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## SUBABUL CULTIVATION

Kingdom	:	Plantae
Order	:	Fabales
Family	:	Fabaceae
Genus	:	Leucaena
Species	:	leucocephala
Common name	:	Subabul

Subabul plant is a wonderful fuel, fodder and fertilizer tree. It suits well for farm forestry. Besides, it can be raised even on soil with average fertility status and under unfavorable climate conditions. Subabul ( *Leucaena leucocephala* ) is a tropical tree with a wide range of uses. Foresters and farmers are exploring its potential and the area planted to this crop is expanding rapidly. The subabul originated in the central America and spread probably as a result of its use as fodder for animals on ship-board to Philippines .Guvana some Spanish ,Islands Nitherlands,New Guinea, Malasia, Hawali in India it is grown in Andhra Pradesh, Karnataka, Tamilnadu , Himanchal Pradesh and Uttar Pradesh.

Subabul under optimum growing condition have yielded extra-ordinary amount of wood which is the highest annual total ever recorded. It also produces quality forage, which provides highest weight gain in cattle . It additional uses include silage, hay, living hedges, source of black dyes, decorations , erosion controls, revegetation of hill slopes , provision of wind breaks, shade and roadside beautification . coffee, coca , cinchona, pepper , vanilla and other shade – loving crops grow well beneath subabul shade. *Leucaena* is a species of the family Leguminosae . It is known as wonder tree because of its many-fold uses . Subabul plantation is good for investment as well as for making herbs.

## **CLIMATE**

Subabul is a tree of the tropics and subtropics and it grown up to an elevation of about 500 meters. It is capable of withstanding large variations in rainfall, temperature , wind and drought . It requires warm climate. The best growth is obtained in areas with 600- 1700 mm annual rainfall .It thrives well under high light intensities I.e. best in full sun . It can also grow in areas where a minimum of 250mm annual rainfall, though gives less yield. It can withstand drought and in some areas where it grows naturally, there is practically no rain for 8-10 months in a year.

## **SOIL**

The roots of subabul plant can reach deep for nutrients and water. Thus plant can tolerate a wide array of soil conditions. It thrives well in soils with textures varying from rock to heavy clay. It has considerable salt tolerance and often survives in exposed coastal areas. It grows well in neutral or alkaline soils with pH 6.0- 7.7.

## **VARIETIES**

A number of subabul varieties are grown , which differ enormously in their size, form and production . Based upon their use , these have been classified into following groups.

### **A- PERU TYPE**

Varieties in this group are profusely branching and bushy type . They are shrubs with average height of 5m at maturity . They produce little trunk ,but extremely high quantity of foliage. These are suitable for fodder, shade-tree for coffee, cocoa, cinchona, pepper, vanilla etc. Indian varieties K-8, K-28 and k-67 are recommended for fodder production and grassland pastures.

### **B- HAWAIIAN TYPE**

Varieties in this group are trees, that grow taller than 20m and produce less branches. These are suitable as shade-tree in tea gardens. These types are grown on forest land for timber – wood and regions of soil erosion.

## **C-SAVADOR TYPE**

Plant of this variety are like tree of varying height these are also know as arboreal or Guatemala .

## **SEED AND SOWING**

Goods seeds should be selected and treated before storage as well as sowing. Treatment before sowing are of various kinds as explained here.

## **A -SELECTION OF SEED AND ITS STORAGE**

Ripe pods of subabul plant from the mother tree are collected before they open to scatter the seed on the ground. The pods are spread to dry on a hard surface such as concrete floor or canvass in a well ventilated room or out in the open . On drying , the pods are stirred and the seed is collected. The seed should be dried before insecticides such as Malathion or Metoxychor or with a fungicide as it is liable to be attacked by insects and fungai. The seed should be stored in airtight containers at about 10 oc . Seed stored under such conditions retain viability for longer period .If not properly stored, the seed loses about 50 % viability in 4- 5 months.

## **B-PRE – SOWING SEED TREATMENT**

Subabul tree seed coat is hard and waxy. Some seed-born disease damage the crop therefore , some pre-sowing treatments to the seed are necessary . these are described here.

## **TREATMENT FOR HARD-WAXY SEED COAT**

To obtain high and uniform germination , following methods of seed treatment are adopted.

## **HEAT TREATMENT**

This is the best method of treating large quantities of seed. The seeds are dipped in hot water at 80c for 5 minutes. Treated seeds are dried before sowing.

## **ACID TREATMENT**

In this methods , the seeds are treated with concentrated sulphuric acid for 10 minutes and then washed thoroughly . Since it is a concentrated acid great care must be taken to avoid any injury to a person treating the seed

### **MECHANICAL SCRATCHING**

In this method, seeds are rubbed against sand or rough stony surface. It may be done by putting the seed in a rotating drum lined with sand paper. Care must be taken that at the time of scratching, the ovary should not be injured. By this method only a small number of seeds can be treated.

### **TREATMENT AGAINST DISEASES**

The germinating seeds are attacked by Fusarium and Aspergillus fungi. Coating the seeds with 7.5 % a.i. Arasan- 75 WP and covering the seed coat with latex, protects the seed against fungal attack and increases seed germination.

### **INOCULATION WITH RHIZOBIUM**

Subabul tree seed requires inoculation with specific strain of Rhizobium bacteria to ensure nodulation of the roots and nitrogen fixation as this crop is not indigenous to India . For neutral or slightly alkaline soil , acid exuding strain of rhizobium like NGR -8 or NGR -35 is used. For acidic soils, alkaline exuding strain like CB BT or CIA T 1967 may be necessary. The inoculants Rhizobium culture is mixed with an adhesive like 2% arabic solution and the seeds are coated with this adhesive-inoculant mixture and then some dry coating material as lime is added and seed is pelleted. Another method is to mix the Rhzobium culture in 10 % WN gur ( jiggery ) solution and coat the seed. The seed can also be inoculated after scarification by simply soaking the seeds in a solution of rhizobium and water. About 250 g of rhizobium culture is sufficient to treat about 20 kg seed. The treated seed is dried in shade and should not be stored for more than a week before sowing. In the absence of bacterial culture, a pinch of soil from the subabul growing field may be spread for better results.

### **TREATMENT WITH FUNGUS**

In addition to Rhzobium the growth of a beneficial mycorrhizal fungus , on the roots and roots hairs of subabul , produces a vast network of its hyphae which

helps the plant in obtaining and making more efficient use of mineral nutrients and thus subabul can grow well in soils low in minerals as phosphorus.

## **SOWING**

Sowing implies raising seedlings in the nurseries and then transplanting or sowing seeds directly into the fields.

## **NURSERY RAISING TECHNIQUE**

Seedling can be raised in nursery beds or in polythene bogs.

### **-IN NURSERY BAGS**

The best way of cultivation of the subabul is raising the seedling of the crop and transplanting them in the main field. The seedling are grown in well prepared fine textured soil. About 8- 10 kg seed is required to raise the required number of seedling for fodder. Sowing in the nursery is done in March. April depending upon the climate conditions of the locality. Treated seeds are sown in line 30cm apart at a distance of 5cm at the depth of 15centimeter. Irrigations and weedings are given as and when required .The seedling attain plantable size by july- August.

### **1-IN POLYTHENE BAGS**

Seedlings can be raised in polythene bags, filled with soil and FYM in the ratio of seeds are sown per polythene bag a depth 1.5 centimeter. If both the seeds in a bag germinate one is gently clipped off ensuring the least disturbance to the roots of the required seedling .shifting the places of the polythene bags at an interval of a month is necessary as the tap-roots of the seedlings develop fast and pierce through the bag and hold the soil bellow .

### **2-FIELD PLANTING**

Planting of the seedlings in the main field is july- August . Planting for fodder requires trench formation ,while plantation of forest tree require pit formation one month before planting . Trenches of size 30x30 cm or pits of size 30x30x30 cm are dug. The space between trenches for fodder may be 1m to 2m, and 3-4m for fodder cum-intercrop cultivation . The space between pits for forest may be 3x10 m depending upon requirement. A soil moisture containing FYM @ 5-10 tones/ha, 20

kg 10% BHC dust/ba, 15- 20 kg N/ha 15-30 kg P/bag and 2-4 tones lime/ha ( if soil pH is 5.0) is filled in trenches seedlings are planted at the spacing . Approximately more than 10,000 seedlings/ha are sufficient to get maximum fodder yield . A soil mixture containing 5 kg FYM 10 gN, 20 gN 20 g P 275 and 15 g BHC per pit is filled in the pits for forest plantations

Nursery raised seedling are planted out earth balls. In case of polythene bag raised seedlings the bag is removed before planting .but care is taken to ensure that the soil column enclosing the roots is not broken during the removal of polythene bag or during .Pruning of the lower branches is helpful in areas of low and erratic. The old nursery stock can be used for stump planting.

### **3-DIRECT SOWING**

Sometimes direct sowing of the seed by broadcasting or seed drill is done for fodder production only. For this purpose the best is monsoon season . The spacing of 60cm between lines and 30cm among plants is suitable. The land should be well prepared and 8-10tones of FYM 30kg phosphate and 20 kg nitrogen per hectare along with 20 kg 10% BHC dust may be mixed while ploughing the field. Seed may be planted to the depth of 15-20 cm approximately 10-20 kg/seed is required for direct sowing.

### **FERTILIZER APPLICATION**

Subabul is a leguminous crop therefore it does not requires much nitrogenous fertilizers for normally good soils. If soil is poor, based upon soil- test the additional fertilizer can be applied. Without any soil test a safe dose of 20-25 kg/ha and 30-35kg p 20/ha can be applied before sowing .It gives a good start to the crop. The application of phosphatic fertilizer once is two years before monsoon helps to maintain the production.

### **IRRIGATION**

Irrigation are necessary to the developing seedlings in the field . since roots have not sufficiently penetrated to the safe depth in the sub-soil to the make contacts with soil-moisture. Subabul is a deep rooted crop withstands sufficient prolonged

drought condition up to 8 months. In situation of prolonged drought irrigation at an interval of two months keeps on the normal growth.

## **FIELD MANAGEMENT**

Following procedure should be followed to maximize yield.

### **WEEDING AND INTERCULTURE**

Weeding and interculture can be done together by hoeing. However interculture also includes measures taken against frost wind animals etc.

#### **1-HOEING**

During the growing seedling period hand weeding is necessary. Since the crop is much responsive to shade and photo period free from weed competition are quits suitable for the development of the seedling. Once the seedlings are slow growing in the beginning and are likely to be suppressed by weeds. The bushes which may shade the seedlings should be cut . On large areas the use of herbicides is an option so far no entirely satisfactory herbicide available.

#### **2-PROTECTION AGAINST FROST**

In some areas of north India which experience frost during winter shading the seedlings to protect them against frost is necessary. Irrigation in frost periods may also be helpful.

#### **3-FENCING AGAINST ANIMALS**

Subabul is a fodder which is palatable to most of the animals such as snails ,rats, rabbits,deer, monkey,etc. Therefor effective fencing is also necessary to keep these animals out of the plantation area.

### **INTERCROPPING**

The subabul grown for intercropping is planted in trench lines 3-4m apart or more. The pits for forest plantation are at 3x10m or any convenient spacing. Thus any suitable crop like corn ,sorghum, any cereal ,oil, or bushy or non- bushy annuals or perennial crop can be grown in between the space.



## **CROP ROTATION**

The subabul plantation depending upon its use for industrial ,fuel or fodder is cleared before 6 year and the field are again prepared and planted as per planted as per requirements with any new crop or with new seedlings of this crop

## **PEST AND DISEASES**

The following are the major pests and diseases of subabul

### **A-PESTS**

The most serious insect pests attack young seedlings. Mound- building ant causes a severe damage in some regions by eating the leaves and back of young seedling. An occasional problem on seedlings and young shoots is caused by the mealy bug, but normally it is kept under control by predatory insect. Twing borer ( *Xyleborus morigerus* ) feeds on the sap of the leaves and branches, seed weevil ( *Areccerus fasciculatus* ) attacks the young pods and eats the developing seeds. Seed yield also is greatly reduced by the larva of the moth *ithome lassula* which feeds on the flower heads. However this is usually of little economic consequence unless the trees are being grown for seed production.

### **CONTROL**

Spraying with BHC WP or DDT Or Endrine 0.02 % solution at seedling stage at a monthly interval gives a reasonable control and and normal development of the seedlings.

### **B-DISEASE**

The most important diseases that attack the subabul the subabul crop are (1) fungal gummosis ( *Fusarium semitectum* ), bark canker ( *Phytophthora dreschleri* ) (3) damping off ( occurs in wet soils with dense population of seedlings ), (4) leaf spot ( *Camptomeris leucaenae* ), and (5) bacterial pod blight.

### **CONTROL**

1-To control these diseases following techniques are suggested. The use disease resistant varieties, such as Hawaiian Giants is resistant to gummosis and hybrid progenies of interspecific crosses are resistant to leaf spot.

- 2-Use of balanced fertilizer according to soil test.
- 3- Planting at proper spacing and drainage condition.
- 4- Spacing with some systematic insecticide to kill the pod bores which also introduce the fungus the pod.
- 5- spraying with some fungicides

### **HARVESTING FOR GREEN FODDER**

No where is the forage shortage worse than in the seasonally dry tropics. Here subabul fodder is particularly its annual yield of edible dry matter ( leaves and fine stems ) per hectare are generally between 16-10tonnes . The gaint varieties tend to produce under more frequent harvest ( I.e. 4-6 weeks ). The Hawallian giant K-8 planted with density of 5000 trees/ha yields about 8 tonnes of forage /ba at 1.5 year age. Atypical leaf forage contains 89.4% dry matter, 24.2% crude protein , 4.4 % ether extract. 13.3 % crude fibre, 10.8% ash 1.98 % calcium, 0.27 phosphorus , 19.7 % digestible protein, 57.3% total digestible nutrients and 3995 gross energy Kcal/kg .It has however ,low sodium and iodine contents and needs to be supplemented by forage rich in these minerals. Because of the wide Ca : P ratio supplementation with feeds rich in phosphorus is also necessary. Subabul leaf-meal is especially valuable and vitamins, pro-vitamin A content is among the highest recorded in plant specimens.

### **LOPPING FOR TREE GROWTH**

The plants of the subabul are lopped after 2 year of growth I.e. leaves twigs and thumb thick branches are cut by the sharp pruning scissors and the main stem is allowed to grow into tree for timber and fuel wood.

### **PROBLEM OF MIMOSINE IN GREEN FODDER**

Cattle are fed only with subabul green fodder continuously for for six months results in general ill-health, loss of tail and tump hairs, excessive salivation ,poor growth and swollen thyroids. This is due to high content of the mimosine (amino acid ) i.e. 3-5 % of dry matter. Cattle grow well if their feed contains less than 30 % of subabul dry matter. In ruminant animals, mimosine ca be rapidly converted by bacteria in the rumen to dihydroxypyridine (DHP) , with is then broken down

into non-toxic compounds , some salts supplements also help in easy in break down of mimosine.

In non-ruminant animals ,subabul feed used as a major portion of the diet has resulted in fall of hair in rabbits , delayed sexual maturity in pigs and poultry. Therefore,ration in poultry should have less than 6 % dry weight of subabul feed and less than 10 % for pigs and other non-ruminant animals . This quantity of subabul feed gives the palatability and increase protein and vitamin contents of the feed.

### **SUBABUL GROWN IN PASTURES**

Under condition of prolong drought upto 8-10 month long . the scraggly bushes are often among most efficient forages. The deep roots of this plant allow it to remain green and productive long time after shallow –rooted grasses and pasture legumes have withered. The subabul pasture continue to give fodder longer in dry seasons and on return of rainy season they recover rapidly and pasture is restored.The pasture of this crop is browsed as it reaches a height of metre. In this way they get no chance to grow into trees and their inherent vigour and coppicing ability show up not in wood but in the masses of new foliage . These pastures continue producing year after year , under good management i.e. replacement of soil nutrients.

### **SUBABUL GROWN FOR TIMBER WOOD**

Under suitable soil and well distributed rainfall conditions the tree has reached a height of 18m in 5-6 years i.e. diameter 25-30 cm and dense wood . Under deep soil conditions 10000 or more per hectare give sufficient dense population of the trees, which keeps the trunks reasonably straight. The trees may, harvested before six years.

### **MEDICINAL VALUE**

The excessive contents of mimosine ( amino acid ) in subabul leaves can used as medicine for removing hairs of animals, those suffering from disease which spread through hair.

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