ICAR-NRCP

Newsletter - संवादपत्र

January to June 2023

From the Director's Desk - निदेशक की कलम से

Dear Readers,

It gives me immense pleasure to release the Newsletter of ICAR-NRCP, Solapur for the period January – June 2023. It's a matter of pride that NRCP's pomegranate processable variety **'Solapur Anardana'** has been released by Joint Agresco-2023 for anardana purpose and it's in consideration of SVRC-2023 Notification. This centre has developed and validated an effective, economical and eco-friendly technology: **"Stem solarisation for the management of bacterial blight disease"**, which immensely benefited and widely accepted by the pomegranate farmers of the regions. NRCP has identified and validated the InDel markers that are specific to growth and development of pomegranate. Similarly dose for gamma irradiation to increase the variability and identify potential mutants' has been standardized. Other notable technologies include **mass production protocol for pomegranate fruit piercing moths *Eudocima materna* and process of osmotic assisted pomegranate dried arils.**

For the benefit of farming community, NRCP team surveyed the pomegranate growing areas in Gujarat and Rajasthan to identify and solve the location specific problems. The centre has also organised five training programmes and participated in four agricultural exhibitions. During this period, ICAR-NRCP has signed a MoU for technology commercialization and NRCP Staff has received meritorious fellowships, awards and externally funded projects. I extend my hearty congratulations to the dedicated efforts of scientists and other staff of ICAR-NRCP.

Contents

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Research achievements/Highlights/ Technology developed

Pomegranate Variety: Solapur Anardana

Release proposal for NRCP developed pomegranate variety "Solapur Anardana" was submitted and presented in Joint Agresco-2023 at MPKV, Rahuri during 25-27th May, 2023. It is a high yielding variety (23 t/ha). It was release by the institute in 2017. It has higher acidity (4.8%) and anthocyanin content (460 mg/100g) and suitable for anardana purpose; more recovery of anardana from arils (>21%).

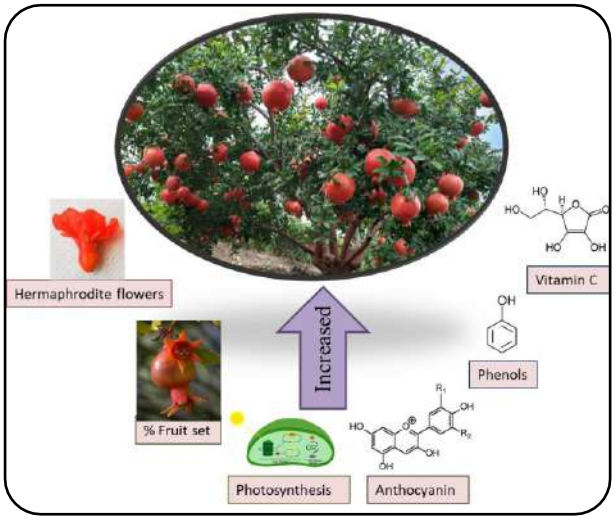
Solapur Anardana Fruit

Fruit exposing arils

(Dr. K. D. Babu)

Enhancing Flower Induction and Nutritional Quality of Pomegranate: Role of Plant Growth Regulators and chemicals

Two-year field study was carried out using ten plant growth hormones/chemicals viz. spermidine (1.5 ppm), putrescine (44 ppm), 6 benzyl adenine (200 ppm), ammonium sulphate (5000 ppm), potassium dihydrogen phosphate (5000 ppm), naphthalene acetic acid (20ppm), proline (100 ppm), chitosan (500 ppm), ascorbic acid (250 ppm) and paclobutrazol (36 ppm) to find out their role in flower induction and fruit quality. Flowering pattern was significantly affected by treatments. Most of the treatments showed less than 75% male flowers compared to control plants (80%), with Potassium dihydrogen phosphate being the best treatments.



Parameters significantly enhanced by application of plant growth hormones

The results of fruit set percent showed Potassium dihydrogen phosphate to be most effective as up to 66% fruit setting was achieved. Treatments like putrescine (64%), chitosan (64%) and 6-BA (61%) also showed significant fruit setting compared to control (43%). Total soluble sugars, one of the most important parameters as far as consumer preference is concerned, was significantly higher in fruits harvested from ammonium sulphate treated plants (16.35°Brix), followed by NAA treatment (15.67°Brix). Total phenols were the maximum in NAA and ascorbic acid treated plants (2156 mg/L and 2135 mg/L, respectively).

Total antioxidative capacity in terms of FRAP showed similar trend as that of ascorbic acid and was significantly higher in NAA, ascorbic acid, chitosan and spermidine treated plants (31.12, 30.79, 30.15 and 29.91 mgAAE/100ml, respectively). Likewise, putrescine significantly and chitosan also showed significantly enhanced anthocyanin content compared to control fruits (30.34 mg and 29 mg cyanidine/100ml, respectively). Based on the results, few of these chemicals can be included in the package of practices, where spermidine can be included to enhance number of hermaphrodite flowers, potassium dihydrogen phosphate or putrescine can be used to enhance fruit setting. The chemicals used for fruit setting will also help to enhance fruit anthocyanin content and hence fruit color.

(P. Raigond, A. More, N.V. Singh, Shilpa P., K. D. Babu, N. A. Giri, N. N. Gaikwad, C. Awachare, P. G. Patil & R. A Marathe)

Development of InDel markers specific to gene families involved in pomegranate growth and development

Currently four pomegranate genome assemblies are publicly available on NCBI, with the largest being "Bhagawa" at 342 Mb, followed by "Dabenzi" at 328 Mb, "Tunisia" at 320 Mb, and "Taishanhong" at 274 Mb. These genomes offered useful genomic information on many well characterized gene families that play crucial role in pomegranate growth and development. These includes gene families for sugar metabolism and transporters, such as sucrose synthase (SUS), sucrose transporter (SUT), and exported transporter (SWEET), as well as gene families for transcription factors like three-amino-acid-loop-extension (TALEs), YABBY, auxin responsive factors (ARFs), and basic leucine zipper (bZIP). Recently, gene derived InDels (Insertion and Deletion) markers have attracted greater attention due to their co-dominant inheritance, repeatability, ease of application, and can detect polymorphism within genes. Therefore, to design InDel markers specific to seven gene families involved in growth and development of pomegranate, retrieved 140 representative genes *i.e.* PgbZIP (65), PgSWEET (20 genes), PgTALE (17), PgARF (17), PgSUT (10), PgYABBY (6), and PgSUS (5), from the four draft genomes of pomegranate using BLASTn homology search. All the gene sequences were examined and compared through multiple sequence alignment to identify and design 245 InDels primers. Initially, all these primers were got *e*PCR verified on the Tunisia genome to identify 148 (60.41%) e-mapped markers. Then subsequently 107 polymorphic markers got ePCR confirmed on multiple genomes with an average PIC value of 0.62. Further, through wet-lab experiments on six pomegranate genotypes 54 InDel primers were got validated off which 37 (71.15%) were found to be polymorphic. Finally, the immediate utility of these developed InDel markers was demonstrated by analysing genetic diversity among 16 pomegranate genotypes using 16 InDel markers. The marker resources developed here could definitely serve as valuable genomic resources for future genomics assisted breeding in pomegranate.

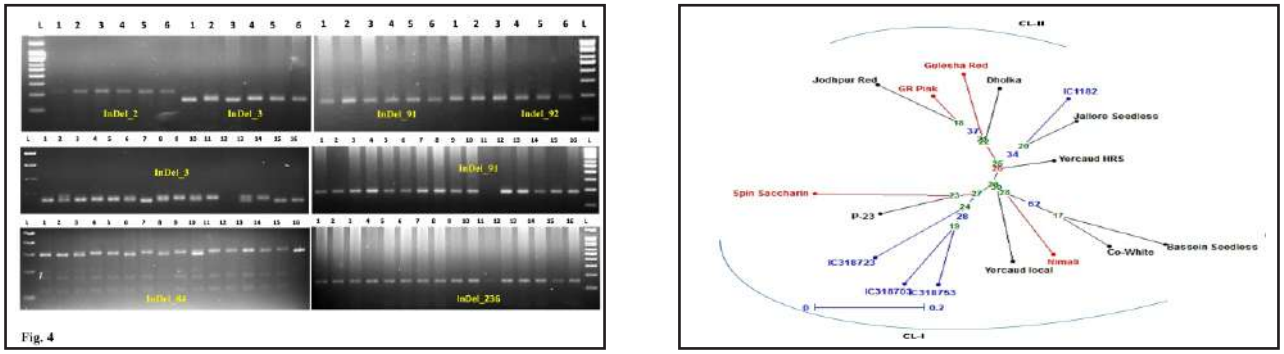


Fig. 4

Wet lab validation and genetic relationships among 16 pomegranate genotypes based on InDel markers

(P. G. Patil, S. M. Jamma, Manjunatha N., K. D. Babu, N. N. Gaikwad, P. Raigond, Shilpa P. and R. A. Marathe)

Standardization of LD_{50} & GR_{50} of gamma rays for the Pomegranate Cultivars Bhagawa and Solapur Lal

The present study was conducted to determine LD_{50} doses of gamma rays for the most popular cultivars Bhagawa and Solapur Lal for vegetative propagules. The study consists of different treatment dosage ranging from 10 - 60gy. The percent sprouting and growth rate has been calculated, and subjected for statistical analysis for both the cultivars viz., Bhagawa and Solapur Lal. The observations were recorded on treated plants and subject for probit analysis. A linear Probit regression model was developed to determine the mean LD and GR of both the genotypes (Table). The lethal doses (LD 50) for acute and chronic levels of irradiation have been identified for Bhagwa and Solapur lal cultivars.

Variations were observed between the genotypes and the doses. The established LD and GR doses from this study can be utilized in large-scale mutagenesis breeding programs for generating a wide range of mutants.

Name of the Cultivar	Bhagwa	Solapur lal
Component	Estimate	Estimate
Mean X	27.875	28.794
Mean Y	-0.809	-0.915
Intercept	-5.620	-6.030
Beta	3.329	3.505
Lc_{50}	48.774	52.541
LL	43.164	44.024
UL	55.114	62.706
Log (Lc_{50})	1.688	1.720
Log LL	1.635	1.644
Log UL	1.741	1.797
Chi-Square ML	61.926	42.444
Sign (Chi-Square)	0.000	0.000

Estimation of Probit Line, LC_{50} / LD_{50} and Fit statistics

(P. Roopa Sowjanya, Shilpa P. and R. A. Marathe)

Stem Solarization : And Eco-Ffriendly, Economical and Effective Technology to control the Bacterial Blight of Pomegranate

Among the various diseases of pomegranate bacterial blight disease (BBD) is most threatening. It is caused by a bacterium *Xanthomonas axonopodis* pv. *punicae* and affects all plant parts, but is most destructive on fruits. The disease resulted in yield losses to the extent of 60-80% under epidemic conditions. It is prevalent throughout the year and most devastating during the rainy season – the season most preferred in arid/semi-arid regions.

Based on experience and information in other crops the Centre developed IDIPM schedule and gave first successful demonstration in 2008-09 later the schedule was successfully validated in 41 orchards in 3 states from 2008-2015. However, the farmer had to avoid rainy season crop with this schedule. Hence, with constant efforts today the centre has come up with the new technology of 'STEM SOLARIZATION' which farmers can confidently take in rainy season. The technology is an eco-friendly, cost-effective and most effective management strategy for this devastating disease. The technology in brief is visualized below.

Six Steps to Manage Bacterial Blight in Rainy Season crop

Step 1
Sanitation, Main Pruning, fertilizer application Dec/Jan

Step 2:
Irrigate the crop till mid- March

Steps 3:
Put crop on stress for complete defoliation in April

Steps 4
Stem Solarization for 10-20 days in May

Steps 5
Bahar (light) pruning, INM, take rainy season crop

Steps 6
During crop season follow recommended practices

Harvest Bacterial Blight Free Pomegranate Produce around December

(Jyotsana Sharma, Manjunath N., S.S. Pokhare and V. Lokhande)

Standardizing the Mass Production protocol for pomegranate fruit piercing moths, *Eudocima materna*

The protocol aims to support research, pest management strategies, and biological control efforts concerning the pomegranate fruit-piercing moth. The protocol involves several key steps and considerations, including moth collection and identification, setting up a suitable rearing facility, cultivating host plants, collecting and incubating eggs, rearing larvae, managing the pupal stage, handling adult moths for mating, and implementing monitoring and quality control measures. Overall, this protocol serves as a valuable tool to enhance our understanding of the pomegranate fruit-piercing moth and aids in the development of sustainable and effective approaches to managing this pest in pomegranate orchards and agricultural systems.

(Mallikarjun M.H., R. A. Marathe, Manjunatha N., & S. S. Pokhare)

Osmotic assisted convective drying of pomegranate arils

The convective drying of pomegranate arils is time consuming, energy intensive and affects the quality. The osmotic pre-treatment has been resorted prior to convective drying for improving drying performance and quality. The osmosis factors temperature (30–60°C), time (50–250 min), and TSS (40–60°Bx) were optimized using Box–Behnken design of response surface methodology. The quadratic models have adequately explained the process and the optimum conditions were temperature (48.52°C), time (209.65 min), and TSS (51.31°Bx). The osmotic pre-treatment at optimum conditions followed by the convective tray drying reduced the drying time by 9 hours and the mean energy consumption by 0.172 MJ/g.

The light microscopy revealed rupture and breakage of the honeycomb-like cellular structure of the pomegranate aril. The quality analysis of dried arils revealed that the texture (softness) and TSS improved by 11.75 N and 4.2°Bx respectively likewise sensorial quality such as taste, mouth feel, and overall acceptability of the OATD (osmo-assisted tray-dried) arils significantly improved over the TD (tray-dried). However, there is a minor loss of 15.48, 12.52, and 15.88% in anthocyanin, phenols, and antioxidant capacity respectively in OATD compared to TD. The OATD arils can be stored for up to six months in MAP.

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

Farmers Corner

Farmers Variety registration through ICAR –NRCP, Solapur

ICAR-NRCP, Solapur played an important role in registration of a farmer's variety in pomegranate in Maharashtra. Shri. Vittal Bhosale, Pomegranate grower from Tupewadi, Aurangabad has identified a Bhagawa variant with uniform fruit bearing, bigger fruit size and relatively higher number of fruits per plant in comparison to Bhagawa. Average fruit size ranged from 280-300 g. In uniform bearing plant yields about 28-30 kg fruits per plant. ICAR-NRCP as DUS nodal centre evaluated this variety claim and characterized for fruit and other parameters across two years and four seasons. The team visited his location during flowering and fruiting period and observations were recorded and variety got characterised and submitted the file to PPVFRA for the variety registration, and farmer got his variety protection as per Farmers Right Act 2001. The team of scientists from NRCP DUS centre are Dr. Shilpa parashuram, Dr. P. Roopa Sowjanya, Dr. Dhinesh Babu, Dr. Jyotsana Sharma and Dr. R. A. Marathe. By the continues efforts and monitoring of the fields the variety got registered and got protection for the first time in pomegranate crop.


PLANT VARIETIES REGISTRY
Certificate of Registration

PPFRA Registration certificate of Farmer's variety 'Sharad King'. Director and Team of scientists of NRCP, Solapur handing over the certificate to Shri. Vittal Bhosle

Special Event

Stakeholders meet on Clean Plant Program in Pomegranate

The Government of India launched a Clean Plant Programme (CPP) with the assistance of Asian Development Bank. The mandate of CPP is to strengthen the system of propagation of horticulture planting material for ensuring availability of quality planting material in the country, particularly in respect of perennial crops. ICAR-NRCP is one of the centre for CPP for Pomegranate. On 23rd of January one day stakeholders meet was organised to facilitate the interaction between the team of experts on CPP (officials from Asian Development Bank, NHB, scientist of ICAR-NRCP) and other stakeholders of the pomegranate propagation industry (private tissue culture labs, registered nurseries, progressive farmers). The team of CPP includes Shri C.P. Gandhi, Deputy Director, National Horticulture Board (NHB), Ministry of Agriculture & Farmer's Welfare; Ms. Sunae Kim, Natural Resources and Agriculture Specialist, Asian Development Bank (ADB); Sh. Krishna Rautela, Associate Project Officer, ADB; Shri Sunil Kumar, Senior Horticulture Officer, NHB; and Shri Chirag Bhatia, Consultant, MIDH. The committee also visited the proposed location assigned for establishment of Clean Plant Program (CPP).

Shri C.P. Gandhi, Ms. Sunae Kim, Sh. Krishna Rautela, Shri Sunil Kumar, Shri Chirag Bhatia, Dr. R.A. Marathe and staff of NRCP during Stakeholders meet on 23rd Januaray 2023 at NRCP, Solapur

Officials of Asian Development Bank, National Horticultural Board and members of pomegranate propagation industry at Stakeholders meet on 24th Januaray 2023 at NRCP, Solapur

Events organized (Seminar/ Webinar/ Symposia/ Conferences etc.)

Details of the event	Course Director/ Co-coordinators/ Team
Igniting Young Minds for scientific innovations on 27/03/23 sponsored by Dept. of Science and Technology, Govt. of India at NRCP, Solapur.	Dr. R. A. Marathe (Course Director) Dr. Roopa Sowjanya (Org.Sec.); Dr. Manjunatha N. (Jt. Org.Sec.); Dr. N. V. Singh & Dr. Shilpa P. (Co-org Sec.)
One Day Workshop on "Women and IP: Accelerating Innovation and creativity" on the occasion of World IP Day on 26/04/23 at NRCP, Solapur.	Dr. R.A. Marathe (Convener) Dr. N. N. Gaikwad (Org. Sec.)
Diagnosis and management of Shot hole borer in a pomegranate at ICAR-NRCP, Solapur on 03/02/23	Dr. R.A. Marathe (Course Director) Dr. Mallikarjun M. H. (Coordinator)

One day Workshop on "Igniting Young Minds for scientific innovations" 27th March 2023

One day Workshop on "Women and IP: Accelerating Innovation and creativity" on 26th April 2023

Events attended by NRCP Staff (Seminar/ Webinar/ Symposia/ Conferences etc.)

Title of the event	Date	Organizers	Participants
National Conference on Plant-parasitic Nematodes	16-17 January, 2023	Bayer India Pvt. Ltd. at Bengaluru	Dr. Mallikarjun M.H.
Platinum Jubilee Conference of the Indian Phyto-pathological Society	2-4 February, 2023	Indian Phyto-pathological Society, New Delhi & Uni. of Mysore, Karnataka	Dr. S. S. Pokhare, Dr. Manjunatha N. & Dr. Jyotsana Sharma
'Interactive Session of Young Scientists with 112th FOCARS	22 April, 2023	NAARM, Hyderabad	Dr. Pinky Raigond
Women and IP: – Accelerating Innovation and Creativity	26 April, 2023	Online by PPVFRA, New Delhi	All staff of NRCP
5th International Conference on "Climate Change and Its Impact (CCI 2023)"	09-11 June, 2023	SKUAST-K Srinagar, J&K., & AETDS, Uttarakhand, India)	Dr. Mallikarjun M.H

Trainings/ FLDs/ OFTs organized for the farmers/ students/ entrepreneurs etc. by NRCP (on campus/ off campus)

Title	Date	Sponsoring / collaborating agency	Course Director/ Co-coordinators/ Team	Participants and Venue
Pomegranate farmer's seminar on "Improved cultivation Practices of Pomegranate"	16/02/23	KVK, Mundra, Kutch-I	Dr. R . A .Marathe, Dr. Nilesh N. Gaikwad, Dr. Manjunatha N., Dr. S. S. Pokhare	(300) Durgapur Village, Kutch, Gujarat
Scientist-farmers interface meeting on "Good Horticultural Practices for Pomegranate production"	19/02/23	Valagro Biosciences Private Limited	Dr. R. A. Marathe, Dr. N. N. Gaikwad, Dr. Manjunatha N., Dr. S. S. Pokhare	(120) farmers of Gujarat at Village Kothda Chakar of Anjar Tahsil, Kutch, Gujarat

Training program on "Export quality pomegranate production"	19/03/23	Shiv Kisan Farmer Producer Company Budiwada & KVK, Gudamalani, Rajasthan	Dr. Jyotsana Sharma, Dr. S. S. Pokhare and Dr. Mallikarjun H.	(250) Budiwada, Rajasthan
State Level training Program and Exhibition on Useof Geographical Indication of 'Solapur Pomegranate' for Domestic market, Export and Value Addition	11/04/23	AMDUS Sangh, Pune, State Agri. Dept., MSH & MPB, Pune, MSAMB, Pune, APEDA, Mumbai & NABARD	Dr. R. A. Marathe, Dr. N. N. Gaikwad, Dr. Namrata Giri and Dr. S. S. Pokhare	(300) Pandharpur, Dist Solapur
Training program on "Good Horticultural Practices for Quality Pomegranate Production and Value Addition"	07-09 June, 23	NABARD through Agri. Export Facilitation Centre (AEFC), Jodhpur.	Programme Director: Dr. R. A. Marathe Course Coordinators: Dr. S. S. Pokhare & Dr. N. N. Gaikwad	(20) farmers of Rajasthan at ICAR-NRCP, Solapur
Skill development training on "Post-harvest Management and value addition of Pomegranate"	13/04/23	KVK Tuljapur, Solapur	Dr. N. N. Gaikwad & Dr. Namrata Giri	(15) women farmers of KVK Tuljapur at ICAR-NRCP, Solapur

Training program on "Export quality pomegranate production" at Budiwada, Rajasthan on 19.03.2023


Organised 'Dalimb Pik Parisanvad' on 16.02.2023 at Durgapur Village, Kutch, Gujarat by ICAR-NRCP Solapur in collaboration with KVK, Mundra, Kutch-I


Farmers - Scientists Interface Meeting on 19.02.2023 in Bhuj areas of Gujarat


Skill development training on "Post-harvest Management and value addition of pomegranate" on 13.04.2023

Training attended by NRCP staff

Title of the training	Date	Organizers	Participants
ICAR sponsored 10 days CAFT training programme on " Artificial intelligence and advances in ICT for smart agriculture and food processing"	23/02/23 to 04/03/23	ICAR-CIAE, Bhopal	Dr. Namrata Ankush Giri

Resource person in training programmes

Program detail	Resource person	Title of the topic
Farmer Scientist Interaction in the Agricultural Exhibition organised by Rotary club of Modanimb on 06. 01. 2023 at Modanimb tehsil- Madha, Dist: Solapur.	Dr. S. S. Pokhare and Dr. Mallikarjun H.	Pest, Diseases and Nematode management in pomegranate
National webinar on Recent advances and opportunities in post-harvest technology Organized by Kirti M. Doongursee College, Dadar and Mula Eduacation Societies, Sonai college on virtual mode on 21.01.2023.	Dr. N. N. Gaikwad	Recent techniques in Fruit processing
Seminar on "Improved cultivation practices of pomegranate" at Durgapur village, Mandavi Tahsil of Kutch in collaboration with KVK Kutch I, Mundra on 16.02.2023.	Dr. R. A. Marathe	Nutrition management in Pomegranate.
	Dr. N. N. Gaikwad	Delivered presentation on entrepreneurial opportunities in pomegranate processing
	Dr. S. S. Pokhare	Delivered presentation on Nematode and Insect pest management in Pomegranate
One-day seminar on High-Tech Pomegranate cultivation at University of Jodhpur on 07.03.203. organised by Jodhpur Agricultural University and Centre of Excellence for Pomegrante, Dindhol, Bassi, Rajasthan.	Dr. Jyotsana Sharma	Pest and Disease management in Pomegranate
Igniting Young Minds for scientific innovations, Dt. 27.03.2023, at ICAR - NRCP, Solapur.	Dr. Roopa Sowjanya	Genome wide Association mapping and its Applications.
	Dr. Manjunatha N.	Next Generation Sequencing and its Applications.
	Dr. P. G. Patil	Genome editing and its Applications.
Training workshop titled "Empowering Young Researchers for Sustainable Developments" organised by TEC of IVRI, Pune on 31.03 2023.	Dr. S.S. Pokhare	Research in Germany – Experience that transformed me.
One Day Workshop on "Women and IP: Accelerating Innovation and creativity" on the occasion of World IP Day on 26. 04. 2023 at ICAR-NRCP, Solapur	Dr. N. N. Gaikwad	Intellectual property Rights for Creativity and Innovations.
Good Horticultural Practices for Quality Pomegranate Production and Value Addition" for the farmers of Rajasthan on 7-9 June, 2023	Dr. K. D. Babu	Establishment new pomegranate orchards and its management at initial stage.

	Dr. C. Awachare	Selection of quality planting materials & Pomegranate Canopy architecture management.
	Dr. J. Sharma	Pomegranate Disease Management.
	Dr. S. S. Pokhare	Pomegranate Nematode Management.
	Dr. N. N. Gaikwad	Post-Harvest management and Value addition in Pomegranate.
	Dr. Mallikarjun M.H	Integrated insect pest management in Pomegranate.
	Dr. N. A. Giri	Nutritional value of pomegranate and its functional foods.

Agricultural Exhibitions/ Farmers fair attended/ Technology displayed

- Dr. Somnath Pokhare and Shri. Mahadev Gogaon attended and displayed the NRCP technologies at Siddheshwar Krishi Pradarshan, Home ground, Solapur from 29/12/2022 to 02/01/2023.
- Shri. Mahadev Gogaon attended and displayed the NRCP technologies at Solapur District Agricultural Exhibition from 5th to 9th March 2023 at Laxmi Vishnu Mill (Exhibition Centre), Solapur.
- Shri. Mahadev Gogaon attended and displayed the NRCP technologies at Krushi Pandhari agricultural Exhibition and Millet Mohatsav at Pandharpur from 28th to 30th June 2023.

Siddheshwar Exhibition, Solapur

Indian Science Congress Exhibition, Nagpur

Peer recognitions/ Awards/ Honors received by the NRCP staff

- **Dr. Prakash G. Patil** bagged Best oral presentation award for the topic entitled 'Development of gene family derived InDel markers for genetic improvement of Pomegranate' presented through online mode during 4th International conference "Innovations to transform Agriculture, Horticulture and Allied Sectors' (ITAHAS 2023) from 21st-23rd June, 2023, organized at Malla Reddy Univeristy, Hyderabad.

- **Dr. Pinky Raigond** received '**NAAS ASSOCIATESHIP 2023'** award under Horticulture section from National Academy of Agricultural Sciences, New Delhi.

Dr. Pinky Raigond receiving 'NAAS ASSOCIATESHIP 2023' award

Technology Commercialization/Linkages/Collaborations / MoU signed

- MoU Signed between ICAR-NRCP, Solapur and **Willowood Chemical Limited, New Delhi** for contract research project on evaluation of Bio-efficacy and Phytotoxicity of beta-Sitosterol and Stigmasterol on Pomegranate on 27th March 2023.
- MoU Signed between ICAR-NRCP, Solapur and **Bayer Crop Sciences Limited, India** for research on collaboration 12th May 2023.
- ICAR-NRCP, Solapur has transferred the technology of "In-vitro Propagation of Pomegranate cultivar Bhagawa including Bio-hardening" to **Department of Horticulture, Government of Karnataka,** Biocentre, Hulimavu, Bengaluru on 24th May 2023.
- ICAR-NRCP, Solapur has transferred technology to **M/s. UPL Limited, Mumbai** for the Mass Production protocol for pomegranate fruit piercing moths *Eudocima maternal*.
- MoU Signed between ICAR-NRCP, Solapur and **Walchand College of Arts and Science, Solapur** for student exchange.

Dr. R. A. Marathe Signed a MoU agreement with officials of the Government of Karnataka

Signing of MoU with M/s. UPL Limited, Mumbai

Dr. R. A. Marathe Signed a MoU agreement with officials from Walchad College of Arts and Science, Solapur

Dr. R. A. Marathe, Director NRCP and Mr. Yogesh Mohite of Bayer Crop Sciences with the MoU document

Publications

Research papers

1. Manjunatha N., Jyotsana Sharma, Somnath S. Pokhare, Mansi G., Chakranarayan, Ruchi Agarrwal, Bhagyashri Suresh Gavande, Baswaraj Raigond, M. H., Mallikarjun & Rajiv A. Marathe (2023). Development of simple and quick DNA release protocol for conventional PCR-based detection of *Xanthomonas axonopodis* pv. *punicae* causing bacterial blight in pomegranate. *Archives of Phytopathology and Plant Protection*, DOI:10.1080/03235408.2023.2228004. (NAAS Score:7.0)

2. Manjunatha, N., Pokhare S. S., Sharma J., Patil P. G., Agarrwal R., Chakranarayan M. G., Sirsat J. D, Patil Jyoti & R. A. Marathe (2023). Collar rot caused by *Calonectria hawksworthii*, a new record for pomegranate (*Punica granatum*). *Journal of Plant Pathology*. DOI: 10.1007/s42161-023-01391-4. (NAAS Score:8.64).

3. Jyotsana Sharma, Manjunatha N., Somnath S. Pokhare, Prakash Patil, Ruchi Agarrwal, Mansi G. Chakranarayan, Jaydip Dilip Sirsat, Jyoti Patil, Rajiv A. Marathe (2023). First report of *Lasiodiplodia theobromae* causing stem canker of pomegranate (*Punica granatum* L.) in India. *Plant Disease* https://doi.org/10.1094/PDIS-09-22-2025-PDN. (NAAS Score:10.50).

4. Giri, N. A., Gaikwad, N. N., Raigond, P., Damale, R., & Marathe, R. A. (2023). Exploring the Potential of Pomegranate Peel Extract as a Natural Food Additive: A Review. *Current Nutrition Reports*. https://doi.org/10.1007/s13668-023-00466-z. 1-20. (NAAS:11.50)

5. Sawant, C.P., Jyoti, B., Gaikwad, B.B., Gaikwad, N., Kemar N., Kumar, M. (2023) Optimization of Operational Parameters of Site-specific Pesticide Spray Module for Young Pomegranate Orchards using RSM and RBFNN-PSO, Techniques. *Journal of Biosystems Engineering*. https://doi.org/10.1007/s42853-023-00185-x` (NAAS Score: 7.98).

6. Manna, K., Khan, Z.S., Saha, M., Mishra, S., Gaikwad, N., Bhakta, J.N., Banerjee, K. and Saha, K.D., (2023). Manjari Medika Grape Seed Extract Protects Methotrexate-Induced Hepatic Inflammation: Involvement of NF-κB/NLRP3 and Nrf2/HO-1 Signaling System. *Journal of Inflammation Research*, 16,467-492. (NAAS Score: 10.63).

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Book Chapters

1. Namrata A. Giri, B. K. Sakhale and Nilesh P. Nirmal. (2023). Functional beverages: an emerging trend in beverage world. In: Recent Frontiers of Phytochemicals (Application in Food, Pharmacy, Cosmetics and Biotechnology). Sidartha Pati, Tanmay Sarkar and Dibyajit Lahiri (Eds). Elsevier Publisher, US, P.706.

2. Visalakshi Chandra C., Sheela M. N., Suresh Kumar J., Namrata A. Giri, and Senthil Alias Sankar. (2023). Cassava In:Production technology of underutilized vegetable crops. Rakesh K. Dubey, Jagdish Singh (Eds). Kalyani Publisher, New Delhi, PP.531-552.

3. Bhagwan K. Sakhale, Namrata A. Giri, and B. B. Borse. (2023). Role of Phytochemicals in Human Health. In: Novel Processing Methods for Plant-Based Health Foods (Extraction, Encapsulation, and Health Benefits of Bioactive Compounds). Megh R.Goya, N.Veena, Ritesh B. Watharkar (Eds). CRC Press, Taylor & Francis Group, 187-205.

Pomegranate Advisories/ E-Publications/ Other publications

1. Dr. J. Sharma, Dr. A. Maithy, Dr. N. V. Singh, Dr. Mallikarjun, Dr. Manjunatha N., Dr. S. S. Pokhare (English & Marathi). Bimonthly Pomegranate Advisory for Bearing Orchards (Feb-Mar 2023). https://nrcpomegranate.icar.gov.in/files/Advisory/127.pdf

2. J. Sharma, S. S. Pokhare, N. V. Singh., Manjunatha N., Mallikarjun H & R.A. Marathe (English & Marathi) Advisory for Pomegranate crop hit by unseasonal rains and hail storm (March 2023). https://nrcpomegranate.icar.gov.in/files/Advisory/129.pdf

3. Dr. J. Sharma, Dr. A. Maithy, Dr. N. V. Singh, Dr. S. S. Pokhare, Dr. Mallikarjun, Dr. Manjunatha N. & Shri. Mahadev Gogaon. (English & Marathi) Bimonthly Pomegranate Advisory for Bearing Orchards (April-May 2023). https://nrcpomegranate.icar.gov.in/files/Advisory/131.pdf

4. Dr. Jyotsana Sharma, Dr. Ashis Maity, Dr. N.V. Singh, Dr. Mallikarjun H., Shri. Dinkar Chaudhari and Dr. Somnath S Pokhare. (English & Marathi) Bimonthly Pomegranate Advisory for Bearing Orchards (June- July 2023). https://nrcpomegranate.icar.gov.in/files/Advisory/138.pdf

5. Dr. Jyotsana Sharma, Dr Mallikarjun H, Dr. K Dhinesh Babu, Dr. S. S. Pokhare and Dr. Manjunatha N. Adhoc List of Agrochemicals with European Union (EU) Maximum Residue Level (MRL) And Pre Harvest Interval (PHI) For Pomegranate Production. (April 2023). https://nrcpomegranate.icar.gov.in/files/Advisory/134.pdf

6. Shilpa Parashuram, Babu K.D., Roopa Sowjanya P, Pinky Raigond, Chandarakant Awachare, Mallikarjun MH, Mahadev Gogaon, RA Marathe (2023) Important commercial varieties of pomegranate. NRCP/Extension folder/2023/2, pp 4.

New Projects sanctioned

- Setting up a biocontrol production laboratory to demonstrate and popularize the use of biocontrol agents for sustainable pest management in pomegranate Budget: Rs. 3.46 Corer funded by RKVY, Govt. Maharashtra. (Project Director: Dr. R A Marathe; PI: Dr. Mallikarjun M.H., Co-PI: Dr. Manjunatha N. & Dr. Somnath Pokhare).

- Establishment of Plant Health Clinic for Pomegranate growing regions of Maharashtra Budget: Rs. 3.11 Corer funded by RKVY, Govt. Maharashtra. (Project Director: Dr. R A Marathe; PI: Dr. Manjunatha N., Co-PI: Dr. Somnath Pokhare & Dr. Mallikarjun M.H.).

- Development and evaluation of spray and freeze dried pomegranate juice powder and its reconstitution Budget: Rs. 49.92 Lakh, ADB funded MAGNET Project of MSAMB, Govt. of Maharashtra. (Project Director: Dr. R A Marathe; PI: Dr. Nilesh Gaikwad, Co-PI: Dr. Namrata Giri).

- Evaluation of IDIPM Schedules using new molecules for export quality pomegranate production and Demonstration of Bayer's plant protection schedules on Model Pomegranate orchard for quality production Contract Research Project Funded by Bayer Crops Science Ltd. Budget: Rs. 42.82 Lakhs (PI: Dr. Jyotsana Sharma and Dr. Chandrakant Awachare).

- Study the effect of Surround-WP® Foliar Sprays on Preventing Sunburn and Cracking for increasing Quality Fruit Yield of Pomegranate Contract Research Project Funded by: Tessenderlo Kerley India Private Limited, Gurgaon, Haryana Budget: Rs. 24.65 Lakhs (PI: Dr. Chandrakant Awachare)

- Evaluation of bio-efficacy and Phyto-toxicity of -Sitosterol & Stigmasterol 0.05% DF (Brand Name: WILBOND) on Pomegranate crop Contract Research Project funded by Willowood Chemical Limited, New Delhi. Budget: Rs. 10.05 lakhs (PI: Dr. Pinky Raigond).

International Women's Day Celebration

International Women's day was celebrated at ICAR-NRCP, Solapur on 8th March, 2023 and this event was attended by all the staff, students, research scholars etc. of NRCP. The programme was inaugurated by the Dr. R. A. Marathe, Director, ICAR-NRCP and addressed to the gathering about the achievement made by the lady scientists and NRCP staff. A lecture on the "Role of Women's in Agriculture" was delivered by Dr. Jyotsana Sharma, Principal Scientist, ICAR-NRCP. On this occasion, the women staff who has made significant contribution in research and administration work was identified and felicitated by the Director, ICAR-NRCP as follows:

- Dr. Ruchi Aggrawal, SRF-Plant pathology
- Mrs. Amarja More, Young Professional-II
- Mrs. Sonali P. Homkar, Contractual Staff

This programme was also graced by the speech about the importance of celebration of International women's day by Scientific staff of the centre. This event was co-ordinated by Dr. Namrata Giri, Scientist, ICAR-NRCP, Solapur.

Celebration of International Women's day at ICAR-NRCP, Solapur

Republic Day Celebration

ICAR-NRCP, Solapur celebrated 74th Republic Day on 26th January, 2023 by unfurling of the Indian National flag by Dr. R. A. Marathe, Director, ICAR-NRCP in presence of all the scientific, technical, administrative, contractual etc. staff of the centre. The gathering was addressed by the speech of the Director followed by the felicitation of the farm labour and children of the staff who scored highest in academics. Different event and competition such as musical chair, lemon-spoon race etc. was conducted on this occasion and prize were given to the winners.

Republic day celebration at ICAR-NRCP, Solapur

Outreach activities

Events organized under SCSP

One-day 'Farmer scientist interaction and farm input distribution programme' and 'Training on Pomegranate cultivation cum farm input distribution programme'for SC farmers of Kalaburagi district under SCSP scheme of ICAR-NRCP, Solapur was conducted in collaboration with KVK, Kalburgi on 27th February and 27th June 2023 respectively by Team consists of Dr. R. A. Marathe (Course Director);Dr. Pinky Raigond (Course Coordinator); Dr. Shilpa Parashuram, Dr. Chandrakant Awachare, Dr. Mallikarjun Harsur (Co-organizers) at KVK, Kalburgi.

Programme for SC farmers of Kalaburagi district of Karnataka at KVK, Kalaburagi

Events organized under STC (TSP)

Training details	Team	Input distributed
One-day awareness-cum-training program on "Good agricultural practices for sustainable crop production" for tribal farmers of Gadchiroli under the STC-TSP scheme" of ICAR-NRCP, Solapur in collaboration with KVK, Kalaburagi, Sonapur Gadchiroli, Maharashtra at Gadchiroli. No. of Participants 74.	Dr. R.A. Marathe (Course Director); Dr. Mallikarjun M.H., Dr. Shilpa P. & Mr. R. D. Damale (Coordinators)	Agriculture inputs like Insecticides-Emamectin benzoate 5% SG, Chlorantraniliprole 18.5% SC, and Battery-operated Knapsack sprayer

One-day training cum demonstration programme under Scheduled Tribe Component (STC –TSP Scheme) of ICAR-NRCP, Solapur in collaboration with KVK, Sonapur Gadchiroli, Maharashtra at Gadchiroli. No. of Participants 79.	Dr. R.A. Marathe (Course Director); Dr. Mallikarjun M.H., Dr. Shilpa P. & Mr. R. D. Damale (Coordinators)	Green gram seeds and Knapsack sprayers

Distribution of Agriculture inputs and equipment to the ST beneficiaries under STC Scheme at Gadchiroli

Radio / TV talk

Dr. Nilesh Gaikwad participated in Live Phone in programme Krshidarshan of DD Sahyadri entitled "Opportunities in Pomegranate Processing". It was telecasted on 23rd February 2023at 6.00 PM live on DD Sahyadri.

Farmers Visit

About 110 farmers from different villages of Gadchiroli District, Atpadi and Indapur of Maharashtra visited ICAR-NRCP, Solapur for updating their knowledge in the various aspects of pomegranate production and protection.

Different farmer groups visited NRCP to know the Good Package of Practices for Export quality pomegranate production

Distinguished Visitors to ICAR-NRCP, Solapur

Hon. Sh. Anup Kumar, IAS, Add. Chief Secretary, MSAMB, GoM and Sh. Deepak Shinde, Project Director, MAGNET Society, MSAMB, GoM visited ICAR NRC on Pomegranate, Solapur on 21st April 2023. They visited the demonstration block of pomegranate and Pomegranate processing pilot plant and appreciated the research work undertaken at ICAR-NRC on Pomegranate, Solapur.

Students Visit

- Total of 33 student of V semester of B. Tech (Biotechnology) of Lokmangal College of Agricultural Biotechnology, Wadala, Solapur visited ICAR-NRCP as a part of their educational tour on 23rd February 2023.
- Fifty-Six students of DBF Dayanand College of Arts and Sciences, Solapur visited ICAR-NRCP as a part of their educational visit on 9th May 2023.
- About 85 students along with six faculty of College of Agriculture Udgir, affiliated to VNMKV, Parbhani visited ICAR-NRCP as a part of their educational tour on 8th June 2023.
- 41 students of B. Sc. Agriculture and 3 faculty members of KAKU College of Agriculture, Beed visited ICAR-NRCP on 27th June 2023 as a part of their educational tour to know the ongoing research and extension activities of the centre.

Meetings attended by the NRCP staff

1. Dr. N. N. Gaikwad, Sr. Scientist Participated in the BOS subcommittee meeting as member for finalization of the syllabus of M.Tech. integrated in cosmetic technology of PAHSUS, Solapur on 10.1.2023
2. Dr. Somnath S. Pokhare and Dr. Manjunatha N. attended 32nd Meeting of State Level Sanctioning Committee (SLSC) of Rastriya Krishi Vikas Yojna-Cafeteria (RKVY) at Office of Chief Secretory, Mantralaya Mumbai-32 on 11.01.2023
3. Dr. Nilesh Gaikwad, Sr. Scientist Participated in the meeting of the cluster development cell of National Horticulture Board on behalf of the Director ICAR-NRCP, Solapur for the consideration of bids received for Solapur pomegranate cluster in online mode on 12.01.2023 called by Director, Horticulture, Govt. of Maharashtra.
4. Dr. Nilesh Gaikwad, Sr. Scientist participated in 15th state level executive committee meeting of MIDH, Govt. of Maharashtra conducted in online mode on 30.1.2023.
5. Dr. K.D. Babu, Principal Scientist attended the Pre-PRC meeting of MPKV Rahuri on 16.02.2023 & variety release proposal of Solapur Anardana was presented on 16.02.2023.
6. Dr. K.D. Babu, Principal Scientist attended the RRC meeting of MPKV, Rahuri on 19.03.2023 & variety release proposal of pomegranate var. 'Solapur Anardana' was presented.
7. Dr. K.D. Babu, Principal Scientist attended the Scrutiny meeting of MPKV, Rahuri on 05.04.2023 variety release proposal of pomegranate var. 'Solapur Anardana' was presented.
8. Dr. K.D. Babu, Principal Scientist attended the Pre-RFRC meeting of MPKV, Rahuri on 13.04.2023 and presented the variety release proposal of pomegranate var. 'Solapur Anardana'.
9. Dr. K.D. Babu, Principal Scientist attended the RFRC meeting of MPKV, Rahuri on 29.04.2023 and presented the variety release proposal of Pomegranate var. 'Solapur Anardana'
10. Dr. K.D. Babu, Principal Scientist attended the 51st Joint Agresco meeting of SAUs, MCAER at MPKV Rahuri, 25-27 May 2023 & presented the variety release proposal of Pomegranate var. 'Solapur Anardana' in the Session: Variety Recommendation / Release of Horticultural Crops. Joint Agresco - 2023 has recommended pomegranate var. Solapur Anardana for anardana purpose in Maharashtra State.
11. Dr. K.D. Babu, Principal Scientist attended the QRT meeting of AICRP-AZF through online mode on 08.05.2023 & presented achievements of Solapur Centre Pomegranate Crop on 08.05.2023.

12. Dr. Namrata Giri, scientist attended state level training programme on "Use of GI of Solapur Pomegranate for marketing and Export" organized by AMDUSS, ICAR-NRCP, NABARD, APEDA, MSAMB and State Agril. Depart on 11.04.2023 at Pandharpur, Solapur, M.S.

DPC meeting and Promotions

The DPC meeting was held at NRCP on 09.02.2023 for the promotion of the Scientist through CAS. The members includes Dr. A. S. Dhavan, Ex. Vice Chancellor, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Chairman; Dr. G. P. Mishra, Pr. Scientist (Genetic & Plant Breeding), IARI, New Delhi, Dr. N. G. Ravichandra, Professor, AICRP (Nematodes), University of Agricultural Sciences, GKVK, Bangalore; Dr. H. G. More, Former Director of Extension Education, MPKV, Rahuri; Dr. S. A. Ranpise, HOD, Horticulture, MPKV, Rahrui; Dr. K. V. Ravishankar, Pr. Scientist (Biotechnology), ICAR-IIHR, Bengaluru; Dr. Prakash Patil, Project Coordinator, AICRP on Fruit, IIHR, Bangalore; Dr. Jagdish Rane, Director, ICAR- Central Institute for Arid Horticulture, Bikaner; Dr. R. M. Sharma, Pr. Scientist, FHT, IARI, New Delhi, Dr. R. A. Marathe, Director ICAR-NRCP, Solapur; Sh. R. B. Rai, Administrative Officer, ICAR-NRCP,Solapur and Dr. K.D. Babu, Principal Scientist and PME cell incharge, NRCP, Solapur. The following Scientists get promoted through DPC meeting:

- Dr. Nilesh Gaikwad, Sr. Scientist (AS & PE); Dr. Prakash G. Patil, Sr. Scientist (Plant Biotechnology) & Dr. Pinky Raigond, Sr. Scientist (Plant Physiology) got promoted from RGP 8000/- to RGP 9000/-
- Dr. Somnath Pokhare, Scientist (Nematology) from RGP 7000/- to RGP 8000/-
- Dr. Roopa Sowjanya P.,Scientist (Genetics and Plant Breeding) from RGP 6000/- to RGP 7000/-



Dr. A. S. Dhawan, Dr. N. G. Ravichandra , Dr. Jagdish Rane, Dr. K. V. Ravishankar, Dr. R. A. Marathe and Dr. K. D. Babu during DPC meeting for the promotion of NRCP scientists on 09.02.2023

Infrastructure developed

Procurement of First utility vehicle of NRCP on 30.03.2022

Drinking water facilities for farm workers created on 19.04.2023

Farm Machineries - Mini tractor (25 HP) and Tractor (75) brocured on 26 may 2023

Electronic and Print Media coverage

दैनिक नवज्योति

पश्चिमी राजस्थान में गुणवत्तापूर्ण अनार उत्पादन की अपार संभावनाएं

भारतीय कृषि अनुसंधान परिषद
Indian Council of Agricultural Research

महाॲग्रो

डाळिंब संशोधन केंद्र, बायर क्रॉपसायन्सेसमध्ये करार

एकात्मिक कीड-रोग व्यवस्थापन वेळापत्रक विकसित करणार

सुबाल अंगोदन

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लोकमत

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करार काय असेल..

ದಾಳಿಂಬೆ ಕೃಷಿ ವೈಜ್ಞಾನಿಕ ತರಬೇತಿ

ಕಲಬುರಗಿ: ಐಸಿಎಆರ್ ರಾಷ್ಟ್ರೀಯ ದಾಳಿಂಬೆ ಸಂಶೋಧನಾ ಕೇಂದ್ರ, ಸೋಲಾಪುರ ಕಲಬುರಗಿ ಮತ್ತು ಐಸಿಎಆರ್-ಕೃಷಿ ವಿಜ್ಞಾನ ಕೇಂದ್ರ ಇವರ ಸಂಯುಕ್ತ ಆಶ್ರಯದಲ್ಲಿ ರೈತರಿಗೆ ಎಸ್.ಸಿ.ಎಸ್.ಪಿ ಯೋಜನೆಯಲ್ಲಿ ದಾಳಿಂಬೆ ವೈಜ್ಞಾನಿಕ ಕೃಷಿ ತರಬೇತಿ ಕಾರ್ಯಕ್ರಮವನ್ನು ಕೃಷಿ ವಿಜ್ಞಾನ ಕೇಂದ್ರ, ಕಲಬುರಗಿಯಲ್ಲಿ ಆಯೋಜಿಸಲಾಗಿತ್ತು.

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