

Pests and Diseases of Rubber in North East India

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ABSTRACT

Leaf diseases of rubber caused by *Corynespora cassiicola* and *Guignardia heveae* (leaf spot); *Bipolaris heveae* (bird's eye spot); *Colletotrichum gloeosporioides* (leaf anthracnose); *Oidium heveae* and *Gloeosporium alborubrum* (SLP) were noticed in all the plantations visited. High intensities of *Gloeosporium* and *Oidium* leaf fall occurred in all stages of growth of rubber plants in most of the locations and caused repeated defoliation and die-back. High incidence of *Oidium* was also observed on flowers causing wither and drop off. Abnormal leaf fall disease caused by *Phytophthora botryosa* was noticed in a few plantations in Tripura in 1988. High intensity of pod rot caused by *Phytophthora* and *Gloeosporium* was found in most of the plantations in Assam, Tripura and Meghalaya. Low incidence of pink disease (*Corticium salmonicolor*), bark canker (*Phytophthora* sp) and brown root rot (*Phellinus noxius*) were noticed in a few plantations of Assam and Tripura. Mild attack of termites, slugs, snails and caterpillars were also observed in some plantations. Severe infestation of scale insects (*Saissetia nigra*) was found in most of the plantations in Assam and Tripura and caused severe damage of plants in some of the cases.

INTRODUCTION

The para rubber tree (*Hevea brasiliensis* Muell. Arg.) is one of the most important economic crops of the tropics occurring more abundantly in the rainfed zone of Africa, South East Asia and Tropical South America producing 99% of the world's natural rubber. In India, rubber has successfully grown in the hinterlands of the South West coast comprising of Kerala and the adjoining districts of Tamilnadu and Karnataka. Development of rubber plantations in North Eastern (NE) region has been taken up 3 decades ago and it is established successfully.

As the rubber plant has become an important plantation crop in NE India, investigation on the detrimental effects on health and vigour of rubber is very essential. It is known that the rubber plant

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is highly susceptible to various diseases and pests by which growth and yield of rubber is much affected (Murray, 1933; Hilton, 1959, Rao, 1975; Yu Zhuotong, 1989). Moreover, the virulence of each disease or pest varies from one locality to another and this variation is dependent primarily on the environmental and cultural conditions under which the crop is grown. the presence of agro-climatic factors like uniformly high temperature (25 to 35°C), high humidity and well distributed rainfall in most parts of the year in NE region are much congenial for the occurrence of diseases and pests. As the scientific report on the incidence of various diseases and pests on rubber in NE region is not available, a survey of various disease and pests has been carried out.

MATERIALS AND METHODS

A survey was conducted in 1987-89 during winter, summer and rainy months in 175 locations of rubber growing areas of Assam, Meghalaya, Tripura and Mizoram and the observation was made on the seasonal occurrence of various diseases and pests of rubber and damages caused by them. The intensity of foliar diseases were assessed by scoring as low, medium and high following the methods described by Harsfall and Heuberger (1942). For diseases like pink and bark canker, the sampling methods was same but in place of individual leaves, the branches were taken for recording the grade of disease. For root rot disease, the sampling unit was individual plant on which grade of disease was reported. The causal organism of each and every disease was isolated in pure culture at laboratory from diseased samples. The causative agencies of the diseases specimens were identified by laboratory studies and also confirmed it by International Mycological Institute (IMI), England.

RESULTS AND DISCUSSION

Secondary leaf fall (SLF) diseases

The SLF disease caused by *Oidium heveae* Steinm (Powdery mildew) was noticed on tender leaflets in all stages of growth of rubber plants in 175 locations of Assam, Meghalaya, Tripura and Mizoram during December to May (Table 1). During survey, *Oidium* was noticed as dominant pathogen in most parts of the rubber growing tracts at the altitude of 150 to 500 m particularly at the time of refoliation after wintering. Disease intensity was measured and 60 to 70% trees were found to be affected severely and showed 50 to 90% powdery patches on tender leaflets resulting in repeated defoliation and die-back of branches in most of the locations surveyed. Flowers were also affected with *Oidium* resulting a considerable loss in seed production. High intensity of *Oidium* leaf fall was noticed in PB 5/51, 1; PB 86, and Tjir 1 as compared to other clones indicating thereby that these clones are highly susceptible to *Oidium* disease. The severe outbreak of this disease was positively correlated with the factors like uniformity of wintering, speed of refoliation, susceptible clones, elevations of plantation, cloudy weather with damp night and very light shower of short duration. The intensity of this disease was very less after May might be due to presence of frequent rain or heavy showers which is inimical to the spread of the pathogen (Fernando, 1971). A carpet of immature shrivelled and blackened fallen leaflets (2 inch. long) on the ground in some of the plantations in Assam and Meghalaya indicated that the environmental and cultural conditions are most favourable for severe manifestations of this disease.

Another type of SLF disease caused by *Gloeosporium alborubrum* Petch was noticed on tender leaflets of all ages of rubber plants during April to September in all 175 locations surveyed. High intensities of *Gloeosporium* leaf fall (GLF) was noticed during rainy season in most of the mature plantations (Table 1) in Meghalaya and Assam caused repeated defoliation and die-back twigs and branches resulting loss in vigour and growth. The severe manifestation of this disease was also noticed in RR11 105, RRIM 600 and PB 86 as compared to other clones. High incidence of GLF was also observed in seedling nursery in some of the areas in East Khasi Hills and West Garo Hills of Meghalaya and in some areas of Assam and Tripura (Table 1) resulting defoliation and die-back of shoots. Pod rot caused by *Gloeosporium alborubrum* was noticed in most of the mature plantations in Tripura, Assam and Meghalaya resulting a considerable loss in production of viable seeds.

The severe outbreak of *Gloeosporium* SLF disease in some of the locations in Meghalaya and Assam during rainy season revealed that the environmental and cultural factors are most favourable to attack as the refoliation period is prolonged due to high incidence of *Oidium* disease. GLF is essentially a wet weather disease but unlike *Oidium* and *Phytophthora* leaf disease, it is not confined to any particular season of the year although virulent attacks generally occur only in the monsoon periods. Wimalajeewa (1965) reported that the ability of the spores of this fungus to withstand relatively high temperature for longer period without losing viability and their capacity to germinate in humid conditions in the apparent absence of free water makes this disease a constant source of danger throughout the year. Several workers reported a considerable loss in vigour and yield due to high incidence of *Gloeosporium* SLF disease in mature plantations (Wimalajeewa, 1963; Wimalajeewa and Lloyd, 1963; Liyanage *et al.*, 1971; Ismail, 1983).

Abnormal leaf fall and pod rot

The abnormal leaf fall and pod rot (ALF/PR) disease caused by *Phytophthora botryosa* (Chee) was noticed in May/June 1988 at Pathalia and Paticheri Rubber Estate of TFDPC, Tripura during South West monsoon. A carpet of bright-green matured leaves with 1 or 2 chocolate-brown or dark-brown lesions on petiole along with 1 or 2 white spots of coagulated latex in the middle of each, was found on the ground in severely affected rubber gardens at Patichery. Due to high incidence of the disease, extensive die-back of twigs and branches were also noticed in most of the affected trees. High incidence of pod rot with a drop of coagulated latex on the surface of the infected lesions of downy white growth was noticed in most of the rubber plantations in Assam, Tripura and Meghalaya in 1988 and 1989 (Table 1). About 50 to 60% trees mostly on the peripheral zone, and 60 to 80% pods were affected with this disease resulting 70 to 80% defoliation (seedling plantation in 1963-64 at Patichery). The affected pods remained attached on the trees in blackened, mumified and undehiscent conditions.

Although the *Phytophthora* leaf fall and pod rot is a serious disease of rubber in South India 75 to 85% defoliation is probably in absence of treatment resulting in a 30 to 50% loss in yield (Ramakrishnan, 1960). The severe outbreak of this disease in 1988 in NE region was normally confined only to isolated belt of South Division in Tripura. Very low incidence of abnormal leaf fall of rubber occurred in 1989 at Pathalia and Patichery might be due to unfavourable weather conditions in spite

Table 1. Diseases surveyed in rubber plantation of North East during 1987-89

Assam			Meghalaya			Tripura			Mizoram		
A	B	C	A	B	C	A	B	C	A	B	C
Sarutari	5	...*	Pallenckata	1		Taranagar	7	...*	Tuichhaum	3	
Topatoli	2	...*	Killing	3	...*	Madhuban	4		Bilkawthlir	3	
Darangiri	1		Burnihat	2		Anandanagar	3				
Nayekgaon	7		Umling	5		Suryanagar	3				
Bargaon	5	...*	Moranagar	1		Zirania	2	...*			
Burepahar	4	...*	Ganolgre	5		Lathichera	2	...*			
Rongagora	2	...*	Darachigre	2		Nagichera	2				
Bargang	2		Rani	2	...*	Warangbari	5	...*			
Ouguri	5	...*	Kharkutta	2	...*	Promodnagar	5				
Chandrapur	4	...*	Baghmara	7	...*	Khowai	5	...*			
Dolamara	3		Gurpani	3	...*	Toxapara	3	...*			
Panbari	2		Gaobari	3		Simna	3	...*			
			Dambukapal	5	...*	Bankumari	4				
			Thebrongiri	3		Paticheri	5	**			
			Damjongiri	4		Pathalia	5	**			
			Garobada	3		Takmachera	9	...*			
			Mendipathar	5	...*	Tulakona	3				
						Bogafa	3				

A=Name of Places; B=Nos. of rubber gardens visited in each place; C=Disease prone areas.

*= High intensity of Oidium & Gloeosporium SLF and Corynespora leaf spot present;

**= High intensity of Phytophthora leaf fall present.

of the presence of heavy inoculum on the infected pod surface. According to Peries (1969) if the temperature is not above 20 to 28°C; relative humidity above 80%; at least 0.1 inch of rain per day and less than 3 hours of sunshine/ day prevail for 4 consecutive days when the infected fully mature green pods are present on the trees, leaf fall epidemics can be expected to occur within 14 days. Daily rainfall is more important in governing the severity of the disease during the period when mature pods are present on the trees (Satchuthsananthavale and Danttanarayana, 1973; Liyanage *et al.*, 1983).

Corynespora leaf spot (CLS)

The leaf spot disease caused by *Corynespora cassiicola* (Berk. & Curt.) Weir. was found only in nursery plants during December to March in most of the locations surveyed in Assam, Meghalaya and Tripura. The infected lesion was noticed on tender as well as just maturing leaflets particularly along the veins showing the characteristic symptoms of vein necrosis from the necrotic zone backwards on lateral veins towards the main veins. The severe outbreak of the disease was mainly noted in seedling nursery in several locations of Assam and Meghalaya (Table 1). About 50 to 60% plants were affected with this disease and caused 60 to 70% defoliation leading to die-back of shoots and eventual death in most of the daces. The severe outbreak of CLS disease is mainly confined to seedling nursery, yet the incidence of the disease poses much problem. Repeated defoliation due to attacks of *Corynespora* resulted in the severe retardation of growth, extending the period of immaturity and ultimately causing die-back of shoots or death of plants. Several workers reported that even a single small lesion on any parts of the leaf is sufficient to cause leaf fall indicating thereby that a toxin may be involved in the disease syndrome (Onesirosoan *et al.*, 1975; Liyanage and Liyanage, 1986; Liyanage *et al.*, Chee, 1988).

Leaf anthracnose

The leaf anthracnose caused by *Collectotrichum gloeosporioides* Penz. was noticed on semi-matured as well as just maturing leaves mainly in nursery plants in most of the locations surveyed in Assam and Meghalaya during March/April showing the symptoms of characteristics targetlike concentric zones formed by lines of spore masses in tiny black bristles. In some of the areas of plantations particularly in budwood nursery 10 to 15% were affected with the disease and the intensity of infection was below 30%.

As the occurrence of leaf anthracnose disease of *Hevea* is confined only to nursery plants and caused very little damage, it is considered to be a minor on this crop at this stage in NE region.

Bird's eye spot

The Bird's eye spot (BES) disease caused by *Bipolaris heveae* (Petch) v. Arx. was noticed on immature as well as semi-matured leaves mainly in nursery during February to May in most of the locations surveyed. The circular infected lesion (1-3 mm in diameter) showed the typical symptoms of shot-holes with reddish-brown margin. The disease intensity was assessed and found 30 to 40% infection on semi-matured leaves.

Although BES is a common leaf disease of *Hevea* the damage caused by it is very less and therefore, it is considered to be a minor in NE region. It is reported by some workers that due to

high leaf spotting the photosynthetic capability may be reduced which ultimately leads to loss of vigour of plants resulting thereby some delay in growth of plants to reach optimum size for budding operation and also decrease in budding success (Hilton, 1952; Rao, 1975).

Guignardia leaf disease

It was caused by *Guignardia heveae* showing the characteristic symptoms of pine-head size of rusty-brown leaf spots with yellow halos occurring on semi-matured leaves during Feb/March in budwood nursery plants (RRIM-600 and PB 235) in some of the locations visited in Assam and Meghalaya. The disease intensity was assessed and found below 20% infection and caused very little damage to plants. *Guignardia* leaf disease is less common in NE region which might be due to shorter periods of dry weather. Tan (1985) reported that the severe outbreaks of the disease can be seen in prolonged dry weather.

Pink disease

The pink disease caused by *Corticium salmonicolor* Berk & Br. was noticed on rubber plants (RRIM 600) at the age of 3 to 4 years at Bargaon Ruber Estate, APCDC, Assam and at Madhuban rubber plantation (Private) during July/August, 1988 with characteristic symptoms of exudation of latex followed by the appearance white, silky cob-web like mycelium on upper side of the bark surface just near the fork region. Dead branches with dried up leaves, long black streak of coagulated latex and many side shoots from dormant buds just below the diseased parts were also the characteristic symptoms of the disease. The severe outbreaks of the disease was never noticed in any plantations surveyed in NE region. However, in most of the rubber growing countries the pink disease is confined to certain areas only and the problem has never been serious. But when it occurs to main stem (18 months to 2 years old plant) and also to main branches (4 to 10 years old plant) during South West monsoon with the consequent loss of canopy which retards the growth and extend the period of immaturity of plants (Hilton, 1958).

Bark canker

Bark canker caused by *Phytophthora* sp. was noticed in some of the plantations at Ouguri Rubber Estate, APCDC, Assam and at Mandarin in Tripura during July/August, 1988. About 10 to 15% plants (RRIM 600) at the age of 3-4 years were affected and caused very little damage. The characteristic symptoms of the disease were noticed only at the advanced stage of infection showing bark bursts and oozing out of reddish or purplish coloured liquid. The incidence of bark canker disease is confined mainly to a few plantations of Assam and Tripura and caused very little damage to plants. However, there is greater possibility of the outbreak of this disease in severe form as the environmental and cultural factors of NE region are congenial to the incidence of the disease.

Brown root rot disease

The brown root rot (BRR) disease caused by *Phellinus noxius* (Corner) G.H. Cunn. showed the initial symptoms of partial or extensive discolouration of the foliage accompanied by cessation of growth resulting defoliation and die-back twigs and branches. The characteristic symptoms of blackish

mucilaginous sleeves encrusted with earth and gravel was noticed on lateral roots and tap root near the collar zone. The manifestation of brown root rot disease was found always in scattered form where it occurred and noticed only in one rubber tree at the age of 3 years at Toxapara and Khowai private plantation in Tripura during July 1988 and one at Sarutari Research Farm (Assam) at the age of 5 years during September 1989 which ultimately caused a total loss of the affected tree.

Early detection of BRR disease in the field is particularly a very difficult because of its slower growth in the soil. The occurrence of the root disease in NE region is confined to a particular place and the damage caused is very limited due to slow-growing root rot pathogen. Several reports indicated that the pathogen of the disease has not been studied extensively as the spread of the disease is very slow and normally affects a single tree in particular location for a longer periods (Jhon, 1966; Nicole *et al.*, 1986; Nandris *et al.*, 1987). The brown root rot pathogen loses aggressiveness and ability to spread towards a healthy tree with time (Geiger *et al.*, 1985). Nandris *et al.* (1988) reported that the decrease in susceptibility of rubber plants to the disease after 6 years of planting might be due to increase in defence reactions simultaneous with the age of host plants.

PESTS OF RUBBER

Although the disease problems of rubber in NE region are many and serious, pest infestations on this crop are comparatively very few and less serious. Among the various pests, termites, caterpillars, slugs and snails and scale insects are common in NE region.

Termites

Termite infestation was noticed on rubber plants at all stages of growth during October to April in most of the locations surveyed in NE region. The severe infestation was noticed in nursery particularly in polybag plants showing the symptoms of crinkled, distorted and discoloured foliage causing defoliation and eventual death of the plant. Termite infestation of aerial parts of the young plants was also noticed showing a sheet of mudwork over the trunk which caused injuries on bark surface inside the casing of mud and exudation of latex.

Caterpillars

Caterpillar, a bark feeding minor pest of rubber plants was noticed in some of the plantations in Assam and caused on damage to the living tissues. Occasionally it was noticed in large numbers on the tapping panel causing injuries to the newly tapped areas and overflowing of latex over the trunk.

Slugs and snails

Low infestation of slugs and snails were noticed in nursery and young plants in some of the locations surveyed in Assam (Bargaon, Ouguri, Tapatoli, Chandrapur, Sorutari, Burhapahar and Rongagora) and in Meghalaya (Umling, Killing, Ichamati and Byrnihat) during July to September. At the time of favourable weather they crawled up young rubber plants and drank latex from apical portions by lacerating the tender buds resulting in the development of several side shoots around the

apical region. Sometimes slugs and snails ascended the trees into tapping out and drank latex causing considerable spillage of latex from the cut.

Scale insect.

Infestation by scale insect was found to be comparatively more severe than pests in NE region. *Saissetia nigra* Nietn. infestation was noticed on any green parts of the young rubber plants in the nursery as well as in the field during April to September, 1989 in most of the locations surveyed in Assam and Tripura. The infestation was quite severe in most of the locations in Tripura during June to August 1989 during defoliation and die-back of twigs and branches.

Association of sooty mould due to sugary secretion by scale insect was also noticed in rainy season showing the symptoms of black coating on the upper surface of the leaves. Fortnightly, the growth of orange red coloured entomogeneous fungus (*Hypocrelia*) was found on scale insect by which the population of scale insect was killed eventually during the later part of rainy season.

Field observations on the pests problems in Hevea crop indicated that the importance of pest infestation in NE region is not very significant except that of scale insects and termites which caused considerable damage (Jayarathnam, 1968). Harris (1971) reported that the termite infestation in young rubber plantation can be facilitated by root disease or other injuries which can destroy the latex barriers. Scale insect infestation particularly in PB 5/51 at Sorutari Resarch Farm (Assam) caused severe damage to plants indicating thereby that this clone is very much susceptible than others. Fortunately, the scale infestation was found to be controlled biologically in nature by an entomogeneous fungus and reduced the damage caused, simultaneous with the increase in growth of entomogeneous fungus. Rao (1965) reported that the association of sooty mould on the leaf surface of scale insect affected Hevea crop is harmless to plants except for the preservation of sunlight falling on leaves required for photosynthesis.

Information obtained by field survey on pests and diseases of Hevea crop in NE region in the limited span of 3 years (1987-89) has revealed that although year to year regional variations are apparent, but consistent trends of general prevalence are detectable. Field observations indicated that the hevea crop is susceptible to several economically important diseases. However, SLF disease caused a potential threat to rubber crop in some of the areas in Assam and Meghalaya where weather conditions are conducive to infection by *Oidium* or *Gloeosporium* during refoliating period. Although the incidence of abnormal leaf fall caused by *Phytophthora* occurred in a few pockets of South Tripura division in 1988, it may spread all over the rubber growing tracts in NE region as the environmental and cultural conditions are most favourable.

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