

## BILAKKHANI : A MULTIPURPOSE SHRUB FOR ECOFRIENDLY AGRICULTURE

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Plant biodiversity of N.E. India is well known. An important leguminous shrub *Tephrosia candida* has been utilized by the aborigines of N.E. India for centuries in their various needs. It has praiseworthy qualities for incorporation in ecofriendly agriculture. Indian agriculture needs this plant to be considered as boon from the mother nature in the same sense as the agricultural system of other developing countries did. In this paper emphasis has been given to establish *T. candida* as a 'need of the our plant' for Indian agriculture.

In recent years the Indigenous Technical Knowledge (ITK) is gaining importance around the globe, both among the scientists and rural development agencies because of its high potential to develop environment friendly and low cost technology based on proper scientific footing. Identification and utilization of such knowledge (wisdom) from the elderly people of remote villages will surely bridge the gap between modern science and age-old customs or practices. The biodiversity of plants in the hot humid north-eastern region of India has been utilized by the aborigines since the dawn of civilization for their various needs including agriculture and home remedy (*Ayurveda*), thus ITK developed.

One important shrub used by the natives of north-eastern part of India is *Tephrosia candida* (Roxb.) DC. Its Assamese equivalent name is 'Bilakkhani' or 'Boga medoloo'. The taxon is indigenous to India. In India, the geographical distribution of *T. candida* covers among others Assam, West Bengal,

Arunachal Pradesh, Meghalaya, Sikkim, Manipur, Tripura and Nagaland<sup>1</sup>.

### Botany of the Plant

It belongs to the subfamily Papilionaceae of Fabaceae (Leguminosae) family. It is a gregariously growing semi-perennial shrub with a height of 1.5-4.5 m. The stem is erect, slender, woody and branched; leaves are imparipinately compound, 12-20 cm long; leaflets narrowly oblong to ovate-oblong (3.8-5.2 cm × 0.8-1.3 cm), greyish white and aresilky beneath. The anemophilous flower is typical to leguminosae, white to creamy white in colour tinted with red in racemes. Pods are slightly recurved, clothed with brown silky hairs, 7-10 cm in length and contain 10-15 seeds in each pod. Seeds are deep brown in colour.<sup>1</sup>

*T. Candida* is diploid with 22 longer chromosomes, median to nearly terminal centromeres.

### Uses of Bilakkhani

#### Weed Control

The unique feature of this plant is its weed controlling ability, particularly the

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notorious perennial *Saccharum spontaneum* (Kans)<sup>2</sup>. Controlling of Kans grass by conventional methods in field condition is very difficult and cost intensive because of its quick propagation through air dispersed seeds and underground spreading roots (rhizomes), drought resistance and similar other surviving characteristics in adverse condition. The weed controlling capacity (WCC) to *Bilakkhani* is about 77.84%.<sup>2</sup>

The WCC of *Bilakkhani* might be attributed to the allelopathic effect of its flavone compounds on *S. spontaneum* and other weeds. [It is perhaps the leaves of *Bilakkhani* falling on the weedy field decompose naturally and releasing some flavone compounds causing either slow growth or drying up of rhizomatous root system of *Saccharum*. This assumption, however, needs confirmation]. Nevertheless, competition for moisture, nutrients, light, space etc. in the form of smothering and shading effects of *T. candida* are also responsible for weed control. *Bilakkhani* can grow upto a height of 3-4 m, sufficient above the height of Kans grass (2 m) and form thick canopy over the weeds. The average plant population required of *Bilakkhani* in a weedy field may be 0.20 million per hectare.

#### Insecticidal Property

It has been reported that Amorphone (6-hydroxy 6a, 12a-dehydro rotenone) was isolated and identified from *T. candida*. Petroleum-ether extracts of the leaves and stems (amorphone) of the plant tested against larvae of tobacco caterpillar (*Spodoptera litura*) were found most effective.<sup>3</sup>

Leaf powder of *T. candida* (and *T. vogelii*) has a repellent action against banana weevil (*Cosmopolites sordidus*); this phenomenon could be used to prevent oviposition in banana plantations.<sup>4</sup>

One new rotenoid (12a-hydroxy-beta-toxicarol) was isolated from the roots of *T. candida*, which have activity against certain insects.<sup>5</sup> Its root bark contains 0.35% rotenoids, which have insecticidal property.<sup>1</sup>

#### Green Manure/Green Leaf Manure

It has been reported from a field experiment that growth and nodulation of *T. candida* was 3 times greater than that of *Leucaena leucocephala* (Subabul) in acid (pH 4.5) oxisol. None of the plants of *L. leucocephala* nodulated, while *T. candida* averaged 582 nodules/plant at 12 weeks after planting.<sup>6</sup>

At the age of 60 days, when the plant height reaches 60 cm with sufficient root nodules, the crop of *T. candida* can be ploughed down in the moist soil as green manure.

For green leaf manure, leaves collected at the time of harvest or intermittent pruned twigs may be used. At harvest, it produces about 25-30 tonnes of green leaves per hectare. Largest amount of *T. candida* green manure biomass can be harvested in the first 2 years after planting.<sup>7</sup>

#### Amelioration of Problem Soil

*T. candida* is tolerant to a wide range of soils and temperature, preferring acid soils. It can increase surface soil organic carbon and total nitrogen leaves in fallow land compared with natural bush. It has been suggested that *T. candida* increases N availability in the soil and has potential for improving the productivity of acid soils under traditional system.<sup>8</sup>

In an experiment in Brazil, *T. candida* (cv. CPATU 497) produced 9.28 t/ha of dry matter when harvested at flowering of 80% plants and this huge biomass quantity

improved the chemical and physical condition of acid soils.<sup>9</sup>

### Degraded Land Management and Productivity

Continuous cropping in any ecosystem results in soil fertility decline over time. The presence of appropriate tree or shrub species in the natural bush regrowth during a fallow can enhance recovery of soil fertility. Keeping the land fallow and covered with *T. candida* improved both the physical and chemical properties of soil as compared with the natural regrowth alone. Maize yields were significantly increased in *T. candida* plots after a 2 years fallow of degraded land. It was suggested that it enhanced nutrient recycling in addition to the N input through fixation.<sup>10</sup>

It has been reported that suitable methods or strategies to rehabilitate degraded land should incorporate *T. candida*. Intercropping annual crops with *T. candida*, pineapple and *T. candida* intercropping and tea plantation with *T. candida* as shade trees may improve the ecosystem to a considerable extent.<sup>11</sup>

Results from Vietnam suggested that alley cropping rice with contour hedge rows of *T. candida* improve rice productivity of the site by conserving the soil and increasing its fertility through the addition of thinnings.<sup>12</sup>

In an on-farm testing of *T. candida* as an improved fallow species, in hedge rows and in a mulch transfer system, it was observed that *Tephrosia* fallow gave a positive input-output balance for both P and N. *Tephrosia* fallow increased soil N and seemed to positively affect the release of soil labile P.

*Tephrosia* mulch increased upland rice yield by 50% compared with monocrop. In general *Tephrosia* fallow and *Tephrosia* mulch were found to increase crop yield per hectare with acceptable returns and also did better

than monocrop with respect to preventing soil and nutrient losses through erosion.<sup>13</sup>

### Fire Wood

Within 2 years the plant reaches a height of 3.0-3.5 m, which is very nearly to its maturity height. At this stage the average base diameter varies between 1.8 and 2.5 cm with total green weight of 600-750 g/plant. So, it produce around 50 tonnes of dry matter (sticks) at harvest, which may be used as fire wood in the rural kitchen or in the village pottery kilns because of its high combustibility pertaining to high carbon content. In Vietnam also it is considered a good source of firewood.<sup>7</sup>

### Fencing/Support

The dry sticks of the plant are very hard to break. So, it may be used for fencing in the farm, vegetable garden and has support in the betelvine.

### Brief Cultivation Technique

Seeds (test weight 20 g) after over night soaking for 4-5 hours in water to induce germination<sup>7</sup>, may be broadcast for weed control and line sown (25 cm × 20 cm) for other purposes. The seed rate range between 6 and 8 kg/hr. The best time of germination is May-June. So, planting should be scheduled with the onset of monsoon in Indian condition. In Brazil, sowing is done between 3rd week of March and 4th week of June.<sup>9</sup>

Generally, fertilizer is not needed for weed controlling purpose, but for sole crop 20 kg P<sub>2</sub>O<sub>5</sub>/ha may be applied before sowing for better nodulation. It has been reported from Vietnam that on poor soils. *T. candida* responds well to phosphates.<sup>7</sup>

For green manuring, the plant may be allowed to grow upto 2-3 months so that it reaches 60 cm height. At this stage, it is to be ploughed down in the soil.

During the whole growth period, 3-4 mild cuttings of twigs can be taken for green leaf manure. After 2 years of growth it will produce sufficient pods for next generation and in the meanwhile, most of the (about 80%) Kans grass is eradicated and the crop (*T. candida*) is ready for harvest. The harvested sticks are bundled in convenient size and left in the field in upright position for 3-4 days for natural defoliation and the defoliated sticks are to be sun dried for further use.

### Conclusion

A plant like *T. candida* (*Bilakkhani*) is really a boon from the mother nature not only to the poor farmers but also to the scientific community because of its praiseworthy qualities which can be scientifically manipulated and exhausted for the advancement of ecofriendly agriculture and thereby to have a greener planet.

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