Pomegranate

- Pomegranate (*Punica granatum*) is a favourite table fruit in tropical and sub-tropical regions of the world.
- A native to Iran (Persia), it is found from Kanyakumari to Kashmir, but is cultivated commercially only in Maharashtra. Plantations are also seen in Gujarat, Rajasthan, Karnataka, Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Punjab and Haryana.
- In India, it is considered as a crop of the arid and semi-arid regions because it withstands different soil and climatic stresses.

Climate and soil:

- It grows well under semi-arid conditions.
- It thrives best under hot dry summer and cold winter provided irrigation facilities are available.
- The tree requires hot and dry climate during fruit development and ripening.
- It cannot produce sweet fruits unless the temperature is high for a sufficiently long period.
- Humid climate lowers the quality of fruits and increases incidence of fungal diseases.
- The pomegranate tree is deciduous in areas of low winter temperature and an evergreen or partially deciduous in tropical and subtropical conditions.
- It can tolerate frost to a considerable extent in dormant stage, but is injured at temperature below –11°C. Orchards can be established up to an altitude of 500m.
- Pomegranate can be grown on a wide range of soils. It prefers a well-drained, sandy-loam to deep loamy or alluvial soils.

Varieties

Alandi, Kandhari, Muskati, Bassein Seedless, Dholka, Jodhpuri Red, Jodhpuri White, Jalore Seedless, Chawla, Nabha, Country Large Red and Velludu are traditionally identified popular cultivars. Recently, Ganesh from Alandi; G 137 from Ganesh; Jyothi and IIHR Selection from Bassein Seedless, Yercaud 1 and Co 1 are some promising types from locally-available material. Other improved varieties are: Bhagwa, Mridula, Arakta

Propagation

Air-layering: rainy season.

Hard wood cuttings: January-February

Planting

The plants may be planted by square system since all the cultural operations can be performed more conveniently. Planting distance should be maintained depending upon soil type and climate. A spacing of 4–5m on marginal and very light soils is recommended. In subtropical
regions, planting may be done in spring (February–March) provided irrigation facilities are available. However, July-August is ideal time of planting in tropics.

In temperate regions, high-density planting is advocated. A spacing of 5–6m in northern India and even in plains in Deccan plateau is optimum. The spacing has been brought down to 4.5m which is optimum. The high-density plantation—5m × 2m (1,000 plants/ha), 5m × 3m (666 plants/ha), 5m × 4m (500 plants/ha) and 5m × 5m (400 plants/ha)— gives 2–2.5 times more yield than the normal planting distance (5m × 5m) in Deccan plateau. Therefore pomegranate should be planted at a close distance to obtain higher yields. Depending on the growth of the orchard trees, alternate plants could be removed after 6–7 years, maintaining a spacing of 5m × 4m. However, farmers adopt a spacing of 2.5m × 4.5m. Closer spacing increases disease and pest incidence.

Training

Pomegranate plants can be trained on a single-stem or in multi-stem system. The single-stem training has its own disadvantages. The plants have a tendency to produce ground suckers, making the plant bushy. As such it is rather difficult to train the plant to a single stem. The crop is highly susceptible to stem-borer and shoot-hole borer. Moreover, this system is hazardous. Thus single-stem training is uneconomical for commercial cultivation. Therefore multi-stem training is more prevalent in the country. Allowing too many stems also comes in the way of intercultural operation. The varying of stem number of 3–4 does not affect the yield significantly in early years of bearing and a multi-stem training with 4–5 stems/hill is beneficial.

Pruning

Pomegranate plants do not require pruning except removal of ground suckers, water shoots cross branches, dead and diseased twigs and giving a shape to the tree. Pomegranate fruits are borne terminally on short spurs, arising from matured shoots, which have the capacity to bear fruits for 3–4 years. With advance in age they decline. A little thinning and pruning of old spurs to encourage growth of new ones is required. Some useful tips on pomegranate pruning are:

- Fruitful and differentiated buds are located at the distal portion of the branches.
- Pruning of terminal portion of a branch lowers down the total flower production.
- Pruning does not affect sex ratio and fruit quality.
- Pruning affects significantly total fruits, marketable and unmarketable fruits. Fruit size and yield of higher grade fruits are more with high intensity pruning.
- Pruning minimizes the bending of branches and staking.

Manuring and fertilization

Pomegranate is a hardy fruit plant, growing successfully in low fertile soils. Its productivity is greatly increased by the application of manures and fertilizers. Both macro and micronutrients affect its growth, development and productivity. Application of 20kg farmyard manure and 2.5 kg CAN; 1.50 kg SP and 1.00 kg MOP to 5-years and above-old tree annually is adequate. Full dose of farmyard manure, super phosphate, Muriate of potash and half CAN
should be applied during December-January. The remaining dose of Can should be split into two doses: first dose dressed at the time of fruit set and second dose about 4-5 weeks after fruit set.

**Aftercare**

Since pomegranate plants take 4–5 years to come into bearing, intercropping is beneficial. Low-growing vegetables, pulses or green manure crops may be intercropped. In arid regions, intercropping is possible only during the rainy season, whereas winter vegetables are feasible in irrigated areas.

In young orchard, season-wise appropriate intercrops could be taken. However in a bearing orchard, the soil management practices vary with the type of crop since pomegranate gives 3 flushes in a year. In arid conditions, generally mrig bahar is preferred so that natural precipitation could be used for fruiting. Therefore, after harvest, the orchard is left as such untilled under the cover of natural grasses during summer. In May, orchard is tilled, fertilization is done and the bahar is induced. During rainy season and until the harvest, keep the orchard weed-free as its feeding roots are very shallow.

Conservation of soil moisture is quite essential. It is possible through the use of soil covers. Black polythene mulch or organic-matter mulch such as saw-dust, banana trash, paddy husk and groundnut shells are good mulching materials.

**Bahar treatment or flower regulation**

The pomegranate plants flower and provide fruits throughout the year in central and southern India. However, it needs to be thrown into rest period so as to enable prolific harvest at a given time. Looking at patterns of precipitation, flowering can be induced during June–July (mrig bahar), September–October (hasta bahar) and January–February (ambe bahar). In areas having assured rainfall where precipitation is normally received in June and continues up to September, flowering in June is advantageous; where monsoon normally starts in August with erratic pattern, flowering during August is beneficial; the areas having assured irrigation potential during April–May, flowering during January can be taken; and where monsoon starts early and withdraws by September induction of flowering in October is possible. In Rahuri, flowering during January–February is better in quality followed by October flowering. Considering comparable yields, prices and irrigation needs it is recommended that October cropping could be substituted for January flowering.

**Irrigation**

Although pomegranate is considered to be highly drought tolerant, its plants respond very well to irrigation. However, water requirement varies from season-to-season. For mrig bahar, first irrigation should be given during mid-May followed by regular irrigation until the onset of monsoon. In post-monsoon period copious and regular irrigation is essential for better development of fruits and to avoid fruit-cracking. For other bahars (seasons), weekly irrigation in summer and bi-weekly irrigation in winter are advised. The check basin system of irrigation should be followed. For arid and semi-arid conditions, micro-catchments should be developed to
harvest rainwater. Drip irrigation can also be followed to economize water. Saving in water (43%) and increased yield (30–35%) are observed. High salinity in soils and irrigation with saline water affect normal fruit production in pomegranate.

**Harvesting and Postharvest management**

Pomegranate being non-climacteric fruit should be picked when fully ripe. Harvesting of immature or over-mature fruits affects quality. Its fruits become ready for picking 120–130 days after fruit set. The calyx at the distal end of the fruit gets closed on maturity. Ripe fruits give a distinct sound of grains cracking inside when slightly pressed from outside. At maturity they turn to yellowish-red and get suppressed on sides. Fruit colour is not sure guide to maturity. Plucking is done with hand. A grown-up, well-managed tree gives 60–80 fruits annually, with a life span of 25–30 years.

**Crop and grade regulation**

Of these, 5–6% is of ‘A’ grade and 20–25% of ‘B’ grade, whereas remaining ones belong to ‘C’ and ‘D’ grades, and cracked fruits. Though it is practically impossible to get all ‘A’ grade fruits, one can improve average grade by crop regulation. After the fruit set, do not allow fruits to develop in clusters. Keep only solitary fruits. After getting set of fruits of desired numbers as per size of tree, remove all the flowers coming thereafter. In pomegranate it is not only the number of fruits/tree but also the fruit size which influence the net returns. About 60 fruits/tree is optimum crop load for pomegranate Ganesh.

**Grading**

Pomegranate fruits should be graded on the basis of their weight, size and external (rind) colour. The grades are:

Super-sized: Fruits having good, attractive bright red colour weighing more than 750g each and without any spot on the skin.

King-sized: Fruit free from spots, having an attractive red colour and weighing 500–750g.

Queen-sized: Fruits between 400 and 500g, having bright red colour and free from spots.

Prince-sized: fully ripe fruits weighing between 300 and 400g with red colour.

Besides, pomegranates are also graded into 2 grades—12-A and 12-B. The fruits weighing between 250 and 300g with some spots belong to 12-B grade. The fruits of 12-A grade are generally preferred in southern and northern India.
Packing and storage

The size of packages pomegranate changes according to their grade. Corrugated fibre-board boxes are used for packaging since they are light in weight cause less or no damage to fruits, are easy to handle.

In a single box, 4–5 queen-sized fruits, 12 prince-sized and some of 12–A and 12–B grades may be packed. The white-coloured boxes having 5 plies are generally used for export purpose, whereas red-coloured ones having 3 plies are used for domestic markets. The red-coloured boxes are cheaper than white-coloured ones. The size of super-sized, queen-sized, prince-sized, 12–A and 12–B grades are 13” × 9” × 4”, 15” × 11” × 4” and 14” × 10” × 4” respectively. The cut pieces of waste paper are generally used as cushioning material. The graded fruits are placed on cushioning material followed by an attractive red-coloured paper on the boxes. The safe temperature for cold storage up to 2 months or 10 weeks is 5°C. Longer storage should be at 10°C and relative humidity of 95% to avoid chilling injury and weight loss.

Physiological disorder

Internal breakdown

Disintegration of arils in matured pomegranates known as an internal breakdown or blackening of arils, is a serious malady. This disorder cannot be identified externally, whereas the arils become soft, light creamy-brown to dark blackish-brown and unfit for consumption. It is increasing rapidly in the pomegranate-growing pockets in western Maharashtra.

The incidence of internal breakdown occurs 90 days after anthesis. Its intensity increases if the fruits are left on the tree for 140 days onwards. It is evident in evergreen and deciduous cultivars. The incidence is more in ambe bahar. It increases with increase in weight of fruits from 150–200g (26.60%) to more than 350g (60%). No insect or organism is associated with this malady. The TSS, acidity, ascorbic acid, reducing sugars, calcium, phosphorus and enzyme catalase are reduced, whereas non-reducing sugars, starch, tannins, nitrogen, potassium, magnesium, boron and enzyme polyphenol oxidase and peroxidase increase in the affected arils compared with the healthy ones.

The exact causes are not known and remedial measures are difficult to advocate. Therefore pomegranates should be harvested at 120–135 days after fruit set.

Fruit cracking

Fruit cracking, a serious problem, is more intense under dry conditions of the arid zone. The fully-grown, mature cracked fruits though sweet, loose their keeping quality and become unfit for marketing. They are also liable to rot qualitatively. The cracked fruits show reduction in their fruit weight, grain weight and volume of juice. It is due to deficiency of calcium, boron and potash. Fully developed pomegranates crack due to moisture imbalance, as they are very sensitive to variation in soil moisture and also to day and night atmospheric moisture deficit. Prolonged drought causes hardening of peel. If this is followed by heavy irrigation or rains, the
pulp grows and the peel cracks. Cracking of fruits is also due to rise in air temperature during fruit growth and development. It may be a varietal character (3.57% in Kazaki to 76.67% in Suni Bedana) since rind thickness and texture is related to their proneness to cracking. The percentage of cracked fruits is also related to season. It amounts to 63 in spring crop (January–June), 34 in winter crop (October–March) and 9.5 in rainy season crop (July–December) in Jodhpuri pomegranates.

There are some cultivars/strains—PS 75 K 3, Appuli, Shirvan, Burachni, Apsherconskil, Krasnyl, Sur-Anar, Kyrmyz-Kabukh and Francis—which are tolerant/resistant to cracking. Cracking can be managed through maintaining soil moisture and not allowing wide variation in soil moisture depletion, cultivating tolerant types, applying copious and regular irrigation during fruiting season using GA₃ (15ppm) and applying boron (0.2%) reduces cracking of fruits and improve fruit colour.