

STANDARD CULTIVATION PROCEDURE FOR SWEET FLAG (BACHA) – ACORUS CALAMUS IN ODISHA

Introduction: → Sweet Flag (Bacha), *Acorus calamus* is a popular medicinal plant used in several Ayurvedic formulations. Due to its growing medicinal use, it is being rapidly extracted from wild. At present, it is listed as endangered species. It is a semi aquatic plant and is cultivated in damp and marshy places. The leaves have sword shape and are yellowish green in color. The plant grows up to 2 mtrs from the ground. Flowers are cylindrical in shape and are greenish brown in color. The rhizome was found to be a powerful aphrodisiac having Asarone as major alkaloid constituent. The rhizomes of the plant is used to cure various diseases such as sedative, stomachic, aromatic, insecticidal, anti-inflammatory, aphrodisiac, antipyretic, insecticidal, carminative and many other diseases.

Though the climatic condition of Odisha is quite suitable for this crop, but commercial cultivation is yet to begin in our state. Considering the huge demand of Brahmi in herbal market this cultivation should be given priority.

CLIMATIC CONDITIONS FOR SWEET FLAG (BACHA) CULTIVATION

Sweet Flag (Bacha) being a semi-aquatic plant, it can be grown as stand alone as well as intercrop. Conditions favorable for rice cultivation have also been found suitable for Bacha cultivation. Hence, Bacha can also be cultivated along with Paddy in Odisha.

Temperature	Rainfall	Sowing Temperature	Harvesting Temperature
30 ⁰ to 40 ⁰ C	1000 to 2500 MM	30 ⁰ to 32 ⁰ C	15 ⁰ to 20 ⁰ C

SOIL CONDITION

The plant can be grown in a variety of soils ranging from sandy coastal soils to loamy soils of plains. It cannot withstand water logging conditions. It gives best results when grown under well drained loam to coarse sandy loam having pH ranges up to 8.5. The best suited pH range for Sweet Flag (Bacha) plant for its optimum growth and yield is 6.0 to 8.5 (mild acidic to alkaline soil). This plant is suitable to grow in clayey loam and light alluvial soils of the riverbanks & black cotton soils. Sweet Flag (Bacha) is best to produce in the soil that is alkaline in nature.

STEP BY STEP CULTIVATION PROCESS

Soil Testing: → As this crop requires low to medium soil nutrition (50 KG Nitrogen, 7.5 KG Phosphorous and 7.5 KG of Potash per Ha) during various phases of cultivation, it is advised to test the soil to determine the exact quantities of nutrients and micronutrients those prevail in the soil and this has to be done during the months of February to March.

Soil Preparation: → For sweet flag plantation, it requires water logged soil. To bring soil to fine tilth, first fields are watered well with mixture of 1 Tone of FYM (Farm Yard Manure) and 1 Tone of green leaf manure. Then ploughing is done two to three times. The land should be prepared before the onset of monsoon. The best time for planting the crop is March-April.

Planting Material & Seed Variety: → There are around 150 species of Sweet Flag (Bacha) being cultivated across the country and some of the improved variety with their common characteristics is given below.

Sl. No.	Variety	Occurrence	Characteristics	Planting Material	Planting Material Requirement per Hectare
1	<i>Acorus calamus</i>	Wild & native to India, Srilanka & other Asian Countries, North	The leaves of this variety have 5 feet long leaves and have elliptical spadix which is 4 inches long. The species are	Rhizomes	1,00,000 Nos to 1,10,000 Nos

		America & Europe	evergreen and have slow spreading underground rhizomes.		
2	<i>Acorus gramineus</i>	Wild & native to Pacific, some parts of India, other Asian Countries, Northwest America & Europe	The leaves of this variety grow up to 18 inches long and the flowers are about 3 inches long. It has clumps which are 2 feet wide and have slow growth rate.		

Sowing / Transplanting of Rhizomes: → Propagation is mainly done through rhizomes. The rhizomes are first cut into smaller pieces and then sprouted rhizomes are planted. The planting should be done in the month of July-August but the best time to plant the crop is second fortnight of June. The plant spacing should be done at 30 x 30 cm distance between two plants. Rhizomes are sown at depth of 4cm.

The propagation of Sweet Flag is done through two means. One is Seedling Transplantation and second one is rhizomes Transplantation directly in farmer's field. When propagation is done through Seedling then the seeds (rhizomes) are sown in greenhouse. First trays are filled with organic soil and then firmly press the seeds in this soil. Moist the soil until it starts germinating. The germination takes place in around 2 weeks. Before transplanting of the seedlings, proper irrigation has to be done so that the soil will retain good moisture. Now sowing of Sweet flag seeds is done on wet beds with appropriate gapping. After sowing is completed, regular irrigation is done so that moisture will retain in the soil.

Similarly for direct rhizome transplanting, rhizomes are directly sowed in the main field by lightly pressing the rhizomes into the already well moist soil. When the seedlings attain some height by the end of 1st week then irrigation should be done of about 5 cm water standing is required and when the plant becomes tall then at the time of flooded irrigation 10 cm water should be kept above the soil.

SOIL HEALTH & NUTRITION MANAGEMENT

Nutrition Requirement during the whole cropping cycle: → The following table depicts the nutritional requirement during the whole cycle of cropping. At the time of Land Preparation 1.0 to 1.5 Tones of well decomposed FYM along with 0.5 to 1.0 Tone of Green Leaf Manure per hectare is applied which is more or less equivalent to 50% of the basal dose. Apart from this 25 to 30 KG Neem Cake Powder per hectare to be applied to soil during the 1st phase of ploughing process.

Nitrogen (KG / Ha)	Phosphorous (KG / Ha)	Potash (KG / Ha)
50	7.5	7.5

Nutritional Requirement in between the Cropping Cycle: → The Balance of basal doses to be applied 2 times after each weeding & intercultural activities (1st Weeding & intercultural operations to be done after 1 month of planting and then after 2 months of planting) being completed and followed by irrigation. The doses may be in the form of well decomposed FYM (1.5 to 2 Tons per Ha) or application of Amrit Jal (30 Ltrs to be diluted with 300 Ltrs of water per Hectare) or application of Amrit Ghol (50 Ltrs to be diluted with 300 Ltrs of water per Hectare) followed by irrigation in each application.

Irrigation: → During the rainy season, at any point of time if the Rain stops for more than 7 days, then it is advised to irrigate the crop and maintain at least 5 CM water in the field for proper growth of plants. In summer season it is advised to irrigate the standing crop in every 2 to 3 days depending upon the water-holding capacity of the land. It is always advisable to maintain 5 CM to 10 CM of water during the whole crop cycle. But before harvesting, the field should be kept dry.

PLANT PROTECTION & PEST MANAGEMENT

Sweet Flag (Bacha) cultivation needs special care because the rhizome growth depends directly on the growth of Leaves and the leaves are affected by various insects and pests. The following table depicts some common diseases and its protection mechanism seen during various cycles of cropping.

Sl. No.	Name of Disease	Cause	Symptom	Treatment
1.	Slug Damage	It's primary cause is due to Slug Pests which feed on the leaves	The leaves start whitening and withering	<ul style="list-style-type: none"> • Immediately spray a mixture of 30% Neem Tea solution and 30% Neem Oil solution. Then after each 7 Days spray 40% Neem Oil Solution to the whole crop for 5 times.
2	Mealy Bug	It's primary cause is due to Lepidocephalus and Pseudococcus Pests	The leaves start yellowing and withering	<ul style="list-style-type: none"> • Immediately spray a mixture of 30% Neem Tea solution and 30% Neem Oil solution. Then after each 7 Days spray 40% Neem Oil Solution to the whole crop for 5 times. • Spray 1% Bordeaux Solution to the whole crop for 3 times at an interval of 14 days.
3	Black – Brown Leaf Spot	This is a disease which develops due to the fungal attack resulting in discolored spots in leaves.	Black Brown spots are characterized by reddish- brown spores that occur in oval or elongated pustules.	<ul style="list-style-type: none"> • Immediately spray 70% Neem Oil solution. Then after each 7 Days spray 50% Neem Oil Solution to the whole crop for 5 times. • Immediately spray 5% Bordeaux Solution to the whole crop, especially to the root system for min 5 times at an interval of 14 days.

HARVEST & POST HARVEST MANAGEMENT

Plant starts yielding by 6-8 months after sowing. Harvesting is done when the lower leaves dry and turns yellow in color as it indicates its maturity. Before harvesting the field should be partially dried so that digging will be easier.

After harvesting, cleaning is done. After cleaning rhizomes are cut into 5 to 7.5 cm of size. Then rhizomes are air dried and are beaten and rubbed. The rubbing is done 2-3 times. After rubbing, packing is done for transportation. The useful products are made by processing such as extract, oil, powder etc.

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