

Improved cultivation technique of Aonla

Lekh Ram Verma

Rural Agricultural Extension Office, Kasdol, Balodabazar-BHATHAPARA (C.G.) INDIA
(Email : lrextension@gmail.com)

The Aonla (*Emblica officinalis* syn. *Phyllanthus emblica*) is one of the most important minor fruits and a crop of commercial significance. It belongs to the family Euphorbiaceae. It is quite hardy, prolific bearer and much remunerative even without much care. It is also known as Indian Gooseberry Amlaki, Amia, Amali, Ambala, Nelli, etc. Its importance lies in its high richness of vitamin C. It is the second highest source of vitamin C among fruits next only to Barbados cherry. Owing to its hardy nature, suitability to various wastelands, high productivity and nutritive ingredients besides having therapeutic values, Aonla has become an important fruit. In fact, aonla, in its processed form is very popular among the social elites.

In India, its commercial cultivation is done in Utter Pradesh. Pratapgarh, Varanasi, Azamgarh, Sultanpur, etc. are the famous Aonla growing districts of Uttar Pradesh.

Aonla is nightly nutritive and is one of the richest natural source of Vitamin C (600 mg/100 g). The fruits contain tannins which is useful in protecting the ascorbic acid from oxidation. It is valued as an antiscorbutic diuretic laxative, alternative and antibiotic. The fruit can successfully be used as raw materials in preservation industry. Fruits are commonly used for preserve (Murabba), pickle, candy, jam, jelly, squashes etc. It can be dried and powdered to be used subsequently. One or other parts of the plant could be used in treating chronic dysentery, bronchitis, diabetes fever, diarrhea, jaundice, dyspensa, cough and in tanning and dyeing industries. It is a great health and vitality restorer.

Climate: Aonla is a subtropical fruit but its cultivation in tropical climate is quite successful. In India, it is being grown near sea coast upto 1800 m altitude. The tree is not much influenced either by hot wind or frost. However, the young plants should be protected from desiccating wind in summer and frost in winter, at least upto the age of 3-4

years especially in north Indian condition. I Soon after fruit set in spring the fruits remain dormant throughout summer without any growth. This quality makes it highly suitable fruit crop for dry arid region.

Soil : The production shall be highly benefited in deep and fertile soils. Aonla can be grown in light as well as heavy soils except in very sandy ones. The plants have capacity for adaptation to dry regions and can also grow in moderately alkaline soils. It has great tolerance to salinity and sodicity and cultivated in pH range of 6.0 to 8.0 very successfully.

Selection of varieties: After the intensive screening of the research papers on Selection of

– Aonla Varieties it is proposed that 3 numbers of NA -7 variety, one banarasi and one desi variety sapling can be provided to each families for better pollination and yield of Aonla fruits

– It is proposed to plant desi and grafted varieties in 40: 60.

Varieties of aonla: Cultivars like Banarsi, Francis, Chakaiya and Banarsi Red are known to be cultivated in U.P., Krishna (NA 4) and Kanchan (NA - 5) are new finds in Faizabad and Anand -1 and Anand-2 from Gujrat film seedling variables.

Banarasi : It is shy bearer which gives only 10-15 kg fruits per tree at 10 years of age and 100 to 200 kg per tree at the age of 20-30 years. Erect, spreading, medium to tall tree, shy and slightly alternate bearer. Fruit is roundish weighing about 50 g, whitish green, slightly fibrous, scanty to medium juicy, seed to pulp ratio is 1.21. It has less number of female flowers. The fruits contain high amount of Vitamin C. Fruits are generally used for making *murabba* (preserve), candy etc. It starts fruiting in later stages (6-10 years tree age)

Francis: The branches of this variety are drooping type.

| Composition and content fruit | | | |
|-------------------------------|--------------------|---------------|-------------|
| Fruit pulp | 90.97% of fruit | Moisture | 81.2 % |
| TSS (juice) | 23.8% of the juice | Protein | 0.5 % |
| Acidity | 3.28% | Fat | 0.1 % |
| Total sugars | 5.08% | Fibre | 3.4 % |
| Tannins | 2.73% | Carbohydrate | 14.0 % |
| Pectin | 0.59% | Phosphorus | 0.02 % |
| Minerals (represented by ash) | 2.922% | Ascorbic acid | 1094 mg/100 |
| Calcium | 0.05 % | | |

Therefore, it is also called *Hathi jhool*. Fruit weight is around 63g oval roundish, light green, slightly fibrous, moderately juicy, seed to pulp ratio 1:21. It is an earlier bearing variety than Banarasi. A 10 year old tree yields about 50 kg fruits while at 20-30 years age it yields 300-400 kg fruits per tree. But in those areas in Uttar Pradesh where calcium or calcium carbonate is excess in soil, the fruits suffer from internal fruit necrosis during maturity. This is due to excess of calcium and deficiency of boron. Chakaiya: Tree has spreading habit, medium height, prolific and regular bearing tree. It has 4.03 female flowers per branchlet. Seed to pulp ratio is 1:17. The fruit size and tree size, both are smaller than Banarasi and Francis flattened at base and round apex, greenish colour and fibrous. Fruits are green in colour having approximate weight of 30-35 g per fruit. Fruit contains more fibres and, have longer storage life than Banarasi and Francis. The large fruits are suitable for preserve and candy purposes, but the smaller fruits are used for making pickles etc. Fruiting starts from 3rd year and 10 year old tree may yield about 100 kg fruits while 15 year, 20 year, 30 year old trees yield 200, 300, and 400 kg fruits per tree per year, respectively.



Krishna (NA 4) : Chance seedling of Banarasi. Bears moderately. Fruit medium to large in size, flattened, conical angular, basin papillate in shape, skin very smooth, yellowish in colour with red blush, flesh fibreless, hard and semi transparent. Average weight of fruit 40 gram. it is highly suitable for *murabba* making (preserve).



Kanchan (NA - 5) : Trees of this variety are of spreading nature. Fruits are of medium size with average weight 30-35 g. Its pulp is highly fibrous, therefore, suitable for pickles. Tree has spread habit, bears profusely.



There are some other varieties of aonla such as Bansi Red, Anand-I, Anand-2, Narend Aonla-7 etc. which are gradually getting popular with farmers.

Propagation : Aonla is propagated by seed as well as by vegetative methods. They are described below.

Propagation by seed: Aonla plants have been raised by

seeds but the plants do not come true to type and there is a high variability. Besides, plants raised through seed are late in bearing. But for raising rootstocks, seedlings are required to be raised through seeds. Seeds attain full maturity by February when they are extracted from the fruits and sown in the last week of February for getting high percentage of germination. Since there is no seed dormancy in aonla, fresh seeds give almost 100% germination. Process of germination can be quickened by soaking dried seeds in 500 ppm GA (Gibberellic acid) solution for 24 hours. Seedlings can be raised in seed beds or in polythene bags which takes about four months to attain buddable size.

Vegetative propagation : In order to overcome the disadvantages of seed propagation multiplication of superior types of Aonla has been suggested by adopting vegetative methods. Of the various methods of propagation budding has been found to be the most practical and shield budding is the commercial method of Aonla propagation under north Indian conditions.

One year old Aonla seedlings with a girth of about one cm should be shield budded in early June with healthy and plump buds from new growth. Forker and patch budding are also very successful. They can be done at any time from June to September. The most important factor of budding of aonla is the proper selection of mother plant which is highly fruitful and the bud is taken from such a branch which has good number of female flowers, otherwise, the plants will be unfruitful due to the presence of large number of male flowers.

Planting : Grafts or buddings of Aonla are best planted in the beginning of monsoon *i.e.* in the months of June to July. Since the trees grow to a huge size a distance of 8 to 10m both ways is recommended. In areas with irrigation facilities, planting can be done in spring (February-March).

Application of fertilizer : Regular orcharding of Aonla is a rare phenomenon, therefore, nutrition is hardly practiced. However, beneficial effects of nitrogen, phosphorus, potash, zinc, copper, manganese and boron have been recorded. According to a study, nitrogen increases vegetative growth and female flowers, while phosphorus increases sex ratio, initial set, fruit retention and yield, total soluble salts (TSS) and vitamin C content of the fruits. Potassic fertilizer increases the fruit retention and the quality.

Therefore, the young plants should be given 15-20 kg of well rotten farmyard manure and the mature tree requires 30-40 kg in each year during September-October. In addition, application of 30 g nitrogen for each year age of the plant upto 10 years and afterwards 680-700 g of nitrogen per year per tree should be provided. Every mature

tree should also be fertilized with 1 kg superphosphate and 1-1.5 kg murate of potash. The above fertilizers should be given in two equal split doses to mature bearing trees, once during September-October and again during April-May after setting of fruits. The plants need to be irrigated after application of fertilizers.

Foliar spray of 0.6 % borax thrice in the months of September and October at about 10-15 days interval has also been recommended to control fruit necrosis which develops due to deficiency of boron.

Irrigation : Aonla trees are hardy and stand very well against drought. Therefore, hardly any irrigation is practised. However: the crop shall be benefited by giving 2-3 irrigations at the time of full bloom and fruit set. During summer, when the fruit is dormant, there may not be any benefit to irrigate trees. However, the young plants require watering during summer months at fortnightly interval, particularly till they have fully established.

Training and pruning : Aonla tree does not require regular pruning. However, pruning in early years for giving proper shape and development of strong frame may be necessary for which tree should be trained to single stem upto the height of about 1 m and then primary branches can be allowed to regular space all around the trunk.

The pruning of bearing plants can be done after the termination of the crop each year. While pruning, dead, diseased, broken, weak, crossing branches and suckers appearing from root-stock should be removed.

Flowering and fruiting : In Aonla, flowering takes place on determinate shoots appearing in spring season. The flowers commence opening from the last week of March and the blooming period lasts for three weeks. Male flowers appear in clusters in the axil of the leaf all over the branchlet while female flowers on the upper end of the few branchlets only.

Aonla is a wind pollinated crop as the pollen grains are light and are produced in abundance. Pollination is also helped by honey bees. The initial percentage of fruits set may vary from 12 to 18. The initial poor fruit set is due to low sex ratio and lack of pollination or pollinizer or both. Soon after fertilization which takes place within 36 hours of pollination, the zygote rests for 120 to 130 days and endosperm nucleus may also rest for 70 to 80 days after fertilization. Therefore, fruits do not show any symptoms of growth during summer. This zygote dormancy breaks by the end of July as a result of division in endosperm nucleus. Fruits begin to grow with maximum growth in September and attain maturity by the end of November. During this growth phase, flowers and fruits also undergo abscission which has been divided into three

waves:

- The fruit drop consists of unfertilized ovaries and degenerated ovules. This is the heaviest drop as 70 % flowers drop off within three weeks of flowering;
- The second drop consists of drop of young fruitlets at the time of dormancy break; and
- The third drop is spread over a period of rapid growth from August to October. It may be due to embryological and physiological factors such as lack of auxins, improper nutrition and moisture stresses.

Pests and disease of aonla :

Insect pests : Shoot Gall Caterpillar (*Betonsa stytophora*):

The young caterpillars bore into the apical portion of the shoot during rainy season and make tunnel. Due to this, damaged region bulges out abruptly into a gall which provides space for movement of the caterpillar. Due to this, apical growth is checked, side shoots develop below the gall and subsequent growth in following season is badly hampered.

Control : This can be controlled by pruning the affected parts and spraying with 2 % Parathion. Prophylactic spray of systemic insecticide like Roger 0.03 % is also suggested. Bark Eating Caterpillar (*Inderbela tetraonis*):

It damages stem and branches of grown up trees by eating bark and making tunnel into them. This insect is the problem of neglected orchards.

Control: The pest can be controlled by spraying 0.03 % endrin or enjecting kerosene oil petrol in the holes and plugging them with cotton or wet soil during Sept. - Oct. and Feb. - March.

Leaf Rolling Caterpillar (*Garcillaria Acidula*) : This caterpillar rolls the leaf and feed inside reducing the photosynthetic capacity of leaves and causes subsequent leaf shedding.

Control : It can be controlled by spraying 0.08% Malathion or 0.04% Monocrotophos.

Mealy bug (*Nipaecoccus vastator*) : Both nymphs and adults are feed on Aonla tree from April to November.

Control : Organophosphate provide excellent control of this pest. Monocrotophos 0.04% or Malathion 0.08% or Methyl Parathion 0.03% are effective as sprays.

Diseases :

Ring Rust or Aonla Rust (*Ravenelia Emblicae*): Ring rust appears as circular or semi-circular, reddish solitary or gregarious spots on leaves from the beginning of August infection on fruits follow. Generally one or two pustules measuring 10 to 20 mm in diameter appear on infected fruit.

Control: Spraying with Dithane Z-78 at 0.2% at the interval of 7 to 28 days during the months of July to September

proves effective.

Fruit Rot (*Penicillium oxalicum*; *P. islandicum*) : The major loss takes place during transit to the market. The earliest symptom of infection is seen as water soaked lesion on the fruit surface, which enlarges in size followed by development of small pin head size colonies of golden yellow colour. The older colonies turn olive green.

Control: It is recommended that fruits showing such symptoms are discarded for marketing. Bruising and injury at the time of harvesting should be avoided. Treatment of fruits with borax and NaCl to control diseases.

Blue mould (*Penicillium islandicum*): Brown patches with water soaked areas are formed and the fruit is ultimately covered with bluish green pustules. Hygienic storage and treatment with Borax and weak solution of sodium chloride have been suggested to control.

Physiological disorder:

Internal fruit necrosis: In this disorder necrosis symptoms starts with the browning of inner most part of the mesocarpic tissues, at the time of endocarp hardening in the second and third week of September. Browning of mesocarp extends towards the epitearp into brownish black areas on the fruit surface in the second and third week of October. Depending upon the severity of the disorder, mesocarp of affected fruit turns black and become corky and gummy pockets develop.

Control : This disorder is due to the deficiency of boron for which spray of 0.6% borax thrice in the month of September and October at about 10 to 15 days interval are recommended to control the disorder.

Unfruitfulness in aonla: Like other fruits such as mango, apple, etc. unfruitfulness is a problem in aonla orcharding too. In Pratapgarh district of Uttar Pradesh, which is the main aonla producing area in the country, a number of trees are fraught with this malady. This problem is more pronounced in the variety, "Banarasi". Studies have indicated that this problem is not due to lack of pollination as often believed, but it is largely due to absence of female flowers in the tree.

In aonla, fruits are borne in leafy shoots. These shoots

bear male flowers in their upper end and female flowers in the lower end. On the basis of male and female flowers these bearing shoots can be divided into two types: (1) shoots bearing both male as well as female flowers, and (2) shoots bearing only male flowers. In the Banarasi variety of aonla, the number of female flowers or shoots containing female flowers are inadequate and, as such, it is highly prone to unfruitfulness. This problem is not encountered in other varieties such as 'Chakaiya', 'Francis' etc. For overcoming this problem, two points should be borne in mind while raising an Aonla orchard.

– While selecting branch as scion, it should be ensured that scion is taken from the branch bearing maximum number of female flowers.

– An Aonla orchard should have the trees of two or three varieties in order to avoid unfruitfulness of a variety due to lack of female flowers.

Harvesting and yield: Aonla plants starts bearing quite late. Generally, vegetatively propagated tree starts bearing commercial crop after 6-8 years of planting, while seedling trees may take 10-12 years to begin commercial bearing. Productive life of trees is estimated to be 50-60 years under good management conditions.

Generally aonla fruits are ready for harvest in November-December. The fruits are light green at first, but when they mature, the colour becomes dull greenish yellow, or rarely brick red. Maximum vitamin C content is observed in mature fruits, while immature fruits are acrid and low in vitamin C content and minerals. It has been observed that the best time of harvesting aonla fruits is February when the fruits have maximum vitamin C content. Besides, the mature fruits are hard and unyielding to the touch and so are well suited for bulk harvesting as well as distant transportation and marketing.

As far as yield is concerned, the production varies from cultivar to cultivar. 'Banarasi' is a poor yielder as compared to Chakaia and 'Francis'. On an average, a grown up tree should yield 150 to 200 kg fruits per annum.

Received : 18.02.2013

Revised : 03.10.2013

Accepted : 03.11.2013

RNI : UPENG/2006/17696

An International Research Journal

ISSN : 0973-4791

Accredited By NAAS : NAAS Rating : 2.6

ONLINE ISSN : 0976-8963



THE ASIAN JOURNAL OF ANIMAL SCIENCE

Visit : www.researchjournal.co.in