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Harvesting Green Gold: Cultivation of Betelvine in Sundarban

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Betelvine or Pan (Piper betel L) belongs to the family Piperaceae and is a perennial aromatic creeper grown for its leaves. It is an important commercial crop in India, Bangladesh and Sri Lanka and also most profitable amongst all cultivated crops. Betelvine is cultivated over an area of 50000 hectare in India covering the states of West Bengal, Assam, Meghalaya, Orissa, Andhra Pradesh, Tamilnadu and Kerala extensively and in other parts of north and south India in sporadic areas. It is the most important commercial crop which plays a vital role in the overall livelihood security of farm families of South 24 Parganas, Midnapore, Howrah, Hooghly and Nadia district. This has brought a paradigm shift in the farm economy of Sundarbans and offers perennial employment and income to small and marginal farming community because of its capital and labour intensive characteristics. Betelvine cultivation is highly intensive and particularly suited to small holding (may be 5 to 10 decimel land).

The edible portion is green leaf, used as masticatory alongwith arecanut, lime and catechu. Chewing of Pan leaf is an ancient habit having existed for more than 2000 years. It is also auspicious to make offering of betel leaf and arecanut on the occasions such as religious ceremonies, pujas and wedding ceremonies. The Pan leaf contains Vit. B and C and also beneficial in accelerating the process of digestion. It also possess anti microbial activity due to peroxidase, nitric and secratory antibodies (slg A), which offer protection against microbial proliferation in mouth so that tooth and gum decay is kept under check (Kumar et al.).

The betel leaf is also used as medicinal and cosmetic purposes now.

Climate: Betelvine grows well under warm humid tropical forest conditions which provide cool shade with diffused sunlight and adequate supply of moisture in the soil. It can tolerate temperature between 10°C to 40°C. it cannot with stand very cold or very hot wind flow. A cool humid and shady atmosphere is artificially created inside the vineyard or Boroj. Unless such a condition are artificially created, hot winds burn the tender tips of vines and cause their wilting.

Soil: Well drained, loam or clay loam fertile soils are best suited for cultivation of Betelvine. It can also be grown in sandy, sandy loam, red lateritic, black cotton and coastal alluvial soils.

Cultivars Or varieties: There are mainly five cultivars of Betelvine viz. Kappori, Bangla,
Meetha, Sanchi and Maghai grown in India.

1. Bangla: it is moderately vigorous. The leaf is green to dark green, cordate in shape, thick with broad lamina, coarse to touch and pungent. Petiole or leaf stalk is long, thin and widely spaced due to longer internodes. No or very few laterals/ vine. Grown both in north and south India.

2. Mitha: Meetha pan is normally sweet in taste and palatable. Its stalk is small, and less pungent than Bangla variety. Commercially it is the most important variety of West Bengal. Leaves are non fibrous and remain soft after maturation. This variety is grown exclusively in West Bengal and monetarily highly rewarding.

3. Kappory (Tellaku): Leaf is greenish yellow, ovate in shape, smooth with acute tip, juicy and non pungent. It produces large number of laterals/vine and hence, the yield is more when compared to other cultivars. Grown extensively in south India.

4. Sanchi: It has oval leaf blade with long tapering apex. Creeper is more or less like bangla variety. Though the growth is not so fast. The leaf is hot with pungent aroma. Disease resistance and preservation capacity of this variety is also very high.

5. Maghai: This cultivar has smaller leaves than that of other cultivars. Leaf are sweet and palatable. Famous all over India for high quality leaves.

In Sundarban only three cultivars Bangla, Mitha and sanchi are grown. The clone Meetha is grown extensively because of its high demand and price.

Establishment of Betel vine yard (Boroj):
Betel vine is cultivated in a hut like structure called Boroj which is made of either square or rectangular in shape. Usually a path of about one meter width is left all around the garden on the inner side of the enclosure to serve as walking space. Afterwards, beds of 100-125 cm wide and as long as the entire length of side are prepared, leaving about 30 cm walking path between two adjoining beds. The side wall is strengthened and supported by bamboo poles inside the boroj. The distance from one horizontal pole to another is about 20 to 25 cms. The roof, side walls are generally covered with sticks, paddy straw and coconut leaves etc.. The following materials are required to construct a boroj of 5 decimel area, that may cost around ten thousand rupees. The height of boroj may be 7 to 8 feet.

<table>
<thead>
<tr>
<th>Materials</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bamboo</td>
<td>16 pieces</td>
</tr>
<tr>
<td>Iron wire</td>
<td>28-30 kgs</td>
</tr>
<tr>
<td>Coconut rope</td>
<td>8-10 kgs</td>
</tr>
<tr>
<td>Paddy straw</td>
<td>480 bundles</td>
</tr>
<tr>
<td>Jute stick</td>
<td>10000 pieces</td>
</tr>
<tr>
<td>Bamboo pole</td>
<td>1000 pieces</td>
</tr>
</tbody>
</table>

For assured water supply to the betel vineyard at least 10 decimel pond is sufficient for 5 decimel boroj. The pond soil may be utilised for raising the boroj site. The pond bund may also be used for vegetable
cultivation and pond water for aquaculture.

**Planting material and Propogation:**

The betelvine are propogated through terminal stem cutting or setts. Two types of planting material are found such as ‘Peni’ having 2-3 nodes, 10-15 cms length with 2-3 leaves and ‘Agali’ having 6-8 nodes. For taking a cutting, a cut should be made just below a leaf joint or node or leaf junction. The short joined cutting in which leaf joints or nodes are at a short distance obtained from sufficiently matured plants are always better than the cutting in which the distance between the leaf joints is more and from lower portions of the vines. If the cutting are too long it should be shortened from the tip and not the base. Normally a cutting should be planted immediately after its removal from the mother plant. The lower nodes of the vines take longer time to sprout or even fails to do so due to deep dormancy of the adventitious roots. The spacing for cutting varies from region to region. In north India it is 12-15 cms x 75-80 cms, but in south India it is 100 x 20 cms spacing. In sundarbans the planting spacing are generally 60 x 30 cms. As betelvine is vegetatively propogated, special care should be taken for disease free planting material to check the sett borne diseases.

The selected cutting are generally planted after the withdrawal of monsoon in Sundarbans where as in north India the planting season is March or April and in south India it is June- July. 50000 setts are required for planting one hectare area. The selected clones (setts) should be treated with 0.5 bordeaux mixture.

**Training and Lowering of the vines:**

In about a month after planting, the setts began to sprout and creep. As such a thin bamboo stick is placed by the side of creeper to creep along. By 6-8 months time the vines trail up to 180 to 210 cms and fastening with the stick at every 15 to 20 days interval is needed. The operation has to be performed at least 5-6 times for Bangla, Meetha and Sanchi varieties during every subsequent year. The growth of the vines are rapid during rainy season and slow during winter. Lowering of vines are done in quick succession during the rainy season. While creeper is allowed to trail on the stick during the winter without lowering from December-January to February-March. After every lowering down soil is invariably put on the stem lowered and wound up at ground level. Manuring should be done after each operation.

**Manures and Fertilizers:** Betelvine is very fastidious regarding its manurial requirement. The manuring should started with top dressing with oilcake. One month after the planting of setts, oilcake should be applied at 15 days interval, along the rows 8-10 cms away from the vines and mixed in the soil. One hectare of Betelvine yard required NPK in the ratio of 160:80:40 Kg/ha. The oilcake used for Betelvine are generally groundnut cake, mustard cake and neem cake. Using 250 gms of neem cake/ plant is highly
beneficial since it will also reduce the pest incidence. During summer apart from the oilcake, dhaincha seeds and leaves of mango, karanj and neem are also used. Nutrient requirement of Betelvine can also be supplemented through fertilizer application of ammonium sulphate and muriate of potash as basal dressing one month after the planting.

**Irrigation:** Betelvine needs constantly moist soil, but flooding is very injurious as it makes the ridges very compact which creates hinderance in new plant development and aeration. In dry summer month very light irrigation is given frequently. During winter months the frequency may be at 3-5 days interval and in rainy season at 8-10 days interval based on the seasonal and soil condition. A good arrangement for drainage of excess water is always essential to save the roots from decaying and drooping of leaves.

**Picking and Harvesting of Leaves:** The leaves became ready for picking about 90 days after planting and subsequently harvesting at monthly interval. On an average 50-60 leaves are obtained from a vine. During First picking 4000 leaves can be picked from a 5 decimel boroj, which gradually increases and become maximum by 5-6 years. The average yield is found in the range of 45 to 50 lakhs leaves/ha.

**Plant protection Measures:** Betelvine yard is always threatened by pest and disease attack. The major disease and pest and its control measures are given below.

**Pests:** More than 15 insects pests attack betelvine yard, the major ones are described below in detail.

**Betelvine Bug** (*Dispunctus politus*): The nymphs and adults damage the leaves by puncturing and sucking the juice causing the leaves to shrivel, fade and dry up. The pest can be controlled by spraying 0.05% Malathion.

**Linear Scale Pest** (*Lepidosaphes cornutus*): It infects the leaves, petiole and main vines and results in 30 to 35 percent yield loss. The scale insects are either light brown or dark brown in colour. Both the nymphs and adults suck the sap and the infested leaves loose colour, exhibit waxy, watery appearance, crinkle and dry up ultimately in case of severe damage. The severity of damage found more in old gardens.

**Control:**
1. Scale free setts should be selected for planting
2. Remove and destroy severally affected vines.
3. Spray either 5% neem seed kernel extract or 2% neem oil emulsion or chloropyriphos 20 EC at the rate of 2ml/litre of water and repeat after 21 days if necessary.

**Mealy Bug** (*Ferrisia virgata*): The leaves are covered with white masses and the insects suck the sap from leaves and shoots. It can effectively be controlled
Red Spider Mite
*(Tetranichus Sp.)*: Found in the lower surface of leaves and suck the sap of the leaves. The leaves become pale yellow with numerous small spots which reduces the quality of the leaves. It can be effectively controlled by the spraying of 0.03% sulphex.

Nematodes: Three types of nematodes viz. Root knot nematode (*Meloidogyne incognita*), Reniform nematode (*Rotylenchus reniformis*) and Lance nematode (*Haplolamus indicus*) attack on the betelvine yard. The Root knot nematodes affected plants become stunted in appearance bearing yellowish coloured small sized leaves and swollen aerial roots in cluster. When they are uprooted, deformed roots with prominent galls and swelling are observed. They are also found frequently associated in different stages of rotting caused by bacterial and fungal infection. Eventually the affected plants wilt and die.

Reniform nematode frequently associated with betelvine roots and generally cause unthrifty growth of plants producing small feather like leaves. The Lance nematode produced stunted growth of plants with general yellowing of leaves.

Control: For effective control of nematodes following practices can be applied.
1. Chopped green leaves of *Calotropis* and *neem* at the time of planting.
2. Oil cake of *neem* or mustard @ 500 Kg/ha to 2 t/ha.
3. Carbofuran 1.5 Kg a.i. per hectare in fresh planting in endemic areas two weeks prior to planting to manage nematodes in soil.

Aphids (*Aphis gossypii*): Nymphs and adults suck the sap of leaves and tender shoots. Black shooty mould develops on the leaves during the end of January to March. It can be effectively controlled by spraying *Metasystox* 0.03%.

White Fly (*Diaureodres pallida*) and Black Fly (*Aleurocanthus rugosa*): It suck the sap of leaves resulting the development of discolouration of patches and yellowish marking appear on infected leaves considerably. This can be effectively controlled by applying *Confidor* 200 sl or *Neurocombin* @ 1-2 ml/litre water (0.2%).

Leaf eating Catterpilar: This pest can easily be controlled by spraying Malathion at the rate of 0.5%.

To save the Boroj from infestation, before planting setts Heptachlor 37 kg/ha. as basal dose should be applied to the soil.

Disease:

Foot Rot / Leaf rot: It is also known as chitla. The first symptom of the foot rot is darkening of the basal stem. Soon the vine wilts, accompanying by yellowing of leaves and drooping of the vines, starting from the tip downwards.
The first symptom of the leaf rot are the appearance of water soaked lesions. The infected spots enlarge rapidly to cover the blade, which starts rotting. Diseased leaves turn brown to dark brown and later dirty black.

The disease is caused by *Phytophthora parasitica var. piperina* Dast., occurs in severe form in rainy season. This is a soil borne pathogen.

**Control :**
1. At the time of planting, the setts should be dipped at least for 20 minutes in 1% bordeaux mixture or 0.1 % ceresan.
2. Bordeaux Mixture (0.5%) or 0.2% Zineb (Dithane Z 78) should be spread on the ground near vines and also on diseased leaves at an interval of 15 days from last week of June to October.
3. Once the plant is diseased, it should be removed and the soil partially sterilized by drenching with chestnut compound or adding lime and mix thoroughly.

**Anthracnose :** Small black circular lesions appear on leaves expanding rapidly in humid conditions. Leaf spots appears as brownish black centre with yellowish hallow around and in severe cases the leaves drop owing to shrinkage of tissues. The disease is caused by *Colletotrichum capsici*, a set borne pathogen which is a very serious disease.

**Control :**
1. Before planting the setts should be dipped in 0.1% Ceresan or other organo mercurial solutions.
2. Spraying once or twice 0.2% solution of Zineb (Dithane Z 78) or 0.1% Bavistine

**Powdery Mildew :** The disease affect the foliage, causing several damage. Small white patches appear on both the surfaces of young leaves. These patches enlarge running together to cover large portion of the blade, covering the leaf surface with characteristic whitish powdery coating. It is a fungal disease caused by *Oidium piperina*. It is an air borne disease usually appear in the month of January and February. Warm humid weather and cool nights favours the spread of disease.

**Control :**
Sulphur dusting, the most effective method of controlling powdery mildew disease, cannot be used because it renders the leaves unfit for chewing purposes. This disease can be controlled by spraying of Sulphex (0.25%) or Benlate (0.25%).

**Leaf Spot :** This is the most serious disease affecting the Betelvine yard in Sundarbans. Locally it is known as ‘Angari’. Minute water soaked spots developed on the under surface of leaves. Later these appear on upper surface also as dark round angular ones surrounded by yellowish zone. The centre of spots are motteled down and later turn black and in severe conditions leaves turn yellow and fall.

It is a bacterial disease caused by *Xanthomonas compestris var. Betlicola*. This occurs mainly in high humid season and rapidly
covers the whole vineyard.

Control:
High precautions are very much necessary to reduce the incidence of this disease in vineyard.

1. Two to Three sprays of 0.25% Zineb or Zirum should be made after every six months as a protective measure.

2. The disease intensity can also be reduced by regulating the shade in the vineyard.

3. Drenching with wettable Ceresan 0.1% or Agallol 0.1%

4. This disease can effectively be controlled during primary stage by spraying either of 1% Bordeaux Mixture and Streptomycin Sulphate 250-500 ppm or 0.25-0.3% Zineb and Streptomycin Sulphate 250-500 ppm at monthly interval starting from August to January.

5. Uproot the diseased plants and burn or bury them to protect other vines.


7. Spray of plantomycin 500 ppm is also useful in control of leaf spot.

Dew or Fog Injury: Betel vine leaves are also damaged due to dew or fog injury. In winter season the leaves are injured due to drops of dew which turns into white spots and blotch. This injury can reduce the market price of infected Betel leaves.

Control:
1. The disease can effectively be controlled by spraying 0.3% Zineb (Dithane Z 78) or 0.25 to 0.3% Zirum spray 2-3 times on a fortnightly interval.

2. The disease incidence can also be lowered through extra layering of upper surface of boroj by paddy straw.

Betelvien Wilt: In severe condition plant started wilting and shown water stress condition caused by Phytophthora capsice leomican.

Control:
It can effectively be controlled by applying neem leaf extract(2%) or neem cake extract (0.5%).

Use of Plant Growth Regulators: It has been observed under various research experiments that Betelvine growth and yield can be increased through the application of plant growth regulators. Three sprays of Mixtalol (0.1%) and Tricontanol (0.5%) were found very effective in increasing the growth and yield of Betelvine. It is also capable of alleviating water stress damage under medium stress. (Sengupta 2001)

Problem and Prospect: Betelvine cultivation in Sundarbans has its overall and holistic Socio-economic impact on the farming community. It is the most important cash crop and its cultivation has already brought a perceptible and conspicuous change in the livelihood security of Sundarban agriculture and its farming population. Farmers are
selling their produce at local markets as well as the distant markets in Midnapore district. The growers are also facing several constraints. The most important constraint is price fluctuation because of volatile seasonal fluctuation in the production of Betel leaf. The price of Mitha leaves zoomes to Rs. 3500 to 4000 in winter months and decreased alarmingly to the level of Rs. 800 to 1000 in summer and rainy season. The non existence of Regulated market and Poor infrastructural facilities in this area are the other constraints being faced by the growers.

References:
