ALL INDIA RUBBER
PLANTERS' CONFERENCE
MUNDAKAYAM
1966

DISEASES AND PESTS OF HEVEA RUBBER IN INDIA AND THEIR CONTROL

Paper by

K.V. GEORGE
Dy.Director (Pathology)
Rubber Board
Kottayam--9

---

paper presented on 28th december, 1966.

DISEASES AND PESTS OF HEVEA RUBBER IN INDIA AND THEIR CONTROL

K.V. George, Dy.Director (Pathology),
Rubber Research Institute of India, Kottayam-9.

...

The concept of a struggle for existence in the biological world, has a corollary, the idea of a balance of nature. Nature tries to maintain this natural balance through varied means, amongst which, incidence of pests and diseases forms an effective weapon. This natural balance can be modified by man in his efforts to suit better his needs.

Many of the problems in plants are a result of modern agriculture. Man through his agricultural practices, has created radical changes in the biological world in a relatively short period. This has upset nature's intricate system of checks, counter-checks and succession of populations. While nature tries to scatter plant species, agriculture tends to concentrate large populations of a single plant species, in definite areas, year after year. The outbreaks of pests and diseases serve to remind us of the disastrous results that can ensue when extensive areas are grown with one crop, in succession. In the cultivated plant, the interests of man, meet and clash with those of innumerable organisms and phenomena of nature.

When the rubber tree was growing wild in the mixed tree stands of primeval jungle conditions in the Amazon valley, its disease problems were not conspicuous and often obscured. But, when it was introduced to the East and vast contiguous stretches of monocultural plantations established, its disease problems became pronounced. In the Far Eastern countries where rubber was planted extensively, the experience in the different countries varied. The climatic factors, particularly, rainfall and its distribution, appear to determine to a great extent, the severity of various diseases in the different countries. In India, we have an array of fungal diseases, particularly serious on the foliage. And the ravages of these diseases and the resultant losses account to a great extent, the comparatively poor average yields obtained. Therefore, in any attempt to increase production of natural rubber in this country, effective disease control becomes imperative.

...2.

Amongst various fungal pathogens infecting different parts of the rubber plant, in different stages of growth, Phytophthora palmivora is the most important one. Many types of infection are caused by this pathogen and depending on the plant parts affected and the symptoms produced, the resultant diseases are known as Shoot rot, Pod rot, Bark rot, Patch canker and Abnormal leaf fall.

Abnormal Leaf fall disease:-

Abnormal leaf fall is the most destructive foliage disease of Hevea rubber and is capable of causing crop losses of 25 to 50%, consequent on premature defoliation. The disease first recorded in 1910, is now prevalent in all the rubber growing tracts experiencing a predominently heavy S.W. Monsoon. It makes an annual recurring occurrence during the wet weather months and fades away as the S.W.Monsoon rains recede. Fruit infections which start early in the season, provide the disease inoculum for later leaf infections, which normally occur only after the setting in of continuous rains. Cloudy weather, continuous rain and high atmospheric humidity favour quick spread of the disease. The economic losses caused by this disease is reflected in many ways: on young plants, shoot rot and the resultant retardation of growth, increases the immaturity period. On older plants, premature leaf shed result in considerable crop losses and deterioration of the trees soon follow. Availability of good viable seed for propagation purposes becomes very much restricted due to fruit infection.

As in the case of other plant diseases incited by fungal parasites, there are two main approaches towards control of this disease: viz. chemical control through fungicidal application and through evolving disease resistant material. The chemical control measures that have been developed and currently practiced in the country include, spraying of 1% Bordeaux mixture through conventional high volume sprayers, as well as oil based copper oxychloride formulations dispersed in suitable grades of mineral spray oil and applied either from the ground employing suitable low volume air blast sprayers or through aerial application employing air-craft. Spraying Bordeaux mixture on tall rubber trees is a slow, hazarduous and costly operation, necessitating large volumes of water at a time when acute scarcity is felt and hence its

application now, is essentially restricted to small holdings, even-though it provides assured effective protection from the disease. For spraying in nurseries and young plants in the field up to about four years after planting, this method would, however, be desirable.

Low volume air blast spraying technique employing Micron sprayers obviates most of the above difficulties. The speed of operation is fairly fast (10 to 12 acres per day), the labour force required is comparatively less and due to finely atomised spray, fungicide requirement for effective protection is considerably low - all these factors make the application highly economical. Against 10 to 15 pounds of copper per acre of mature rubber used while spraying with Bordeaux, only 3 to 4 pounds of copper are sufficient for satisfactory disease control while using the Micron. There are two models of Micron sprayers, viz. Mini-micron-77,5, the smaller unit suitable for spraying trees up to a height of 55 ft and Micron-420, the bigger model, suitable for spraying taller trees, up to a height of 75 ft. Oil based copper oxychloride is mixed with spray oil in the proportion of 1:5 and sprayed at the rate of 12 to 15 litres per acre of mature rubber. For highly disease susceptible planting materials like PB 86, it is desirable to give two rounds of spray each with 8 to 9 litres of the fungicide-oil mixture (1:6 Prop.). For immature rubber, a single round of spray with 7 to 9 litres of the fungicide-oil mixture gives adequate protection. In view of the lower quantity of copper used per acre, particular care is to be taken to spray only as close to the onset of the S.W. Monsoon rains as possible. Micron spraying technique is essentially suited to medium and fairly large holdings. They could be employed in smaller holdings also, if worked on a co-operative basis.

In view of the rather limited effective period for prophylactic spraying of rubber, ie. about 30 to 40 days, as far as large plantations are concerned, aerial spraying appears to be suited, chiefly because of the speed of operation and quick coverage of large areas in limited time. The topography of the major rubber tracts would appear to suit better helicopter operation compared to fixed wing aircraft. For aerial application, about 17½ litres of fungicide-oil mixture (1:6 Prop.) is used. In aerial application, experience has shown that a certain percentage of the total area sprayed, say 5 to 10%

represented by missed patches, invariably show poor leaf retention.

Testing of various fungicide formulations based on Copper as well as of an organic nature, both in dust and wettable powder forms and application machinery, has been in progress in search of effective and economic formulations and application techniques; micron spraying technique using oil based copper oxychloride dispersed in mineral spray oil is the out-come of extensive and critical laboratory and field evaluations carried over a number of years. Aerial spraying also developed concurrently.

It may be of interest to mention in this connection that in Ceylon, a recent investigation has shown that under the climatic conditions prevailing there, the intensity of the disease is not serious enough to warrant costly spray operations and that economic disease control could be effected through copper fungicidal dusts. Climatic conditions determining the severity of the disease is different in our country from that prevailing in Ceylon and consequently, the severity of the disease is much more in India compared to Ceylon and hence it would not be proper to practice the same measures as carried out there.

Coming to the second aspect of disease control, viz. use of disease resistant varieties, unfortunately, much progress has not been made yet, for the simple reason that we have no material which is yet proved to be resistant to the disease. Amongst the planting materials now commercially exploited in the country, based on field observations, G1.1, BD 10, Avros 255 are considered to be rather tolerant to the disease compared to the highly susceptible material like PB 86, Tjir.1 etc.; however, their correct reactions under artificial infection conditions are yet to be determined. In some of the plantations, in the old unselected seedling population, individual trees occasionally stand out prominently with a good canopy of leaves, though unprotected, amidst the surrounding trees practically bereft of leaves. As such trees could be tolerant to the disease, their multiplication through buddings and establishment at the Experiment Station, for assessing their correct reactions is being carried out. Two such collections show promise of disease tolerance under field conditions.

A few foreign clones, viz. F, FX and IAN, reported to have shown tolerance to Phytophthora elsewhere, as well as Hevea banthamiana and H.spruciana have been introduced and established at the Experiment Station and their performance is being studied. Developing plant material combining disease resistance and high yield, in a perennial crop like rubber, is a long drawn out process. In the absence of known disease resistant parents for hibridization work, as is the case in rubber, the process becomes very much more complicated as we have to depend on chance which may give a progency showing disease resistance. Recently, work has commenced in this line.

It is often noticed that shy seeders, usually show less disease incidence compared to prolifically seeding trees. There does not appear to be any genetic correlation between the seeding habit and disease susceptibility and it would appear that since the fruits are comparatively more susceptible than the leaves, fruit infections which occur early in the season would provide ample disease inoculum for later development of the disease on the leaf.

Till such time that disease resistant plant material is available, we have to resort to prophylactic fungicidal sprays for controlling the disease and averting serious crop losses and deterioration of the plants.

A high copper content of latex is reported to interfere with manufacturing qualities. In the light of annually repeated copper fungicidal applications for Phytophthora control, a fear is often expressed that the copper content of the latex might go up and thereby become unacceptable for certain types of manufacture. Based on analytical figures available, there does not appear to be much cause for concern in this line. Tolerance limits for copper prescribed by International standards allow up to 8 ppm in concentrated latex and the maximum levels observed in our latex are well within this limit. During the days following spraying, the possibility of a certain amount of washing down of soluble copper during rains through the tree trunk and into the collection cups exists, but then, it to be remembered that about 60 to 70% of the copper contained in the field latex is eliminated during either concentration or acid coagulation. However, every possible precaution to avoid direct copper contamination

on the days of actual spraying operation would be essential. It would be desirable that tapping is suspended on the days spraying is carried out so that the direct contamination can be avoided.

While on the subject of copper content of latex, it is interesting to note that as per recent findings from Malaysia, indications are that copper content of the latex is positively correlated to yield. There is also a belief that the copper content of the latex during the infection period or just prior to that, may be positively correlated to resistance to Phytophthora.

Powdery Mildew disease:-

Another important foliage disease is Powdery Mildew caused by Oidium heveae. The first report of its occurrence in the country was in 1936. Since then, it has been observed to build up and spread gradually and by 1956, the disease was reported from practically all the rubber growing districts of South India.

The disease affects Hevea at all stages of growth. Peak disease incidence occurs at the refoliation time, when the tender foliage formed after wintering are affected and are shed as a result. New leaves formed are again infected and shed if prevailing weather conditions are favourable for the disease. Infections on half mature leaves do not result, usually in defoliation, but the photosynthetic activity of such leaves carrying the infected lesions is considerably lowered. The pathogen also infects the inflorescence and tender fruits, resulting in poor seed production. Successive waves of infection and refoliation result in rapid depletion of stored reserves in the plant; deterioration of the trees and fall in latex production soon follow. In young rubber, infections leading on to defoliation and die back of branches, result in stunting of growth and consequently, the immaturity period is extended.

Cloudy days, cool nights, overhanging mist and light showers during the refoliation period, favour the development of the pathogen and quick spread of the disease. Plants and branches under shade are affected to a greater extent. At higher altitudes, climatic factors are generally

favourable for the persistence of the disease, practically the year round. It is common experience that late wintered trees often suffer more from the disease.

Most of the clones and seedlings now commercially grown in the country are suceptible to the disease. Tjir 1, TJ 16, BD 10 and Av 49 are some of the clones observed to be highly suceptible. The clone LCB 870 is resistant, but is a poor yielder. PB 86 and PR 107 are also reported to be of below average susceptibility.

Sulphur is the most effective fungicide for controlling this disease. Spraying of wettable sulphur is found to be more effective than dusting, but, from practical and economic considerations, the former has to be restricted to nurseries and immature rubber. But, on mature rubber, finely powdered sulphur (325 mesh) is dusted with the help of suitable power dusters. Four to five rounds of dusting using about 10 lbs. of sulphur per acre per round, at intervals of 7 to 10 days, during the refoliation period, gives satisfactory disease control. In this connection, it may be pointed out that at higher elevations, where the invironmental factors favour the persistence of the disease, added rounds of sulphur application may become necessary. Instead of pure sulphur, processed sulphur containing not less than 70% sulphur and the rest made up of an inert filler like talc, can also be used effectively. The advantage of such compounded sulphur is that it does not require any special licence for transporting and storage. Dusting operation is best carried out during early morning hours, so that the dust rises up properly in the still morning atmosphere and further, the dust will stick well to the leaves with the dew present. Amidst various models of dusters tried, Mistral II AB - power duster of Birchmayer make is found to be an efficient, sturdy and easily portable one.

Minor foliage diseases:-

Other less important foliage diseases are Birds Eye Spot caused by Helminthosporium heveae, and leaf spot caused by Corynespora cassiicola, both mostly noticed in the young stages, secondary leaf fall caused by Gloeosporium alborubrum, secondary leaf spot caused by Colletotrichum gloeosporides, and tarjet leaf spot caused by Pellicularia filamentosa, the latter three being noticed

either in the immature or occasionally mature stage. Generally, these diseases do not warrant any large scale control measures. In some nurseries, under open exposed conditions, Corynespora leaf spot may become serious causing defoliation and stunting of growth. Attempts at controlling this disease through repeated spray applications using various chemicals have not been very successful; however, providing shade has been observed to control the disease satisfactorily.

Pink Disease:-

Pink disease caused by Pellicularia salmonicolor is another commonly encountered disease and most serious on plants between three to ten years age. With large areas under new and replanting coming up in recent times, this disease has assumed considerable importance. The disease usually starts at the forking point, though infections anywhere on the trunk or branches may also occur. Disease incidence and spread takes place during the wet weather, though pronounced external symptoms of leaf yellowing and drying are noticed only later. In the initial stages, a superficial cobwebby fungal growth develops on the bark. Later, the pathogen penetrates the bark, causing cracking and rotting of bark. Exudation of latex is also often noticed. Extensive rotting of bark causes a ringing effect and consequently, the distal portions of the affected branch start drying up. The dried up leaves remain attached. Dormant buds below the affected region get accelerated and a number of adventitious shoots develop. The damage to the main stem is often severe and the whole plant may be lost. In many cases, only branches are lost; even then, growth is adversely affected.

Most clones now grown in the country are susceptible to the disease. TJir and BD 10 are observed to be highly susceptible. Many jungle and cultivated plants are collateral hosts of this pathogen. Infections on Mangoe, Jack and Cashew are common.

The control of the disease is achieved by scraping of the affected bark after applying Bordeaux mixture or paste and again applying Bordeaux paste. The treatment would be useful only in early stages of infection. In advanced cases, it would be necessary to cut away the affected branches, care being taken to effect the cut in

healthy tissue. As Bordeaux paste gets washed away in rain, application of the pastemay have to be repeated in heavy rain-fall areas. Tar, though recommended earlier, is not safe on young bark, especially of buddings. A systematic inspection of the trees, row by row, block by block, during the wet weather season, will help in effectively treating the diseased plants in the initial stages itself and in preventing spread of the disease. As a precautionary measure, the fork regions may also be sprayed at the time of spraying against Abnormal leaf fall.

In Malaysia, usually, treatment is limited to fork infections, branch infections being left unattended. In immature trees, Bordeaux mixture and in mature tapping trees Fylomac 90, is sprayed from the ground using an extension lance. Under our conditions of heavy rainfall and high atmospheric humidity, application of Bordeaux paste would be preferable to Bordeaux spraying. Further, leaving branch infections unattended as in Malaysia, cannot be recommended under our conditions.

Patch Canker:

Patch canker caused by Phytophthora palmivora or Pythium vexans, is another disease commonly observed during the wet weather. Cankers may be formed on the stem or collar. The bark is damaged and often raised, with a foul smelling pad of rubber between the bark and the wood. Cracks are noticed in the discoloured bark, with a foul smelling rubber pad between the bark and the wood. In serious cases, the rotting may extend to the cambium and outer wood. Treatment consists of the excision of diseased tissues, disinfection of the exposed parts with a suitable organomercurial fungicide and then applying a petrolatum wound dressing compound. Aretan (1 oz. in 2½ gallons water) or ceresan wet (1 oz. in 1 gallon) are organo-mercurial fungicides found effective. Wax rex and rubber kote are suitable wound dressing compounds now available indigenously.

Bark rot and mouldy rot:

Bark rot caused by Phytophthora palmivora and mouldy rot caused by Ceratocystis fimbriata are diseases affecting the tapping panel. These diseases occur during wet weather. Bark rot is commonly noticed, whereas mouldy

rot is only rarely met with in this country, eventhough it is a serious problem in many other countries. Discontinuing tapping during the rainy season and protecting the panel and bark below the cut with an organomercurial fungicide and an overcoat of a wound dressing compound, can almost eliminate this disease. However, in practice, there is seldom a complete stopping of tapping during the rainy season. In such cases, the above fungicidal application may be repeated once in four to seven days. This treatment becomes all the more important when rain guards are fixed on the tapping panel.

Dry rot:

Dry rot or charcoal rot caused by Ustulina deusta is noticed in some plantations, affecting the roots, collar, main stem and branches. The disease incidence is more in plantations where a lot of dead stumps and logs lie about. Infection is through wounds. Soon-after a gale or storm, disease incidence becomes prominent. Exudation of latex from the infected parts is noticed. Black irregular double lines in the infected wood is a characteristic symptom. The infected wood becomes soft and dry and disintegrates easily. As a result of infection, branches dry up or the main trunk may snap at the weakend affected region. Prophylactic treatment of wounds and eradication of the fructifications formed on dead wood, help in reducing disease incidence. Infected parts in early stages of infection can be saved by first spraying with Bordeaux mixture, then lightly scraping and brushing with organomerucurial fungicide and then overcoating with a wound dressing compound.

Brownroot disease:

The only root disease prevalent in this country is Brown root disease caused by Fomes noxius. This occurs in other countries also and has many other host plants. Though plants of all ages are susceptible, the disease is more often noticed during the immature stages, in new as well as replantings. The infection originates from some diseased stump and by root contact, spreads to rubber. In loose soils and in low lying water logged areas, disease is usually more. The growth of the tree is arrested, the leaves lack lustre, they later turn yellow and are either shed or, more often dry up and

stick to the branches. On exposing the root system of affected plants, characteristic symptoms are visible on the tap root and main laterals. The bark is rotten and plastered with a mixture of soil, pebbles and fungal hyphae. Affected plants can be saved if detected in the early stages and treatment carried out. The treatment consists of exposing the roots carefully, cutting away the dead roots, scraping the diseased bark of partially infected roots, disinfecting the root system with organo-mercurial fungicide and over-coating with wound dressing compound. After this, the soil may be put back and drenched with the fungicide solution. The soil around the collar of the surrounding plants may also be drenched with the fungicide solution, as a precautionary measure.

Brown bast:

Amongst the disorders of the rubber plant caused by non-parasitic agencies, brown bast is the most important and common one. This tapping panel disease is very often found associated with intensive tapping, though, rarely, immature plants also show similar symptoms. Late dripping of latex with a low d.r.c., partial drying and discolouration of the tapping cut are early symptoms. Later, the cut goes completely dry with cessation of latex. This is followed by cracking and scaling of bark. Irregular swellings develop in the portion of the renewing bark as well as beneath the tapping cut. High yielding clonal seedlings are found to be prone to this disorder. Generally speaking for clonal seedlings S_2D_3 and for buddings (except G1), S_2D_2 tapping systems are recommended for reducing incidence of Brown bast. Tapping rest for periods of three to twelve months used to be recommended as a curative measure, but, in Malaysia, now they recommend tapping away of the affected bark in one operation and then, normal tapping is resorted to in healthy latex yielding bark.

Sun scorch:

To avoid Sun scroch, nursery beds should be mulched with dry leaves and young plants in fields, if exposed, should be given shade by bamboo baskets, woven coconut leaves or with leafy branches. From the second year onwards till the canopy closes over, the stem from the ground level upwards, may be lime washed, on the browned portion.

Insect and animal pests:

Insect pest problems of rubber, are negligible in our country, so far. Infestations of scale insects, mealy bugs, cockchafer grubs, termites and mites are occasionally encountered in localised situations, but they seldom, call for large scale chemical control measures. Recently, damage to young plants caused by snails and slugs are noticed in many localised plantations. They feed on the tender terminal shoot, retarding growth and inducing proliferation of shoots. Slugs feeding on latex directly from the tapping cut and collection cup are reported from a number of plantations in Malabar area. The only practical and effective way of controlling snails and slugs is through use of Metaldehyde baits. Animal pests found to damage rubber, particularly in clearings are rats, squirrlls, rabbits, porcupine, and occasionally elephants. Use of cynogas, poison baits, traps, shooting and electric fence etc., could be used for controlling these pests.

Though we have a number of serious diseases of rubber in this country, still, we are fortunate in not having some major diseases and pests prevalent in other countries, viz., South American leafblight caused by Dothiedella ulei, restricted to western hemisphere, white root disease caused by Fomes lignosus and Coptotermes curvignathus, a termite species in Malaysia. Recently, Ceylon has reported a suspected case of Virus infection causing bark splitting in two to three year old plants.

In recent years, the out put of manufactured rubber products has gone up sharply but the indigenous production of raw rubber has not increased proportionately, on the other hand, the gap between demand and supply continues to widen. Scientific research and adoption of improved methods of cultivation can alter the phase of development. Adoption of intensive cultivation methods with a scientific approach, coupled with phased replanting of old, moribund and uneconomic holdings which have outlived their economic life span. with modern high yielding material, offers the greatest promise of increasing production and meeting the country's demand. Intensive cultivation aims at increasing the unit area production through scheduled cultural, manurial and plant protection practices. In our country, diseases often act as the major factor

limiting successful development and production of rubber. A concerted effort towards timely and effective plant protection measures is bound to lead to better returns to the grower. For raising a good plantation and for ensuring economic returns, attention to plant protection measures alone is not sufficient. While fighting the pests and diseases of a perennial plantation crop like rubber, choice of suitable planting material, attention to cultural operations like soil management and early establishment of a leguminous ground cover, timely and balanced feeding and adoption of suitable exploitation techniques, so as to help the plants to be maintained in a vigorous condition and be capable of withstanding attacks of parasitic agencies without any serious break down, are only necessary preludes to adoption of plant protection measures so as to achieve maximum results and ensure thrifty growth and production. Control of diseases of rubber grown under unpropitious condition, becomes difficult and uneconomical.

...*...

RS/24.xii.'66.