BROWN BAST INCIDENCE OF *HEVEA BRASILIENSIS*

By

SEETHA I. WICKREMASINGHE

Brown bast which is simply known as the drying of bark has now become a serious problem to rubber plantations in most of the rubber growing countries. Though some people call it a disease, no pathogen such as a virus or mycoplasma, has been detected so far in association with brown bast condition (Liyanage et *al*, 1982). It is more generally recognized as a physiological disorder of bark of the rubber tree (*Hevea brasiliensis*).

The first signs of trees that are affected with brown bast are the appearance of small patches of dry bark on the tapping cut. These areas are clearly visible immediately after tapping and before the latex begin to flow along the tapping cut. The advanced symptoms of brown bast are the swelling and cracking of bark below the tapping cut. The amount of latex that could be obtained by tapping of such a tree is very low and the whole tree would go completely dry at the end. The loss of yield is of a serious concern to planters, although this disorder does not lead to the death of the rubber tree.

The most commonly found clones that are affected with brown bast are some high yielding clones, amongst which are clones RRIC 101, PB 25/59, GL 1, RRIM 600, RRIM 623. These clones are considered to be "brown bast sensitive" while clones, such as PB 86 and RRIC 100 are thought to be more resistant to brown bast.

The pattern of distribution of brown bast is another striking feature. According to a survey done by some scientists of the Rubber Research Institute of Sri Lanka, the pattern of distribution of brown bast was found to be random in some clones and non random in some other clones. RRIC 101 and RRIM 600 showed the largest proportion of non random distribution (found in clusters), where as 2/3 or 66% of the PB 86 areas showed a random distribution (Soyza et *al*, 1983). This suggests that the clonal factor also plays an important role in the occurrence of this physiological disorder.

Even though the brown bast incidence has been observed far back as 1920s', a direct remedy to overcome this bark dryness is yet to be found.

Some believe, through their observations and experience, that a tree affected with brown bast would overcome it's bark dryness, if the tree is given a considerable time of rest. In other words, if tapping of such a tree is stopped for some time there is a chance for it to recover. This idea in fact is used in estate practice. They rest trees affected by brown bast and recommend tapping of such trees at a later date when they are thought to have recovered from the disease. However it is only a temporary remedy.

Isolation of pre-tapping panel, by making grooves on both sides of tapping cut up to tapping depth is often practised in smallholdings as a method to control panel dryness. Anthony et. *al.* (1981) had discussed similar methods of controlling panel dryness of rubber trees, including isolation of the pre-tapping panel on virgin bark, and treatment of partially or totally dry cuts. They had also introduced a schedule of recommended tapping practices for dry rubber trees.

Another generally accepted cause which has been attributed to bark dryness is over exploitation. It is understood that the repeated removal of large quantities of latex causes nutrient stress on the tissue of the bark that is exploited. Experimental evidence for this has been reported by Fay in 1982, by inducing dryness in clone GT I rubber trees, which had been tapped twice a week, by tapping them 6 times a day. He observed histological changes such as coagulation of latex and noted some evidence that continued tapping of trees show symptoms of exhaustion. Therefore, susceptibility to brown bast remains an important factor determining tapping intensities; hence indirectly in determining yields.

Considering the work done on brown bast in past, some workers have suggested that the water and the nutrient stress are important in the development of brown bast (Schweizer, 1936). Vollema (1949) and Compagnon (1953) observed a greater incidence of brown bast development during and after wintering period. The argument they forwarded was that during the period of winter availability of soil water was limited. Therefore, roots cannot absorb water in such conditions (thus practises) causing a considerable water stress. Sharples and Lambourne (1924) pointed out that the repeated removal of large quantities of latex with consequence fluctuations of water available to the bark could be responsible for the development of brown bast. According to Compagnon et, *al*, (1953) nutrient stress is also important as brown bast has shown varied response to treatment with potassium.

Another striking feature of brown bast is, it's apparent failure to spread from virgin bark to regenerated bark and it's failure to spread from one regenerated panel to another (Paranjothy *et. al*, 1975). They say it is essentially a disorder of the latex vessels, originating in and along the vessels. There is no flow of latex from vessels in diseased bark, because the latex in the vessels is coagulated. The coagulation of latex within the vessels would naturally lead to the death of the vessel. Another group of early workers suggested that the phloem necrosis and phloem senescence could be the primary cause for brown bast (Horne, 1925; Chua, 1969). But the findings of Paranjothy et. *al.* in 1975 reveals that the necrosis of phloem elements in brown bast material was not clearly seen.

Studies done by ultra centrifugation methods show the apparent damage of lutoids in vessels of brown bast affected trees. The bottom fraction which is largely comprised of lutoids, was found to be floculated or reduced in the latices of partially dry trees. A reduced staining reaction of the bottom fraction of the latices of intensively tapped trees was also evident (Paranjothy *et. al*, 1975).

In addition to above mentioned environmental, clonal and histological studies, one would realise the importance of physiological and biochemical aspects as well, in the case of finding a remedy to brown bast. Because the latex or so called yield of rubber tree which is formed within the tree is necessarily in association with physiological and biochemical reactions. Sype (1984) observed that the physiological characteristics of the latex of affected trees were not markedly different from those of healthy trees but were distinguished by weak metabolism and by lutoid weakness. Regarding the hormonal factor, Chrestin (1984) commented that intensive hormonal treatment of bark increases toxic oxygen generating activity and leads to the lysis of the latex organells and specially of the lutoids. It has also been observed that the total protein content in A-serum of brown bast affected trees decreased in considerable amounts in most of the clones analysed (Prematilleke, 1982). Tupy (1985) points out an association of low sucrose availability in latex vessels with premature degeneration of vessels and bark dryness.

In conclusion, this physiological disorder of *Hevea* is of considerable economic importance, as it very often affects the high yielding clones and trees of *Hevea*. Although there is a considerable amount of information on brown bast, natural rubber researchers have so far failed to find the exact cause of this disorder. Therefore, the development of an early warning signal for brown bast condition based on existing information and any new biochemical physiological or nutritional parameters, would certainly be of immediate value in controlling this disease condition.

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