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Production technology of Bael

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Bael

Bael (Aegle marmelos *L.*) is on important indigenous fruit of India the importance of Bael fruit lies in its creative properties, which make the tree one of the most useful medicinal plants of India.

Composition and uses

The ripe fruit to laxative and dysentery. It has a great demand for native systems of medicine such as Ayurvedic (Kritikar et al. 1935).

Various chemical constituents, viz, alkaloids, coumarone and steroids have been isolated and identified from different parts of bael tree such as leaves, wood, roots and bark (chattering and Roy, 1957 and 1959 and 1959, chattergce and Bhattacharya, 1959, shoeb *et al*

1973. Some studies have been made on the assented outs of the leaves (Barlas and Deshpande, 1951) and on the physical properties and uses of gums in the preparation of adhesives, water probing and oil emulsion coating (Badar-ud-Din, 1950., Haksoor and kendurkar, 1961).

The Bael fruit is one of the most nutritious fruits, according to gopalan at all (1971), It content (61.5) gm water (1.8) gm protein (0.39) gm fat (1.7) gm minerals, (31.8) gm carbohydrate, 55 mg carotene (0.13) mg (1.19) mg riboflavin (1.1) mg niacin and (8.0) mg vitamin C per 100 gm of edible. No. other fruit has such a high content of riboflavin.

chemical analysis of bael reeds revelated that the seed contained 62% percent protein (water soluble and 60% in soluble) 32% oil, 3% carbohydrate, 3% as (Banergee and maiti, 1980) Marmelosain is most probably the these poetically active principle of Bael fruit, It has been isolated as a colorless crystalline compound (Dixit and Dutt, 1932).

Bael becomes of its hard shell, the mucilaginous torture and numerous seeds, it is difficult to eat out of hand is not popular as a dessert fruit. In the excellent flavour and nutritive and the rapactics values of the bael fruit lies in untapped potentiality for processing (Roy and singh, 1979).

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Origin and Distribution

The bael has been known in India from prehistoric times. The leaves of the tree are traditionally used as racred to "Lord shiva" according to Hindu custom. In the epic ages, such as those of the "Ramayana" bael fruit was known. On Prakash (1961) found mention of the bael in Vedas and also in early Buddhist and Jain Literature.

It grown throughout the Indian perinasal as well as in Sri Lanka, Pakistan, Bangladesh, Barma, Thailand and most of the south-East countries.

Species and Verities

Species: the genus Aegle belonging to family Rutaceae, consists of 2 or 3 species, and the generic name is of Greek the specific name, marmelos is a Portuguese one.

The tree is deciduous, 6-8 m in height, with trifoliate aromatic leaves and the branches usually have long straight spines. The bark is shallowly burrowed and corky. The flowers 2cm. wide, sweet-scented and greenish white, the calyx is shallow with 5 short, broad teeth, pubescent outside. There are five petals (rarely 4), which are oblong oval, plant, thick, pale greenish tie coherent in bundles. The ovary is oblong ovoid slightly tapering, the axis being wide. Calls are many, 8-20, small and arranged in a cirde, with numerous ovules in each cell. The Fruit is usually globose with pericarp nearly smooth, greyies yellow, thick, 2-3 mm hard and followed with soft pulp. Seeds are numerous, compressed and arranged in closely packed in the cells (seed cavity) surrounded by mucilage. The testa is white with woody hairds. The embryo has large cotyledons (Reuther *et al*, 1967).

Studied 24 varieties from 4 different locations in India Agra, Calcutta, Delhi and Varanasi fruits of different to varieties were spherical, oblong, cylindricd, pear shaped, flat etc, weight of fruit varied from 360 to 1850 gm. The % of pee, seed and fibre of the different of bael fruit were found to very from 20.54 to 36.11, 0.81, to 5.55 and 1.31 to 4.10 respectively. The maximum edible portion obtained among the varieties studied was 77.25% and lowest 59.37% the percentage of total soluble solids, sugar and mucilage ranged from 31.0 to 355, 12.50 to 17.9 and 12.78 to 19.57 respectively.

The singes in acidity, P.H, ascorbic acid and phenolic acid were found to be 0.31 to 0.42%, 5.0 to 5.3, 7.68 to 18.20 mg/100 gm and 3000 to 17500 mg/100respectively. The bael contains a substantial amount of phenolic, which, contributes to its astringent taste. The balance of mucilage make fruit more palable.

Soil and Climate

Bael tree is very hary and can thrive well even in swampy, alkaline and stony sols having P.H range from 5 to 10 (Jauhari and Singh, 1971). According to Davis (1930) bael

tree grown even on poor clay soils where other three fail. Bael tree cab be grown up top an altitude of 1,219 m and are not damaged by temperature as low as 7^0 C.

Area and Production

There is no organized orcharding of bael in India. Its cultivated is restricted and it grows mainly, wild or in temple gardens. The fruit is available in almost all the statis of India, but most abundantly available in Uttar Pradesh, West Bangal and Orissa no data however, is not available regarding its area and production.

Propagation

Seed:

Bael is usually propagated by seed which are shown in June, seedling are transplanted a year later.

Vegetative Propagation:

Suckers Bael propagated by seeds seldom produces a plant tree to type. It can be propagated through root suckers.

Budding:

It can also be propagated successfully by budding on 1 year 2-year-old rootstocks. Experiments were carried out on patch budding, T- budding and Chip budding at monthly intervals from July to October and from Mach to June. Percentage of bud take was higher with patch budding, budding in the month of June or July gave best result (Singh *et al*, 1976, Moti Dhar and Chaturvedi, 1976).

Grafting:

Bael fruit can be grafted onto a number of related planted, such as Aegle Froegle gabonesis and Aegilops's Chevalieri, (Reuther *et al*, 1967).

Top working:

Old and uneconomic bael tree can be turned into economics and vigorous one top working. In this method the tree in headed back 1 to 12 above the grounded level during march and new shoot emerge from the stump. A few healthy shoots are retained and desired scions budded on them in the month of June. In this way, inferior and old unproductive bael tree can be transformed in to superior and remunerative fruit trees (Jauhari and Singh, 1971).

Cultivation

There is no recommendation for the preparation of the soil and pit or system and methods of planting in bael trees. However, general method adopted in case of citrus plant taken upon manuring fertilization, irrigation, inter cropping, etc.

It was found thar any Bael tree in southern Florida were suffering from zinc deficiency. Application of small amount of zinc sulphate caused them to make a vigorous new growth with green leaves favoured the setting and mattering of a good crop of a fruit (Rauther *et al*, 1967).

Fruit Growth and Development

The growth rate of bael has three district plashes, the initial slow increased for the one month followed by rapid increased for the four month and them more or less a stationary phase until the fruit or harvested. From the respiratory studied bael fruit can be classified as a climacteric fruit (Ray and Singh, 1980) monthly supernation on the morphology changes of Bael, as observed by Roy and Singh, (1970) are given below.

Fruit drop is a problem in Bael fruit, Pramanik and Bose (1974) tried various growth substances, viz, 2-4-D, GA-3, 2,4,5, -T with the different concentration but could not present the fruit drop.

Pest and Diseases

There is no serious pest on bael

Diseases:

Patell et al (1953) reported that bacterial shot-hole and fruit cracking of bael is

Period after fruit set	Characteristics of the fruit
One month (June)	Peel deep green and sot no. of seed, the flesh on exposure turns brown very rapidly, fruit oblong
Two months (July)	Peel deep green, soft and easily peeled by knife, flesh light yellow, turns brown on exposure, small soft seeds and thin mucilage noticed, fruit oblong.
Three months (August)	Peel deep green hard difficult to peel by knife, fees light yellow seed soft, size increased, mucilage them fruit spherical
Four months (September)	Peel deep green, very hard impossible to peel by knife, flesh light yellow seeds a little hard, kernel formation noticed, mucilage fairly thin cavity almost full of seed and mucilage, fruit spherical
Five months (Octo ber)	Peel deep very hard green, woody, flesh yellow, seed hard with hairy growth on surface, kernel prominent, mucilage thick, fruit spherical
Sex months (November)	Peel deep very hard green, woody, flesh yellow, seed hard, hairy on surface, kernel prominent, mucilage very thick, fruit spherical.
Seven months (December)	Peel light green, very hard and woody., flesh deep yellow, seed very hard, hairy with full formation of kernel, mucilage very thick, fruit spherical.
Eight months (January)	Same as December
Nine months (February)	Same as January
Ten months (March)	Pell greenish yellow, faint small of ripeness, other characteristics as in February.
Eleven months (April)	Pell greenish yellow hard and brittle, flesh texture softer, flavour or ripeness more prominent, other characteristics as in March.
Full ripe stage (8 days after harvest)	Pell yellowish, pronounced ripe bael fruit flavour, pulp sweet and soft, fruit detaches easily from the stem end.

caused by xanthomonas bilval the symptoms on leaves or characterized by round water-soaked sports (0.5 mm) surrounded by a clear halo. Gradually, the sport increased in size (3 mm to 5 mm) and from brown lesions with saucer like depressions in the centre surrounded by oidy, raised margin the primacy localized lesions all over the leaf are always followed by following out of the dead tissues leaving circular or slightly irregular perforation or shoot-holes. The pathogens also in feet the fruit, twigs and thorns.

Harvesting yield packaging and storage

Seedling bael tree require seven to eight years to bear while budded plants stat bearing at the age of 4-5 years. The member and size of the fruit increase with advance in age and size of the tree. Proper care harvesting bael fruit. At the time of harvest, the tree generally gets defoliated and the fruit are completely exposed. The fruit should be picked individually from the tree with a portion of fruiting stalk and should not be allowed to drop. Harvesting by shaking the tree is discouraged as the the fruit are likely to developed cracks on impact because of the very brittle peel.

The number of fruits per tree may go up to 200 to 400 at the age of 10 to 15 years. However, a crop of 800 to 1000 fruits on 40-50year old seedling tree is not in common there is no recommended practice for packaging bael fruit. At present the fruit are packed in genny baskets and wooden boxes and sometimes they are transported without any packaging.

In order to present fungal infection, it is highly desirable that the fruit should not develop any crack during packing, storage, transportation and marketing. The storage life of bael fruit could be increased from two weeks at 30^0 C to 12 weeks at 90 V. marked physiological break down is noticed when storage temperature is below 9^0 C (Roy and Singh, 1979 C)

Breeding and Varietal Improvement

There is no systemic work on the breeding and varietal improvement on bael. However, bael provides on excellent seape for improvement of fruit quality by breeding as. In India, different stasis, are available, If the cultivation is bael is intensified after selecting and ideal variety, this fruit might emergence as a potential fruit for the processing industry.

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