

Report of insect pests and diseases in Pippali and Sarpagandha from Assam



Pathology

KEYWORDS: Pippali, Sarpagandha
Citrus black fly, Mealy bug, Nematode, Scale insect

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ABSTRACT

Piper longum commonly known as 'Pippali' and *Rauwolfia serpentina*, 'Sarpagandha' are two important medicinal herbs. The productivity of these crops is highly affected due to the attack of different insect pests and diseases.

Sufficient informations on insect pests, diseases and nematodes in pippali and sarpagandha from North Eastern part of India is relatively scanty, for that a survey programme was undertaken to study the occurrence and distribution of these two plants throughout the state of Assam and secondly to study the occurrence of different insect pests, diseases and nematodes in these crops. The symptoms observed due to pest attack are stunted growth, deformation and yellowing of leaves and tender shoots, root galling, and loss of vigour etc. Important insect pest reported from pippali is Citrus black fly and in sarpagandha, scale insect and mealy bugs were found abundantly. In pippali, Phytophthora blight and Cucumber mosaic virus (CMV) were also recorded. Root-knot nematode infestation has been found in both the plant species where severity was more in sarpagandha.

INTRODUCTION

Plants have been the source of medicine since thousands of years (Hammer *et al.* 1999 and Bishnu *et al.* 2011). Indian subcontinent is one of the World's twelve leading Biodiversity Centres, encompassing sixteen different agro-climatic zones and about 426 habitats of specific species. It has been estimated that about 45,000 plant species (nearly 20% of the global species) occurs in the Indian Sub-continent of which about 3500 species are having medicinal values (Chatterjee, 2002). *Piper longum* L. (Piperaceae), one of the medicinal plants, commonly known as 'long pepper', is widely distributed in the tropical and subtropical regions of the world, throughout the Indian subcontinent, Sri Lanka, Middle Eastern countries and in Americas. *Rauwolfiaserpentina* or 'Snakeroot' or 'Sarpagandha' is a medicinal plant in the family Apocynaceae. The roots and fruits (spike) of pippali contain piperine and pipartine alkaloids. In Ayurveda the roots are used as a carminative, tonic to the liver, stomachic, abortifacient, aphrodisiac. Whereas the fruits possess haematinic, diuretic, digestive, general tonic, besides being useful in inflammation of the liver, pains in the joints, and night blindness. Similarly, the roots of sarpagandha contains 1.0 to 1.9% total alkaloids depending upon the quality of roots. The drug is suitable for mild anxiety or patients of chronic mental illness. It is useful in diseases of bowels and in fever (Annon, 2017). The production of both these two crop is very limited due to many factors of which, pests and diseases are important. Due to over exploitation of these two plants in nature, they have become rare and endangered. Problems arising out of rapid genetic loss of medicinal plants forced the need for international co-operation and co-ordination to undertake programmes for conservation of medicinal plants to ensure that adequate quantities are available for future generations (Chatterjee, 2002). Considering the economic importance of these high valued crops the present study on occurrence and distribution of pippali and sarpagandha in Assam and also occurrence of different pests and diseases has been undertaken with a view to protect these plants in a safer way there by preventing huge losses.

Materials and Methods

A random roving survey was undertaken to study the occurrence and distribution of pippali and sarpagandha, along with insect pests and diseases from different districts of Assam during 2015-2017 (Plate 1 a, b). Soil and plant samples from pippali and sarpagandha were collected along with different insect pests and diseases. Infected

pippali and sarpagandha plants showing typical symptoms of disease, root samples showing root galls, root necrosis were collected and kept separately. Depending upon the availability of plants, 170 plants/soil samples of each has been randomly collected and data pertaining to insect pests were recorded. Per cent plant infestation was recorded by using the following formula:

$$\text{Per cent infestation} = \frac{\text{No of infested plants}}{\text{Total no of observed plant}} \times 100$$

The nature of damage by each insect was observed and documented. The immature/mature insects recorded on the plants were collected and reared in the laboratory of Department of Entomology, Assam Agricultural University, Jorhat. Identification of specimen was based on morphological characteristics studied under simple and compound microscope.

Fungal diseases were identified based on symptomology study and its mycelial and conidial characteristics following standard mycological keys (Barnett and Hunter, 1972). Viral disease was identified with the help of symptoms and by using Serological detection technique ie., ELISA.

Extraction of nematodes from soil was done by modified Cobb's Sieving and Decanting Technique (Christie and Perry, 1951) where a series of sieves (20, 60, 150, 250 and 350) were used for extraction of nematode from soil. Killing and fixing of nematodes was done by treating nematodes with 8 per cent boiled formalin solution. For staining of nematodes in plant tissue, Acid fuchsin in lactophenol method was followed (Byed *et al.*, 1983).

Result and Discussion

A random roving survey was conducted to see the distribution and abundance of these two medicinal plants in Assam. Pippali a wild native of Assam, is found abundantly throughout the districts of Assam, across different Agroclimatic zones mostly in wild form. Sarpagandha is also found throughout the state of Assam, in wild, domesticated and commercialised forms.

Both these plants are susceptible to different insect pests, nematodes and diseases caused by fungal, bacterial and other agents. The

information recorded with respect to occurrence and distribution of insect pests and diseases on these two medicinal plants during the survey (Table 1) revealed that highest record of insect and disease infestation of 30.58 per cent was found in sarpagandha followed by 24.11 per cent in pippali. There was record of three major insect pests belonging to order Hemiptera, associated with pippali and sarpagandha from different parts of Assam (Table 2).

The major insect pest recorded from pippali is Citrus black fly (*Aleurocanthus* sp.). It belongs to the order Hemiptera and family Aleyrodidae. It is found to aggregate in huge number (Plate 2. a, b), feed the plant from the lower surface and damages the leaf by sucking nutrients from it, resulting in weakening the plants. Besides this citrus blackflies excrete honeydew like substance on the lower leaf surface due to which sooty moulds develop on the upper surface, which was clearly visible on infested leaves (Plate 2. c. and d). Sooty moulds make a coat on the surface of pippali leaves, giving a dirty black look of the leaf (Plate 2. c and d). Sooty mould growing on honeydew deposits blocks light and air from the leaves, severely reducing photosynthesis and leaf respiration. This can reduce fruit set by up to 80% or more.

Microscopic observations of citrus black fly reveals that the nymphs are black in colour with prominent spines (Plate 3. a). On the tip of the spine droplet of honeydew can be seen (Plate 3 a). Citrus blackfly has several natural enemies. One parasitic wasp (*Encarsia* sp.) has been observed during this study (Plate 3. b).

A fungal disease caused by *Phytophthora* sp. (Phytophthora blight) and a viral disease caused by Cucumber mosaic virus (CMV) was also recorded from pippali. Typical symptoms observed in case of Phytophthora blight are, dark spots with fimbriate margins appear on the leaves enlarge to cover the lamina and finally spreads to stems (Plate 4). If the plant stems are infected, an irreversible wilt of the foliage occurs leading to the death of the plant. Microscopic study revealed sporangia of *Phytophthora* sp. with conspicuous papilli (Plate 5).

Cucumber mosaic virus has also been recorded from most of the infected samples. CMV causes a systemic infection in host. The initial symptom starts with chlorosis of young leaves (Plate 6), over the basal portion of the leaf or over the entire leaf. Mosaic pattern developed encompassing the entire leaf. Symptoms with varied degrees of deformation including sunken interveinal lamina with protruding primary veins were observed. Plants, were deformed and stunted in growth.

Root-knot nematode, *Meloidogyne incognita*, was also prevalent in pippali in some of the surveyed areas. *M. incognita* belongs to the order Tylenchida and family Heteroderidae. The roots of root-knot nematode infected pippali were moderately galled with small curved galls (Plate 9 a). Microscopic examination of the galls revealed the presence of adult females, eggs and juvenile stages of *Meloidogyne incognita* in the vascular region of roots (Plate 9 b). The females, pyriform in shape while males were vermiform (Plate 11 b).

In sarpagandha, scale insect (*Saissetia* sp.) was found to be the most devastating pest in the western districts of Assam. It belongs to the order Hemiptera, sub order Sternorrhyncha and superfamily Coccoidea. Hemispherical scales were found clustering on the shoots, leaves, and young fruit of sarpagandha plants (Plate 7). It infects lower surface of leaves along with the mid ribs and mid veins. They are also found on petioles and tender shoots. Scale feeds on the plant sap and causes loss of vigour. Leaves turn yellow and drop down resulting in sick plants. The toxins in the saliva of scale insect also induced brown spots on the foliage.

Another important insect that has been recorded in sarpagandha was mealy bug (*Corcidiomyces* sp.). It belongs to the order Hemiptera and family Pseudococcidae. The nymphs and adults of mealy bug remain on the under surface of the leaves and stems and

suck the sap resulting in deformation of the leaves and branches. Affected plants turned yellow, followed by wilting and drying. Leaves showed crinkling appearance (Plate 8 a). Bugs secrete honey dew that favors development of shoot mould which in turn affects the photosynthesis process by the leaves. Presence of honey dew also invites ants (Plate 8.b).

Root-knot nematode, *Meloidogyne incognita*, was prevalent in almost all the surveyed sarpagandha growing areas. The roots of root-knot nematode infected sarpagandha are profusely galled (Plate 10. b). Adult females, eggs and juvenile stages of nematode were present in the vascular region of roots. The females were pyriform in shape. Infected plants were pale green (Plate 10. a), stunted and exhibited unthrifty growth.

Conclusion

Both these medicinal plants are susceptible to diseases and pests. Citrus black fly in pippali and scale insect and mealy bugs in sarpagandha, were prevalent in most of the areas of Assam. Phytophthora blight and Cucumber mosaic virus (CMV) were also found in abundance, which can cause huge loss to the crop. Abundance of root knot nematode was also confirmed in sarpagandha and pippali growing areas of Assam. Further studies need to be conducted on distribution, abundance and seasonal population build up, and yield losses due to these pests in the host concern.

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Table 1. Record of insect, and other disease causing organisms from the collected samples

SL No.	Targeted Medicinal Plants	Total No. of Plants	Healthy	Disease infected	% Infestation
1	Pippali	170	126	44	24.11
2	Sarpagandha	170	118	52	30.58

Table 2: Record of infected samples and per cent disease or pest infestation

Plants	Samples	Diseases		
		Insect	Nematode	Fungus/Bacteria/others
Pippali	170	10	13	21
Sarpagandha cuttings	170	36	16	-

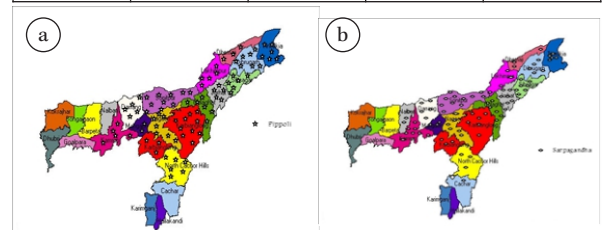


Plate 1 a, b. Distribution of Pippali and Sarpagandha in 15 districts of Assam



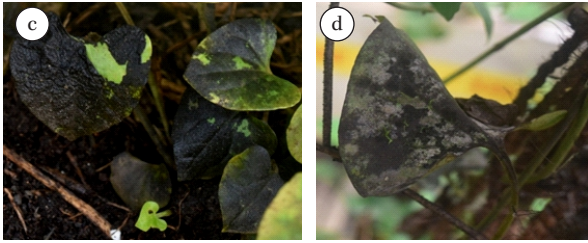


Plate 2: a, b. Heavy infestation of citrus black fly on Pippali, c, d. Sooty mould development on infested leaves

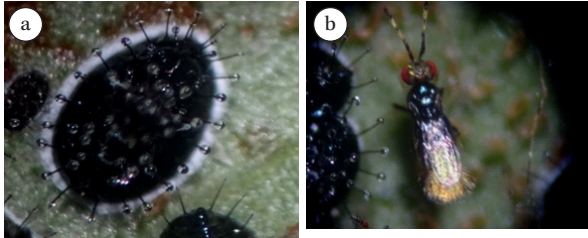


Plate 3. a. Pupae of the citrus black fly, b. Adult parasitic wasps

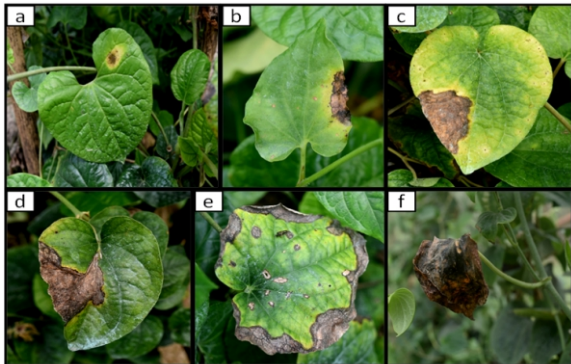


Plate 4. Symptoms of Phytophthora blight disease in Pippali

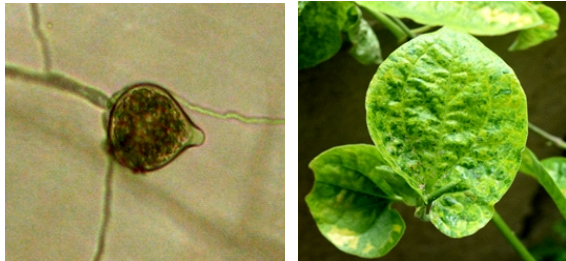


Plate 5. Sporangium of Phytophthora with conspicuous papeli



Plate 6. CMV infection in Pippali

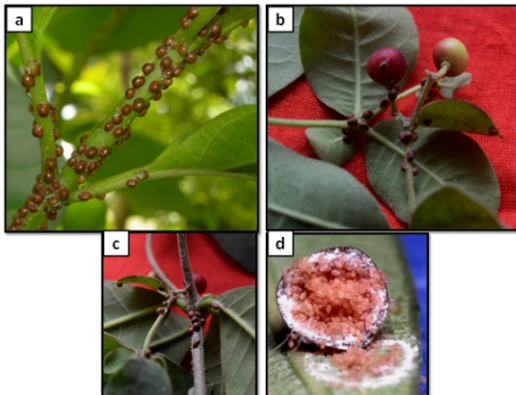


Plate 7. a, b, c, and d. Scale infestation in Sarpagandha

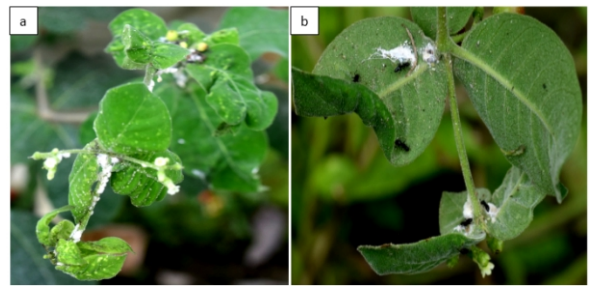


Plate 8. a, b. Mealy bug infestation in Sarpagandha



Plate 9. a. Symptoms of root knot nematode infestation in pippali, b. adult female root knot nematode inside the stained root



Plate 12. a. Symptoms of root knot nematode infestation in sarpagandha, b. galling in roots of sarpagandha

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