Muller, K. O. & Borger, H. (1940). Experimentelle Untersuchungen uber die *Phytophthora*. Resistez der Karloffel. Arb. Biol. Abt. (Aust Reichsanst). Berlin **23**: 183–231.

Ouchi, (1983). Induction of resistance or susceptibility. Annual Review of Phytopathology **21**: 289–315.

Thankamma, L., Rajendran, T. P. and Joseph Mani. (1979). A pressure machine for injecting rubber trees. Proceedings of the second Annual Symposium on Plantation Crops. II. (ed. Venkataram, C.S.) 181–189.

Thankamma, L., Madhavan Nair, J., Deo, A. D. & Dinesh Kumar. (1985). Role of stress metabolites on pink disease management in *Eucalyptus tereticornis*. Indian Forester (In press).

Van der plank, J. E. (1975). *Principles of plant infection*. Academic press, New York. pp. 216.

Wheeler, H. (1975). *Plant Pathogenenesis*. Springer Verlag, New York. pp. 106.

L. THANKAMMA
Rubber Research Institute of India,
Kottayam-686009, India.

OCCURRENCE OF *COLLETOTRICHUM* LEAF SPOT DISEASE OF RUBBER IN INDIA

A disease with severe spotting on rubber leaves leading to defoliation in some cases has been found recently in certain plantations in South India. The disease appears to be widespread and very serious. Severe incidence was noticed on six-year old trees of RRII 105 and RRIM 701 in 1983 in an estate in Manimala, Kerala State. Subsequently the disease was found in many other rubber growing areas also, affecting both mature trees and budwood plants. The disease makes its appearance on the leaves during February-March and the infected leaves persist throughout the year. This disease has been reported earlier in Malaysia (John, 1952) and it was described as *Colletotrichum* leaf disease. There is another leaf disease of rubber known as anthracnose which is also caused by *Colletotrichum gloeosporoides*. The symptoms of *Colletotrichum* leaf disease and anthracnose are quite different, though the pathogen involved in both diseases is the same. The present paper is a report of the incidence of *Colletotrichum* leaf spot disease of rubber in India.

The *Colletotrichum* leaf disease was first reported on rubber seedlings in Ceylon and the pathogen was identified as *Colletotrichum heveae* Petch (Petch, 1906). Later in Malaysia a species of *Colletotrichum* attacking seedlings in nursery and young rubber trees in the field in association with *Helminthosporium* and *Gloeosporium* was reported (Beeley, 1937). A species of *Colletotrichum*, different from *Colletotrichum heveae*, was observed by Altson (Altson, 1950 a) and he has also reported an anthracnose on rubber caused by *Colletotrichum ficus* Koorders (Altson, 1950 b). In India the pathogen *Colletotrichum* was first observed on rubber in Andamans (Mitra and Mehta, 1938) and its occurrence in the mainland was known when the anthracnose (secondary leaf spot) caused by *Glomerella cingulata* was described (Ramakrishnan and Radhakrishna Pillay, 1961). Though several species of *Colletotrichum* and *Gloeosporium* are reported on rubber, they represent conidial stages of *Glomerella cingulata* S. & V. S. (Carpenter and Stevenson, 1954). However, the symptoms caused by *Gloeosporium*

Fig. 1. Immature leaflet with dark spots and yellow halo

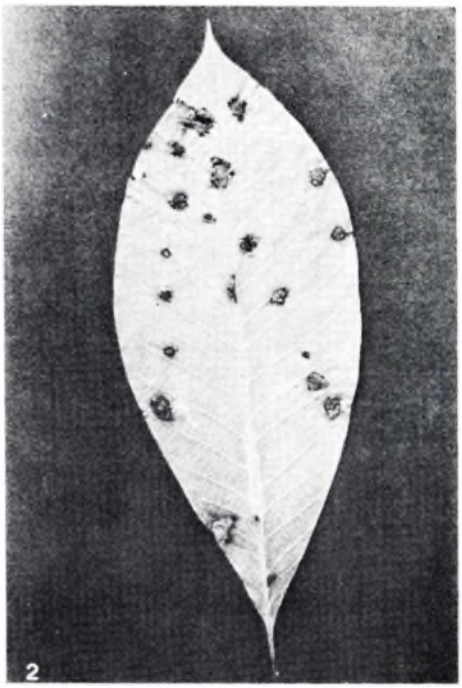

Fig. 2. Mature leaflet with dark black lesions

Fig. 3. Papery texture of the infected spots

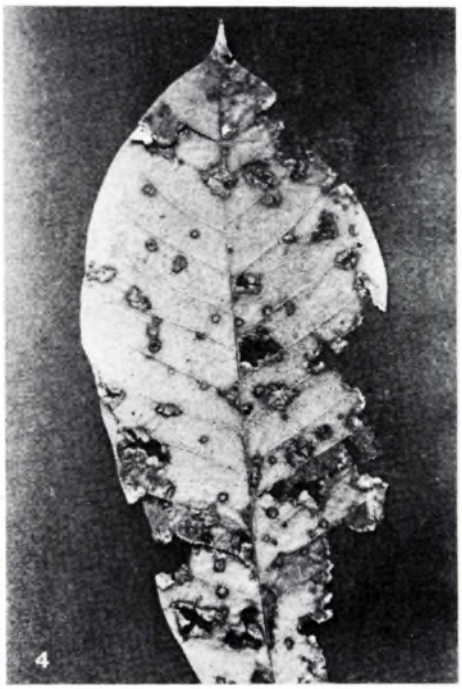

Fig. 4. Severe infection causing torn leaflet

and *Colletotrichum* differ very much. In the case of the disease under report also, isolation from different types of lesions viz. very young yellow spots, dark spots with yellow halo, dark black irregular lesions and old spots with shot-hole appearance yielded the same pathogen and it was identified by the Commonwealth Mycological Institute, Kew, England as *Colletotrichum gloeosporoides* (Penzig) Penzig & Sacc., the conidial form of *Glomerella cingulata* (Stonem.) S & V. S.

Leaves at the tender stage are susceptible to *Colletotrichum* leaf spot disease. Infection may lead to defoliation in some cases. However, in several cases, the infected leaves also mature and the extensively spotted leaves are retained on the trees. The disease first appears as minute yellow spots which later attain dark colour and then each spot develops a dark brown centre surrounded by a yellow halo (Fig. 1). They enlarge and the size of the spots may vary from 1 to 5 mm (rarely 10 mm). The spots are almost circular and they occur on or in between veins. As the disease advances, the leaves become highly spotted with irregular brown patches of various sizes which are dark brown on the lower surface and ashy brown on the upper surface. Sometimes dark black lesions, (Fig. 2) circular to irregular, prominent on both surfaces of the leaf having a lighter shade on the lower surface are also noticed. These spots appear slightly raised from the surface giving a characteristic embossed effect. In all cases as the spots age, the central portion of the spot becomes lighter in colour, papery in texture and gets torn off (Fig. 3). The infected leaves may turn yellow. It is also observed that in certain cases all the leaves in a particular tree are highly spotted. The disease becomes more serious when the leaves are completely shredded and parts of the torn leaves are shed (Fig. 4).

The disease is common in rubber plantations in South India and several clones are prone to this disease. RRIM 600, PR 107, BD 10, GI 1, RRIM 701, RRII 11, RRII 33, RRII 105, PB fractional clones and CH clones are found to be susceptible to this disease. However, clones F 4542 and Fx 516 are observed to be free from its attack.

Artificial inoculation was carried out on young rubber seedlings using conidial suspension of *Colletotrichum*. Leaves at different stages of maturity viz. leaves at copper brown stage, light green stage and mature leaves were inoculated by spraying the conidial suspension using an atomizer. The inoculated leaves were enclosed in polythene bags for 24 hours and the covers were removed. After 72 hours of inoculation, dark spots surrounded by yellow halo were observed on the leaves at the copper brown stage and light green stage. The pathogen *Colletotrichum* was reisolated from such spots. No spots were found to be developed on leaves inoculated at the mature stage.

REFERENCES

Altson, R. A. (1950a). Pathological Division. Report for the year 1947. *Report of Rubber Research Institute, Malaya* 1945–48, p. 125.

Altson, R. A. (1950b). Pathological Division. Report for the year 1948. Report of Rubber Research Institute, Malaya 1945–48, p. 169.

Beeley, F. (1937). Pathological Division. Report for 1936. Report of Rubber Research Institute, Malaya 1936, p. 91.

Carpenter, J. B. & Stevenson, J. A. (1954). A secondary leaf spot of the *Hevea* rubber tree caused by *Glomerella cingulata*. Plant Disease Reporter **38** : 43–46.

John, K. P. (1952). A hitherto undescribed leaf disease of *Hevea* rubber caused by a species of *Colletotrichum*. Journal of Rubber Research Institute of Malaya **14**: 11–19.

Mitra, M. & Mehta, P. R. (1938). Some leaf diseases of *Hevea brasiliensis*, new to India. Indian Journal of Agricultural Science **8**: 185–188.

Petch, T. (1906). Description of new Ceylon Fungi. Annual Report of Botanical Gardens, Peradeniya **3**: 1–10.

Ramakrishnan, T. S. & Radhakrishna Pillay, P. N. (1961). Secondary leaf spot (Anthracnose) of *Hevea brasiliensis* caused by *Glomeralla cingulata* (Stonem) S & V. S. Rubber Board Bulletin **5**: 85–87.

V.K. RAJALAKSHMY
ANNAKUTTY JOSEPH
Rubber Research Institute of India,
Kottayam-686 009, India.