

**A REVIEW WORK ON ORIGIN AND HISTORY, BOTANICAL
DESCRIPTION AND AGRO-TECHNOLOGY OF THE MEDICINAL
PLANT SINDURI (*BIXA ORELLANA* L.)**

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ABSTRACT

Bixa orellana L. is an important medicinal plant commonly known as Sinduri. From the plants grown in Rampurhat College and Rathindra Krishi Vigyan Kendra, Birbhum, W.B, India, it was found that Sinduri is a shrub or a small evergreen tree with a height of 2-6 m with the leaves as glabrous, ovate and with the base sub cordate and apex acuminate. The tree produces bunch of fruits of brown or crimson coloured capsule. Seeds are coated with a thin, red to orange coloured resinous coating. Annatto is native to continental tropical America. In India, it is cultivated in Orissa, Maharastra, Karnataka, Tamil Nadu etc. The agro-technology of *Bixa* cultivation is not well documented in India. Being a hardy tree it does not require very fertile soil. However, it thrives well under 22-44 ° C. At the time of planting, certain amount of organic manure is required. Besides that, phosphorous is an important nutrient for Sinduri cultivation. The best method of annatto propagation was found budding and stem cutting treated with IAA or IBA. A three years old plant produces 0.5-1.0 kg of seeds per tree per year. Thus seed yield may be around 250-500 kg/ha/year. Seed coat of annatto contains different colourants of carotenoid groups viz. Bixin, norbixin etc. Approximately 1 MT seeds yield 20 kg of bixin. The bixin and other alkaloids present in *Bixa* are being used for different medicinal and cosmeceutical uses.

Key words: *Bixa orellana* L., Sinduri, Annatto, bixin, origin, distribution, botanical description, agrotechnology

Introduction:

Sinduri, is a highly valuable medicinal plant and is quite common in India. It is also known as annatto and 'lipstick tree'. It has the botanical name of *Bixa orellana* L. The commercial product of annatto of sinduri plant is annatto dye, a red/orange pigment known as bixin, extracted from the seed coat. This dye as well as plants is used mostly in dairy industry, medicine industry, textile industry and for animal feed.

Sinduri plants grown in Rampurhat College and Rathindra Krishi Vigyan Kendra, Birbhum, West Bengal, India can be described as a shrub or a small evergreen tree with a height of 2-6 m. The bark of the shrub is brown and smooth. The leaves are glabrous, ovate, having a length of 7-25 cm and width 4018 cm with the base sub-cordate and apex acuminate. Leaves are scaly on both surfaces when young, and their petioles are slender, with length of 4-12. The tree produces large clusters of brown or crimson capsular fruit. Seeds coated with a thin, highly coloured resinous coating that shrubs as the raw material for the preparation of annatto colourant.

Earlier review articles on *Bixa* have provided thorough information on the chemistry (Preston and Rickard, 1980); extraction methods and formulations (Aparnathi and Sharma, 1991); pharmacology and uses (Srivastava *et al.*, 1999); toxicology and processing of annatto (Satyanarayana *et al.*, 2003); analytical methods to analyse annatto colour (Scotter, 2009) and a scope for its improvement through biotechnological mediation (Venugopalan *et al.*, 2011). The present review investigates and compiles information in the literature that reveals its origin, distribution, botanical description and agro-technology.

Origin and distribution:

Bixa belongs to the native flora of Brazil, Paraguay, Colombia, Dominican Republic, Haiti, Trinidad, Mexico, Panama and Hawaii (Ramatho *et al.*, 1987), although annatto is native to Tropical America. According to the name of the Spanish scientist Francisco de Orellana, who is credited with discovering the Amazon river in the 16 th century, the name of the species of this plant had been designated. Nowadays it is produced in several tropical countries such as Srilanka, Indonesia, India and East Africa (Bole, 1995). As an ornamental plant it is cultivated in different parts of India. But organised cultivation is in practice mainly

in parts of Orissa, Andhra Pradesh and Maharashtra and to some extent in Kerala, Karnataka and Tamil Nadu for obtaining annatto dye (Patnaik, 1971).

Botanical description:

Bixa orellana L. is a bushy shrub with a height ranging from 3-10m. Bark is more or less smooth with many warty lenticels. The plant branches several times near the ground with a spreading crown. The plant roots firmly with a thick tap root and fibre laterals. *Bixa* leaves are arranged spirally. The flowers are wide, pink or purple coloured. It has a panicle type inflorescence with bi-sexual, regular and hypogynous flowers. Flowers are with 5 petals and with numerous stamens. The filaments are long, extremely thin and white or pink in colour. Gynoecium is bi-carpellary and syncarpous. The ovary is unilocular with parietal placentation bearing numerous ovules (Chopra and Kaur, 1965). Fruits have two valves, covered either with dense soft bristles or a smooth surface. Fruits are approximately 4 cm wide, appear in a variety of colours: green, brownish green, maroon and bright red. When ripe the pod splits in half to reveal about 50 seeds encased in a red pulp (Howard, 1989; Liogier, 1995).

Agro-technology:

Soil:

It is a hardy tree and does not require very fertile soil for its cultivation. Annatto is grown in well drained red and alluvial soil with pH 6-7.5 and average soil which has moisture retention capacity is suitable for the cultivation of this crop. Soil which is poor in drainage and has rocks in the sub soil should be avoided.

Climate:

Annatto is a tropical plant. It thrives well under 20⁰ to 44⁰ C temperature and 800-1500mm annual rain fall. It can be grown successfully in a warm dry climate. Annatto is considered shade sensitive and the highest yields are obtained with full sun exposure (Rosalen *et al.*, 1991).

Management:

Land should be ploughed, levelled and prepared before planting. Annatto grows best on nutrient rich clay soils with a pH of 5.5±6 (Bole, 1995; Rosalen *et al.*, 1991). Seedlings

are transplanted when they are 20 cm tall. Pits of Size 30 cm³ are dug in early March at a spacing of 4.5 m X 4.5 m. They are filled with a mixture of soil and compost before the onset of monsoon. Basic information on seed yields, biomass, nutrient accumulation and mineral nutrition of annatto trees growing under agro-forestry conditions with different inputs of fertilizer and lime was documented (Elias *et al.*, 2002). Under agro-forestry conditions on a ferralitic upland soil, annatto showed a pronounced growth and yield response to increased fertilizer inputs which seemed to be due mainly to improved availability of phosphorous. It requires a specific soil rich in Mn (Sharon and D'Souza 2000). However, application of well rotten FYM @ 25 t/ha increased the seed yield of sinduri. Annatto is presently being grown as an avenue tree or a hedge plant; hence, its fertilizer requirement is yet to be worked out. Pits are watered immediately after planting. Regular irrigation depending on the climate is necessary for good growth and yield of the crop. Pruning of ornamentals is recommended to shape and thicken the crowns (Warren, 1997). Plant is very hardy in nature and is not attacked by any pest or disease of serious nature. (Venugopalan *et al.*, 2011).

Reproduction:

Planting material can be obtained through seeds, cuttings and tissue culture plants from certified and quality source. The germination percent of seeds is reported to be low (25-30%) due to high percentage of non-viable seeds and mucilaginous secretion. Mechanical scarification was reported to improve germination of fresh seeds (Amaral *et al.*, 1995). Stem cuttings rooted (upto 60%) when treated with IAA or IBA. Untreated cutting did not root (Thirunavoukkarasu and Saxena, 1997). Annatto can be grafted by several techniques. The best method is budding (70 % success in tests) (Bruckner *et al.*, 1991).

Harvesting and yield:

Generally flowering starts during 3 rd year of planting. However, tissue cultured plants are reported to be under flowering in 2 nd year itself (NABARD, 2007). Generally the plants flower in the July- August and the flowering continues up to October. In about 30 days of flowering, capsules begins to appear on the trees and after 90 days of appearing the capsules they mature and dry up in January. On maturity, the dried capsules make a rattling sound. The dried capsules are kept packed in gunny bags and kept closed for some days. Later they are taken out and exposed to sun. Screening of harvested capsules to discard fungal infested seeds is vital as it will not only rot the seeds but also bring down the quality of seeds. (TEMEIS Project, 2009). A three year old plant on an average yield about 0.5 to 1.0

kg of seeds per tree per year. The maximum yield is obtained from 4 to 10 years age plantation. Seed yield may be around 250 to 500 kg per hectare per year from 4 year old plantation (www.indg.in) . An Indian Plantation yielded 529 kg/ha of seed at 2 years old and 2,483 kg/ha of seed at 3 years old (Kanjilal and Singh, 1995).

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