

Pomegranate Revolution in India

A Success story of ICAR



ICAR-National Research Centre on Pomegranate

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Solapur, Maharashtra
413 255**



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Pomegranate attracted mankind since time immemorial, earlier due to its magical therapeutic use and now due to alluring returns as well as consumer awareness towards its innumerable health benefits. The pomegranate cultivation in India has steadily picked up during the last decade. Demand in the international market has enhanced the scope for earning higher dividends from this crop. Moreover, it is an ideal crop for the sustainability of small holdings because of its adaptability to topography, soil and agro-climatic condition prevailing in arid and semi-arid regions of India. Climate change has resulted in lower productivity of some high value crops like apple, forcing the growers to shift to alternative crops like pomegranate, dragon fruit *etc.* for mitigating the challenges of water scarcity. Fascinated by its innumerable health and monetary benefits, people from not only rural areas but also employed urban youth, having uncultivated ancestral land are venturing into pomegranate cultivation to taste the benefits of the fruit of paradise.

RELEASE OF VARIETY BHAGWA

Indian Council of Agricultural Research (ICAR) established All India Coordinated Research Centre on Arid Zone Fruits (AICRP-AZF) at ICAR-Central Institute for Arid Horticulture (ICAR-CIAH) Beechwal, Bikaner (Rajasthan) with one of its coordinating Center at Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri (Maharashtra) for dedicated research on pomegranate in the year 1976. The research efforts under ICAR -AICRP on Arid Zone Fruits resulted in release of variety Phule Bhagwa (Popularly known as Bhagwa) – a soft seeded variety with bright red attractive rind and aril colour - in 2003-04 by MPKV, Rahuri. The variety became highly popular over traditional cultivar Ganesh having pink coloured arils. The cultivar Bhagwa brought revolution in pomegranate cultivation in India.

The popularity of this variety in 2016-17 can be witnessed through tremendous increase in pomegranate area under cultivation (122.91%), production (279.15%), productivity (70.12%) and export (382.17%) as compared to those of 2003-04. Today more than one lakh families are earning livelihood from this crop in India.

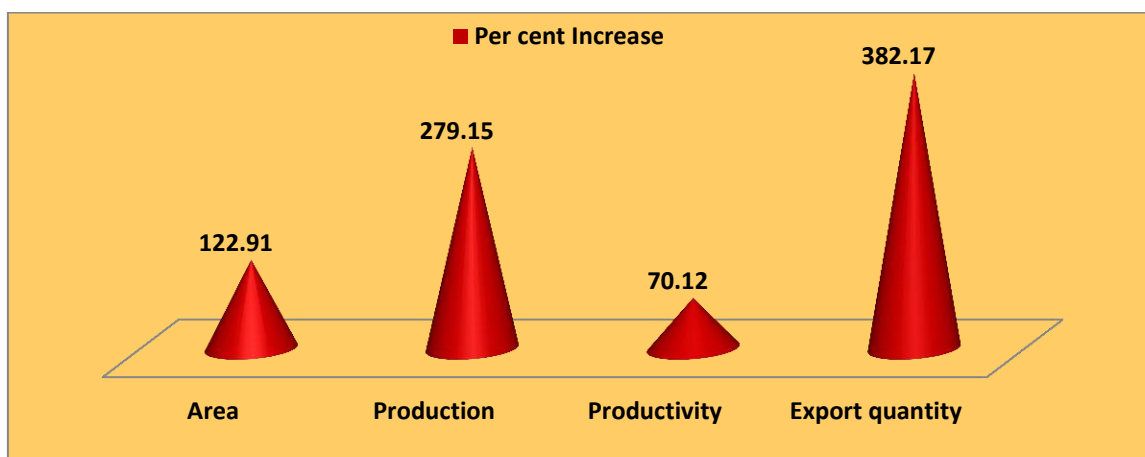


Cultivar Ganesh variety till 2003

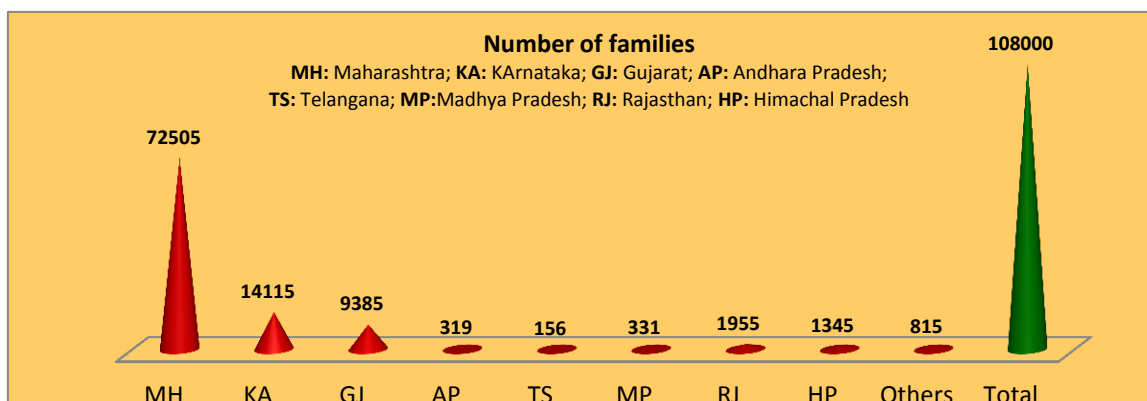


Cultivar Bhagwa: The ruling variety after 2003

Cultivars that Popularized Pomegranate Cultivation in India



Percent increase in pomegranate area, production and export in 2016-17 after release of variety Bhagwa in 2003-04



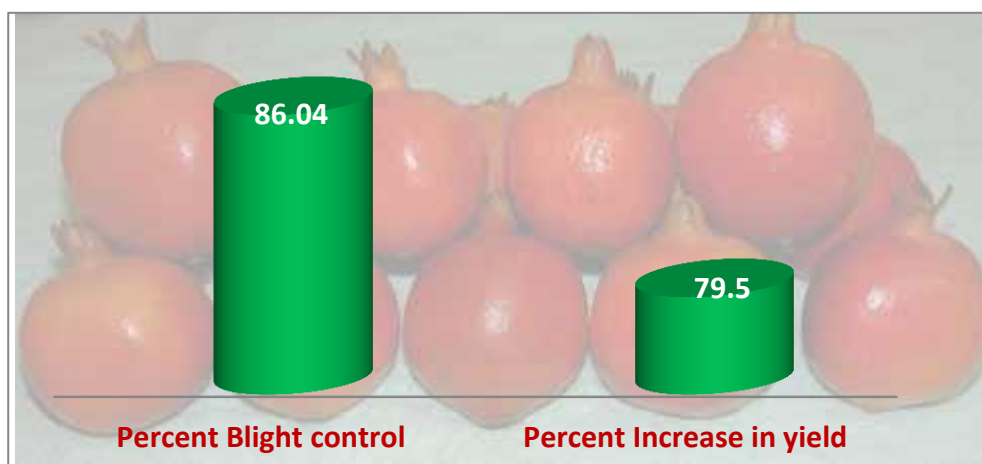
Estimated number of families earning livelihood from pomegranate cultivation in India

COMBATING HURDLES IN POMEGRANATE CULTIVATION

Management of Bacterial Blight for Enhanced Production and Productivity

Bacterial blight was the major impediment in successful cultivation of pomegranate. ICAR-NRCP conclusively proved that the causal organism was a bacterium *Xanthomonas axonopodis* pv *punicae* and that no other pathogen was involved with this disease. The disease was causing huge losses (80- 100%) threatening its cultivation.

The ICAR-NRCP, Solapur developed a robust integrated disease and pest management schedule (IDIPM) and successfully demonstrated it at multilocations in the bacterial blight affected farmers' orchard. This instilled the confidence among the farmers and resulted in huge expansion of pomegranate area under cultivation, production, productivity and livelihood security of more than 1 lakh farm families in India.

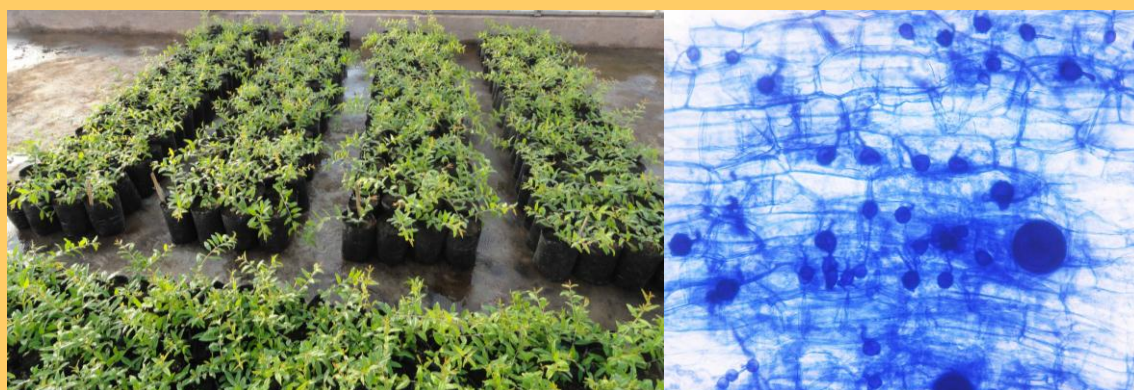


Impact of ICAR-NRCP's IDIPM on blight management and yield

Before IDIPM**After IDIPM****Effect of ICAR-NRCP developed IDIPM on pomegranate bacterial blight**

Production of Disease Free and Elite Planting Material

In order to ensure freedom from bacterial blight and wilt and to cater to the need of rapid expansion in pomegranate area, protocol for *in vitro* propagation of pomegranate cultivar Bhagwa has been standardized using green nodal segments and shoots tips and biohardening of *in vitro* raised plants at the time of secondary hardening with beneficial microbes (arbuscular mycorrhizal fungi like *Glomus* spp. and *Aspergillus niger* strain AN 27). The biohardening technology was also standardized for hardwood cuttings and commercialized. These technologies have been commercialized with 6 firms. ICAR-NRCP through public private partnership mode have produced and supplied 6.0 lakh bio-hardened disease free tissue culture plants of cv. Bhagwa to different parts of the country as depicted in the map later.



Colonization of roots with *Glomus* sp in bio-hardened tissue cultured saplings



Pomegranate bio-hardened tissue culture plantation with ICAR-NRCP saplings



Horti Floral Biotech, Tembhurni, Tal Madha, Dist. Solapur, Maharashtra



HU Gugale Agro Biotech Company, Jamkhed, Dist. Ahmednagar, Maharashtra



KF Bioplants Pvt. Ltd., Pune, Maharashtra



Hariyali Hitech, Kalas BK, Taluka – Akole, Dist- Ahmednagar

Major commercial firms producing disease free pomegranate saplings using ICAR-NRCP's technology

Value Added Products from Pomegranate

It is evident that the strong outreach activities of ICAR-NRCP have resulted in rapid increase in production and productivity of pomegranate in India. With dedicated research activities during the last 5 years ICAR-NRCP developed a value chain approach for total utilization of pomegranate. The efforts were inspired by idea of total utilization of pomegranate for diversification of utilization pattern, presently dominated by table purpose consumption to value added products for avoiding distress sale and higher profit realization to pomegranate growers and employment generation through development of enterprises. The Centre was instrumental in standardizing and commercializing the technologies for pomegranate juice and Ready-to-Serve beverage, minimal processing of pomegranate arils, pomegranate wine and extraction of high value virgin pomegranate seed oil.



**M/s GK1Farm Fresh
Mahaboobnagar, Telangana**



**M/s Bhauraya Distributor
Solapur, Maharashtra**



**Mr. Girish Uttam Ware
Pune, Maharashtra**



**M/s TVK beverage Pvt Ltd
Solapur, Maharashtra**

Juice and RTS drink processing technologies commercialized with various firms

Pomegranate for juice and ready to serve (RTS) beverage: Success Story of Skill Development: Make in India and Startup Enterprise

Mr. Vijay Kale young entrepreneur established startup enterprise M/S TVK Beverages at Solapur (Maharashtra) -the heartland of Indian pomegranate production for utilizing readily available pomegranate and ICAR-NRCP technology and guidance for skill development. He left his well-paid job at Saudi Arabia to pursue his dream.

ICAR-NRCP played important role in establishing new startup enterprise by:

- Conceptualization of business plan
- Providing information on FSSAI licensing
- Training on pomegranate RTS beverage development and packaging
- Technology licensing
- Hands on experience at pomegranate processing pilot plant
- Guidance for establishment of pomegranate processing unit



TVK Beverages at a glance

Initial investment: Rs.120 lakh
Production Capacity: 1000 liters/day
Manpower Required: 5 Persons
Market Linkages: Self Marketing
Present Turnover (Rs): Rs.15 lakh/ month
Profit: Rs 1.8 lakh/month

Pomegranate juice/RTS processing plant at M/S TVK Beverages at Solapur (MH)

Processing of Fresh Pomegranate Arils (Edible Part)

Pomegranate is difficult to eat fruit unlike oranges or banana. Hence, there is a huge demand of extracted arils (edible part) from pomegranate for fresh consumption. However, shelf life of these freshly extracted arils for marketing is a challenging task

ICAR-NRCP standardized the technology of minimal processing of freshly extracted arils, with hygienic processing, pretreatment with natural products and packaging that enhanced shelf life up to 14 days. The technology provides convenience in relishing otherwise difficult to eat pomegranate.

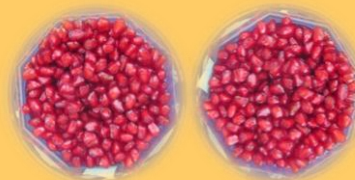
The technology was recently transferred to M/s Ananya Agro Product, village Shevate, Pandharpur, Solapur (Maharashtra). The Owner of firm Mr. Vishnu Gaikwad was an unemployed graduate. Utilizing the technological support and guidance of ICAR-NRCP, he along with two partners Mr. Ganesh Tondale and Mr. Avinash are able to make earning for their families. The enterprise has objective to provide hygienically packed, healthy snack in

the form of fresh pomegranate arils with targeted institutional marketing in schools, hospitals and other public places.



Ananya Agro Food Products at a glance

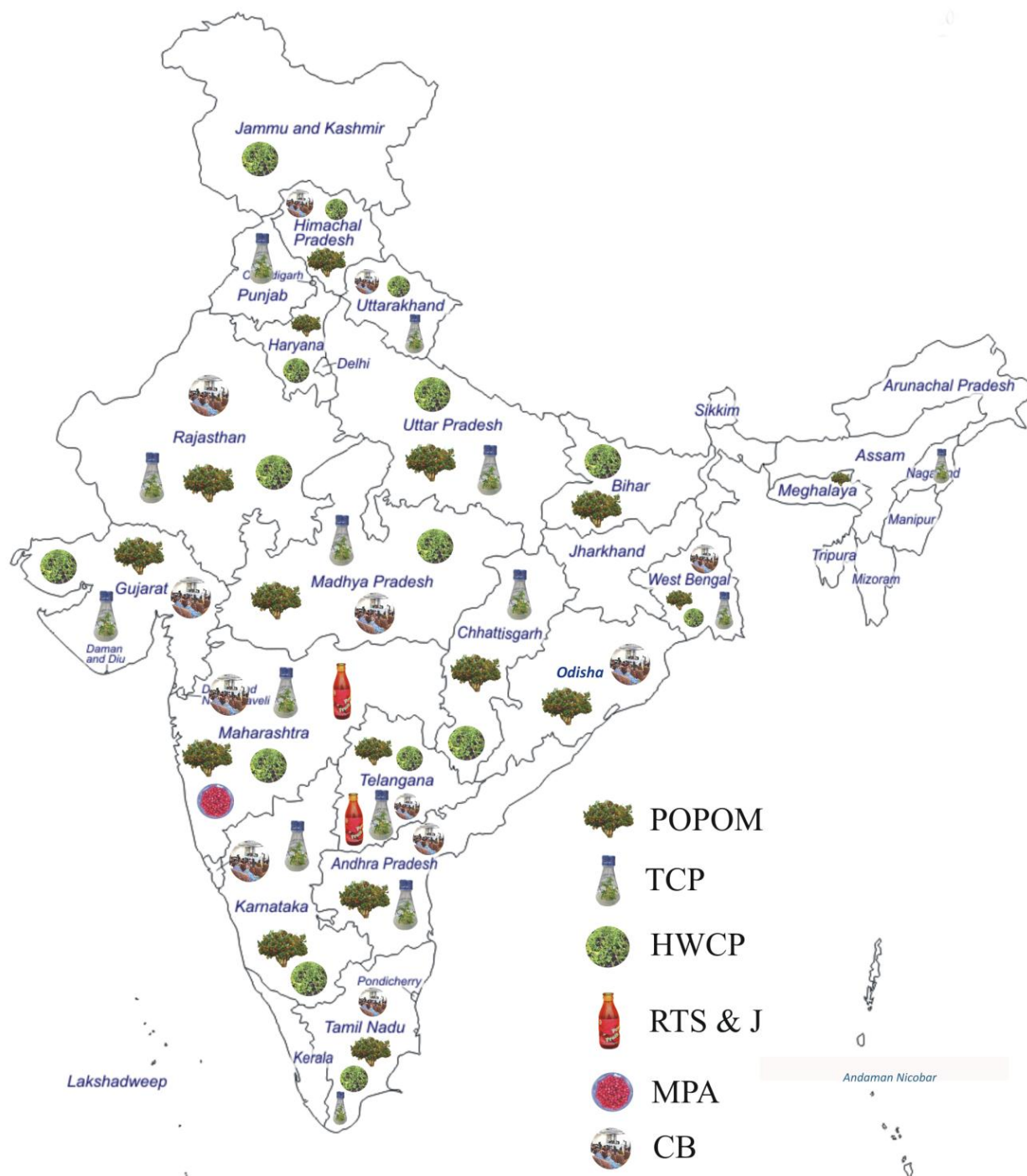
Initial investment (Rs.): 4.0 lakh
Production Capacity: 30 Kg arils /day
Manpower Required: 4 Persons
Market Linkages: Self Marketing
Present Turnover: Rs. 3.31 lakh/ month
Net Profit: Rs. 0.88 lakh/month



Mr. Vishnu Gaikwad at his Minimal processing Unit at M/s Ananya Agro Food Products, Shevate, Pandharpur, Solapur (MH)

DEMONSTRATIONS, CAPACITY BUILDING AND EXTENSION MATERIAL

ICAR-NRCP effectively disseminated its technologies through demonstrations, on site and in-house capacity building and supply of extension material all over India. The Centre has been instrumental in transferring developed technologies to stakeholders in Maharashtra and other pomegranate growing states through trainings organized at the Centre, participation as resource person in training cum awareness programmes and exhibitions organized by other organizations and institutes, as well as field visits. The Centre has strengthened pomegranate cultivation not only in Maharashtra but also in states like Gujarat, Odisha, Telangana, Rajasthan, Karnataka, Andhra Pradesh, Telangana, Tamil Nadu and Madhya Pradesh. NRCP has also introduced pomegranate cultivation in tribal areas of Gadchiroli district of Vidarbha in Maharashtra, Bankura and Purulia district in West Bengal and Raigada in Odisha.

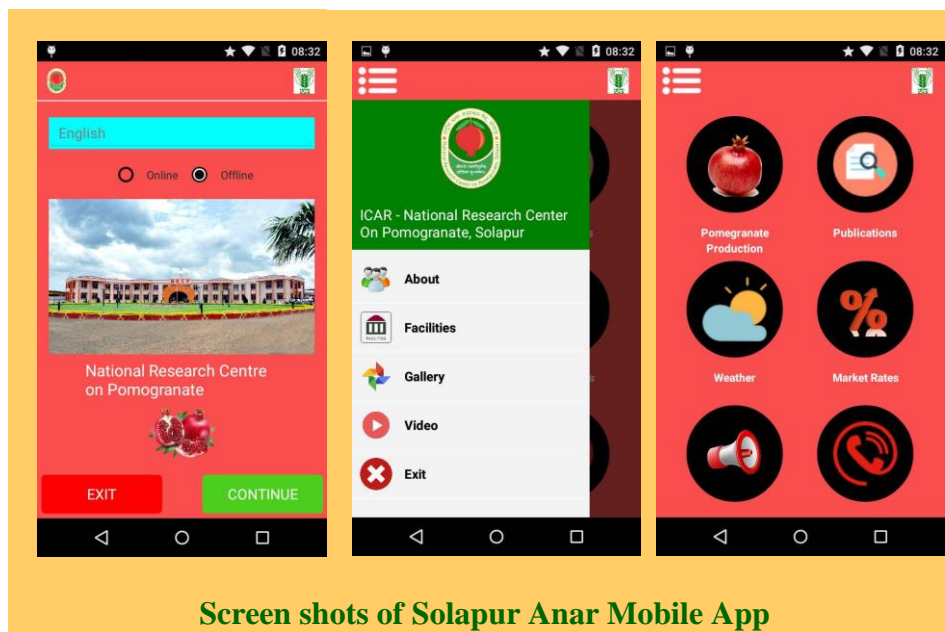


POPOM- Package of Practices for Pomegranate Orchard Management; **TCP** – Tissue Culture Plants; **HWCP**-Hard Wood Cutting Plants; **RTS&J** – Ready to Serve Drink and Juice; **MPA** – Minimal Processing of Arils and **CB** – Capacity Building

Outreach activities of ICAR-NRCP In India

Mobile App: Solapur Anar

To disseminate the information on various technologies and to answer queries on pomegranate farming, ICAR-NRCP has developed Mobile App called ‘Solapur Anar’. The app provides information on all aspects of pomegranate production and value addition. The first version of the app ICAR-NRCP was downloaded by 23920 persons while recent updated version ‘Solapur Anar’ launched in April 2017 has 2394 downloads. The app has been developed in six languages viz English, Hindi, Marathi, Kannada, Telugu, and Gujarati.



The ICAR-NRCP has a user friendly website (nrcpomegranate.icar.gov.in) which is easily accessible by all the stakeholders.






IMPACT

The research efforts by the scientists and awareness initiatives of ICAR-NRCP in collaboration with other ICAR-institutes and state universities successfully brought down the losses due to bacterial blight-the major constraint in pomegranate cultivation. The technology for disease free planting material and processing gave fillip to pomegranate cultivation. The demonstrations and trainings played a significant role in understanding the challenges and strategies in pomegranate cultivation and building the confidence of the growers. The impact of ICAR-NRCP efforts and achievements is visible through constant increase in area under cultivation, production and productivity of pomegranate during last six years.

WAY FORWARD

The ICAR-NRCP has some technologies in pipeline for commercialization in near future. Some of these are:

Solapur Lal: A promising variety of pomegranate ‘Solapur Lal’ has been developed through breeding. The new variety having very high iron, zinc, Vitamin-C, and anthocyanin contents in the edible parts is a boon to combat nutritional deficiencies in human apart from its high yield and precocious bearing.

Solapur Lal	Characters	Bhagwa
	Medium (2.0-2.3)	Medium (1.8-2.1)
Red	Calyx colour	Red
160-165	Fruit maturity (days)	180-185
23-27	Yield (t/ha)	16-20
280-290	Fruit weight (g)	287-297
Red	Fruit colour	Red
Medium (3.3-3.5)	Rind thickness (mm)	Medium (3.3-3.5)
40-41	100 Aril weight (g)	35-36
Dark Red	Aril colour	Red
Medium	Seed Texture	Soft
45-50	Juice % (ml/100g)	43-48
17.5-17.7	TSS (°Brix)	15.7-15.9
19.4-19.8	Vitamin-C (mg/100g)	14.2-14.6
385-395	Anthocyanin (mg/100g)	355-365
5.6 – 6.1	Iron (mg/100g of fresh arils)	2.7-3.2
0.64–0.69	Zinc (mg/100g of fresh arils)	0.50-0.54
		
		
Comparative performance of Solapur Lal vs. Bhagwa		

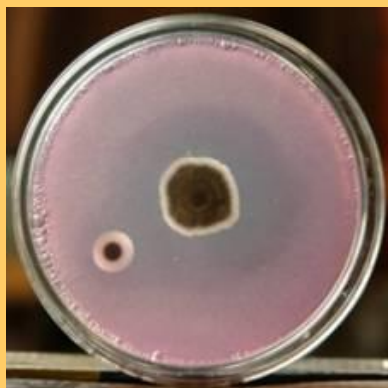


Biofertilizer *Penicillium pinophilum*: ICAR-NRCP has developed a carrier based bio-fertilizer formulation using *Penicillium pinophilum* having tremendous potentiality for making the naturally unavailable potassium and phosphorus in the soil into easily available form to the plant. It has the capacity to supplement 70% requirement of potash fertilizers, with a saving to the tune of Rs. 40,000/- per hectare on procurement of imported potash fertilizers. It also has potential to increase fruit yield in pomegranate by 24% along with better fruit quality. Hence, the formulation is expected to give a better Benefit:Cost ratio.

Virgin pomegranate seed oil: ICAR-NRCP filed patent vide Application No. 201611011366 E-2/528/2017/DEL for pomegranate seed oil extraction process with retention of bioactive components. The pomegranate seed oil is full of health benefits and is known to improve cardiac health, skin health, immunity, prevents hair fall and reduces hormonal imbalances. Recent studies in murine model exhibited its anti-inflammatory and anti-cancer activities. Research is on for development of a dietary supplement for clinical trial on management of human cancer using virgin pomegranate seed oil. Virgin pomegranate seed oil is sold in the international market at a price of Rs. 15,000 to Rs. 20,000 per liter which can be obtained from 50 Kg of surplus produce that fetches a very low price.

Pomegranate wine: Fermentation of pomegranate juice leads to formation of biogenic amine (Melatonin) which has immense medicinal value. Technology for production of sparkling wine from pomegranate cultivars Bhagwa and Ganesh have been standardized at ICAR-NRCP and ready for commercialization.

Pomegranate rind powder: Pomegranate rind powder has been found to be very rich in phytochemicals having tremendous potentiality for management of diabetic nephropathy, production of organic organic mouth wash, bio-colour for textile dye and cosmetics.



***Penicillium pinophilum* based biofertilizer formulation**



Virgin seed oil



**Sparkling wine from
cv. Bhagwa**



**Sparkling wine from
cv. Ganesh**



Rind powder

ICAR-NRCP Technologies in pipeline



Pomegranate in Solapur wholesale market



हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

Agrisearch with a human touch