Rubb. Board bull. 21, No. 3 1986

596 130

NEW APPROACHES IN DISEASE AND PEST MANAGEMENT IN NATURAL RUBBER*

Dr. K. JAYARATHNAM
Deputy Director (Plant Pathology)
Rubber Research Institute of India, Kottayam-686 009.

Introduction

The para rubber tree, *Hevea brasiliensis* was introduced into India 106 years ago. It is a sturdy perennial tree growing to a height of about 25–30 m. Latex is present in almost all parts of the plant. Hundred years is a short period of history for a plant species. Hence, it has only a few major diseases and pests. The main rubber growing belt of India, the western ghat region, receives rainfall of 1500–4000mm annually. During South West monsoon period from June to August about 70 per cent of the total rainfall reaches this region and push the relative humidity to almost saturation level. This weather condition is quite different from that of the native land of Rubber, Brazil in South America, whereas almost identical weather condition exist in Kanyakumari District of Tamilnadu. The disease and pest patterns in these two regions are distinct.

In western ghat region diseases caused by the fungus *Phytophthora* spp. and Pink disease caused by *Corticium salmonicolor* are very severe resulting in considerable damage to rubber plants, whereas these diseases are not serious in Kanyakumari District. Dry season disease, Powdery mildew caused by *Oidium heveae* is severe and widespread in Kanyakumari District and the high ranges. This disease is not severe, but localised in western ghat. With regard to pests, the bark feeding caterpillar *Aetherastis circulata* is serious in Kanyakumari District and in low rainfall areas like Punalur but not so in high rainfall areas. So far there is no record of *H. brasiliensis* being attacked by any viral, mycoplasmal or bacterial pathogens in India or in any rubber growing countries in S. E. Asia. Recently, an unpublished report has appeared on the occurrence of a viral and bacterial diseases in Brazil.

Disease and Pest Control Spectrum

Disease and pest control is now dealt with in totality and not as an entity. The enormous control exerted by nature is also taken into account while controlling diseases and pests and the impact on environment due to such control measures is also given proper importance. Hence, integrated control approach leading to disease and pest management is the modern trend. In disease and pest management, total eradication of inimical organisms is not aimed, but only the suppression of the intensity of attack below the economic levels of damage. By such an action a small population of the natural enemies of the pathogens and pests could survive and continue to suppress the population of noxious organisms. In total eradication of diseases, and pests the natural enemies loose the ground to survive. When the revival of the disease or pest occur, the noxious organisms tend to grow prodigiously in the absence of natural forces of control and disease and pest resurgence occur. This type of approach is more practiced in control of pests rather than diseases.

There are many methods available for suppression of pathogens and pests like mechanical or physical, cultural, biological, legislative, preventive, curative, irradiation, chemical etc. The effective cultural and biological method for preventing diseases is breeding for resistance. In perennial trees like rubber, breeding process takes many years to produce new germplasms and screen them. Heterozygous nature of rubber makes it all the more difficult and delayed. Limited availability of resistant germ plasm and the genetic variability of the pathogens may make this approach unviable. When many races of pathogens are involved, horizontal resistance is preferred to vertical resistance. For producing horizontal resistant germ plasm a variety of resistant germ plasm is required and the breeding process is complicated and prolonged. Exploitation of natural enemies to control pests is successful to some extent but for disease control this method does not have much scope. All other methods of control except chemical control have limited application with respect to different diseases. In general, chemical control of diseases is at present the most practical and effective for all diseases and pests of rubber.

*The paper presented at the rubber seminar held at Mundakayam on 23rd April 1986.

There are three important land marks in the chemical control of diseases viz. the discovery of Bordeaux mixture in 1882, dithiocarbamate in 1934 and systemic fungicides in 1960. One hundred and four years history of chemical disease control compares well with history of rubber plantation industry in S. E. Asia and India. Copper and dithiocarbamate fungicides are wide spectrum and protectant, whereas systemics are narrow spectrum or specific and therapeutic. The problem of resistance is not very much encountered with copper and dithiocarbamate, but it is a major problem with specifically acting fungicides and antibiotics. Antibiotics with uses in human medicine are likely to have severe restrictions placed upon their use in plant diseases control. Use of clinical antibiotics in Agriculture should be discouraged, principally because of potential hazards of resistance transfer to human pathogens. Pesticides are diverse and have a history of more than hundred years. Pesticide development gave the lead in various aspects of fungicide development. The variety of pesticides give much ease for pest management.

Diseases of Rubber

Diseases caused by *Phytophthora* spp. : Abnormal leaf fall disease caused by mainly P. *palmivora* and *P. meadii* is well controlled by the prophylactic application of copper fungicides. The development of oil based copper fungicide and low volume application by micron sprayers and helicopters are boons in the control of this widespread and debilitating disease. Recent development of a micron sprayer cum duster with gross weight of only 63 kg., considerably relieve the burden of workers carrying them. This machine has better efficiency than any imported machine. Ultra low volume aerial applicationof copper fungicide will be tested when suitable equipments are available. Crown budding of tolerant clones like RRII 33, FX 516 and F 4542 is a biological method of prevention of this disease. RRIM 600 is found to be a good trunk clone for these three tolerant clones. Water based formulations of systemic fungicides like Aliette (specific to *Phytophthora* spp.) and Ridomil were field tested against this disease and found to be ineffective. Single application of water based formulation may be inadequate to protect the trees for a long period. Hence, oil based formulations are to be tested singly or in combination with copper fungicides. When suitable oil based dithiocarbamate fungicides are available they will be tested alone or in combination with copper fungicides. Combination fungicides belonging to different groups may help in reducing the dosage of costly copper fungicides by their synergistic action.

Other diseases caused by *Phytophthora* spp. are shoot rot, patch canker and black stripe. Copper fungicides give effective protection against shoot rot and organo-mercurials like Emisan against the latter two. Since, organomercurials are hazardous to the workers dithiocarbamates like Dithane M 45 can replace them.

Pink disease is a serious stem disease of rubber and some of the high yielding clones like RRII 105 and RRIM 600 are highly susceptible. Application of 10% Bordeaux paste after removing diseased tissue was the control measure recommended. At present use of systemics like Calixin 2% and Tilt 0.1% in latex media are advocated. Thiride is also effective in controlling this disease.

Powdery mildew disease is serious only in localised areas. In young trees repeated defoliation results in death of plants due to die-back and sun scorch. Sulphur dusting was recommended for its control. Fogging calixin 3 per cent in oil is also an effective remedy.

Dry rot caused by *Ustulina deusta* is becoming serious in some localised areas like Palai and Thodupuzha. Copper fungicides are ineffective for the control of this disease. Fungicides specific to ascomycetes like Benomyl, Bavistin or thiophanate methyl will be useful for controlling this disease. The trials are in progress.

Brown root disease caused by *Phellinus noxius* occurs only very rarely. The damage caused is often fatal. At present the disease is controlled to a large extent by drenching organo mercurial fungicide like Emisan 0.015%. Application of sulphur in soil to encourage the growth of antagonistic fungi *Trichoderma* spp. has been practiced in some rubber growing countries for the control of root diseases. However, sulphur application has other problems like increased soil acidity.

Leaf spot diseases caused by *Corynespora cassicola* and *Drechslera heveae* are dry season and *Gleosporium alborubrum* wet season diseases. The former two are better controlled by partial shading and by application of copper fungicides, Dithane M 45-0.2% and Bavistin 0.02%. The latter is controlled by copper fungicides.

Pests of Rubber

Bark feeding caterpillar *Aetherastis circulata* is well controlled by dusting Sevin 5 D or Metacid 2 D with a power tree duster. Parasites and predators that could be liberated in large numbers to control this pest is yet to be identified. Root grubs of the genus *Holotrichia* feed on the roots of rubber plants in the nurseries. This pest is controlled by an integrated approach of collecting adult beetles with light trap, poisoning adult's food plants, hand collection of grubs, exposing grubs to birds, poisoning the grubs by incorporating Sevidol 4:4 G and BHC 10 D in the soil. Scale insects and mealy bugs are well controlled in nature by many parasites and predators and the entomogenous fungus *Hypocrella reineckiana*. Termites in rubber plantations are prevented by drenching Aldrin 0.2% in soil. Slugs and snails are effectively controlled

by applying Temik 0.1% in fine wheat flour as a paste on stem. The same treatment could be adopted for control of porcupines and rabbits. For effectively controlling rats, the single dose blood anticoagulant, Brodifacoum 0.005% is promising. Teimk is also good as bait poison.

Concluding Remarks

At present effective control measures and application techniques have been developed for all diseases and pests of rubber with available fungicides and pesticides in the country. A deadly disease of rubber, South-American Leaf Blight (SALB), which ruined the natural rubber plantations in Brazil is at present prevented from entering India by plant quarantine measures. The problems faced by research workers are non-availability of adequate quantity of new systemic fungicides and oil based formulations. Already copper fungicides are known to reduce yield in potato. A freely available and effective non-copper fungicide alone can help in investigating this problem in rubber.

CHINESE DELEGATION IN INDIA

Under a Sino-Indian bilateral exchange programme in science and technology a four member Chinese delegation visited the Rubber Research Institute of India. The members of the delegation were Lu Xing Zhen, Director, Rubber Research Institute South China Research Academy of Tropical Crops, Wang Ke, Vice Director, Yunnan Research Academy of Tropical Crops, Lin Tian Ming, Dy. Divisional Chief, San Jiang State Farms Bureau, Gnang Dong Province, Qian Fa Ngen, Dy. Divisional Chief, Foreign Affairs Bureau, State Farms Bureau, Ministry of Agriculture.

This was in return to an earlier visit to China by an Indian team comprising of Director of Research, Rubber Production Commissioner and the Tissue Culture Specialist last year. The Chinese delegation visited the Regional Stations of Rubber Research Institute of India in Maharashtra and North East. They also studied the situations in our small holdings and large public sector plantations. China grows rubber in its southern provinces and Hainan Islands. The climatic conditions existing there have many things in common with that of the situations prevailing in the North East Regions in India and this aspect forms the theme of the bilateral co-operation. We have already exchanged clones. Chinese also have given us clones which are cold resistant.