

RUBBER DISEASES TO BE CAUTIOUS IN THE NEXT MILLENNIUM AND STRATEGIES IN PREVENTION AND CONTROL*

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SUMMARY

Rubber plantations in Sri Lanka suffer from more than 20 diseases and six diseases namely white root disease, *Oidium* leaf disease, *Colletotrichum* leaf disease, *Phytophthora* leaf fall, *Corynespora* leaf fall (CLF), and black stripe will continue to be important diseases in the next millennium. As chemical control alone may not be an accepted strategy in future, steps have already been taken to introduce the integrated approach of pest management with special emphasis on genetic resistance. We are confident that the present approach will minimise the incidence of common diseases with minimum cost and least environmental hazards. However, *Corynespora* leaf fall, a disease with relatively a recent origin will remain as a grave threat to the natural rubber industry not only in Sri Lanka but also in other rubber growing countries in Asian and African continents.



During the last three decades more than half a dozen of new pathogens have been discovered from Sri Lankan rubber plantations. Though the majority of these diseases are confined to the nurseries today, causing epidemics in the

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field will be possible with the introduction of new high yielding genetic material in future. In view of this situation the biology, epidemiology and management of these pathogens have been investigated and a special programme on screening of potential clones against most of these diseases is in operation. The danger posed by exotic pests will increase tremendously in the 21st century due to increased trade, heavy movement of tourists and high speed of air travelling. Hence, every possible effort has already been made to protect the Sri Lankan territory contaminating with unwanted exotic pests.

Key words : disease management, millennium, new rubber diseases, rubber diseases

The rubber tree (*Hevea brasiliensis* Muell Arg.) is the major source of natural rubber in the world. This jungle plant native to tropical rain forest of South America was introduced to Sri Lanka in 1876 via Royal Botanic Garden at Kew. From this single introduction by Sir Henry Wickham, great South East Asian rubber plantation developed covering more than six million hectares today. Presently Sri Lanka is comparatively a small producer in the context of the world rubber economy. However, rubber industry is of vital importance to the economy of Sri Lanka. Next to tea it is the most important commodity, being the second major contributor to agricultural export earnings and employment generation. The total area under rubber in Sri Lanka is reported to be 162,000 hectares representing around 9 percent of the total cultivated area.

As most of the other agricultural crops when rubber was grown in its natural habitat under forest conditions pest and diseases were of very little importance due to the balance in nature. But with the introduction of *Hevea* to new habitats as an agricultural crop, consequence in the number of diseases has increased tremendously.

Presently, rubber plantations in Sri Lanka suffer from more than 20 diseases and six diseases namely white root disease, *Oidium* leaf disease, *Colletotrichum* leaf disease, *Phytophthora* leaf fall, *Corynespora* leaf fall (CLF) and black stripe have been identified as economically important diseases in the country. This phenomenon will continue to the year 2000 and probably beyond. However, *Corynespora* leaf fall, a disease with relatively a recent origin will remain as a threat to the natural rubber industry not only in Sri Lanka but also in other rubber growing countries in Asian and African continents (Jayasinghe, 1997). Unlike in all the other canopy diseases of *Hevea* rubber plant, the fungus *Corynespora* is capable of attacking the tree throughout the year. The pathogen causes severe defoliation on susceptible clones resulting die-back. In view of this situation fungicides should be sprayed throughout the year to obtain a successful control of the disease. This has become impossible under the present rubber economy and introduction of resistant clones has become the only hope in the management of this deadly disease. Unfortunately in the year 1995, several outstanding clones which were regarded as highly resistant to CLF during the first epidemic have succumbed to the disease. These dynamic changes of the

pathogen depending on the host genotypes will continue posing a grave threat to the future of the rubber industry in Sri Lanka.

With regard to the management strategies of all the other common diseases, chemical control is widely accepted since the beginning of this century (Peries, 1966). These chemicals effectively kill off the fungus eliminating the disease. Until recent times, the recommendations have been made without paying much attention to economic benefits and environmental pollution hazards. However, this attitude was changed during 1960's and Pathologists initiated extensive research projects with the view of minimizing the application of chemicals to the environment (Peries & Liyanage, 1987). As a result extensive research programmes were formulated to study the biology, epidemiology, host parasite relations and disease resistance. On the basis of these findings it has been possible to reduce the number of applications of fungicides to control diseases or even totally eliminate the use of chemicals in some instances (Table 1) (Jayasinghe & Jayaratne, 1997). Further, it is worthy to note that in diseases where chemical control is still recommended, less hazardous alternatives have been discovered during the recent past (Table 1). These recommendations will remain unchanged during the early part of the 21st century.

Table 1. *Old and present recommendations in management of rubber diseases in mature clearings (after Jayasinghe & Jayaratne, 1997)*

Disorder	Old recommendation	Present recommendation
<i>Oidium</i> Leaf Disease	Dusting of sulphur during Jan. and Feb. in all rubber growing regions 100 kg/ha; 8 rounds/season	No routine dusting is recommended Dusting of S only at higher elevations above 300 ft allowed.
<i>Phytophthora</i> Leaf Fall	Dusting of copper powder 140 kg/ha; 25 rounds in May-Sept.	No chemical application is recommended
<i>Colletotrichum</i> Leaf Disease	Spraying of Cu fungicides or organo-mercurial fungicides.	No chemical application is recommended.
Bark Rot	Application of panel dressings Antimucin Filomac 90 Difolatan Brunolinum	Application of panel dressings Brunolinum Ridomil
White Root Disease	Application of the a collar protectant containing PCNB	Application of the collar protectant containing PHENOL/Drenching of less hazardous fungicides

Among the other recommended strategies in controlling *Hevea* diseases, most appropriate approach is the breeding for resistance. Most of the clones recommended

in the past (PB 86, Tjir 1, RRIC 36, RRIC 45, RRIC 52) were highly susceptible to majority of the economically important diseases of the rubber tree. Thanks to the efforts of Breeders and Pathologists, presently RRISL is in a position to recommend *Hevea* clones resistant to most of the economically important diseases (Jayasinghe & Jayaratne, 1996). The present replanting trend shows that only the resistant clones are being accepted by the growers. As a result, it seems that chances of disease epidemics and subsequent yield losses due to several common pathogens present today will be very remote during the next millennium. However, the pathogens identified as capable of undergoing rapid changes (eg. *Corynespora cassiicola*) may interfere with the long lasting resistance of the perennial host causing significant losses.

Root diseases especially white root disease will continue to pose a challenge during both mature and immature stages of rubber. The present method of application of collar protectant after exposing the diseased root system will be replaced by the soil drenching techniques when treating the significant root diseases, due to the increasing labour costs in next millennium.

Biological control, reduction of the disease incidence through other living organisms is considered as one of the ideal disease management systems in the world. Decades of research carried out by RRISL have lead to the introduction of biological control strategies to manage certain important diseases such as white root disease and *Phytophthora* disease complex of the rubber tree. Several new projects have already been commenced and these projects will be continued in the future giving high priority.

As in other agricultural crops relative importance of the diseases has changed over the years and several new diseases have been discovered during the recent past. The pathogens discovered during last two decades are highlighted in the Table 2 with the reference for the first published record. If these diseases are not closely monitored and properly managed may gain prominence in the 21st century. Further, disease epidemics in the field are predicted with the introduction of new high yielding genetic materials without proper screening. In view of this situation the biology, epidemiology and management of these pathogens have been investigated and special programmes on screening of potential clones against *Hevea* diseases are in operation (Jayasinghe, 1998).

The danger posed by the exotic pests (Table 3) will increase tremendously in the next millennium due to increased trade, heavy movement of tourists and high speed of air travelling. Hence, every possible effort has already been made to protect the Sri Lankan territory contaminating with unwanted exotic pests (Jayasinghe, 1998).

It is clear from the above examples that a combination of quarantine aspects, crop sanitation, cultural, biological and chemical procedures are now being recommended in the control of diseases of *Hevea* in Sri Lanka giving high priority to genetic resistance. This integrated approach will not only open the door to the increase in productivity by reducing the disease incidence but also to reduce the cost

involved in disease control and to minimise the environmental pollution hazards beyond the year 2000.

Table 2. *New pathogens recorded on Hevea in Sri Lanka during the last twenty years**

Disorder	Causal agent	Reference (first record, diagnosis, world distribution & nature of damage)
<i>Fusarium</i> wilt	<i>Fusarium solani</i>	Liyanage, A de S & Dantanarayana, D M (1983). <i>Trans. Brit. Mycol. Soc.</i> , 80: 565-567
<i>Corynespora</i> leaf fall	<i>Corynespora cassiicola</i>	Liyanage, A de S; Jayasinghe, C K; Liyanage, N I S & Jayaratne, A H R (1986). <i>J. Rub. Res. Inst. SL.</i> , 65: 47-50.
Collar and hypocotyl rot	<i>Sclerotium rolfsii</i>	Jayasinghe, C K; Liyanage, A de S & Warnapura, S S (1988). <i>FAO Plant Prot. Bull.</i> 36: 189.
<i>Phytophthora</i> leaf fall	<i>Phytophthora citricola</i> as one of the pathogens.	Liyanage, N I S (1989). <i>Plant. Path.</i> , 39: 438-439.
Target leaf spot	<i>Thanatephorus cucumeris</i>	Jayasinghe, C K (1993). <i>Plant Path.</i> , 42: 473-474.
Root-knot nematode	<i>Meloidogyne incognita</i>	Jayasinghe, C K & Wettasinghe, D S (1993). <i>FAO Plant Prot. Bull.</i> 41: 36.
Foot canker and sudden wilt	<i>Nattrassia mangiferae</i>	Jayasinghe, C K & Silva, W P K (1994). <i>Plant Path.</i> , 43: 938-940.
<i>Geotrichum</i> associations on roots	<i>Geotrichum</i> sp.	Jayasinghe, C K & Wettasinghe, J L P C (1996). <i>J. Rub. Res. Inst. Sl.</i> , 78: 102-105.
<i>Colletotrichum</i> leaf fall	<i>Colletotrichum acutatum</i> as the main cause.	Jayasinghe, C K; Fernando, T H P S Priyanka, U M S (1997). <i>Mycopathologia</i> , 137: 53-56.

*List of publications was prepared based on ; Anon. (1988) Pathology of *Hevea brasiliensis*, IRRDB Bibliography, Hertford, UK and Review of Plant Pathology, CAB International, London, UK.

Table 3. *Pests and diseases identified as quarantine importance to Sri Lanka*

- a. South American Leaf Blight (caused by *Microcyclus ulei*)
- b. Target Leaf Spot (caused by *Thanatephorus cucumeris*)
- c. Tar Spot (caused by *Phyllachora huberi*)
- d. Fusicoccum leaf Blight (caused by *Fusicoccum* sp.)
- e. Phytophthora Leaf Wither (caused by *Phytophthora capsici*)
- f. Mandarova Attack (*Erinyis ello* : insect pest)
- g. Lace Bug Attack (*Leptopharsa heveae* : insect pest)

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