SOUTH AMERICAN LEAF BLIGHT — LIKELYHOOD BEHAVIOUR IN SRI LANKA AND STRATEGIES IN MANAGEMENT

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ABSTRACT

South American Leaf Blight (SALB), caused by *Mycrocyclus ulei* is the most devastating disease of *Hevea brasiliensis*. Three types of spores namely conidia, pycnospores and ascospores are produced by the pathogen and it has been proved that conidia and ascospores are responsible for the disease dissemination. It was predicted that a carrier like host plant *(Hevea)*, other plants or plant parts, animal or man carrying the spores of the pathogen on their body is required for any spread of the disease to far away places. Hence, frequent air travel and air cargo from tropical America to Sri Lanka are the main chances for accidental introduction to the country.

It was predicted that if SALB were to reach South East Asia, it would be equally destructive in Sri Lanka, particularly to those areas which suffer from heavy attack of the powdery mildew. By far the most important factor favouring SALB is the high susceptibility of clonal materials planted in the country. Although first line of defence against SALB is the plant quarantine, the quarantine failures can occur for various reasons. Hence, we must prepare for any eventuality by conferring resistance to the trees by breeding for resistant varieties as breeding for horizontal resistance is the only economical long term solution for this problem. Other management practices such as (a) identification of climatically unfavourable areas (b) crown budding with SALB resistant *Hevea* species and (c) use of more efficient and economical defoliants and fungicides are also being discussed.

Key Words:

South American Leaf Blight, quarantine, chemical control, breeding for resistance, *Hevea brasiliensis*.

South American Leaf Blight (SALB), caused by *Microcyclus ulei* (P. Henn) is the most devastating disease of Para rubber *(Hevea brasiliensis* Muell. Arg.). The disease is also of great historical interest since it was the most important single factor in the complete failure of attempts to cultivate rubber in the American tropics during early part of this century. For instance Brazil was the only country in the world which exported rubber during latter half of the last century. In 1907 its total export to Europe was 38,000 metric tons. By 1914 its share of the world supply was 44% and in 1930 it had dropped to a mere 2% . In 1951 Brazil had to import the natural rubber for the first time.

The Pathogen

Microcyclus ulei (P. Henn)V. Arx. is an ascomycete and produces the sexual and asexual stages both on the same rubber leaves. Three types of spores namely conidia, pycnidiospores and ascospores are produced and it has been proved that conidia and ascospores are responsible for the disease dissemination. Conidia, which produce on immature leaves are by far the most important propagules because of the large number produced and their ability to survive prolonged periods. Ascospores are produced on fully matured and old leaves. These spores are protected from dosiccation by the wall of the ascocarp and are capable of survive the dry periods that precede the refoliation period.

M. ulei is an obligatory parasite which possesses several physiological races. Six races of the pathogen have been definitely confirmed todate, however more races of the pathogen are likely to exist. This fact contributes to the breaking down of resistant of clones which have shown high degree of tolerance in the past.

Disease Symptoms

Disease symptoms vary with the stage of the leaf maturity at the time of infection. The first visible symptoms of the disease are the slight crinkling and distortion of the young copper brown rubber leaflets. This is followed by dull velvety lesions which are olive to greyish in colour, usually on the lower surface. If the infection is heavy the young leaf soon blackens, shrivels and falls. the lesions of the remaining leaves will enlarge and pycnidia, dark coloured raised structures are formed on the upper surface of the maturing leaflets. Subsequently, the pycnidia become more prominent and developed into perithecia which produce microscopic asci. With the maturity of the leaves the centre of the lesions turns papery white and eventually these tissues are torn-off leaving a shot-hole.

Besides the leaves, *M. ulei* is also known to attack petioles, young stems, flowers and immature green pods.

Possible Introduction and Likelyhood Behaviour of the Disease in Sri Lanka

From the recent findings on biology and epidemiology of the pathogen it could be predicted that a carrier like host plant *(Hevea),* other plants or plant parts,

animals or man carrying the spores of the pathogen on their body is required for any spread of the disease to far away places. Hence, frequent air travel and air cargo from tropical America to Sri Lanka are the main chances for accidential introduction of the disease to the country. It is worthy to note that *Hemilia vastatrix,* fungal pathogen which wiped out the coffee plantations in Sri Lanka during the year 1870 has spread to Brazil by the year 1970 where it enjoyed complete freedom from coffee rust for a century. Is it not possible that SALB will one day take the return route from Brazil to Sri Lanka?

M. ulei infects tender leaves and young tissues, as do *Oidium heveae* Steinm. and *Colletotrichum gloeosporioides.* (Penz.) Sacc. As with the diseases that these two fungi cause, there is little doubt that among the climatic factors predisposing trees to infection the most important is rainfall. In Brazil, SALB develops strongly in the state of Bahia which has an evenly distributed annual rainfall exceeding 2100mm, whereas the state of Espirito Santo largely escapes severe infection. Here the rainfall is only 1200 mm, with a well marked dry season during the period of refoliation.

Pathologists compared the epidemiology of *M. ulei* with those of *Oidium heveae* and *Colletotrichum gloeosporioides* and concluded that behaviour of SALB is closer to both these common pathohogens. Certainly, as far as the release of the conidia from leaves is concerned, the non-wettable spores of *M. ulei* behave like those of *O.heveae,* whereas in the manner of dispersal, by rain and wind, there are similarities with both *O. heveae* and *C. gloeosporioides.* SALB is probably equally severe in areas with cloudy days (u.v. irradiation is fatal to the spores), cool nights (required for ascospore release) and over hanging mist or light drizzle (conditions which favour conidial sporulation and germination) as in areas having prolonged rainfall. *O. heveae* survives during the year on scattered flushes, particularly those under shade, and develops severely on the young leaves produced after wintering. *M. ulei* could similarly survive on the old leaves and provide an ascospore inoculum all year round.

Therefore it is clear that if SALB were to reach South East Asia, it would be equally destructive in Sri Lanka, paticularly to those areas which suffer from heavy attack of the powdery mildew.

On the other hand certain factors have been identified in Sri Lanka which may reduce the severity of the disease incidence in the country. The most important factors unfavourable for the SALB in Sri Lanka are the shorter refoliation period and the occurrence of this refoliation period in the drier part of the year. As discussed earlier all the other factors in major rubber growing regions are highly favourable for the disease spread. By far the most important factor favouring SALB is the high susceptibility of clonal materials planted in the country. (RRIC 121 shows resistance only for few physiological races of the pathogen).

Future Research Needs and Strategies in Prevention and Control of SALB.

It is an accepted fact that first line of defence against SALB is the plant quarantine. The enforcement of plant quarantine measures to safeguard our rubber from the introduction of SALB cannot be relaxed at any time. However, it is worthy to note that quarantine failure can occur for various reasons. There is no full proof method of preventing spores entering the country and education is the only hope. We must prepare for any eventuality by actively engaging ourselves in research on conferring resistance to the trees by breeding for resistant varieties as breeding for horizontal resistance is the only, economical long term solution for this problem. This exercise is a challenging job for our breeders as around nine physiological races of the pathogen have been identified todate. Among the other research needs.

(a) Identification of areas suitable for cultivation but climatically unfavourable for the disease (like Maranhao State in Brazil)

(b) Possible use of SALB resistant *H. pauciflora* clone PA 31 on high yielding trunks (RRIC 100, RRIC 102, RRIC 110 etc.).

(c) Use of more efficient and economical defoliants which allow uniform refoliation and reduce the number of fungicide applications (presently available defoliants are MERPHOS, THIDIAZURON, GARLON, 2.4.5.T).

(d) Effective and economical fungicides for organised large scale spraying (presently available fungicides are CHLOROTHALONIL, BENOMYL TRIADIMEFON, THIOPHENATE-METHYL, MANCOZEB).

(e) Improvement in mechanization and application technology.

In this regard immediate action is required to develop more efficient ground spraying machines as economy, terrain and land area in Sri Lanka are not acceptable for aerial spraying with helicopters or fixed wing air crafts.

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