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Packaging, Post Harvest Treatments, Storage and Protection of Aonla and their Role in Health Care: An Overview

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ABSTRACT

Aonla (*Emblica officinalis* Geartn) king of arid fruits popularly known as “Indian gooseberry” is a small sized minor subtropical fruit that grows widely in North India. India ranks first in the world in area and production. It is considered as “Wonder fruit for health” because of its unique qualities. It is a rich source of vitamin C. It is a perishable fruit and therefore it is necessary to extend its shelf life by adopting good post harvest management practices. Post harvest losses are the major constraints which discourage farmers to go for aonla cultivation. The extension of shelf life may be possible by checking the rate of transpiration, respiration and by checking microbial infection. Different chemicals like waxol, Ca (NO₃)₂, CCC, carbendazim, GA₃, borax, kinetin and packaging materials like nylon net, perforated PE bags, ventilated CFB boxes, gunny bags, wooden crates etc., can be used for prolong the storage life of fruit. Refrigerated storage also helps in enhancing the storage life of fruit. There are so many products like aonla squash, candy, jam and chutney prepared from fruit and it also has the quality to prevent the disease like skin disease, hair falling, blood pressure and some other diseases.

Key words: *Emblica officinalis*, post harvest management, storage, packaging

INTRODUCTION

Aonla (*Emblica officinalis* Geartn), also known as Indian gooseberry, is one of the oldest Indian fruits and considered as “Wonder fruit for health” because of its unique qualities belonging to the family of Euphorbiaceae. It is one of the most important fruit of tropics and subtropics of Indian subcontinent. It has played an important therapeutic role from time immemorial and is frequently recommended for its synergistic effects in both the Ayurvedic and Unani systems of medicine (Agarwal and Chopra, 2004). Being a very rich source of vitamin C (500-1500 mg/100 g) (Shankar, 1969) and other nutrients like polyphenols, pectin, iron, calcium and phosphorus (Nath *et al.*, 1992), the fruit has a potent antioxidant property (Frei *et al.*, 1989).

However, aonla fruit is highly perishable and has a short shelf life of 5-6 days (Pathak *et al.*, 2009) as fruit is sensitive to bruises, browning, desiccation and various post-harvest diseases. It is available for few months from October-January (Ghorai and Sethi, 1996). Appropriate storage and processing methods can curtail the post harvest losses to 30% (Goyal *et al.*, 2008) and make the fruit available for longer period. A few post harvest technologies that exist are complex and are unaffordable to the marginal and small farmers at the farm level (Kumar and Nath, 1993).

Extension of storage life may be possible by checking the rate of transpiration, respiration and microbial infection. Plant growth regulators, certain chemicals and fungicides play a great part in increasing the storage life (Dhumal *et al.*, 2008). Processing into value added product will not only reduces the post harvest losses but also provides higher returns to the growers.

Thus, the objective of the present review on different aspect of post harvest management and value addition was to explore the technologies available to reduce post harvest losses and increase the availability of aonla.

USES OF AMLA IN DIFFERENT WAYS

Amla as a food: Many people find amla to be very sour so, salt and turmeric are being added to them when eaten raw so that, they will go easy on the taste buds. These fruits are sweetened and made into jams, sorbet, pie filling and ice cream. They are rich in proteins, vitamins C and minerals which help in strengthening the immune system.

Medicinal benefits of amla: There are so many reasons why should start looking for food supplements containing amla gooseberries. It is packed with all the good stuff to keep you brimming with health. It is found to be very helpful in cleansing and eliminating toxins from the digestive system. It also works effectively as a laxative and diuretic. In addition, amla is said to be one of the three ingredients of Triphala that a traditional medicine in India consisting of three botanicals, blended to cure dysentery and biliousness and other illnesses.

The seeds of the amala gooseberries are burnt and pressed for oil extraction. This oil is dabbed on cuts, scrapes and other kinds of wounds to heal and sanitize them. The leaves are boiled in water with a pinch of salt and cooled thereafter to be used either as a mouthwash or cleanser for eye irritations.

Amla in beauty products: The amla gooseberries are sun and air dried for a couple of weeks until they get so dry that they can be easily grounded into fine powder. This powder, when mixed with other natural ingredients like coconut oil and yoghurt, can remove hair product residues from the curly hair and make it shiny and healthy. It helps in encouraging hair growth and strengthens each hair strand to prevent hair breakage. It is also used popularly in shampoos and conditioners because of how it enhances the colour of light curly hair and prevents premature greying of hair.

Immunity booster: One reason for amla's reputation as a general energy-promoting, disease-preventing tonic may be its effect on the immune system. Multiple studies have shown significant increases in white blood cell counts and other measures of strengthened immunity in rodents given amla.

Respiratory disorders: Indian gooseberry is beneficial in the treatment of respiratory disorders. It is especially valuable in tuberculosis of the lungs asthma and bronchitis.

Diabetes: This herb, due to its high vitamin C content, is effective in controlling diabetes. A tablespoon of its juice mixed with a cup of bitter gourd juice, taken daily for two months will stimulates the pancreas and enable is to secrete insulin, thus reducing the blood sugar in the diabetes. Diet restrictions should be strictly observed while taking this medicine. It will also prevent eye complication in diabetes.

Heart disorder: Indian gooseberry is considered an effective remedy for heart disease. It tones up the functions of all the organs of the body and builds up health by destroying the heterogeneous or harmful and disease causing elements. It also renews energy.

Eye disorder: The juice of Indian gooseberry with honey is useful in preserving eyesight. It is beneficial in the treatment of conjunctivitis and glaucoma. It reduces intraocular tension in a remarkable manner. Juice mixed with honey can be taken twice daily for this condition.

Scurvy: As an extremely rich source of vitamin C, Indian gooseberry is one of the best remedy for scurvy. Powder of the dry herb, mixed with an equal quantity of sugar, can be taken in doses of 1 teaspoon, thrice daily with milk.

Ageing: Indian gooseberry has revitalizing effects as it contains an element which is very valuable in preventing ageing and in maintaining strength in old age. It improves body resistance and protect the body against infection. It strengthens the heart, hair and different glands in the body.

Hair tonic: Indian gooseberry is an accepted hair tonic in traditional recipes for enriching hair growth and pigmentation. The fruit, cut into pieces is dried preferably in the shade. These pieces are boiled in coconut oil till the solid matter becomes charres. This darkish oil is excellent in preventing greying. The water, in which dried amla pieces are soaked overnight, is also nourishing to hair and can be used for the last rinse while washing the hair.

Indian gooseberry is used in various ways. The best way to take it with the least loss vitamin C, is to eat it raw with a little salt. It is often used in the form of pickles and it is dried and powdered. The berry may also be used as a vegetable. It is boiled in a small amount of water till soft and taken with a little salt.

HARVESTING AND CHEMICAL TREATMENTS

There is a linear increase of quality parameters from 35 days old to fully matured fruit (120 days) of aonla and hence, it is ideal to harvest fruits at 120 days after fruit set particularly for processing (Sivakumar and Sundaram, 2010). Chemical treatments play an important role in increasing the shelf life of aonla. Pre-harvest sprays (twice) of 1% calcium nitrate+0.1% Topsin-M decreased the weight loss (11.09%) and decay loss (14.43%) and prolonged shelf-life to upto 20 days compared with 10 days in the control at ambient temperature (Yadav and Singh, 1999). Further treatment with Topsin-M and Bayleton controlled *Penicillium oxalicum* for 10 days and *Aspergillus niger* for 20 days and extended shelf life (Yadav and Singh, 1999). Singh *et al.* (2010) found that fruits treated with 1.5% CaCl_2 and stored in ZECC (Zero Energy Cool Chamber) recorded least PLW (16%), spoilage loss (16.5%), respiratory activity ($83 \text{ mg CO}_2 \text{ kg}^{-1} \text{ h}^{-1}$) and exhibited 11 days of shelf-life, while untreated (control) had 6 days economic life. It was closely followed by 1% CaCl_2 +ZECC treatment. Post harvest treatment with calcium nitrate (1%) minimized the weight loss during the storage period and no pathological loss was observed with Borax (4%) up to 9 days of storage (Nath *et al.*, 1992).

Post harvest treatment with 6% waxol+1% $\text{Ca}(\text{NO}_3)_2$ followed by 6% waxol+400 ppm CCC recorded lower PLW and moisture loss throughout the storage period. The treatment with 6% waxol+0.1% carbendazim was found effective in reducing decay loss. Treatment with 6% waxol+100 ppm GA_3 resulted in maximum retention of ascorbic acid followed by treatment 6% waxol+400 ppm CCC (Dhumal *et al.*, 2008).

Patel and Sachan (1995) used calcium nitrate (1%), GA (40 ppm), CCC (400 ppm) and kinetin (10 ppm) for experiment. After treatment, they packed fruits in perforated polythene bags and stored at ambient temperature. The PLW and rotting percentage increased with the increase in storage period. According to them, calcium nitrate (1%) was the best treatment to minimize the weight loss of fruits. No rotting was observed upto 9 days of storage in kinetin (10 ppm) treated fruits. GA (40 ppm) treatment gave better retention of vitamin C during storage of aonla fruits.

PACKAGING

At present, proper packaging is inadequate in case of aonla. Aonla fruits can be packed in gunny bags of 50-100 kg capacity. But problem is that the fruits got impact, vibration and compression injuries during transportation in these gunny bags. The corrugated fiber boxes are better as these provide appropriate atmosphere and ventilation inside the box, printable information at low cost and recyclable also. Newspaper lining should be provided inside the CFB cartons. Minimum spoilage (16.0%) was noticed in corrugated fiber board boxes with newspaper liner package followed by CFB boxes with polythene liner (17.0%), where as it was highest in gunny bag without any liner (30.19%) after 13 days of storage (Singh *et al.*, 2005). Singh *et al.* (1993) found that wooden crate with polythene liner is most suitable for packing and long distance transportation of aonla fruits. Percent weight loss and bruising were minimum in this container as compared to gunny bag. Dhumal *et al.* (2008) observed that packaging of fruits in perforated PE bags had remarkable effect in reducing PLW, retention in moisture and acceptable physico-chemical qualities. The shelf life of aonla fruits was extended upto 15 days at room temperature when fruits were treated with 6% waxol+400 ppm CCC and packed in perforated PE bags. This treatment combination recorded the maximum score for marketability. The physico-chemical changes were faster in untreated fruits (control) packed in nylon net bags.

STORAGE

Aonla fruits are highly perishable in nature as it's storage life in atmospheric conditions after harvesting is very limited. Storage facilities such as cold storage and controlled/modified atmospheric storage are very expensive and not in the direct reach of poor farmers (Kumar and Nath, 1993). Singh and Kumar (1997) reported that the decay loss was minimum (26.56%) in modified storage condition on 24th day of storage whereas it was maximum (48.70%) in zero energy cool chamber. The fruits may be kept in cold storage for 7-8 days at 0-2°C and 85-90% relative humidity.

PLANT PROTECTION

Pest

Gall caterpillar: Young caterpillars bore into the apical portion of the shoot during rainy season and make tunnel. Due to this, apical regrowth is checked, side shoots develop below the gall and subsequent growth in following season is greatly hampered. Cutting off the infected apices and prophylactic spray of systemic insecticide like dimethoate 0.03% will control the pest.

Bark eating caterpillar: It damages the stem and branches of grown up trees by eating the bark. The affected portion should be cleared and few drops of kerosene should be applied in holes to keep this in control.

Disease

Rust: Rust appears as circular reddish solitary or gregarious on leaves and also on fruits. Spray 0.2% Mancozeb at an interval of 7-28 days during July-September.

Physiological disorder: Necrosis, a physiological disorder, has been observed in aonla fruits. Francis variety is highly susceptible followed by Banarasi incidence initiates with browning of mesocarp which extends towards the epicarp resulting into brownish black appearance of flesh.

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