ICAR-NRCP

Newsletter - संवादपत्र

January - June 2021

From the Director's Desk - निदेशक की कलम से

Greetings from ICAR-NRCP

The newsletter of ICAR-NRCP for January-June, 2021 portrays the centre's major research achievements, activities and events that happened over the past six months. It is proud moment for us that, national level DUS (Distinctiveness, Uniformity and Stability) centre exclusively for the pomegranate has been established at NRCP, Solapur. The DUS examination helps in pomegranate variety protection, new variety identification, prevent mislabelling or misleading of pomegranate varieties, enhance market transparency and in conservation of pomegranate plant genetic resources.

NRCP released one bio-fortified, high yielding, early maturing pomegranate variety 'Solapur Lal', having high iron, zinc, Vitamin-C and anthocyanin contents in the edible parts. It is a boon to combat nutritional deficiencies in human. Even during continuous rainy days it flowered profusely with good fruit set.

Many scientists from this centre are awarded with prestigious fellowships and awards. Centre continued as capacity building by organizing training programmes for farmers, state officials and entrepreneurs.

I thank the Editorial Board for their sincere efforts in bringing out the Newsletter. I place on record my thanks to all the staff members of NRCP for their contributions in bringing out this issue of the Newsletter.

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Dr. R.A. Marathe took over the charge of Director, ICAR-NRCP, Solapur

Dr. Rajiv Arvind Marathe took over the charge of Director, ICAR-National Research Centre on Pomegranate, Solapur on April 28, 2021. He has vast field working experience in Pomegranate (8 Years), Citrus (15 Years), and Soil (8 Years) institutes of ICAR located under different agro-climatic regions including NEH regions.

As a founder member he pioneered establishment of new institute ICAR – NRC on Pomegranate, Solapur and worked here during the year 2005 to 2013. He executed almost all the works viz. foundation stone laying ceremony, land acquisition, development of 150 acres' research farm of pomegranate on watershed basis having farm sheds, vermi-composting unit, polyhouses, and four water harvesting ponds having eight crore liters of water storage capacity, other farm infrastructures and also construction to inauguration of office cum laboratory building.

During his professional carrier of 33 years, Dr. R.A. Marathe made research contributions mainly in the areas of soil survey, mapping, soil characterization, rootstocks, nutrient and water management in citrus and pomegranate fruit crops grown under containerised nurseries and orchards. He coordinated more than 50 research projects, contract research projects, externally funded projects, projects from NITI Aayog, World Bank, Vidarbha Development Board, NATP, NETWORK, HORTSAP, RKVY, SERB, BARC and many other projects. He has more than 100 publications in reputed journals, many award, fellowships, recognitions, appreciation letter to his credit.

Research achievements/ Highlights/ Technology developed

Solapur Lal: Joint AGRESCO-2021

Solapur Lal is the first bio-fortified pomegranate variety developed by NRCP, Solapur. It has higher yield (23 t/ha), early maturity (160 days), higher total soluble solids (17.6° Brix), Vitamin C (19.2 mg/100g), Anthocyanin (390 mg/100g), etc. This variety exhibit 60% more Iron and 25% more Zinc content over Bhagawa, the ruling variety.

Solapur Lal Fruit

Fruit exposing arils

Arils

(K. Dhinesh Babu)

Activities under DUS Centre on Pomegranate at ICAR- NRCP, Solapur

On site DUS characterization of farmer variety 'Sharad king' at Tupewadi, Aurangabad has showed the presence of distinctive characteristic features for petal length (long), fruit length (long), aril length (short) and fruit maturity (medium) in comparison to 'Bhagawa' (medium, medium, medium, and late maturity, respectively). It is found susceptible to bacterial blight disease. The two years consolidated report of the two hybrid varieties (NRCP H-4 and NRCP H-14) has showed that the NRCP H-14 is having vigorous plant growth habit with yellow red tinge fruits, very sweet pink arils and hard seeds. While, NRCP H-4 fruit rind is yellow with red tinge, arils are pink with acidic juice embedded with hard seeds. All these are medium duration varieties takes about 140-165 days to mature after anthesis. In 2021, NRCP H-6 (Solapur Lal) and NRCP H-12 (Solapur Anardana) varieties got registered under PPV&FRA, New Delhi as new varieties.

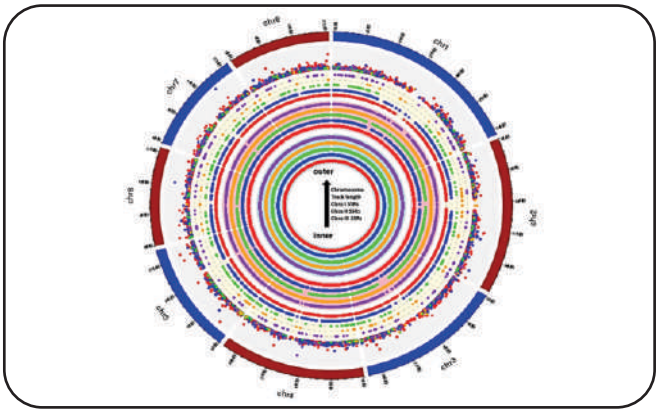
Sharad King

Bhagawa

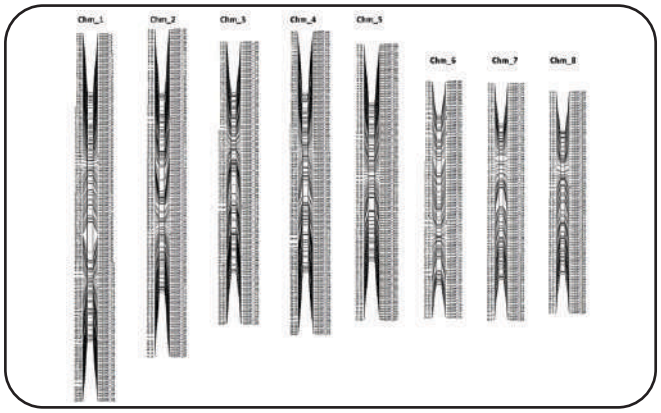
(Shilpa Parshuram & Roopa Sowjanya P.)

Development of chromosome specific hyper variable SSR markers for large-scale genotyping applications in Pomegranate

DNA marker technology facilitates the identification of genetic determinants (genes/QTLs) underlying various traits of economic significance, and SSR markers represent one of the most informative, abundant, and easy-to-use marker systems for genetic studies and plant breeding programs. However, paucity of highly polymorphic chromosome-specific molecular markers in pomegranate has hampered map-based gene/QTL analysis. Availability of chromosome-level genome assembly of the pomegranate cultivar such as 'Tunisia' (296.85 Mb, Luo et al., 2019) provided with unprecedented opportunity for genome-wide characterization and development of the first set of chromosome-specific highly informative 3,839 hypervariable SSR markers (tract length > 30 nt). Considering the significance of SSRs with greater tract length with higher degree of polymorphism for genetic analysis in other crops, here, designed and validated 3,839 class I SSRs in the 'Tunisia' genome through ePCR and found 1,165 (30.34%) SSRs producing a single amplicon. Then, selected 906 highly variable SSRs (> 40 nt) from the ePCR-verified class I SSRs and *in silico* validated across multiple draft genomes of pomegranate, which provided a subset of 265 highly polymorphic SSRs. Of these, 235 primers were got synthesized and validated on six pomegranate genotypes through wet-lab experiment. About 221 (94%) polymorphic SSRs were found on six genotypes and 187 of these SSRs had ≥ 0.5 PIC values. The utility of the developed SSRs was demonstrated by analyzing genetic diversity of 30 pomegranate genotypes using 16 HvSSRTs spanning eight pomegranate chromosomes.



Chromosome wise distribution of SSR motifs and their tract lengths

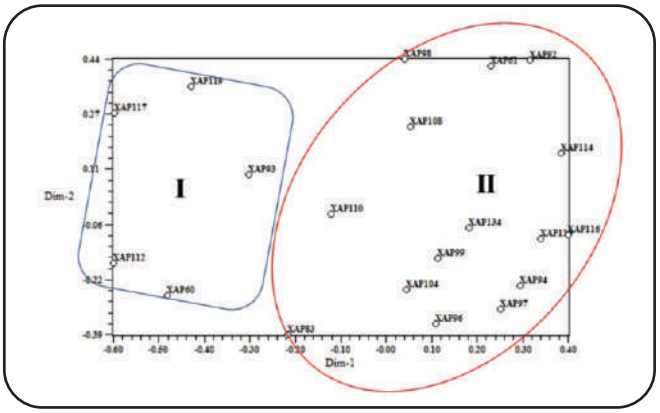


Physical map showing locations of 906 highly variable SSRs on 8 chromosomes

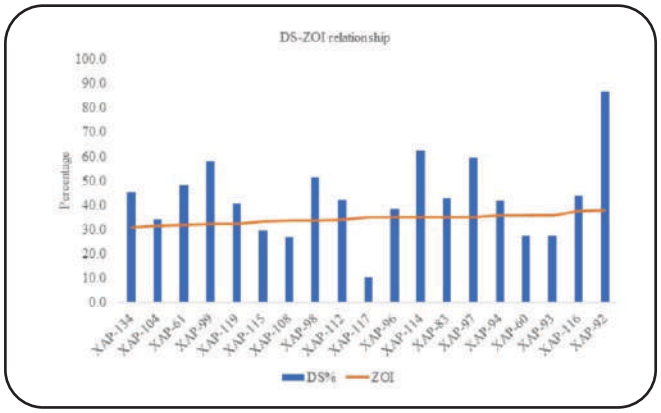
(Prakash G Patil, Nripendra Vikram Singh, Karuppannan Dhinesh Babu & Jyotsana Sharma)

Genetic Diversity and Streptomycin Sensitivity in *Xanthomonas axonopodis* pv. *punicae* Causing Oily Spot Disease in Pomegranates

Xanthomonas axonopodis pv. *punicae* (Xap) causes bacterial blight disease in pomegranates, often leading to 60–80% economic loss. In absence of a suitable Xap-resistant variety, the near monoculture of the susceptible variety, Bhagawa, has aggravated the problem further. In recent times, Xap has spread to different geographical regions, indicating the wide adaptability of the pathogen. Moreover, lower sensitivity of Xap towards streptocycline containing streptomycin sulphate and tetracycline sulphate (9:1) under field conditions is frequently reported. Therefore, the current study was undertaken to assess the genetic variability of Xap isolates using SSR markers, there *in vitro* sensitivity towards streptomycin was evaluated, and the probable molecular basis of acquired resistance was studied. Two highly diverse isolates showed extreme differences in their pathogenicity, indicating the highly evolving nature of the pathogen. Moreover, all the isolates showed less than 50% growth inhibition on media containing 1500 µg/mL streptomycin, indicating a lower level of antibiotic sensitivity. On the molecular level, 90% of the isolates showed the presence of strA-strB genes involved in streptomycin metabolism. Additionally, G to A transitions were observed in the rpsL gene in some of the isolates. The molecular data suggest that horizontal gene transfer (strAB) and/or spontaneous gene mutation (in rpsL) could be responsible for the observed lower sensitivity of Xap towards streptomycin.



Grouping of Xap isolates based on their genetic diversity as analysed by SSR markers



Relationship between percent disease severity (%DS), observed after 6 weeks, and zone of inhibition (ZOI) at the highest concentration (1500µg/mL) of antibiotic

(Manjunatha N., Jyotsana Sharma, Somnath S. Pokhare, Prakash G. Patil, Mallikarjun M.H. & R.A. Marathe)

Low Calorie Pomegranate Fruit Drink

Low-calorie drinks are promoted as healthy alternatives to sugar-sweetened beverages. Free or added sugars have been acknowledged as a readily available source of energy, which accounts for a large percentage of daily energy intakes, leading to excess calories, weight gain and obesity. The use of natural and artificial sweeteners has been optimized for the development of low calorie pomegranate fruit drink. It was prepared using natural (stevia) and artificial sweeteners (sucralose and aspartame) by substituting sucrose (refined sugar) at the rate of 0, 25%, 50%, 75% and 100%. The total sugar content of beverage was significantly reduced from 15.03% to 4.5% due to use of non-calorific sweeteners. The energy value was also reduced from 60.12 kcal/100ml to 18 kcal/100ml. The sensory evaluation resulted in higher panel score to the beverage containing 75% stevia and 25% sucrose when compared to the beverage prepared using sucralose and aspartame sweeteners. The developed beverage is suitable for the consumers on low calorie diet and also for patient with type-II diabetes.

(Namrata A. Giri, Nilesh N. Gaikwad & R. A. Marathe)

Events organized

Title of the event	No. of participants	Date	Course Director/ Co-coordinators/ Team
Pomegranate Field Day organized on the occasion of the first harvest of the demonstration plot H13	30	26 March, 2021	Dr.Ashis Maity & Dr.Somnath Pokhare
International Women's Day	50	8 March, 2021	Dr.Jyotsana Sharma, Dr. Shilpa P. & Dr. Roopa S.

Events attended by the NRCP staff

Title of the event	Date	Organizers	Name of the participants
Webinar on Prospects of underutilized fruits in India for nutritional security & entrepreneurship	24 March, 2021	SKNAU, Jobner, (Online)	Dr. K.Dhinesh Babu
"Containing Malnutrition" through Horticulture- by Dr. Anand Kumar Singh, DDG (Hort. Sci), ICAR	5 April, 2021	NRCP, Solapur (Online)	Dr. Mallikarjun H.

International webinar "Exchange of Post PVP Control Measures"	8 April, 2021	PPV&FRA, New Delhi (Online)	Dr. Shilpa P.
One day National webinar on 'IPR & Patents'	19 June, 2021	V.G. Shivdare College of Arts, Commerce & Science, Solapur (Online)	Dr. Shilpa P.
National Webinar on "Nematodes A Continuing Bottleneck in Crop Production : Available Technologies and Recent Advances"	6 April, 2021	Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan (Online)	Dr. Somnath S. Pokhare
National e-conference on Biodynamic Calender and Technological Intervention for Horticulture Sustainability and Health Security in Changing Climate	21-23 January, 2021	UAHS Bidar (Online)	Dr. Roopa S.
International webinar on "Exchange of Post PVP Control Measures" on - PPV & FRA	6 April, 2021	PPV & FRA, New Delhi (Online)	Dr. Roopa S.

Trainings conducted for farmers/ students/ officers/ entrepreneurs etc.

Title of the training	No. of participants	Date
Quality pomegranate production and value addition for doubling farmer's income for bio squad team of Valagro Pvt. Ltd.	26	15-17 February, 2021
Collaborative training programme on "Modern practices for export quality pomegranate production and value addition"	51	28-30 February, 2021

Training on 'Quality pomegranate production & value addition for doubling farmer's income' during 15-17 February, 2021

Training attended by NRCP staff

Title of the event	Date	Organizers	Name of the participants
Training Programme on "Quality pomegranate production and value addition for doubling farmer's income" for Valagro Biosciences organized by ICAR-NRC on Pomegranate, Solapur	15-17 February, 2021	ICAR-NRCP, Solapur	Dr. N.V. Singh
Virtual training course on "Management of Fruit Genetic Resources" organized by ICAR- NBPGR, New Delhi, ICAR-AICRP (F) and ICAR-IIHR, Bangalore.	1-2 February, 2021	Virtual mode	Mr. Chandrakant Awachare

Peer recognitions/ Awards/ Honors received by the NRCP staff

Name of Scientist	Name of award	Awarding organization
Dr. R.A. Marathe	Fellow of Indian Society for Arid Horticulture, Bikaner, Rajasthan (FISAH-2021)	Indian Society for Arid Horticulture, Bikaner
Dr. K. Dhinesh Babu	Fellow of Indian Society for Arid Horticulture, Bikaner, Rajasthan. (FISAH-2021)	Indian Society for Arid Horticulture, Bikaner
Dr. K. Dhinesh Babu	Life Time Achievement Award in Fruit Science	Society for Development andAdvancement of Agricultural Technologies (SDAAT), Meerut
Dr. N.V. Singh	Fellowship of the Confederation of Horticulture Associations of India-2021 (FCHAI)	Confederation of Horticulture Association of India (CHAI), New Delhi
Dr. P. G. Patil	NESA Eminent Scientist Award -2021	National Environmental Science Academy, New Delhi
Dr. P. G. Patil	Excellence in Research Award -2021	Society for Scientific development in Agriculture and Technology, UP
Dr. Shilpa Parashuram	Young Scientist Award-2021	Environment and Social Development Association (ESDA), New Delhi
Mr. Rahul Damale	Young Scientist Award-2021	Society for Scientific Development in Agriculture & Technology (SSDAT), Meerut, India
Dr. K. Dhinesh Babu et al.	Best Poster award-2021	Indian Academy of Horticultural Science (IAHS)

Technology Commercialization/Linkages/Collaborations / MoU signed

Sr. No.	Purpose of MoU	Collaborative Institute/Organization
1.	Training and Research work for students	ICAR-NRCP, Solapur and Mahatma Phule Krishi Vidyapeeth Rahuri (MPKV)

2.	Training and Research work for student	ICAR-NRCP, Solapur and Aditya College of Agricultural Biotechnology, Beed (Affiliated to VNMKV)
3.	Training and Research work for student	ICAR-NRCP, Solapur and Dr.YS Parmar University of Horticulture & Forestry, Nauni, Solan (H.P)
4.	Research Work for student	ICAR-NRCP, Solapur and D.S.T.S.Mandals College of Pharmacy, Solapur
5.	Research Work for student	ICAR-NRCP, Solapur and VNMKV, Parbhani

Publications

Research papers

1. Patil, P. G., Singh, N. V., Bohra, A., Sowjanya, R., Raghvendra, K.P., Mane, R., *et al.* (2021). Comprehensive characterization and validation of chromosome-specific highly polymorphic SSR markers from pomegranate (*Punica granatum* L.) cv. Tunisia genome. *Frontiers in Plant Science* **12**: 645055. doi: 1 0.3389/fpls.2021.645055 **(NAAS rating:11.75)**
2. Gaikwad, N.N., Kalal, A.Y., Suryavanshi, S.K., Patil, P.G., Sharma, D, Sharma J. (2021). Process optimization by response surface methodology for microencapsulation of pomegranate seed oil. Journal of Food Processing and Preservation. 45 (6) e15561. https://doi.org/10.1111/jfpp.15561. **(NAAS rating:7.41)**
3. Singh, N.V., Karwa, N.N., Birajdar, S.B., Parashuram, S., Patil, P.G., Babu, K.D. et al. (2021). Evaluation of plant beneficial microbes for bio-hardening of *in-vitro* raised pomegranate saplings. Indian Journal of Agricultural Sciences 91(1): 29-33. (NAAS rating:6.37)
4. K.J. Jeyabaskaran, P.S. Shirgure, Vikramaditya Pandey, A.K. Srivastava and S. Uma. (2021) Fertigation in Horticulture : A Guarantee to Economized Quality Production. Indian Journal of Fertilisers 17 (4) : 364-383. (NAAS rating:4.76)
5. Babu, K.D., Sharma, J., Maity, A., Singh, N.V., Patil, P.G., Shilpa, P. and Marathe, R.A. (2021). Pomegranate: An ancient fruit for health and nutrition. Progressive Horticulture. 53 (1): 3-13. (NAAS rating:4.49)

Book chapters

1. Singh, N.V., Karimi, H.R., Sharma, J. and Babu, K.D. (2021). Propagation Techniques and Nursery Management. In: The Pomegranate: Botany, Production and Uses (Eds. Sarkhosh, A., Yavari, A. and Zamani, Z). CABI Publishing – Wallingford OX10 8DE, United Kingdom. 196-224.
2. Carter, J.M, Yavari, A., Sarkhosh, A., Jia, Z., Merhaut, D.J., Preece, J.E., Cossio, F., Qin, G., Liu, C., Li, J., Shilpa, P., Babu, K.D., Sharma, J, Yilmaz C, Bartual J, Mustafayeva Z, Saeedi, MA., Awd NA, Moersfelder J and Hou L.(2021). World pomegranate cultivars. In:.The Pomegranate: Botany, Production and Uses (Eds. Sarkhosh, A., Yavari, A. and Zamani, Z.), CABI Publishing – Wallingford OX10 8DE, United Kingdom. 157-195.

Popular articles

1. Awachare, C., Singh, N.V., Babu, K.D., Marathe, R.A., (2021). Canopy management in pomegranate for improved quality and yield. Biotics Research Today, 4(1); 11-13.
2. सोमनाथ पोखरे, मंजूनाथा एन., ज्योत्स्ना शर्मा, दिनकर चौधरी, व विजय लोखंडे तेलकट डाग रोग व्यवस्थापनाच्या सहा पायऱ्या'ॲग्रो प्लानिंग, सकाळ अग्रोवन, ७ मार्च २०२१.

3. सोमनाथ पोखरे, मंजूंनाथा एन., ज्योत्स्ना शर्मा, दिनकर चौधरी, व विजय लोखंडे. 'डाळिंबामधील तेलकट डाग रोग व्यवस्थापनाच्या सोप्या सहा पायऱ्या'शेतकरी मासिक, एप्रिल २०२१:43-44.

4. Jyotsana Sharma, Somnath Pokhare and Mallikarjun (2021) Dalimbatil Keed Rog Niyantran. Sakal-Agrowon, 11 April 2021.

5. Jyotsana Sharma, Somnath Pokhare and Mallikarjun (2021) Ambya Baharatil Keed-Rog. Vyavstapan. Sakal-Agrowon, 20 April 2021.

6. Giri N.A., Gaikwad N. N. & Marathe R.A. (2021). Potential application of Pomegranate Peel as a natural food additive. Kerala Karshakan (E-journal). 13-18.

7. Giri N.A., Gaikwad N. N., Marathe R.A. & Chaudhari D. T. (2021) Karonda: A protective hedge around pomegranate orchard. Agro India. 24-25.

Technical Bulletin and others

1. Singh, N.V., Sharma, J., Shilpa, P., Roopa Sowjanya, P., Marathe, R.A. (2021). Outreach Programmes of ICAR-NRCP under SCSP and STC to disseminate pomegranate production technologies. Technical Bulletin No. NRCP/2021/2, ICAR- National Research Centre on Pomegranate, Solapur, p. 33.

2. Manjunatha, N, Somnath S. Pokhare, Jyotsana sharma, Mallikarjun M.H., and Siddalingayya S. Salimath. (2021). Dalimbe Beyela Beru Gantu Jantuhulu Roga mattu adar samagra nirvahane. NRCP. Extension- 2021/3. p. 04.

3. Mallikarjun H. Jyotsana Sharma, Somnath S. Pokhare Manjunatha, N. & Rajiv Marathe. (2021). Pomegranate Shot hole borer Management. ICAR-NRCP/EXTN/2022/1. Published under CROPSAP.

International Women's Day Celebration

On March 8, 2021 the International women's day was celebrated by NRCP. Mrs. Pryamvada H. Godbole, Managing Director, The Solapur Chemicals Pvt Ltd. (Chief guest), Dt. Sapana Dodmani-Pawar, Dietician (Guest of Honor) and Dr. Jyotsana Sharma, Director (Acting) ICAR - NRCP, Solapur inaugurated the program. There were two keynote address, one on "Role of women in entrepreneurship" by Mrs. Priyamvada H. Godbole and another one on "Food and Nutrition tips for Women Health" delivered by Dt. Sapana Dodmani-Pawar. On this occasion, four women excelling in different fields were felicitated. Their details are given below :

1. Bhakti Jadhav : Water Body Rejuvenation, Solapur
2. Shobha Pawar : Small Scale Producer (Pomegranate Juice), Solapur
3. Laxmi Birajdar : Small Entrepreneur (Millets), Solapur
4. Sunita Habbu : Value addition in Millets, Solapur

Felicitation to Women for their valuable contribution in the field of Agriculture at NRC on Pomegranate, Solapur

Activities under Swachhata Abhiyan

The Swachhata Abhiyan was conducted at ICAR-NRC on Pomegranate, to create awareness among the society. Coconut & Mango plantations were conducted at Hiraj research field of ICAR-NRCP. Building premises, laboratories, library, guest house and research field were cleaned with the active involvement of ICAR-NRCP staff. The public places were cleaned along with awareness among the people, Dustbins were placed at public places like temple and residential areas. Swachhata activity was also. conducted at Jaloli Ta. Pandharpur Dist. Solapur with the compost making demonstration to the villagers. The debate competition and drawing competitions were conducted at Shree Sharadchandra Patil School, Solapur in order to create awareness among children.

Various activities under Swachhata Abhiyan by NRCP Staff

Events organized under SCSP

Venue	Activities
State: M.P. **District** : Tikkamgarh **Village** :Tal Lidhora, Barmadang, Dor **SC population benefitted:** 85	• Pomegranate orchards established and are in bearing stage • Agri-input and technical support provided • Capacity building programmes organized
State : Karnataka **District** :Kalaburgi **Village** :Santanur, Vaijapur **SC population benefitted:** 15	• Technical and agri-input support provided • Agri-input and technical support provided • Capacity building programmes organized
State :Maharashtra **District** :Solapur **Village** :Nimgaon and Solankarwadi **SC population benefitted:** 20	• Pomegranate orchards established and are in bearing stage • Agri-input and technical support provided • Capacity building programmes organized
State :Rajasthan **District** :Barmer and Alwar **Village** :Rajeshwar Nagar, Roopbas, Sherpur **SC population benefitted:** 20	• Pomegranate orchards established and are in bearing stage • Agri-input and technical support provided • Capacity building programmes organized

Agri-input distribution to SCSP beneficiery during training programme

Agri-inputs distribution to the STC farmers under TSP scheme of NRCP

Training programmes organized for tribal and SC farmers under SCSP/STC

Sr. No.	Name of the training programme	Place
1.	Model Propagation and Pomegranate Production Technologies for Farmers and Coordinating Agencies under SCSP, TSP and MGMG	ICAR-NRCP (Virtual mode)
2.	Material distribution and orientation programme for SC beneficiary farmers of Vaijapur and Santanur	ICAR-NRCP, Solapur

Events organized under TSP

State	Activities
State: Madhya Pradesh **District:** Anuppur **Village:** Manmari, Reusa, Baskhala, Baska, ali, Chaka, Changeri, Reula Behratola, Jamunia, Chapani, Chhauhari, Chapani, Kadmaha, Pathroudi, Thouda. **ST population benefited:** 115	• Pomegranate orchards established & in bearing stage • Agri-input and technical support provided • Capacity building programmes organized
State: Chhatisgarh **District:** Koriya **Village:** Kerabehara,Dorki **ST population benefited:10**	• Pomegranate orchards established & in bearing stage • Agri-input and technical support provided • Capacity building programmes organized Master trainers groomed

Electronic and Print Media coverage

Distinguished Visitors to NRCP

Dr. Ashok Dhawan, Hon. VC, VNMKV, Parbhani visited NRCP on 07.02.2021

Dr. Poonam Malakondaiah, Special Chief Secretary, Govt. of Andhra Pradesh visited NRCP on 03.03.2021

Meetings attended by the NRCP staff

1. 26th Research Workers Annual Group Meet, AICRP on Arid Zone Fruits
2. Farmer interface meeting on management of shot hole borer and pomegranate at Ajnale, Sangola
3. HORTSAP meeting on modification of the pomegranate survey proforma for pest scouts and monitors at Sakhar Sankul Shivajinagar, Pune, Maharashtra
4. Board of studies, Cosmetic Technology department, Solapur University for designing and finalization of the course wise syllabus, marking system etc. for B.Tech (Cosmetic Technology)
5. 13th Foundation Day Function of ICAR-NIASM, Baramati and Panel Discussion
6. Discussion session organized by Maharashtra Pomegranate Growers' Research Association, Pune on the occasion of Foundation Day of MPGRA, Pune.
7. Webinar Organized for officers of Telangana State Government on Pomegranate cultivation
8. Three-Day Farmers' Training Programme Organized by VNMKV, Parbhani
9. Review meeting of DUS centres under the Chairmanship of Dr. K. V. Prabhu, Chairperson of PPV&FRA, New Delhi.

Published By

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