Leucaena Leucocephala (Subabool) A PROMISING FORAGE PLANT

ICAR Research Complex for NEH Region
Tripura Centre, Lembucherra - 799 210
Tripura (west)
Tripura
Leucaena Leucocephala (Subabool)
A Promising Forage Plant

Leucaena leucocephala is a leguminous tree or shrub having originated in central America. Though it is known by several names in different parts of the world, however, in India it is better known as subabool. It is a suitable plant for cultivation in north eastern region and has several uses.

Advantages

Most importantly, subabool can provide quality herbage almost throughout the year and can be used in the diets of ruminants, swine and poultry. It can be used as food, timber, pulp, fibre etc.

It does not require extra land for its growth as it can be planted as fencing in the farms and can be pruned at any height without damaging the growth of the plant.

The plant grows extensively and can even be planted in wastelands or lands unsuitable for crop cultivation or in the borders of croplands thus making the plant suitable for cultivation under various land/topographic situations.

It can withstand large variation in temperature, rainfall and wind.

It also helps in preventing soil erosion and conserving soil moisture.

Types

Hawaiin type: These are short bushy varieties up to 5 m high, flowering very young and almost round the year. These are chiefly used to produce fuel, wood and charcoal.

Salvador type: These are tall and tree like growing up to 20 meters having large leaves and pods and thick branchless trunks. Some high yielding Salvador type are also called Hawaiin Giants and cultivated for timber and other wood products.

Peru type: It is also tall like Salvador type but with extensive branching down the trunk. This is rapid growing and the best type for forage production and use in pastures.

Varieties

K-8, K-67, K-72, S-11, K-340 and Peru are some of the promising varieties.

Soil

It can inhabit a wide range of soil types and topography ranging from narrow valleys to flood plains, rolling hills and mountains with
gentle to steep slopes. The best growth is, however, obtained on deep and fertile soil. Light textured soil is better than clayey soil for root development and growth. It thrives well on soils which are slightly acidic to slightly alkaline (pH=5.5-8.5). The growth is severely limited with soil pH below 5.5.

Climate

It is a tree of tropics and subtropics growing better upto an altitude of about 500 meters, however, it can withstand large variations in rainfall, temperature, wind and drought. The growth is limited by very low temperature.

Seed formation, collection and storage

The seed formation may take place in first and second year of planting. The flowers are small, white, 1-2 cm in diameter and arranged in pairs. The flowers are usually self pollinated.

The pods are flat, almost straight and develop quickly. Young pods are green and translucent while mature one’s are reddish brown and hard. Each pod may contain 15-30 seeds. The mature seeds are flat, shiny and brown with a waxy seed coat.

Ripe pods are collected before they open to scatter the seeds on the ground.

The pods are spread to dry on a concrete floor inside a well ventilated room or out in the open. On drying, the pods are stirred and the seed is collected. The seeds should be dried before storage. The seeds can be treated with insecticide or fungicides before storage in airtight containers.

Propagation

*Leucaena* is mostly raised either by direct sowing or by seedling. It can be established by vegetative cuttings but it is rarely practised.

Seed treatment

The *Leucaena* seeds have hard seed coats, therefore, pre sowing treatment of the seeds is desirable in order to get high and uniform germination.
Following are the methods of seed treatment:

**Hot water soaking**: This is the simplest and most commonly used method. The seeds are soaked in hot water (80°C) for 5 minutes. Alternatively, the seeds are poured into boiling water in a volume ratio of 4:1, allowing it to cool off and decanting off the water. The treated seeds are dried before sowing.

**Mechanical scarification**: This can be done by putting the seeds in a rotating drum lined with sand paper.

**Acid treatment**: The seeds are kept in concentrated sulphuric or hydrochloric acid for 15 minutes, washed thoroughly with water and dried before use.

For better nodulation and nitrogen fixation, *Leucaena* seeds should be inoculated with *Rhizobium* culture depending on the soil. Since the soils are acidic in this region, so the alkaline exuding strain of *Rhizobium* (CB-81) should be used for inoculation. For alkaline soils, acid exuding strains (NGR-8 or NGR-35) are useful. The culture is mixed with an adhesive (2 per cent gum arabic solution) followed by dry coating with materials like lime. In a second method, the culture is mixed with 10 per cent jaggery solution and the seeds are coated with this solution. Normally 250 g of *Rhizobium* culture is sufficient to treat 20 kg of *Leucaena* seeds. The treated seed should be dried before use.

Direct sowing may be done after the onset of monsoon. The field should be free of weeds and prepared well. The seed rate varies with the type of site and need. For soil conservation and forage production, a closer spacing (1 m x 0.3 m) may be required while for timber production, a spacing of 3 x 3 m to 5 x 5 m may be adopted. Regular weeding and protection from grazing should also be taken care of. The seedlings are raised in nursery by sowing the treated seeds in 30 cm x 5 cm spacing about 1.5 cm deep during April-May.

Seedlings can also be raised in 20 x 10 cm bags filled with soil and compost in 2:1 ratio by sowing the seeds at a depth of 1.5 cm. Generally, 2 seeds are sown per bag. If both germinate, one may be clipped. Planting is done in July-August in 30 x 30 x 30 cm pits.

Depending on the need, the spacing between rows may range from 0.3 m for forage to as wide as 3-4 m in case of intercropping with agricultural crops or for timber. Plant to plant spacing with in a row may vary from 15-20 cm to 3 m. P<sub>2</sub>O<sub>5</sub> (60 kg/ha) at the time of planting encourages the growth. Regular weeding in the initial
stages, if planting, is a must. For fodder, a plant height at harvest may be kept at 1 m while for agroforestry the height depends on the underneath crops.

**Harvesting**

Harvesting can be done at 9 months after planting and then at 40-50 days intervals. A yield of 75 and 95 kg/plant could be obtained after 3 and 4 years of planting, respectively when planting is done in a row at a spacing of 2 meters. A plant density of 5000 trees/ha yielded 75 qtls of forage/ha at 1.5 years of age.

**Nutritional Characteristics**

*Leucaena* is a very promising forage crop under rainfed conditions of this region. It is relished by livestock. It is a good protein supplement in straw based diets. Everyday feeding of 5-10 kg of subabool leaves in a straw based ration will not only maintain a cow but will supply enough of nutrients to support a milk yield of 2-2.5 litres. Silage can also be prepared from *Leucaena* leaves with 30-60 per cent dry matter (DM). Leaves can also be ensiled with chaffed grasses in 1:1 ratio.

Cattle can be safely fed *Leucaena* leaves up to a level of 30 per cent (DM basis) but when it makes up more than 50 per cent of diet for longer periods, the toxicity symptoms like loss of hair, excessive salivation, poor growth and swollen thyroids etc. appear. The ill effects are due to presence of an antinutritional factor-mimosine which may form 3-5 per cent (DM basis) of the protein present. In ruminants, mimosine is converted to dihydroxy pyridone in the rumen by bacteria which is a goitrogen. Mimosine content in the leaves can be reduced by heating the fresh moist leaves at about 70°C.

![Jackfruit + Leucaena leaf feeding](image1)

![Cattle fed on Leucaena leaf](image2)

**Table 1 - Nutritional characteristics of *Leucaena* leaves (on dry matter basis)**

<table>
<thead>
<tr>
<th>Component</th>
<th>Crude protein (%)</th>
<th>Ether extract (%)</th>
<th>Crude fibre (%)</th>
<th>Nitrogen free extract (%)</th>
<th>Total ash (%)</th>
<th>Digestibility (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude protein (DMMD)</td>
<td>23.33</td>
<td>1.92</td>
<td>12.83</td>
<td>55.79</td>
<td>6.13</td>
<td>65.18</td>
</tr>
<tr>
<td>Crude fibre (OMD)</td>
<td>44.63</td>
<td>19.15</td>
<td>25.48</td>
<td>12.38</td>
<td>3.91</td>
<td>67.64</td>
</tr>
<tr>
<td>Nitrogen free extract (%)</td>
<td>P (%)</td>
<td>0.29</td>
<td>244</td>
<td>Cu (ppm)</td>
<td>24</td>
<td>2.81</td>
</tr>
<tr>
<td>Lignin (%)</td>
<td>12.9</td>
<td>161</td>
<td>0.34</td>
<td>7.94</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- DMD: Dry Matter Digestibility
- OMD: Organic Matter Digestibility
- ME: Metabolizable Energy
- DM: Dry Matter
drying of leaves at high temperature, immersing the leaves in ferrous sulphate solution and ensiling the leaf forage.

The chemical analyses of the leaf fodder and other nutritional characteristics studied at ICAR Research Complex, Tripura Centre have been presented in Table 1. The leaves are rich in protein content. The fibre contents are low as compared to grasses. The dry matter digestibility is approximately 65-70 per cent. The leaves are a very good source of Ca, however, Ca : P ratio is quite wide which should be brought to optimum by P supplementation. The total tannins were found to be 2.81 per cent. The palatability and digestibility of Leucaena leaves is quite high. The Leucaena seed is also rich in protein ranging from 27 to 30 per cent.

The amino acid composition of Leucaena meal is reported to be superior to many other plant protein sources. The leaves are also good source of carotene. Leucaena leaf meal can be incorporated in the diets of chicks and broilers up to a level of 5 per cent and in the diets of growers and layers up to 10 per cent. Thus, the desired yellow yolk and yellow skinned broilers can be raised. The leaf meal can also be included in the diets of pigs.

Paddy straw with Leucaena leaves

Feeding of Napier hybrid with Leucaena

Keeping in view the significance of Leucaena leaves in the nutrition of livestock particularly ruminants, it is advocated to grow the plant extensively in farming systems like agri silviculture, silvi pastoral, watershed development projects, on field bunds, waste lands etc. so that the gap between demand and supply of nutrients for animals may be lessened.

Publication No. 22 . Year 2006 (1000 copies)

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Printed at New Manikya Press, Agartala, Tripura. Tel : 0381-2223784