

Cultivation of Longan (*Dimocarpus longan Lour*) In Bihar Condition

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ABSTRACT

Longan is an important fruit crop of Asian countries, especially in China, Vietnam, and Thailand. It has an attractive color, taste, fragrance, and rich source of nutrients and other bioactive components. Longan fruit has three parts pericarp, aril, and seed. The white aril is an edible portion of this fruit, while peel and seed are generally discarded. It is an emerging economic fruit in the international market. Its production rises in Asian countries China, Thailand, Vietnam, and India in the last few years. It is consumed as fresh and in processed form like canned products and dried flesh. Longan fruit is also used as an ingredient in herbal medicines. Longan production in North Bihar would prove beneficial in crop diversification and the availability of fruits of the litchi group. There is also a high scope in processing industries and value addition such as frozen, canned food, flesh dried, and as a liqueur. Longan has great medicinal values. Dried longan flesh can use as an ingredient in many herbal medicines and also used as an antidote against poison. Longan is a very good fruit crop for processing industries and pharmaceutical industries. Ultimate farmers will get benefited with this fruit. Longan fetches higher price from domestic as well as the international market.

Keywords: Longan; Nutrients; Production; Bihar; Medicinal Value

INTRODUCTION

Longan (*Dimocarpus longan Lour.*) is an evergreen fruit tree species of the Sapindaceae family grown in the subtropical region [1]. It is native to Southern China and introduced into India in 1798 according to Groff. Longan falls under order Sapindales; family Sapindaceae; and sub-family Sapindoideae and has chromosome no. $2n = 2x = 30$. Sapindaceae family exists many other fruits viz., litchi (*Litchi chinensis Sonn.*); Rambutan (*Nephelium lappaceum L.*); Pulasan (*Nephelium mutabile Blume*); Spanish lime (*Melicoccus bijugatus Jacq.*); Guarana (*Paullinia cupana Kunth*) and Ackee (*Blighia sapida KD Koenig*). The longan fruit is known as 'dragon eyes' because of its round shape and translucent flesh, and the seed which resembles an eye. The longan is the subtler cousin or little brother of litchi. In Indian literature found that longan is not

only originated in china but also southwestern India and the forest regions of Assam and the Garo hills. The introduction of the longan was into Florida from southern China by the United States Department of Agriculture in 1903 [2]. Based on morphological characters of pollen of cultivars and their wild species in China, and suggested the primary center of origin was Yunnan, and the secondary center of origin was Guangdong, Guangxi, and Hainan province in China [3].

This is one of the most economically important fruits, commonly cultivated in Asian countries. Longan is grown throughout South East Asia from tropical to subtropical. The leading producing countries in the world are China, Vietnam, Thailand and India [4]. In India, longan is mainly cultivated in West Bengal and North Bihar [5]. Longans are capable of growing throughout India, from the northeastern borders to the

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southern parts of India. In India, the longan industry is still now at the infancy stage.

Longan fruits usually are eaten fresh and fruits having immense value. The edible portion of this fruit is a fleshy aril, which is rich in sugar. The nutritional composition of longan fruit may vary widely depending on types of cultivar, climatic condition, growing soil type and soil fertility [6]. The edible portion of fruits for export quality is 67% - 78% of whole fruit weight. Longan is a very rich source of nutrients and bioactive compounds. It is a good source of energy and it contains good amounts of carbohydrates, protein, iron, phosphorus, calcium, and vitamins especially have more vitamin C than litchi fruits. The longan fruits also high in sugar content. The T.S.S. was recorded in cultivars Wu (17.8 %) and Ku [7]. Longan fruit has greater importance in Chinese medicines.

Status of Longan in India

Longan is commercially grown in China, Thailand, Vietnam and few parts of India among the world. China is the leading producing country in the world while in India it is cultivated in West Bengal and North Bihar and Bengal is a prominent longan grower. Though longan is not as popular in India like litchi than in other Asian countries. In India, it is usually imported from Thailand. This exchange between countries was facilitated by trade talks occurring in 2006 and 2012. The aims of such types of agreements were lowering tariffs and increasing longan's marketing efforts in India. Longan is a humid tropical fruit crop but it is capable of growing throughout India, from the South up to Northeastern borders. As explained in the book, "Minor Fruit Crops in India," the longan grows best in tropical regions with mild summers and winters and even rainfall.

At ICAR-National Research Centre for Litchi in Muzaffarpur are doing an evaluation and propagation experimental studies from 2004 to boost longan cultivation in India. Recent studies by the scientists of National Research Centre showed that the longan is well-performing on a par with litchi. The NRC's scientists also distributed longan saplings to the farmers of North Bihar's villages like Minapur, Mehshi, and Kanti among litchi growers. In current, these plants well survived in agro-climatic conditions of North Bihar.

IMPORTANCE AND USES

USES

Medicinal Uses

Longan fruit is rich in nutrients and bioactive compounds and has great medicinal value. Since ancient times pericarp of longan fruit is used as traditional medicines to boost human immunity. The dried flesh of longan fruit is used as an ingredient in many Chinese herbal medicines which is cured insomnia and stomach ache and dried flesh is also used as an antidote for poison. It contains a good amount of saponin which's why its seed is used in shampoo making. The dried leaves having anticancer properties due to quercetin and quercitrin. Flowers of longan are also used as an ingredient of

Chinese herbal medicines. It is also cured of yin, agitation, palpitation, excessive sweating and panic attacks. Longan is also used as a memory enhancer [12].

SPECIES AND VARIETIES

Important Varieties

In India there are not more varieties available in this crop only one variety has been developed from ICAR-NRC Litchi, Muzaffarpur and further improvement research work are going on this crop.

Gandaki Longan

The variety which is developed by India. It is an early maturing, regular bearing and good in fruiting quality. The aril percentage is 69% to 74% and TSS is 20°B to 23°B [20].

Soil and Climatic Conditions

Longan is an evergreen subtropical tree and well adapted in tropical climatic conditions. Red loamy soil rich in organic matter is good for its cultivation. It required annual rainfall of about 1,500 mm. water stresses and drought conditions may affect its productivity. Drought during the flowering and fruit set period can reduce fruit productivity. For a good flowering optimum temperature of 15°C-22°C is required for 2 to 3 months. It is very sensitive to frost and chilling injury. Generally, day temperature more than 40°C and night temperature more than 25°C is unfavorable for the growth and development of fruit and it leads to fruit drop. The soil and climatic condition of North Bihar are suitable for its cultivation. The annual rainfall of Bihar is 1205 mm that is not much less than its required rainfall [21-22]. In North Bihar, few litchi growers also planted longan plants and now they survived well and also produce good flowering and fruiting.

Propagation and Planting

Similarly litchi, longan can be propagated from seed and through vegetative propagation methods such as cutting, budding, grafting, inarching and layering. Longan loses seed viability very quickly. Seed propagate plants take a longer time (7-8 years) to fruiting and planting material is also not true to type. Air layering is a most successful method than others among vegetative propagation. In air layering success rate is very high about 80%-90% [10]. Select healthy and strong shoot 2.5 cm in diameter or pencil thickness for air layering. Remove a strip of bark to the cambium layer about 45 to 60 cm from the tip of the shoot. Wrap with a plastic bag filled with sphagnum moss and tied plastic. Air layer should remove after 2-4 months [23]. The best time for planting longan saplings is the onset of the monsoon. The pit should prepare two weeks before planting and should be left for solar sterilization. The ideal size for pit is 60 x 60 x 60 cm. At the time of planting, we should remove polybags from air-layered seedlings and should plant them into the prepared pit. Spacing varies from 6 x 6 m to 10 x 10 m from plant to plant and row to row. The spacing

depends upon soil and climatic conditions, manure, and fertilizers and varieties [24].

CARE AFTER PLANTING

Training and Pruning of Tree

After 3-4 years of planting, trees are subjected to formative pruning to obtain a proper open canopy. Remove all the branches and only 3 to 4 scaffold branches with broad crotch angle are left to obtain a good structure of a tree. Skirt or lower hanging branches should maintain at 1 to 2 m above the ground level. The height of the tree should maintain 3 to 4 m for easy care and other practices. In China at every growth of flush they retained one strong branch to form a natural round shape with 6-10 main branches [22-23].

Manures and Fertilizers Management

Nutrient management is the main factor affecting production. The recommended dose of organic fertilizer is about 10 kg/tree/year, should apply 3 to 4 times within a year. The first application of fertilizer is done two weeks after harvesting to encourage new growth of flush. Inorganic fertilizer should apply (20:10:10) at the rate of 1 kg/tree along with organic manure at the rate of 6 to 10 kg/tree. It will help in the fruit set. The third application of fertilizer should be done two weeks after the fruit set same as the second application and it will help in the growth and development of fruit. The final application should be at the seed maturation stage by applying inorganic fertilizer (14:14:21) at the rate of 2 to 3 kg/tree [21]. In medium fertile soil, fertilizer should apply at the rate of 1:0.4:0.9: N: P₂O₅:K₂O with active agents to improve the yield [26]. Fertilizer should apply at four times during the entire crop cycle. First at panicle emergence (October-November) second at one month before the fruit set (January-February) third at one month after the fruit set (March-April) and final at two weeks after harvesting of the crop during June-July [23].

FRUIT GROWTH AND DEVELOPMENT

Harvesting and Storage

Generally, air layered tree starts fruiting in the third to the fourth year after planting. Longan fruits take 4 to 6 months from flowering to harvesting that's depends on the cultivars and growing climatic condition. In general, longan gives yields 2 to 5 kg/tree in the fourth year but after fifteen years it yields 150 to 200 kg/tree. Longan is a non-climacteric fruit in nature. The maturity of longan fruit is determined by fruit shape, skin color and fruit taste [21]. The taste of immature longan fruit is tasteless [27]. Harvesting should be done twice at an interval of 7 to 10 days. The shelf life of longan fruit is very low and the declining visual appearance of fruit and also a reduction in qualities. Longan fruit can be stored at ambient or room temperature for 3 to 4 days. Stored at 1°C to 5°C temperature resulting in aril breakdown and declined visual appearance of the fruit. Storage of fruit in a controlled

atmosphere at 4% to 6% O₂ and 6% to 8% CO₂ with 85% to 95% relative humidity for long storage life [32].

PHYSIOLOGICAL DISORDERS

Aril Breakdown

Softening of aril or breakdown of aril starts near the pericarp and appears more prevalent at the distal end of the fruit. It is observed in over matured fruit and in this turgidity and translucency losses and fruit become bland in test [32].

Pericarp Browning

Browning of pericarp occurred due to increasing high temperature beyond the 40°C and prolonged water stress [33].

Insect-Pest and Diseases

There are no major insect pests and diseases in longan cultivation in India.

Future Thrust

Longan production in North Bihar would prove beneficial in crop diversification and the availability of fruits of the litchi group. There is also a high scope in processing industries and value addition such as frozen, canned food, flesh dried and as a liqueur. There is also a need for standardized cultivation protocols in Indian conditions because very little or no information is available on the cultivation of longan in India. There is also only a single variety that has developed from ICAR-NRC Litchi, Muzaffarpur and no other variety is available in India. So, need to work on the improvement of the crop. The farmer has sought the intervention of National Horticulture Mission and National Horticulture Board to initiate efforts in supplying sapling and fertilizer to longan growers in North Bihar for increasing cultivated areas under the longan fruit [34].

Longan fruit mature and ripen in the hot season. It has a short shelf life (3 to 4 days) at room temperature. We have to standardized storage conditions for longan fruit which does not affect fruit quality and also expands processing protocols for this crop. Most postharvest research has focused on reducing post-harvest losses and maintains high fruit quality. Research on postharvest biology and technology for longan fruit has advanced at a rapid stage.

When flowering in litchi is over, that period longan bear profuse flowering and provides enough pollen and nectar to honey bees for honey production. That's why longan is very source of honey production when litchi and mango flowering are over and longan is a cross-pollinated crop so honeybees also help in increasing natural fruit set, ultimate it will effect on yield [35].

Longan has great medicinal values. Dried longan flesh can use as an ingredient in many herbal medicines and also used as an antidote against poison. Longan is a very good fruit crop for processing industries and pharmaceutical industries. Ultimate farmers will get benefited with this fruit. Longan fetches higher

price from domestic as well as the international market (Figure 1-3) [36].



Figure 1: Longan tree.



Figure 2: Initial stage of fruits.

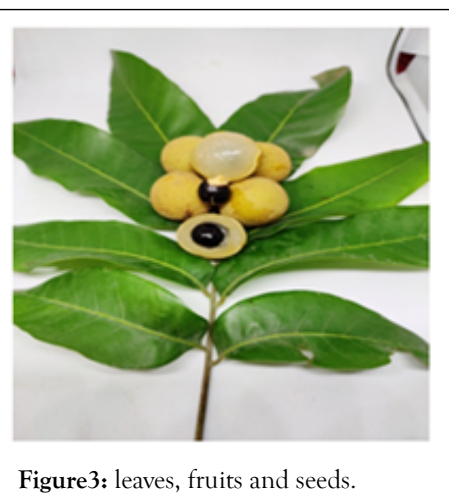


Figure 3: leaves, fruits and seeds.

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