल फूलदान के आकार के होते हैं और मध्यवर्ती आकार में नली सा होते हैं।
- यदि मध्यवर्ती फूलों में फल लगते हैं, तो वे परिपक्वता तक पहुँचने से पहले गिर सकते हैं और परिपक्वता तक पहुँचने वाले कुछ फल विचित्र आकार के हो जाते हैं।
- अनार में लगने वाले फल उभयलिंगी फूलों की संख्या पर निर्भर करते है।
- मृगबहार में सामान्य फूल और फल लगने के लिए, मिट्टी की स्थिति के आधार पर मार्च से मई सिंचाई रोकने से इस अवधि के दौरान पौधोंका विकास कम होता है। पेड़ अपने पत्ते गिरा देंगे और सुप्त रहेंगे। हल्की जुताई के बाद खाद और उर्वरकों की अनुशंसित मात्रा का प्रयोग और मानसून की बारिश की शुरुआत से पहले एक या दो हल्की सिंचाई के बाद पेड़ों की नई वृद्धि होगी और जून में फूल खिलेंगे और फल देंगे ।
- मृग बहार के दौरान फूल और फलों का गिरना प्रमुख चिंता का विषय है जो भारी वर्षा या कीट और बीमारियों के प्रकोप के कारण होता है। इन समस्याओं के समाधान के लिए किसानों को २,४-डी @ १० पीपीएम का छिड़काव करने और आई. सी. ए. आर-एन.आर.सी.पी., सोलापुर द्वारा विकसित आई.डी.आई.पी.एम. अनुसूची के पालन करने का सुझाव दिया गया है।
- हस्त बहार के दौरान, फूलों में अनियमितता एक प्रमुख मुद्दा है जो पौधे को उचित पानी की कमी के कारण होता है। इस पर काबू पाने के लिए हल्की छंटाई के बाद प्लानोफिक्स @ २३ मि.ली./१०० लीटर पानी के, १५ दिनों के अंतराल पर दो छिड़काव की सिफारिश की जाती है। फल फरवरी-मार्च के महीने में तुड़ाई के लिए तैयार होते हैं। इस मौसम में उत्पादित फल अन्य बहारों की तुलना में उच्च गुणवत्ता वाले होते हैं।
- सिंचित क्षेत्रों में अम्बे बहार भी लिया जाता है। इस बहार की फसल जुलाई-अगस्त में तुड़ाई के लिए तैयार होती है। मानसून के दौरान बारिश शुरू होने पर सिंचाई बंद कर दी जाती है। मानसून काल के बाद अक्टूबर-नवंबर में जब पेड़ अपने पत्ते गिरा देते हैं तब हल्की जुताई की जाती है। दिसंबर-जनवरी के

महीनों में खाद और उर्वरकों का प्रयोग किया जाता है, इसके बाद जनवरी में पहले हल्की सिंचाई की जाती है और सिंचाई के एक महीने बाद फूल आने लगते हैं।

- ५० पीपीएम की दर से यूरेसिल के प्रयोग से उभयलिंगी फूलों की संख्या, फल की उपज और प्रति पेड़ फलों की संख्या में वृद्धि दर्ज की गई है।
- २५ पीपीएम प्रति पौधे की दर से यूरेसिल के साथ १००० पीपीएम की दर से साइकोसेल के प्रयोग से फलों का वजन बढ़ता हैं।
- नर फूलों का समय से पहले गिरना और पराग नलिका के अनुचित विकास के कारण होने वाली कम फलधारणा की समस्या के लिए, फूल खिलने से पहले की अवधि में सोल्युबोर (२०% B) या बोरिक एसिड (१७% B) @ ०.०५ – ०.१ % B का छिड़काव करें और फूल खिलने के बाद दो बार (पहला पंखुड़ी गिरने के ७-१० दिन के बाद और दूसरा ३० दिन बाद) छिड़काव करें।
- फलों का फटना और फलों की विकृत वृद्धि को कम करने के लिए बोरॉन स्प्रे [सोलूबोर (२०% B) या बोरिक एसिड (१७% B) @ ०.०५ – ०.१% B] की सिफारिश की जाती है।
- कम फूल, कम फलधारणा, खराब गुणवत्ता वाले छोटे फलों के उत्पादन की समस्या के लिए तांबे आधारित उर्वरकों का मिट्टी के माध्यम से उपयोग करना चाहिए। उदा.: कैल्शियम नाइट्रेट @ १२.५ किग्रा/हेक्टर/प्रयोग (१५ दिनों के अंतराल पर २ प्रयोग)
- यदि फूल और फलधारणा में कमी देखी जाती है, तो कलियों के खुलने से पहले जिंक सल्फेट @ ०.३० – ०.५०% का छिड़काव करने की सलाह दी जाती है।
- आम तौर पर, फसल के मौसम के दौरान सूक्ष्म पोषक तत्वों के ३ स्प्रे देने की सिफारिश की जाती है। ZnSO4 @ ०.३% MnSO4 @ ०.६% बोरिक एसिड (१७% B) @ ०.६% B) या सोलुबोर (२०% B) @०.५ % का पहला छिड़काव कालिया लगने के समय यानी पतझड़ के १५-२० दिन बाद जब पत्तों की नई बहार आएगी। $ZnSO_4$ @ ०.३% और $MnSO_4$ ०.६% का दूसरा और तीसरा छिड़काव फूलोंके पूर्ण खिलने के ३० से ६० दिन बाद दिया जाना चाहिए। इससे अनार की गुणवत्ता, आकार, रंग और स्वाद में सुधार होगा।

Events

Trainings/Workshop/Seminars

ICAR-NRCP has organized a number of training for stakeholders like farmers, extension officers, horticulture department officers and scientists etc. Different need based trainings were also conducted by the centre in collaboration with other government institutes like KVKs & SAU. The participants from Maharashtra and other states were present for training programme and gained knowledge about pomegranate production, water management and disease, insect and pest management and value addition.

Farmers' Field Day organized under SCSP and TSP Scheme

SN	Name of the Program	Venue	Date	No of Beneficiaries
1	Farmers' Field Day-cum-Training Progarmme	Balotra, Barmer, Rajasthan	07.01.2020	100
2	Farmers' Field Day-cum-Training Progarmme	Roopbas, Alwar, Rajasthan	09.01.2020	150
3	Farmers' Field Day-cum Training Programme	Kotma, Anuppur, M.P	11.01.2020	73
4	Farmers' and field staff training of SRIJAN	Jatara, Tikkamgarh, M.P	12.01.2020 - 13.01.2020	50

Training programmes at Barmer and Alwar under SCSP scheme

Agri-input distribution to beneficiaries adopted under SCSP scheme

SN	Programme	Beneficiary Address	Date of MoU	Revenue (Rs.)
1.	M.Sc (Biotechnology)	Karunya Institute of Technology & Sciences (Deemed to be University), Karunya Nagar, Coimbatore- 641 114, Tamil Nadu	03.01. 2020	Nil
2.	M.Sc (Industrial Microbiology)	School of Life Sciences, Devi Ahilya Vishwavidhyalaya, Indore, Madhya Pradesh	09.03. 2020	Nil


Agri-input distribution and training at Kotma, Anuppur, M.P. under TSP scheme

Training programmes conducted by ICAR –NRCP, Solapur for the different stake holders

S N	Name of the Program	Beneficiaries	Venue	Date	No of Benefici -aries
1.	Training programme on Value Addition of Pomegranate	Visitors of Kisan Mela	KVK Gudamalani	24.02. 2020	5000
2.	Pomegranate Processing and Entrepreneur ship. Training on HiTech production technology of Pomegranate	Farmer from Baramati	KVK Baramati	18.05. 2020	180
3.	Post-harvest technology in Pomegranate " in online workshop on "Advances in Pomegranate Production"	farmers of Gujarat	Krishi Vigyan Kendra, Sardarkrushi inagar Dantiwada Agriculture university, Deesa	20.05. 2020	80

Scientific Agro Advisories

In response to queries of farmers, information on pomegranate was provided to the farmers through e-mail and phone. Scientific agro-advisories were sent to more than 2900 pomegranate growers through the "m-Kisan portal" during the period under report.

Transfer of Technology

ICAR-NRCP, Solapur organized the following trainings, workshops/ field day/ FLD, technology transfer agreement for entrepreneurs and MoU for students. In addition, ICAR-NRCP actively participated in several exhibitions besides facilitating the visit of farmers/ stakeholders to the Institute to provide information on pomegranate.

MOU'S, Exhibitions & Mela's

ICAR -NRCP has participated in farmer's fairs, exhibitions and melas at different places of India for disseminating the technologies of ICAR –NRCP, Solapur and also creating the awareness on the pomegranate production importance for livelihood.

1. Participated in Kisan Mela and showcased ICAR-NRCP technologies to farmers KVK, Gudamalani, Barmer II, Krishi Vishwa Vidyalay, Jodhpur KVK, Gudamalani 5000 farmers on 24.02.2020


Dr. Nilesh Gaikwad, Sr. Scientist showcasing pomegranate wine & pomegranate juice technologies to Shri. Kailash Chaudhari, Hon. Minister of State for A&FW, Govt of India.

Visitors/ Dignitaries to ICAR – NRCP, Solapur

SN	Date	Organization/ Place of beneficiaries Category	No. of beneficiaries
1.	07.02.2020	UAHS, Bagalkot Farmers & Officers	28
2.	10.02.2020	KVK, Vijayapur Farmers & Scientists	52
3.	10.02.2020	KVK, Gangavathi Farmers & Scientists	102
4.	24.02.2020	KVK, Gangavathi Framers & Scientists	52

Farmers & Officers from UAHS, Bagalkot and KVK, Vijayapur

Farmers & Officers from KVK, Gangavathi on 10 & 24 Feb 2020

Govt. Initiatives

International Women's day

ICAR-NRC on Pomegranate celebrated International Women's Day on 10.03.2020. The chief guest of the function was Mrs. Chandrika Chauhan, Member, Maharashtra State Women's Commission, Founder, Udyogwardhini. The Guest of honour was Mrs. Shanta, who is successful entrepreneur. Mrs. Chandrika Chauhan delivered speech on her experiences in handling women's issues and building an enterprise with support of women's

Felicitation to Mrs. Chandrika Chauhan, Chief guest on International Women's Day

Publications

1. Singh, N.V., Shilpa, P., Sharma J., Roopasowjanya, P., Babu, K.D., Pal, R.K. and Patil, P.G. et al., 2020. Comparative transcriptome profiling of pomegranate genotypes having resistance and susceptible reaction to *Xanthomonas axonopodis* pv. *punicae.* Saudi Journal of Biological Sciences, https://doi.org/10.1016/j.sjbs.2020.07.023 8.82

2. Patil, P.G., Singh, N.V., Parashuram, S., Bohra, A., Sowjanya, R., Gaikwad, N., Mundewadikar, D.M., Sangnure, V. R., Jamma, S. M., Injal, A. S., Babu, K. D. and Jyotsana, S. 2020. Genome-wide characterization and development of simple sequence repeat markers for genetic studies in pomegranate. (*Punica granatum* L.). Trees structure and Function, https://doi.org/10.1007/s00468-020-01975-y. 7.80.

3. Patil, P. G., Jamma, S. M., Singh, N. V., Bohra, A., Parashuram, S., Injal, A. S., Gargade, V. A., Chakranarayan, M. G., Salutgi, U.D., Babu, K. D. and Sharma, J. 2020. Assessment of genetic diversity and population structure in pomegranate (*Punica granatum* L.) using new hypervariable SSR markers. Physiology and Molecular Biology of Plants, 26, 1249-1261. 7.54

4. Patil, P.G., Singh, N.V., Shilpa, P., Bohra, A., Mundewadikar, D.M., Sangnure, V.R., Babu, K.D. and Sharma, J. 2019. Genome wide identification, characterization and validation of novel mi-RNA based SSR markers in pomegranate (*Punica granatum* L.). Physiology and Molecular Biology of Plants, doi: 10.1007/s12298-020-00790-6. 7.54.

5. Gaikwad, N.N., Kalal, A.Y., Suryavanshi, S.K., Patil, P.G., Sharma, D. and Sharma, J. 2021. Process optimization by response surface methodology for microencapsulation of pomegranate seed oil. J Food Process Preserv., 00:e15561. https://doi.org/10.1111/jfpp.15561 7.41

Book Chapters

1. Ahmad Pervez, Omkar, and Mallikarjun M. Harsur, 2020. Coccinellids on Crops: Nature's Gift for Farmers. In: Innovative Pest Management Approaches for the 21st Century Harnessing Automated Unmanned Technologies (Eds Akshay Kumar Chakravarthy), Spinger publishing Springer Nature Singapore Pte Ltd. 2020.

Popular articles

1. Meshram, D.T., Babu, K.D., Wadane, S.S. and More, B.A. 2020. Water management in pomegranate (*Punica granatum* L.) during hasta Bahar. Agriculture Observer. 1(5), 26- 31.
2. Singh, N.V., Patil, P.G., Shilpa, P., Babu, K.D. and Sharma, J. 2020. Elite pomegranate saplings-imperative for sustainable production. Agriculture Observer, 1(3), 95-98.
3. Singh, N.V., Patil, P.G., Babu, K.D. and Sharma, J. 2020. Model pomegranate orchard establishment for sustainable production. Agriculture Observer, 1(3), 38-42.
4. Singh, N.V., Maity, A., Mallikarjun, M.H., Sharma, J. Chaudhari, D.T. and Shinde, Y. 2020. Mrig bahar/early mrig bahar. Agrowon, 21st April, 2020: 8
5. ज्योत्सना शर्मा, निलेश गायकवाड, स्वाती सूर्यवंशी (२०२०) डाळींबाचे आरोग्यदायी गुणधर्म आणि प्रक्रिया उदयोग संधी, शेतकरी मासिक, मार्च २०२०-२१.
6. Namrata A. Giri, Nilesh Gaikwad and Shilpa Parshuram 2020. Pomegranate (*Punica granatum* L.) medicinal fruit for human health. Kerala Karshakan e-Journal, P 20-25.
7. Patil, P.G., Singh, N.V. and Jyotsana, S. 2020. Genome-wide mining of SSR markers specific to Bacterial blight of pomegranate (*Xanthomonas axonopodis* pv. *punicae*). Indian Phytopath News, 3(2), April-June 2020.
8. Patil, P.G., Parashuram, S., Singh, N.V. and Jyotsana, S. 2020. Marker technology for pomegranate genetic improvement. Agriculture Observer, 1 (3), August 2020.
9. Patil, P.G., Singh, N.V., Parashuram, S., Babu, K.D. and Jyotsana, S. 2020. Recent advances in pomegranate genomics. Agriculture Observer, 1 (3), August 2020.
10. Patil, P.G., Singh, N.V., Parashuram, S., Babu, K.D. and Jyotsana, S. 2020. Recent Developments in microRNA Research in Pomegranate. Agriculture Observer, 1(4), September 2020.
11. Roopa Sowjanya, P., Bharath Kumar, P., Jambagi and Shilpa, P. 2020, Pseudo testcross: Mapping Population for Tree Species. Agriculture Observer. 1(3), 92-95.
12. Roopa Sowjanya, P., Shilpa Parashuram, Bharath Kumar, P. Jambagi and Gazala Parveen. 2020. Plant Breeding and its Role in Pomegranate Improvement. Agriculture Observer, 1(6), 69-72.
13. Jyotsana Sharma, Ashish Maity, Mallikarjun, and Dinkar Chaudhary. 2020. Dalimba Falbageche Hamgamnihaya Niyoojan. Agrowon 27th October 2020.
14. Jyotsana Sharma, Ashish Maity, Mallikarjun, and Dinkar Chaudhary. 2020. Dalimbatil Burshijanya Mar Rogache Vyavstapan. Agrowon 29th October 2020.
15. Jyotsana Sharma, Ashish Maity, Somnath Pokhare, Mallikarjun, and Dinkar Chaudhary. 2020. Dalimb Pikatil Rogamche Vyavstapan. Agrowon 28th December 2020.

E – Publications

1. Jyotsana Sharma, Mallikarjun, Babu, K.D., Somnath Pokhare and Debi Sharma 2020. Adhoc list of Agrochemicals with EU MRL and PHI for Pomegranate production 2020.
2. Mallikarjun, Somnath, Pokhare and Jyotsana Sharma 2020. Trade/Brand/Commercial Names of Agro-Chemicals 2020.
3. Jyotsana Sharma, Ashis Maity, Mallikarjun, Dinkar Chaudhary, and Yuvraj Shinde 2020. Bimonthly Pomegranate Advisory in English for April-May 2020.
4. Jyotsana Sharma, Ashis Maity, Mallikarjun, Dinkar Chaudhary and Yuvraj Shinde 2020. Bimonthly Pomegranate Advisory in English for June-July 2020.
5. Jyotsana Sharma, Ashis Maity, Mallikarjun, Dinkar Chaudhary and Yuvraj Shinde 2020. Tingal Dalimbe Belege Salahe (Kannada). June-July 2020.

TV Programs

Sharma Jyotsana. 2020. Management of Bacterial blight disease in Pomegranate: ETV facebook live program on Sakal Agrowon on 03.11.2020. Interacted with 'Agrowon' Leading Agriculture Organisation.

Passport Data of Plant Varieties

Dhinesh Babu, K., Singh, N.V., Chandra, R., Sharma Jyotsana, Maity, A., Jadhav, V.T., Pal, R.K., Marathe, R.A., Jalikop, S.H., Sampathkumar, P. and Murthy, B.N.S. 2020. Passport Data of new pomegranate variety NRCP H-6 (Solapur Lal). Plant Variety Journal of India. 14 (5), 13-14.

Patent

Gaikwad Nilesh N. and Pal Ram Krishna "A Process of Extraction of Virgin Pomegranate Seed Oil with retention of bioactive compounds" Patent Filed Application No. 201611011366 E-2/528/2017/DEL. (Granted awaiting NBA agreement)

Awards

Dr. Mallikarjun H. Fellow of the Society for Biocontrol Advancement-2020 2020 Society for Bio-control Advancement, ICAR-National Bureau of Agricultural Insect Resources, Bengaluru, Karnataka

Joining

Mr. Rahul Damale, Scientist (Biochemistry) joined ICAR-NRCP, Solapur on 04.04.2020 due to posting by ASRB

Promotions

1. Mr. Diwakar Sawaji, Sr. Technical Assistant promoted to Technical Officer wef. 15.04.2018
2. Mr. Yuvraj Shinde, Sr. Technical Assistant promoted to Technical Officer wef. 04.06.2020
3. Mr. Vijay Lokhande, Sr. Technician promoted to Technical Assistant wef. 03.06.2020

Relieving : NIL

हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद
भाकृअनुप
ICAR
Agrisearch with a human touch

(An ISO 2009:15 Certified Organization)
Indian Council for Agricultural Research
भारतीय कृषी अनुसंधान परिषद, नवी दिल्ली
National Research Centre on Pomegranate
राष्ट्रीय डाळिंब संशोधन केंद्र
Solapur - 413 255, Mahasrashtra (INDIA)
सोलापूर - ४१३ २५५, महाराष्ट्र (भारत)

Phone – (0217)-2354330, 2350074, **Fax**-(0217)-2353533
Email – nrcpomegranate@gmail.com
www.nrcpomegranate.icar.gov.in