

Annual crop management practices in aonla for subtropical region

Aonla is one of the most nutritious fruits and the second richest source of vitamin C after Barbados cherry. It is also a fair source of carotene, thiamine, riboflavin, and carbohydrate as well as minerals like iron, phosphorus, calcium and magnesium. However, the low yields of aonla might be due to lack of technical knowledge and non-adoption of aonla production technology by the farmers. The knowledge possessed by the farmers and disseminated by institutions may boost aonla production with profitability.

AONLA (*Emblica officinalis* Gaertn.) fruits are rich in vitamin C, minerals (calcium, phosphorus, and iron), and polyphenols, which boost our immune system and enable us to fight against diseases. It has been grown and known in India for more than 3,500 years. It finds a special mention in the ancient Indian text 'Ayurveda' by *Sushruta*, the father of ancient medicine during 1500-1300 BC. India ranks first in the production of aonla, which occupies an area of 94,000 ha with a production of 10.98 lakh metric tonnes. In Uttar Pradesh, aonla cultivation is maximum in nearby belts of the Pratapgarh and Ayodhya districts. The area under the production of aonla is 15.75 ('000 ha), with 63.00 ('000 MT) of production and about 4.0 (MT per ha) productivity. Aonla trees are very tolerant and can easily be grown on all types of soils without any special case. Now-a-days, it is often seen that due to the attack of some diseases and pests, effect of frost and lack of some nutrient deficiency in the soil, farmers are not able get potential yield. In the present article, details of agricultural activities carried out in aonla production throughout the year are being given below.

- The new plants are protected from frost/ low temperatures by covering them with straw from all sides.
- The one year old plants, 100 g of nitrogen, 50 g of phosphorus and 100 g of potash along with 5 kg of rotten cow dung manure should be applied per year per tree. This quantity should be increased with the age of the tree, i.e. for 10 years of age or more, it should be 1 kg of nitrogen, 0.5 kg of phosphorus and 1 kg of potash and 50 kg of rotten FYM.
- During this month, the full dose of FYM, half dose of N, P and K should be applied.
- FYM and other fertilizers should be applied in the periphery of the trunk keeping 1-1.5 m distance from the main trunk and mixed with soil up to depth of 15-20 cm deep. Light irrigation should be given after applying fertilizer.
- The application of N: P: K :: 550:250:600 g along with 40g of Azotobacter and 50 g of PSB per plant has been proved to be beneficial for enhancing yield and improving fruit quality in aonla.
- In alkali soil, in addition to the above mixture of fertilizers, borax, zinc sulphate and copper sulphate (100 g each) should be added in the fertilizer mixture keeping in mind the age and vigour of the plant.

January

- Dry, diseased and insect infested branches etc. are pruned and copper oxy-chloride (3.0 grams per litre) is sprayed on the cut ends.



Orchard of aonla while flowering



Indeterminate flowering in aonla

February

- To protect the new plants from frost during December-January, straw cover should be removed during the second week of this month.
- If pruning of dry, diseased and insect infested branches/barks etc. has not been done till this month, it must be done immediately and Copper Oxchloride (3.0 g per litre of water) should be sprayed on the cut ends.
- The tree basin should be cleaned and moderately irrigated.

March

- In this month, aonla blooms with new buds. Therefore, excess water or moisture should not be allowed in the plant basin. This has an unfavorable impact on the blossoming process.
- Aonla bears fruits through cross-pollination; hence, some honey bee-boxes should be kept in the orchard for better yield.
- Special care of cleanliness should be taken and any dry or insect-infested branches of the tree should be removed.
- Small trees should be irrigated at an interval of 15-20 days.
- The main branches should be allowed to appear at a height of 0.75-1 m above the ground level.
- The trees should be trained to modified central leader system. Two to four branches with wide crotch angle, appearing in the opposite directions should be encouraged in early years to provide maximum fruit bearing area in the tree.

April

- Small trees should be irrigated regularly and ring

basin should be cleaned.

- Irrigation should be done through ring basin or drip method at an interval of 15-20 days.
- In big trees, dry, diseased and insect infested branches should be removed.
- Mulching should be done after irrigation in water scarce areas.
- Stem swelling / bulging can be controlled by proper pruning during this month.
- The infestation of mealy bugs is often seen on the shoots. Due to sucking of juice by these insect, leaves and flowers dry up and fall subsequently, affecting the growth, flowering and fruits of the tree.
- To avoid its spread, the affected leaves and shoots should be pruned in the beginning and destroyed along with the insects so that they do not spread further.
- In case of severe infestation, monocrotophos (0.05%) or quinolphos (0.05%) should be sprayed.

May

- At this time, fruit set will be observed and the fruit remains in the dormant state. Therefore, little moisture is maintained in the root zone of the trees so that vegetative growth continues and reduces dormant fruit drops.
- The bark eating caterpillar eats the bark of the shoots, branches and main stem and makes holes in the stem. Their residential holes can be seen especially at the joints of shoots and branches.
- To manage it, the residential holes are cleaned. Cotton swabs should be soaked in Dichlorvos (0.025%) solution and placed in the holes and closed with wet soil.



Newly planted aonla plants



Fruiting in aonla tree



Aonla trunk affected with bark eating caterpillar



Crop load in aonla



Fruits infected with anthracnose



Value-added products of aonla

- Otherwise, a solution of monocrotophos (0.05%) or chloropyrifos (0.05%) should be poured inside the holes through an injection needle and covered with wet soil.
- In this month, the leaf rolling insect is often seen. The adults of this insect have small moth; the larvae of these moth bind the soft leaves together with silk threads and keep eating the leaves from inside. To prevent this, the twisted webbed leaves are cut at the beginning of the outbreak and destroyed along with the insects.
- In case of severe infestation, insecticides like carbaryl (0.2%) or endosulfan (0.07%) or monocrotophos (0.04%) or chloropyrifos (0.05%) should be sprayed.

June

- To protect fruit/trees from the rust (circular reddish solitary or gregarious on leaves and also on fruits), hexaconazole (0.1%) or mancozeb (0.2%) or soluble sulfur (0.2%) or chlorothalonil (0.2%) are sprayed on the affected branches.
- For new plantation, the land is prepared for establishing new orchard or gap filling is done in the old orchards.
- A pit of 1 m × 1 m × 1 m should be dug at a distance of 8 × 8 m in the square method. While digging the pits, the upper and lower halves of the soil should be kept separately.
- The dug pits should be left open for 10-15 days so that the larvae of harmful insects (inside the pit) die due to intense sunlight.
- A mixture is prepared by mixing 3-4 baskets (approx. 25-40 kg) of well rotten FYM and one kg of neem cake or 500 g of bone meal powder in the upper half of the soil.
- The prepared mixture should to be filled in the pit in such a way that the filled pit remains raised up to 8 to 10 cm above the soil surface.
- If grafted plant are to be planted that too in the alkali soils, then in the above mixture, 5 to 8 kg of gypsum/pyrite or rotted FYM and 20 kg of sand should be added as per requirement before filling the pit.
- During drought, the pits are properly irrigated so that the filled soil settles in its place and the reaction of gypsum or pyrite takes place easily.
- As far as possible, dug pits in barren land should be allowed to fill with rain water and the filled water should be drained out (dissolve harmful salts) within 2-3 days.
- In this month, the shoot gall or shoot gall psylla

are seen on the nursery or grown up trees. At the beginning of the infestation, stem and shoot swell later, the formation of shape like gall.

- Monocrotophos (0.05%) should be sprayed in the beginning (if necessary) and the second spray is done after 15 days interval, wherever the infestation is continuous.

July

- The grafted plants should be planted in the dug pits in the evening.
- Graft should be purchased be from a reliable nursery or a government nursery only and also the joint of the rootstock and scion, should be examined to ensure success.
- 10% more saplings should be purchased for emergency replantation/gap filling.
- Light irrigation should be given immediately after the planting.
- The remaining half dose of N should be given to the trees as methods given earlier.
- Self-incompatibility is found in aonla trees. Therefore, at least two varieties should be planted opposite to each other so that there is no problem of pollination and potential yield can be ensured.
- The foliar application of NAA (15 ppm) + Thiourea (0.1%) or GA₃ (50 ppm) + Thiourea (0.1%), twice during mid-May and mid-July, may effectively overcomes the problem of fruit drop leading to higher yield of quality fruits.
- The stone borer insect infests in this month. The weevil of this insect makes a small hole in the fruit and lays eggs beneath the outer surface. The fruits of 1.5 to 2.0 cm diameter are preferred for laying eggs. After emerging from egg, the larva penetrates the pulp, stone and eats the seeds and finally destroys the complete fruit. The incidence of this insect has been seen more in *Desi* and *Banarasi* varieties. In case of this infestation, carbaryl (0.2%) or monocrotophos (0.04%) or quinolphos (0.05%) should be sprayed at the pea stage of fruit.

August

- New orchard with new plantation can be established in the month, if not done earlier.
- The growth of fruits starts now, so proper moisture should be maintained in the basin (if no rains) so that the fruits can grow smoothly.
- To prevent fruit [small] drop, naphthalene acetic acid (20 ppm) should be sprayed on the trees.

- Waterlogging should not be allowed near trees in newly established orchard. Ensure proper drainage.

September

- For the maximum increase in growth of the fruits, adequate moisture should be maintained in the tree basin.
- Cracking of branches due to excessive fruiting has been observed in aonla varieties like *Lakshmi-52*, NA-7 and NA-6. Therefore, it is appropriate to support the branches in these cultivars.
- Spray of zinc sulphate (0.4%), copper sulphate (0.4%) and borax (0.4%) in this month has been found beneficial to control internal fruit necrosis in aonla cv. *Francis* and *Banarasi*.
- 0.6% borax should be sprayed twice in this month to control fruit necrosis which develops due to deficiency of boron.
- The pomegranate butterfly (*Virecola isocrates*) attacks small fruits. The purple-brown female butterfly lays small, flaky eggs one by one on the fruit. The larvae make hole inside the fruit. Such fruits become weak, rot and fall before maturity. To prevent this pest, spraying of carbaryl (0.2%) or monocrotophos (0.04%) should be done at pea stage. Second spray at 15 days interval should be done, if needed.

October

- The varieties, viz. *Banarasi*, *Krishna* and *NA-10* matures during this month and may be ready till mid-October. Therefore, these varieties should be harvested immediately.
- It should be ensured that fruits neither fall on the ground nor get scratched while harvesting.
- If any fruits are damaged, there may be a chance of a blue mold attack on the fruits. Therefore, to protect from this disease, fruits should be treated with carbendazim or thiophanate methyl (0.1%).
- The harvesting can be done by hand. For big trees, climbing stairs (made up of bamboo/iron rod/pipe) may be used. Harvesting of fruits through hydraulic platform can also be practiced.
- Harvesting should be done in the morning and fruit

should be kept in plastic crate lined with paper cuttings.

November

- Mid season maturing varieties like *Kanchan*, *Krishna*, NA - 6 and NA - 7 mature during this month, so they should be harvested now.
- NAA (15 ppm) + Thiourea (0.1%) should be sprayed to prevent fruit drops in aonla.
- After harvesting, fruits should be divided into three categories (large, medium and small) on the basis of their size, weight and color.
- The immature, injured and diseased fruits should be kept separately.

December

- Aonla cv. *Chakaiya* is a late maturing variety, and are harvested in this month.
- If the fruits of other varieties have not been harvested in the previous month, they must be harvested immediately.
- It is found that if the fruits remain for a long time on the tree, the next year's crop gets affected. So, it is beneficial to harvest the fruits on full maturity and without fail.

SUMMARY

Although the area under aonla crop is increasing, the problems of farmers undertaking aonla cultivation are also increasing. It is appropriate to have a brief review of practices adopted by the aonla farmers and constraints faced by them in scientific cultivation for better production. This useful information can be applied by research scientists and extension agency for developing and delivering improved package of technology among the aonla growers and overcoming the constraints faced by the aonla growers.

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