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# Indigenous Disease Management Practices of *Piper Betel L.* For Traditional Farming Systems in Purba Medinipur, West Bengal

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## Abstract

*Piper betle* Linn. (Green gold of India) is commonly known as betel leaf or 'Pan', belonging to the family Piperaceae is a sustainable economic source for rural people. The betel leaves have infected by different organisms like *Phytophthora*, *Sclerotium*, *Rhizoctonia*, *Colletotrichum* and *Xanthomonas.* This study shows significant traditional treatments for disease management are use of Nitrogen fertilizers, neem-turmeric solution, Cow-dung water, Tulsi plant plantation, smoke of Gandhak, dhuna and karpur, as well as Bordeaux mixture (1.0%) and Fungicide brasicol. This indigenous management can reduce the use of chemical fertilizer as well as enhance the nutritive quality of plant. This practices also promote the cultivar for the cultivation of "Green Gold of India".

**Keywords**

*Piper betel*, Disease management, Purba Medinipur

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## INTRODUCTION

Betel vine (*Piper betle* L.) is the heart shaped deep green leaves, an important horticultural crop of aesthetic and commercial values. This perennial climber is grown throughout the country especially in West Bengal. There are about 100 varieties of betel leaf (common Bengal name 'pan') across the world of which 40 are encountered in India. Out of 40 varieties 30 varieties are found in West Bengal and its adjacent area (Guha, 2006; Guha and Jain, 1997; Maiti et al., 2008).

The most probable place of origin of *Piper betel* (pan) is Malaysia. *Piper betel* (pan) contains some vitamins, enzymes, thiamine, riboflavin, tannin, iodine, iron, calcium, protein, essential oil. The above bioactive compounds are amazingly effective natural medicine for liver, brain and heart diseases (Samanta, 1994; Chopra, 1956; Yadav, 2013). The betel leaves contain substantial amount of vitamins and minerals and therefore, six leaves with a little bit of slaked lime is said to be comparable to about 300ml of cow milk particularly for the supplement of vitamin and mineral nutrition. Apart from the serological aspects the leaves are significantly offered to the people and relatives as the symbol of hospitality. It is grown in the rainfall about 2250-4750 mm, relative humidity 40-80% and temperature ranging from 15-90°C (Asthana, 1947; Asthana and Mahamud, 1945). The use of traditional medicine is widely used in Purba Medinipur district. The information documented in the study shows that the different plant parts are also used for the treatment of various disease the rural people were using leaves (52%) most commonly and followed by Root (12%), Stem (11%), Fruit (11%), Bark (7%), latex (3%), Whole plant (2%), Rhizome (1%) and Bulb (1%) (Patra et al., 2017).

This perennial crop is found to be infected by various diseases of which Powdery mildew, Foot Rot & Leaf Rot Causal organism by pathogens, *Phytophthora parasitical* and *Colletotrichum capsici* are the major constraints for cultivation of the crop across the country (Chatapdhayay and Maity, 1967; Sakseua and Mehrotra, 1970). Leaf rot can damage the crop immediately when it attacks the betle vine (Chaurasia, 1976). Leaf rot and foot rot have been reported to be Causal organism by *Phytophthpra palmivora* and leaf rot may Causal organism 30-100% leaf yield loss (Maiti and Sen. 1997). The relative humidity favors the enhancement of the leaf rot disease (Kumar and Kumar, 2004; Kumar, 1999).

In India, betel vine is cultivated as an important cash crop. Betel leaves are good export plant. The betel farming activities can generate employment opportunities for the peoples especially for villagers throughout the year. In India further, as far as the national employment generation is concerned, about 20 million people derive their livelihood directly or indirectly from the production, processing, handling, transportation and marketing of betel leaves. It is the most important cash crop. The necessity of this plant justifies its nomenclature as the "GREEN GOLD OF INDIA". So, attempts have been made to study the disease of leaf rot, powdery mildew and leaf spot diseases and try to find out control measure of this diseased plant.

**Study Area**

Purba Medinipur is the part of lower Indo-Gangetic and Eastern Coastal plain. Total area is about 4735 $km^2$ and covers rural population is 93.55 % with about 1129 inhabited villages with Literacy percentage 87.67. This area is important for its adjacent tourism.

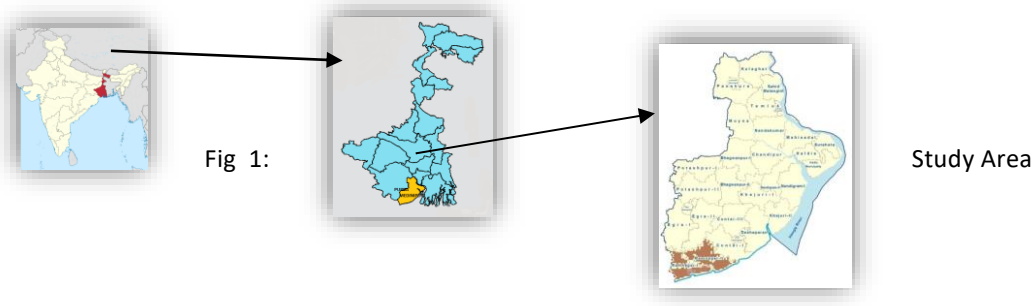

Fig 1: Study Area

**Materials and Method**

This study was done from August 2016 to September 2018 based on our field study of the 'Boroj'. The interactions with the farmers with some questioners throw light on the different diseases which Causal organism widespread damage to the crop and the pathogens causing those diseases. We also interact with them for the indigenous practices for the control of disease. The causal organism, symptoms and indigenous remedial measures of different betel vine diseases are summarized.

Fig. 2; *Piper betel* planted site

**Observation and Discussion**

1. **Foot rot disease induced by *Phytophthora***: -This is the most important disease in betel vine especially in the mitha paan (sweet betelvine).

**Causal organism:** This disease occurs due to a fungus called *Phytophthora parasitica*. The disease is spread by the soil and drainage water. It spreads in moist rainy conditions.

**Symptoms:** The node region near the soil have black spots. During the rainy season, the petioles have these black spots. The petiole rots and dries up. Leaf rotting can also occur due to this pathogen. A whole 'boroj' can be affected by this disease when the temperature is high during onset of the rains.

**Control measure:**

i) The cuttings should be treated with Bordeaux mixture or 0.15% Ridomil solution.

ii) The plant roots should be treated with Bordeaux mixture (1.0%) before rainy season.

iii) In the rainy season 0.5% Bordeaux mixture should be sprayed on both sides of the leaf.

Fig.3; foot rotted plant

**2. Foot rot disease induced by *Sclerotium*: -**This disease is most common in the Bangla Paan (Bengal betelvine). Initially it occurs in patches in a 'Boroj' and then spreadsto the whole 'Boroj'.

**Causal organism:** *Sclerotium* sp. induced foot rot disease can spread through soil. This disease occurs from the onset of rainy season to the onset of winter. Warm and moist conditions are favuorable for the spread of this disease.

**Symptoms:** The black spots are seen on the stem near the soil and underneath the soil. These black lesions are seen from the underneath of the soil to about 8-10 cm. above the soil. The leaves become yellow and are shed from the plant. Infected regions show some white fungal cover or mycelium of the fungi. This disease can occur at any age of the plant at any time.

**Control measure:**

i) Nitrogen fertilizers should be applied in adequate amount.

ii) Fungicide Brasicol (15-20 kg per hectare) should be applied.

iii) The infected plant should be uprooted and destroyed.

iv) The soil after uprooting should be treated with lime water or dilute bleaching powder or neem-turmeric solution to reduce the spread of the disease.

**3. Root rot disease induced by *Rhizoctonia* sp.: -**Tis is also a fungi-induced disease. The rot generally occurs under the soil in the roots.

**Causal organism:** *Rhizoctonia bataticola* is the causal organism of the disease, found beneath the soil.

**Symptoms:** The symptoms occur over the soil near the base of the shoot. The reddish-brown lesions are found to occur on the older roots and seem to cover the shoot near the soil.

Fig. 4; Root rot infected plant

**Control measure**

i) Any type of copper-containing fungicide like Bordeaux mixture, Blitox-30 and blue copper can be applied.

ii) The cultivation area should be neat and clean.

iii) The affected area should be cut and removed to reduce the intensity of the disease.

**4. Leaf and shoot rot disease induced by *Phytophthora*: -**This disease is very widespread in Purba Medinipur district. Mostly, the lower leaves of the plant are affected.

**Causal organism:** *Phytophthora parasitica* is the causal organism spread by soil. The spread of the disease occurs in humid conditions in the rainy season.

**Symptoms:** The circular dark brown lesions with grayish-brown halo around it occur on the leaves which spread very quickly. If these lesions occur in the margins, the leaf shrivels. Widespread lesions result in the shedding of leaves, in some other cases there are holes in the leaves. Thus, the leaves are not marketable.

**Control measure:**

i) Copper oxychloride (300 gm. in 100-liter water) solution should be sprayed at an interval of 15 days.
ii) Dithane z-78 (300gm. In 100-liter water) and Ridomil (15%) should be sprayed to reduce the disease.
iii) The affected plant parts should be removed.

**5. Leaf spot disease induced by *Colletotrichum* sp.: -** This disease is widespread in entire Purba Medinipur.

**Causal organisum:** *Colletotrichum piperis* a soil borne fungi is the causal organism. The disease increases in rainy season.

**Symptoms:** Black or brown spots occur on the leaves. The spots may be of different shapes and sizes. Many spots coalesce with one another to become large spots. A yellow halo is found circling the spots. The spots can be seen on the margins of the leaves. Increased infection results in the brown lesions on the petiole and shoots. This disease persists throughout the year but mostly occur in warm and humid conditions.

**Control measure:**

i) 0.5% Bordeaux mixture should be sprayed on the petiole and both sides of the leaves at the onset of the rainy season at an interval of 15 days.
ii) The 'boroj' must be cleaned of garbage and affected portions should be destroyed.
iii) Cow dung water should be applied on all boundaries of the 'boroj' in the morning.

Fig. 5; Broad black spot-on leaf

**6. Leaf spot disease induced by bacteria: -**The symptoms of this disease are similar to *Colletotrichum* induced disease.

**Causal organism:** *Xanthomonas betlicola,* a bacterium is the causal organism. It is soil borne and spreads through soil.

**Symptoms:** Numerous black spots are seen on the leaves. They coalesce to form larger spots. There is a halo of yellow surrounding the inner black spot. The ventral surface of the leaves is appearing water soaked. But *Colletotrichum* induced spots appear to be dry. This is the main difference between the two diseases. Sometimes both the symptoms are seen in the same plant. When the symptoms spread to the shoot region, it becomes black and water soaked with glue-like exudates ultimately resulting in the breakage of the affected shoot portion.

**Control measure:**

i) 0.5% Bordeaux mixture sprayed at an interval of 15 days on both sides of the leaves can reduce the infection.
ii) 0.015% streptomycin sulphate spraying should be done after an interval of 15 days when the disease is first seen.
iii) Garbage and infected portions of the plant should be removed from the'boroj'.
iv) Cow-dung water should be applied outside the 'boroj' and neem-turmeric water can be used for effective control of the disease.

Fig. 6; Black spot-on leaf

**Overall disease control techniques in betel vine: -**

i) The cultivation area or the 'boroj' land should be chosen such that irrigation water or rainwater does not stand in the soil and is drained off quickly. For this reason, the center of the land should be 5 cm. higher than the boundaries.
ii) A tent made of polythene should be erected over the 'boroj' so that rainwater do not fall on the plants. This tent should be removed after the rainy season.
iii) Formalin solution at the rate of 1 litre on 1 sq. m. should be applied on the soil and the soil should be covered with polythene sheet. After 15 days the plant should be sown.
iv) Shoot cuttings should be obtained from disease-free 'boroj'.
v) Cuttings should be immersed in copper oxychloride and antibiotic (Agrimycin-100) solution.

vi) After sowing, a copper containing fungicide should be sprayed and then after every 15 days.
vii) During the spring season, for better ventilation the cover around the boundaries should be opened for 7/8 days.
viii) Tulsi plant should be planted at several places inside the 'boroj'.
ix) After every 3-4 days the smoke of Gandhak, dhuna and karpur should be given to reduce the intensity of infection. X) To reduce the foot rot and leaf rot disease Ridomil (15%) should be sprayed.

**Insects causing diseases in betel vine: -**

1. White and black fly:

Structure and mode of attack: They remain in groups at the tip region of the shoot. Their eggs are laid in circles or unevenly on the ventral surface of 2/3 leaves on the dorsal surface.

Infection: They suck the plant juice from the young stage. Yellow lesions occur on the leaves reducing its market value.

Time: The attack is most severe before and after the rains in the month of October-November.

2. Jab bug:

Structure: The bug is green in colour and small. They suck the juice of the leaves. As a result, the growth of the stem stops, and the leaves become wrinkled. The sweet juice secreted by the bug form a covering on the lower leaves. Thus, photosynthesis process is affected, and leaves fall off.

Time: The attack is most severe near the end of winter season i.e., January to end of February.

3. Aansh bug:

Structure: It looks exactly like the scales of fish. They remain attached to the shoot and stalk of the leaves. The egg sacs are attached to the full-grown bug.

Infection: They suck the juice of shoot and leaves. So, the growth of shoot is affected. The yield also becomes low.

Time: The attack is seen at the end of rainy season and the onset of winter season i.e., from October to November.

4. Daye bug:

Structure: The bug is soft and milky white in colour. The bugs lay their eggs at 10-12 cm. beneath the soil in special sacs. After the hatching the young bugs remain in groups at the base of the shoot.

Infection: The bugs start from the base and infects slowly the tips of the shoot. They suck the juice after attaching to the shoot tip and leaves.

Time: The attack can take place anytime of the year.

5. Jassid:

Structure: They have brownish colour. They infect the betelvine in its young and adult stage. The young stage has small size and two tail-like structures at its back.

Infection: They suck the juice of the plant. They reside predominantly on the shoot, leafstalk and lower surface of leaf.

Time: It is found throughout the year except the winter season.

**Steps to control betel vine diseases by bugs: -**

The leaves of betel vine are chewed directly by human beings. So indiscriminate use of chemical pesticides can produce health hazards and is not safe.

The use of biopesticides as a substitute for chemical fertiolizersis increasing for this reason. In this respect the extracts of neem, nishinda, basak leaves, tulsi leaves, tobacco leaf and turmeric water are used for this purpose.

Some chemical pesticides like Malathion, Nuvan can be used for checking the above diseases. Nuvan (75%) per litre water can be used at the rate of 0.6 ml. can be used. It is to be noted that the spraying should be done on the lower surface of the leaf. Leaf plucking should not be done before one week of spraying the pesticide.

## CONCLUSION

Betel vine is an important cash crop of West Bengal as well as in India. In Purba Medinipur many farmers are associated with the cultivation of this crop. It is especially important for the economic boost up for this area.

But due to the attack of some bacteria, fungi, and insects this crop is very prone to diseases which decrease the market value of its product. The project also documents the methods for proper management of the diseases for the betterment of the farmers and the society. A well-coordinated effort by the farmers, traders, scientists, administrators, and policy makers is required to boost up the national economy through proper exploitation of this green gold.

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