

GUIDE TO IDENTIFICATION AND MANAGEMENT OF DISEASES AND OTHER DISORDERS IN RUBBER PLANTATIONS OF SRI LANKA

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More than hundred years ago, rubber plant (*Hevea brasiliensis*) was brought to Sri Lanka and to the South East Asian countries from the Amazon forests where it was originated. Since then, this wild jungle tree was converted to a major domesticated within less than a half a century. This great success was due to the systematic exploitation of agricultural research by the rubber research institutes of the world. The most important component in this successful story was the intensive breeding. Presently, only the authenticated genetic material with high yield potentials are selected from intensive breeding programmes and cultivated. However, due to some unforeseen problems such as diseases, deleterious soil factors and unfavorable weather patterns, the expected yields are not being able to obtain by the growers.

As in any other agricultural crop, consequence of the diseases of the rubber tree has increased with the domestication. Hence, the correct diagnosis of rubber diseases or problems associated with diseases in the field by the field staff is of vital importance in the proper management of plantations. Unlike other plantation crops, insect problems are minimal in rubber clearings due to the presence of latex inside the plant tissues. The objective of this presentation is to describe common and unusual problems related to rubber cultivation which sometimes confuse the growers. Issues which are discussed in the article were gathered from the field experience of the Plant Pathology and Microbiology Department.

Problems in nurseries

Seeds collected for raising seedling nurseries, should be viable and healthy. Seeds which have been lying on the ground for longer periods may lack viability due to aging and infection by some fungi such as *Sclerotium* species. *Sclerotium* is a common soil-borne fungus which infects the seeds making them non-viable. The seed coatings of the affected seeds are covered with a whitish mycelium with mycelial threads and avoid those seeds from planting in germination beds as these already affected seeds may be responsible for the spread of the infection in the seed germination bed. During the first few weeks after sowing, it is also possible for development of *Sclerotium* collar rot of seedlings which destroy the emerging seedling plants.

If the nursery beds are not properly cleaned of white root disease infected root particles (inocula), the seedlings can be infected on root contact with the remaining inocula in soil. As a result, the infection could be transmitted to the new fields when these nursery plants are distributed as budded stumps for planting. However, affected plants could be easily identified in the nursery from the above ground symptoms such as buckling and yellowing of leaves. Further, before distribution, the budded stumps uprooted from suspected patches should be examined for the presence of whitish mycelial strands with thick cords on collar, tap root and laterals. In case of finding such infected materials, they should be destroyed immediately. In certain instances, longitudinal cracks appear at the collar region of the seedlings especially during dry months of the year. These cracks predispose the seedlings to the invasion of weak soil-borne pathogens resulting sudden wilts leading to death of seedlings. It has been found that the reason for the cracks is the moist heat resulted due to improper watering during severe drought.

A common complain made by the nursery owners during the recent past was the sudden wilt of the first whorl of budded stumps established in polybag nurseries. The affected plants showed no root regeneration and it was noticed that this condition is commonly associated with compacted clay soil in the bag. Make sure to have adequate number of punched holes at the bottom of bags and use a proper soil/sand mixture for filling the bags to avoid this condition.

Apart from root diseases on seedlings, several other fungal pathogens can cause leaf infections reducing the growth. These diseases are seasonal as the pathogens need specific conditions. Among the disorders, the most important problems are highlighted below (note that the figures given in parentheses represent the recommended chemicals for the respective disease - Table 1). Among the economically important nursery diseases, *Oidium* leaf disease caused by *Oidium hevea* (15), Bird's eye spot disease caused by *Drechslera hevea* (3), *Phytophthora* leaf disease caused by *Phytophthora* species (8, 9, 11), *Corynespora* leaf disease caused by *Corynespora cassiicola*, (1, 6, 10) *Gloeosporium* leaf disease caused by *Colletotrichum gloeosporoides* (1, 6, 10), Algal spots caused by *Cephaleuros virscens* (10), Web blight caused by *Thanateporus cucumeris* (16) play a significant role. The symptoms of the above diseases are characteristically different and there may be a single or a mix-infection on leaves depending on the weather prevailed. However, it is advisable to follow control measures if the infection is severe causing leaf fall. Recommended fungicides can be sprayed alternatively with appropriate frequencies depending on the weather conditions prevailed.

If the nursery is prepared for young budding, the plants are kept in bags for about six months before planting in the field. This period may be expanded up to nine months if the plants are kept until the next planting season. During this period, casualties can occur due to various factors such as leaf scorching due to direct sun

Table 1. *List of chemicals recommend for the management of rubber diseases*

Number referred	Name of the chemical
(1)	propineb (Antracol)
(2)	benomyl (Benlate)
(3)	bordeaux mixture -fresh
(4)	(Brunolinum Plantarium)
(5)	(Candarson)
(6)	captan (Captan)
(7)	carbofuran (Furadan Curater)
(8)	copper oxychloride (Cobox)
(9)	copper oxide (Copper sandoz)
(10)	mancozeb (Dithane M 45)
(11)	copper oxide (Perenox)
(12)	phenol 10% (Collar protectant)
(13)	metalaxyl 8% + mancozeb 64% (Ridomil MZ)
(14)	oxadixyl 10% + mancozeb 56% (Sandofan M)
(15)	sulphur (Thiovit)
(16)	pencycuron (Monceren)

shine, damage to the tap root by cockchafer grubs, leaf diseases, and other bad management practices. To avoid scorching of tender leaves, it is advisable to provide some shade under extreme drought conditions. However, shading may create a favorable micro-climate for the development of fungal diseases. Under such circumstances, adhere to the RRISL recommendations for spraying fungicides. To avoid breeding pests such as cockchafer grubs in bags, carbofuran granules can be applied in to soil in bags (7).

Problems in field plants

To avoid root disease infections in re-plantings, the field should be properly cleaned out of remains of the previous plantation. This should be strictly followed if

white root disease patches have been detected in the previous clearing. In replantings, casualties can be detected during the first few months due to various reasons. The most common problem is the infection of roots by white root disease fungus - *Rigidoporus microporus* (*Rigidoporus lignosus*). If the infection was detected before appearance of severe foliar symptoms, the root system should be cleaned and applied a recommended fungicide (12) on it. During the first few years, the trees can be infected with another root disease referred to as brown root disease caused by the fungus, *Fomes noxious*. The fungus is easy to identify by the characteristic sand adhesion on to the root surface. The treatment is same as for white root disease (12). Infection of stumps by a weak parasitic fungus, *Botriodiplodia theobromae* is problem in some fields. The infection occurs through the cut surface of the stump if the waxing is inadequate. The presence of the fungus can be easily detected by the presence of black powder like sporing structures on the stump surface. The affected plants should be treated with a fungicide by applying on to the stump (2). Die back of tender shoots due to *Phytophthora* infections also could be seen during South-West monsoon periods. Affected plants can be protected by applying fungicides (8, 9). On tapped trees, bark rot disease is a common problem which could be overcome by applying fungicides after each tapping during the SW monsoon period (13, 14). Repeated damage of the collar region by rodents is a common problem in clearings adjoining to the jungles. There is no firm remedy for rodents attacking problem, but it will be better to keep the clearing free of unnecessary weeds and thin out the cover growth. In certain instances casualties in new clearings are resulted due to the damage of tap roots by grubs (7).

From the planting up to the maturity period, the trees are succumbed to various leaf diseases caused by *Phytophthora* spp., *Colletotrichum* spp., *Oidium hevea* and *Corynespora cassiicola*. Disease severity varies depending on the susceptibility of the clone and/or on the weather conditions. Apart from the common leaf diseases, there may be uncommon leaf diseases or differentiation of the canopy (abnormal leaf color, shape or abnormal shoot growth) due to a number of factors: nutritional deficiencies, soil conditions or poor management practices.

If a young clearing is consisted with several clones, only the trees of the susceptible clones are severely affected with diseases. This is more obvious if the clearing is mixed with the clones susceptible to *Corynespora* leaf fall disease. For all the leaf diseases, the remedy is an application of suitable fungicide at recommended frequencies as indicated in the advisory circulars of the RRI. However, it should be kept in mind that main factors determining the frequency of applications are the severity of the disease and prevalent climatic conditions.

Severe stem and branch diseases are not common in Sri Lanka but some problems such as bark cracking and oozing out latex from branches and fork region have been reported. Oozing out of latex at the collar region of stems is a common

problem in clearings where the "elephant foot" is exposed. All such openings should be cleaned and applied with a suitable fungicide (4) and sealed off with a wound dressing (5) to protect the wound from invading weak parasites.

Rubber plants in clearings can become abnormal due to various factors other than pathogenic attacks. Die back of plants in patches due to lightning is a common problem during monsoon periods. There are instances where the collar region of the trees are affected due to lightning current, if the trees are inundated at the time of lightning. Bark of the affected sites are damaged and wounds are appeared in few days after lightning. Perhaps, these wounds are inhabited by colonies of ants or other insects. Therefore, these wounds should be cleaned, applied a fungicide (4) and sealed off with a wound dressing. Another problem where our attention is frequently drawn is the discolouration (reddish colour) of leaves of 1-2 year old young plants. The discolouration begins at the lower whorls and spread towards the apex within few weeks. Discoloured leaves fall off and new shoots appear from the auxiliary buds giving an abnormal appearance to the plant. This condition has been now identified as a clonal character of clone RRIC 100 and no remedial measures are recommended rather than application of an extra dose of fertilizer.