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**Sinduri (ANNATO) Agrotechnology**

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## Product and its applications

Sinduri (Bixa orellana) is a highly valuable plant. It is cultivated commercially to extract the annatto colour. It is also called as Sindurpushpi, Sinduri, Trishnapushpi, Sukomala, Raktabija and Karchchandha in Sanskrit; Latkan, Sinduriya and Jafra in Hindi and Annatto in English.

The commercial product of Annatto or Sinduri plant is annatto dye, a red orange pigment known as Bixin, extracted from the seed coat. This dye is used mostly in dairy industry for colouring butter, cheese, ghee, chocolates and ice creams. It is employed in dyeing of cotton, silk clothes and leather, in coloration of medicines and in making shoe polishes. The colour yielding plant is also used in making bindi or kumkum. Traditionally the red orange colour of this plant has used as a cosmetic by the tribals. In Indian system of medicines especially in Ayurveda, the bitter, cold, dark brown bark is prescribed for curing blood diseases, headache, phlegm, high fever and gonorrhoea. The leaves of Sinduri are used as blood purifier. The paste made from its seeds keeps mosquitoes at bay. Sinduri, when combined with edible items does not affect their taste or flavour. By and large, it is a multipurpose plant whose bark, leaves, roots and seeds are used for medicinal, pharmaceutical, cosmetic and edible colouring purposes. Ink and non edible colours are also made in many countries. The waste annatto seeds after extraction of pigment are dehulled and defatted for preparation of flour which is used as animal feed as it contains more than 12% protein and 40% carbohydrates.

The quantity of bixin in the seedaries from 0.73 to 1.3 per cent by weight and contains carotenoids of various types out of which cisbixin alone accounts for 82 per cent. Since bixin is the principal colouring matter, the chemistry and performance of annatto colour is essentially of the bixin which is an unsaturated compound. The bixin dissolves in vegetable oil, undergoes complex series of isomerisation and degradation reactions when heated to extraction temperatures. A yellow pigment transbixin and cisbixin are the major carotenoids in oil soluble annatto colour. The total pigment content of the commercial annatto butter colour varies from 0.2 to 2.6 percent, at least 30 percent of which is bixin.

## Market Potential

Importers, buyers within the country, processors, traditional practitioners, Ayurvedic and Siddha drug manufacturers throng the markets for procurement of this plant every year. Its domestic demand is quite large. As the production is much less in India, the internal market itself is highly potential.

## Basis and Presumption

The agricultural land and related infrastructure is available with the entrepreneur.

Prices are calculated as per the prevailing market rates.

The yields depend on proper implementation of package of practices.

Economics of cultivation greatly improves on scale of operation.

This activity provides tax-free high returns. Additionally a number of government support schemes are available. Latest provisions need to be checked up.

Market for medicinal plants is volatile and economics may vary from time to time.

## Agri practices

Sinduri is an ever green shrub of the height of 2-5 m. Though bixa is reported native to tropical America and West Indies, it is now widely distributed in most tropical countries like Brazil, Guyana, Mexico, Sri Lanka, Ecuador, Jamaica, Peru, Surinam and India in wild and cultivated forms. In India it is well distributed in Karnataka, Andhra Pradesh, Assam, Tamil Nadu, Orissa, West Bengal, Gujarat, Maharashtra, Madhya Pradesh and Chhattisgarh and also reported to be cultivated commercially for past 15 years.

The plants of Sinduri are basically of two types: a) bearing greenish white flowers b) bearing annato or red coloured flower. The flowers and fruits in both kinds of shrubs of Sinduri appear in clusters. Its leaves resemble with a betel vine leaf and its veins are red in colour. The fruits of this shrub are soft and thorny. The fruits bear nearly 50 red seeds in colour on ripening. It flowers during August-December and fruits in March-April. The fruit splits longitudinally in length in two parts as a result of which the red seeds become conspicuous. These seeds drop down after some time. The red colour compound is extracted from these seeds which are coated with thin pulpy, bright orange resinous coating commonly known as Annato dye or Bixin.

## Soil and Climate

Anatto is grown / cultivated in well drained red and alluvial soils with pH 6 - 7.5. It comes up well in deep soil but can be grown on shallow soils also but needs proper pit digging and soil work. Being a tropical plant it thrives well under 280 to 440 C temperature and 800-1500 mm annual rain fall. It can not withstand severe cold climates. The economic life of plant is 20 to 25 years.

## Land Preparation

Land is ploughed, levelled and prepared before planting. Later pits of size 30 cc are dug in early March at a spacing of 4.5 X 4.5 m and filled with a mixture of soil and compost before the onset of monsoon. It may be planted as line or boundary plantation and as block plantation on degraded/waste lands. Like any other plantation crop, the unwanted weeds and bushes are cleared for better growth. The land may be ploughed by tractors or bullocks and also levelled along contour to facilitate irrigation.

## Propagation

The 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 up to 25-30% due to high percentage of non-viable seeds and mucilaginous secretion. The dye back and drying of seedlings in early stage is reported to be a common phenomenon. It is therefore, preferred to depend upon the cuttings, clonal propagation and tissue cultured plants.

The planting season is generally the monsoon period (June to September). However, it can be planted till October provided assured irrigation source exists for protective irrigation. The pits of 30 x 30 x 30 cm size are dug at 3 x 3 m or 3 x 2.5 m spacing for accommodating 1100 to 1200 plants per ha or nearly 450 to 500 plants per acre. Considering the mortality and gap filling, additional 15-20% plants are required to be arranged. It is, therefore, desirable to arrange 500 planting material per acre.

Flowering generally starts in 3rd year of planting. However, tissue cultured plants are reported to be under flowering in 2nd year. Blooming starts from July-August to end of October. The capsule (fruit) formation starts after 30 days of flowering. The fruiting therefore may be seen from September-October to February.

Pruning is important to get better yield from Sinduri plant. It is recommended to prune the branches/twigs every year after harvest. A light spray of fungicide after pruning is required to avoid the fungal attack. The pruned twigs sprout into 3-5 new shoots which becomes ready for blossoming in next season.

## Fertilizer

During first year, 300 kg NPK is added at planting and after 3 months 300 kg along with 50 kg urea per ha. Second year onwards, 800 kg NPK and 250 kg urea per ha are recommended.

## Irrigation

Though the plantation is required to be done during rains, in case of dry days during monsoons it is always desirable to provide 2-3 irrigations immediately after planting. Therefore, irrigation is desirable at weekly interval taking into consideration the soil type, texture, water holding capacity and atmospheric temperature. Irrigation may also be given at 2nd, 3rd and 4th year onwards for proper growth and seed production. Better results are obtained when moisture stress is absent from flowering to capsule maturity stage.

## Weed control

The weeding, mulching and soil working around the pits are always desirable for better yield. Two weedings up to 3rd year is essential i.e. one weeding and soil working before and one after monsoons.

## Pest control

Harvesting of fruits may be initiated from October onwards. The right stage of harvesting is determined by stage of drying of capsules and development of cracks thereon. Capsules are harvested in bunch.

## Harvesting

Flowers should be nipped off during the growing period in order to obtain more biomass. The crop is ready for harvest after about 135-150 days of planting. During the growing period the flowers if any should be nipped off to obtain more biomass. The crop is harvested manually by uprooting the individual plants.

## Post harvest operations

### Drying

The bunches are spread onto polythene sheets or clothes under semi shade conditions for 6-7 days. The dried pods are beaten to remove the seeds. The separated seeds are winnowed and stored in gunny bags in cool and dry places.

### Yield

The economic yield accrued from 3rd year onwards. The economic age of the plant varies from 12 to 15 years. The average yield in year 3,4,5,6 is 1,2,3,4 kg per plant equivalent to 1.25t, 2.5t, 4.5t, 5t per ha respectively. Generally the yield stabilizes from 6th year onwards after which the yield reduces and re plantation is required.

## Economics of cultivation

Expenditure is incurred towards the labour, planting material, FYM, fertilizers and pesticides, processing, packaging and marketing. The seeds fetch a market price of Rs.70 / kg. Net return per ha after 3rd year onwards up to 10 years is estimated at Rs.90, 000 per year.

## Addresses of some dealers in medicinal plants/ planting material

Tropical Forest Research Institute  
Mandla Road, Jabalpur (M.P.)  
Cedmap,  
60, Jail Road, Jahangirabad,  
Bhopal (M.P.)  
KRD Musli Farm, 10/47, Station Road, Rau,  
Indore-453331 (M.P.)  
Mittal Musli Farm and Research Centre,  
Jamod, Jalgaon (Maharashtra)  
Regional Research Laboratory  
Jorhat (Assam)

Jeevan Herbs & Agro Farms  
178,Keshav Ganj, Sagar (M.P.)  
SSS Biotic.com  
C/o biosourcing.com (P)Ltd.  
A-41, Janpath, Ashoknagar  
Bhubaneswar (Orissa)  
Kasiraj Exports,  
37, Santhai Road,  
Tuticorin (TN)  
A.Y. Agritec Private Limited  
16-7-382/18, Azampura Masjid,  
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