

Importance of an Advanced Propagational Method in Pomegranate

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SUMMARY

Area and production of pomegranate is increasing every year and India is among leading producer, exporter and consumer countries of this fruit. Because in India more than 50% of its cultivation area is occupied by a single state Maharashtra with its leading role as producer too, so there is scope for expanding its cultivation in nontraditional areas including Deccan Plateau regions, dry areas of Madhya Pradesh, Gujarat, Rajasthan, western Uttar Pradesh, Punjab, Haryana and Tamil Nadu as it is suitable to annual rainfall of 25 to 60 cm and salty soil. In Rajasthan, area of cultivation increased from app. 2000Ha to 12000 Ha. in only five years from 2015-16 to 2019-20. But increased cultivation area will require suitable healthy planting material in bulk and it would be possible to complete such demand through advanced method of propagation like plant tissue culture.

INTRODUCTION

Pomegranate is shrub of lythraceae family. This fruit which is termed as 'superfood' was also given a classical Latin name, *Malum granatum*, which means "grainy apple". Leaves of this plant are glossy and flowers are red in colour. Although plant have origination in Iran, Afghanistan and south west of Pakistan but it is also cultivated in some other part of world like; Israel, Turkey Iraq, Syria, Armenia, Spain, Egypt, India, China, and USA. The term superfood given due to its nutritional value in which A 100 g (3.5 oz) serving of pomegranate provides 12% of the Daily Value (DV) for vitamin C, 16% DV for vitamin K and 10% DV for folate. A 100 g of pomegranate provide energy of 83kcal.

Utilization:

Pomegranate var. nana is a dwarf variety of *P. granatum* which is popularly planted as an ornamental plant in gardens. About 45-61% of total fruit weight is edible and consists of about 60-85% juice and 15-25% seeds. Edible part (fruit) is a berry with seeds and pulp which are produced from the ovary of a single flower. Red colour of juice due to presence of anthocyanins and ellagitannins. The taste has its own variation in case of pulp from sweet and aromatic ('Arakta', 'Bhagawa', 'Ganesh', 'Jodhpur Red', 'Jalore Seedless', 'Mridula', 'P-23', 'P-26', 'G-137') to sour and insipid ('Nana', 'Daru', 'VIR-5', 'Eni Krmyzy', 'Alice'). Generally fresh fruit juice consists of 85.4% moisture, 10.67% total sugars, 1.4% pectin, 0.1 g/100 ml total acidity (as citric acid), 19.6 mg/100 ml free amino nitrogen and 0.05g/100 ml ash. Its harvesting time influences acidity to a considerable extent as fruits harvested in mid-October has acidity 1.58% which is lower as compared to late September harvested one which has 1.8% acidity. Due to presence of pectin and fibres and its antimicrobial and antioxidative properties it can be used as preservative. Peel which is a waste material after use of edible part can be used in packaging due to its plasticising, strengthening and elastic properties. In traditional medicinal system, it can be used for treatment of diarrhoea, dysentery, diabetes, cardiovascular diseases, arthritis, Alzheimer's and cancer.

Value added products:

Juice, concentrate and beverage, wine, syrup, jelly, jam (anar rub) and anardana are the various value-added products which already have a good market at national and global level. Some of varieties including Dholka, P-26, P-23, Jalore seedless and Ganesh can be processed for juice in near to their 50% of total weight (Fig -1).

Present status of cultivation area and production:

Global level: The large scale producers of pomegranate are India and China, Iran, Turkey, Afghanistan, the US, Iraq, Pakistan, Syria and Spain.

National level:

India grows six commercial varieties of pomegranate which is Ganesh, Mridula, Arakta, Ruby, Phule Bhagwa and Phule Bhagwa Super. According to National Horticultural Board (NHB) data of 2019-20, pomegranate area of cultivation was 2.83 lakh hectares with a record production of 31.46 lakh MT of fruits. Major contribution in this large cultivation area is of Maharashtra with almost 55% share in national acreage and production. After Maharashtra, Karnataka, Gujarat and Andhra Pradesh are leader in production of pomegranate but Tamil Nadu is leader in productivity with 32t/ha and followed by Telangana and Andhra Pradesh with respective productivity 15.1t/ha, 15 t/ha. There has been a steady increase in area and production of pomegranate in the country. By 2025, figures for the area, production and export of pomegranate are expected to reach 7.5 lakh ha, 114 lakh tonnes and 83,800 tonnes respectively (Fig 2, Fig 3 and Fig 4).

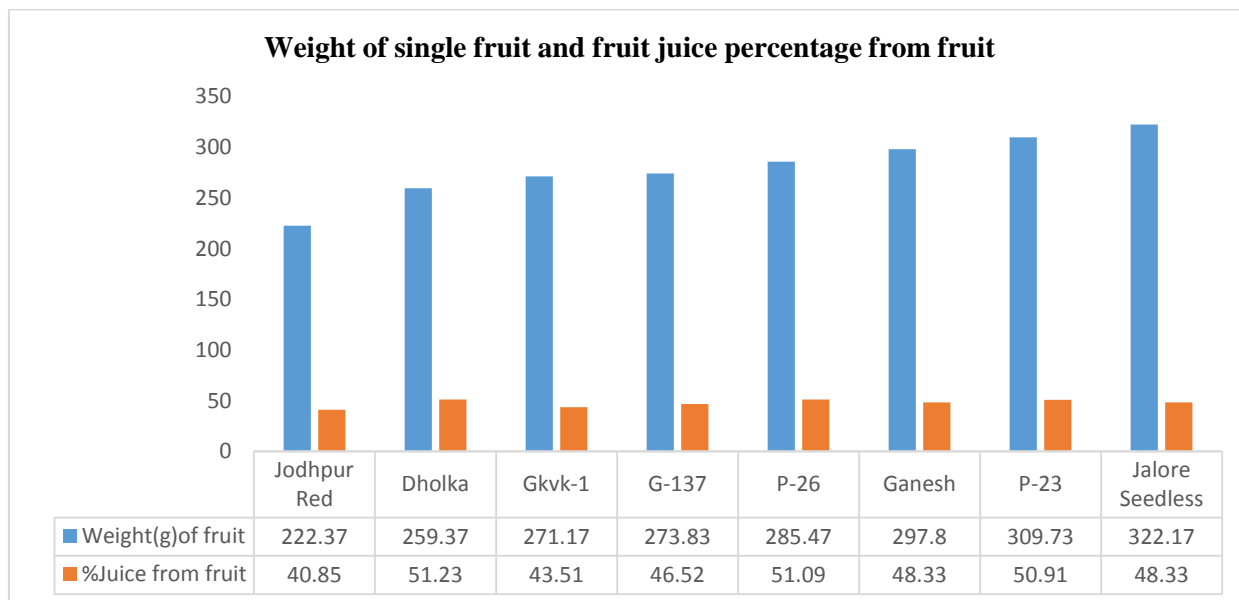


Fig 1. Represent weight of single fruit and percentage juice from different cultivars of Pomegranate.

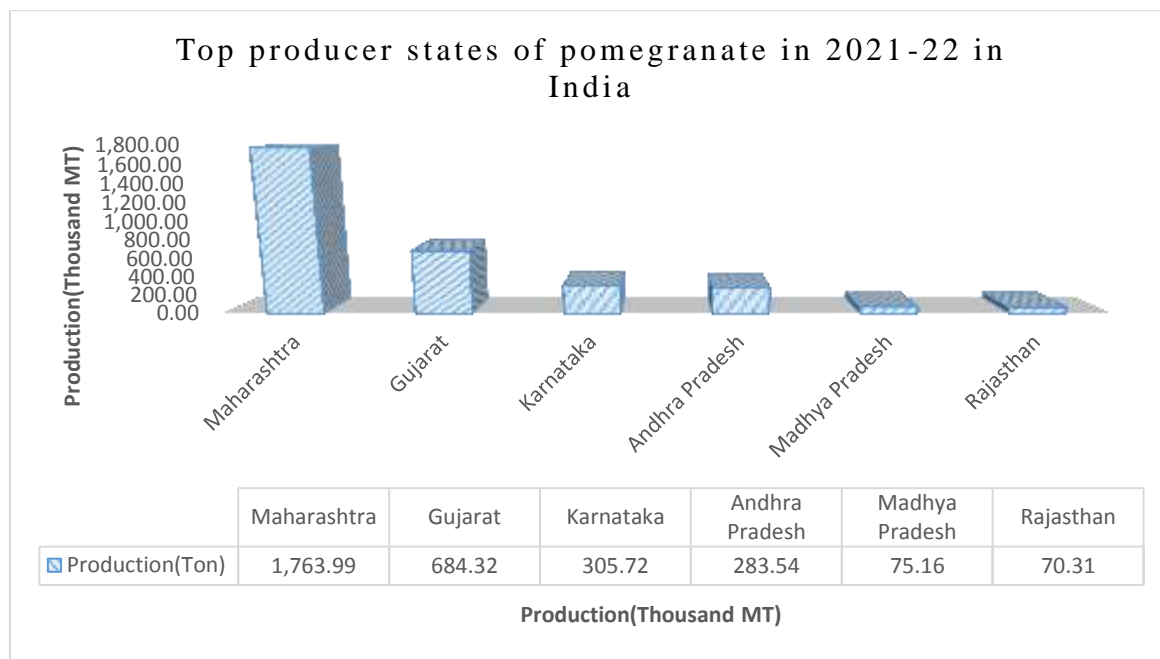


Fig 2: Leading pomegranate producing states of India in 2021-22.

India has advantages for export of pomegranate fruit due to its availability throughout the year and competitively superior varieties including varieties Bhagwa, Phule Arakta, Ganesh. Importer of Indian pomegranate are Nepal, Bangladesh and European nations like Netherland, UK and Arabian countries like; Saudi Arabia, Qatar, Kuwait Oman, UAE.

Market size and increase demand of healthy planting material:

In State of Rajasthan, area of cultivation increased from app. 2000Ha to 12000 Ha. in only five years from 2015-16 to 2019-20. Production of pomegranate is also increasing along with area of cultivation from 10,000 MT to 70,000 MT. 62,120 grafting based pomegranate plantlets were imported for only government nurseries of Rajasthan in 2017-18 from other states.

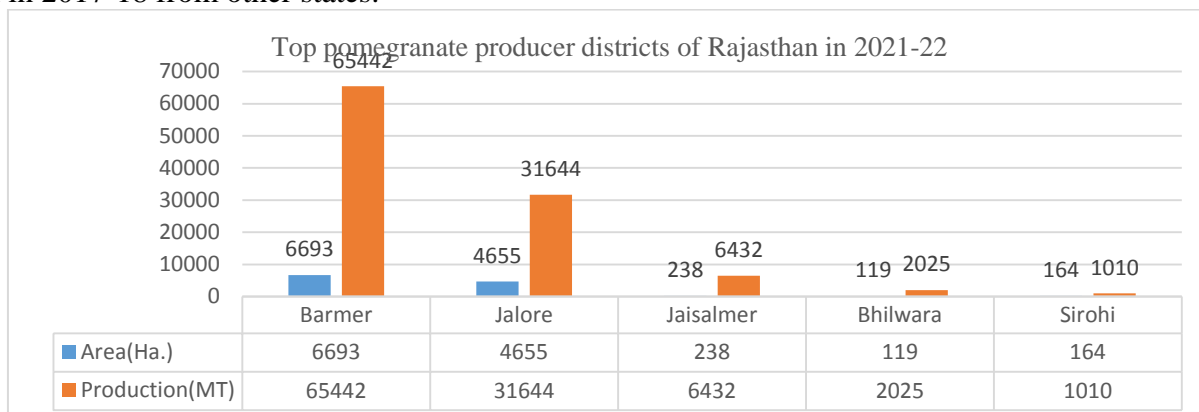


Fig -3: Leading pomegranate producing districts of Rajasthan in 2021-22.

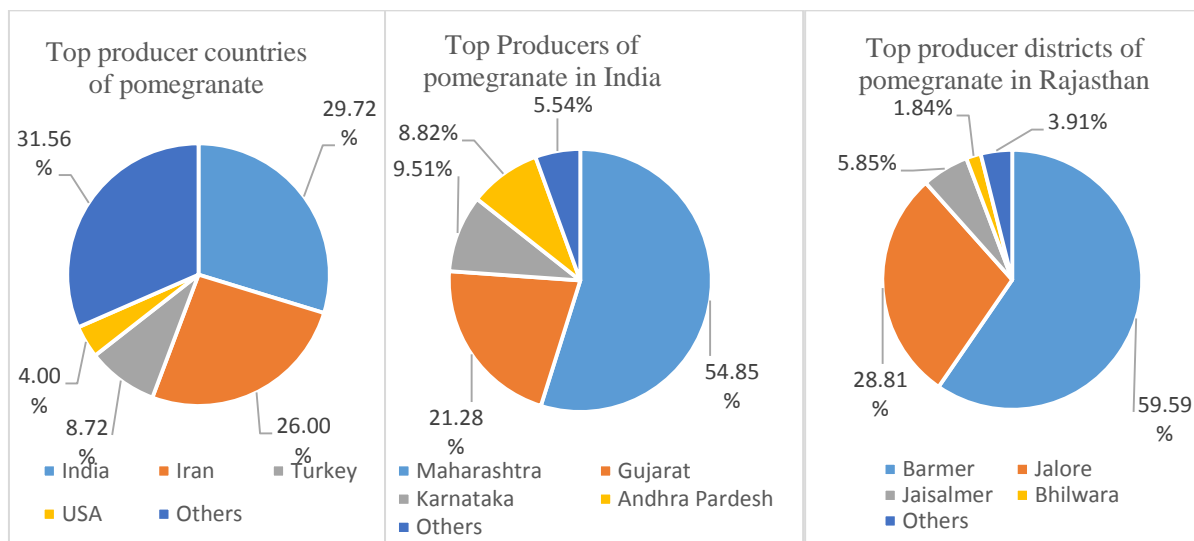


Fig-4: Production share of different regions of world and different regions of India in Pomegranate in 2021-22.

Post harvest diseases and management:

Although microbes like *Penicillium pinophilum* is beneficial in pomegranate plant growth through increasing nutrient uptake (N, P, and K) that resulted in improved growth, significantly higher leaf area index and photosynthetic rate of plant but other species of *penicillium* like *Penicillium implicatum* responsible for rot in pomegranate along with *Rhizopus arrhizus*. Gray mold and rot are two major microbial diseases in pomegranate. *Botrytis cinera* is pathogen of gray mold. *Alternaria solani* is a pathogen of storage phase of pomegranate which responsible decay during storage of fruits. *Aspergillus* spp., or *Alternaria* spp. causes heart rot in pomegranate fruits after rain during flowering and early fruit development. The fungi show symptoms in the form of abnormal skin colour. CO₂-enriched atmospheres and Fludioxonil use are two strategies to growth of *Botrytis cinera*. Dipping of fruits in aqueous Topsin-M and Bavistin can inhibit the growth of *Aspergillus niger* along with it waxing coupled with 0.1% carbendazim is also beneficial practice for pomegranate fruits.

Propagation:

Conventional mean of propagation for pomegranate is based on seedling, softwood and hardwood cutting but the method of seedling generates heterozygous plant material which leads to wide variations in tree and fruit characteristics and softwood and hardwood based method is labour intensive and time consuming so tissue culture is an alternative mean which is useful in this direction to supply the required material as per increasing in cultivation area of pomegranate. Different plant parts like node, shoot tip, internode, axillary bud and leaf were used as an explant to initiate tissue culture of pomegranate.

Importance of tissue culture in pomegranate:

There is requirement of large planting material which has tolerance to bacterial blight disease, biotic & abiotic stresses, specific for processing (anardana) purpose and quality oriented which can be possible through plant tissue culture. There is scope for including nontraditional areas for cultivation of pomegranate and expanding its cultivation areas in Deccan Plateau regions, dry areas of Madhya Pradesh, Gujarat, Rajasthan, western Uttar Pradesh, Punjab, Haryana and Tamil Nadu as it is suitable to annual rainfall of 25 to 60 cm and monthly average temperature around 40°C with assured irrigation facilities. This expansion will be more fruitful with healthy planting material of superior varieties which requires techniques like plant tissue culture to complete such increasing demand of such desired planting material.

CONCLUSION

Cultivation area of pomegranate increasing in India and need of healthy planting material is for cultivation also increasing. To complete such demand of planting material is not possible with conventional methods because these methods have their limitations. Grafting and cutting based plant material production required larger space and extensive labour along with that soil born disease also carried from one place to another place with this grafting based material and one of such problem is nematode infection which affected the production of larger area. These issues can be solved by approaching for modern technique like plant tissue culture.

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