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GRAFTING FOR REPLACEMENT OF TPD AFFECTED BARK OF *HEVEA BRASILIENSIS*

Tapping panel dryness (TPD) is a serious problem in rubber plantations especially where high yielding clones are planted (Sivakumaran *et al.*, 1988). It is considered as a physiological disorder affecting the laticiferous system, extending to the other bark tissues of the affected side and is related to the intensity of tapping (Sethuraj *et al.*, 1977; Jacob *et al.*, 1994). Once occurred, no remedy is suggested other than leaving the tree to rest. A novel approach, to replace the affected bark with healthy one by grafting, was tried and the observations are reported in this paper.

Six TPD affected trees of the clone RRIM 600, under rest for two years, were selected from a clone trial laid out in 1977 at the Central Experiment Station of the Rubber Research Institute of India. On the diseased panel of each tree a 10 cm square area was marked and clean cuts, upto the cambium, was made at the sides of the square with a sharp chisel and left as such for a few minutes for the flow of latex to cease before debarking. An exactly similar area of donor bark was marked above the tapping panel of a healthy tree and clean cuts were made to the same depth. Latex was wiped out and debarking of the marked area was done with the help of the chisel. The donor bark was then collected and handled with utmost care to avoid bruising/contamination and was inserted to the debarked area of the recipient tree, pressed gently to get adhered to the wood and bandaged with polythene tapes having 10 cm width and sufficient length making overlapping winds over the complete area of the donor bark. To keep the bark tightly in position it was tied with jute twine. The grafting was done in December 1993. The bandages were opened six months after grafting, in July 1994. One month after opening, final grafting success was noted and the grafted bark was opened for tapping. A cut of similar length was also opened on the resting portion of the panel, as control. Alternate daily tapping was followed. Observations on the bark were made and bark thickness was measured from four positions of the trunk *viz.* grafted, resting, renewing and virgin bark just above the tapping panel. The soft bast was differentiated from the hard bast by its colour and peeling quality at the active cork cambial zone.

One recording of yield was carried out in September 1994 and one more in the first week of December 1994. After the first recording, one more cut was opened on the resting panel and another round of yield recording was carried out from the three cuts simultaneously in December. Final observations of the trees were recorded in June 1996. Grafted bark as well as the resting bark panels were test tapped to examine the viability of bark and latex flow.

Cent per cent success of grafting was obtained. Hard bast region of the donor bark sloughed off when the bandages were opened and the inner bark had firmly attached to the tree (Fig. 1). TPD affected bark, under rest showed better peeling

Fig. 1. Brown bast affected tree showing (A) firmly adhered grafter bark, (B) affected area on rest after tapping and (C) second cut one year after commencing tapping of the diseased bark. Note the smooth flow of latex on the complete cut of grafted bark (at arrow) and dried area on the cut made on affected bark on rest (at arrow head).

quality when compared to the donor bark. Gomez and Gandimathi (1990) has reported increased meristematic activity for diseased bark. Thomas *et al.* (1995) also observed an increased cambial activity for renewing bark. Visual observation of the samples collected showed continuous growth of the grafted bark. Wound healing process at the grafted region was as in normal graft union while the wound healing of debarked area of the donor tree preceded callus formation at the periphery of the wound as described by Bobilioff (1923).

Table 1 depicts the data on total bark thickness and soft bast thickness. Total bark thickness at the graft region (six months after grafting) and renewing region (after two years renewal) were comparable while that of the resting region was the highest. The difference between grafted region and resting bark might be due to sloughing off of hard bast from the former. Considering the duration of growth period, at renewing area the growth rate is high when compared to the unaffected virgin bark. The soft bast thickness of all the three renewing regions were comparable as the grafted bark also supplemented to the soft bast thickness. The virgin bark had thicker soft bast. The

Table 1. **Bark thickness (mm) at the four physiologically different regions of TPD affected trees**

	I		II		III		IV	
Trees no.	Total thickness	Soft bast thickness	Total thickness	Soft bast thickness	Total thickness	Soft bast thickness	Total thickness	Soft bast thickness
1	7.00	4.00	17.00	3.00	8.00	2.50	15.00	5.00
2	9.00	3.00	20.00	5.50	10.00	5.00	10.00	5.00
3	7.00	3.00	20.00	4.00	9.00	5.00	15.00	5.00
4	5.00	3.00	18.00	3.00	10.00	3.00	15.00	4.00
5	7.00	4.00	18.00	3.00	7.00	3.00	10.00	3.00
6	10.00	6.00	20.00	5.00	8.00	4.00	11.00	4.00
Mean (± SE)	7.50 (0.57)	3.83 (0.48)	18.83 (0.54)	3.92 (0.46)	8.67 (0.45)	3.75 (0.44)	12.67 (1.05)	4.33 (0.33)

I - grafted area, II - affected bark under rest, III - Unaffected bark under renewal

IV - Virgin bark above the tapping panel

proportion of soft bast was the least in the resting bark and the highest in the grafted one. Since the cambial activity at renewing region is higher, low proportion of soft bast could be attributed to high rate of degeneration/periderm formation. As the bark could be peeled easily at the point in between the soft and hard bast, occurrence of cork cambium and repeated bark formation in diseased bark contributing to a thick corky bark is evident. Hence it is suggested that removal of diseased bark would be beneficial.

Latex flow was observed on complete length of tapping cut of grafted bark (Fig. 1) for five out of the six trees. Regarding the control cut (TPD affected, on rest), latex was present only on localised areas in four trees. However, the mean yield over three tappings from the grafted bark was only 4.26 g per plant per tapping while that from the rested bark was 5.63 g per plant per tapping. After regular tapping for three months, partial drying of grafted bark (Fig. 2) was observed in three trees while TPD extended to the interior in rested bark of five trees. When a new cut was made on the rested panel, drying was observed at the inner bark in five cases indicating that extension of TPD to the inner part of affected bark was not due to reopening alone. On final observation after two years the grafted portions in all the six trees were viable with active growth. Its surface had grown in level with that of the resting bark around. On tapping it was observed that the bark is fresh, turgid and normal for colour and latex flow while the bark in control panels were partially or totally dry.

This technique, however, needs further refinements especially in the selection of area of the donor bark and the duration of rest after grafting before tapping the newly grafted bark.

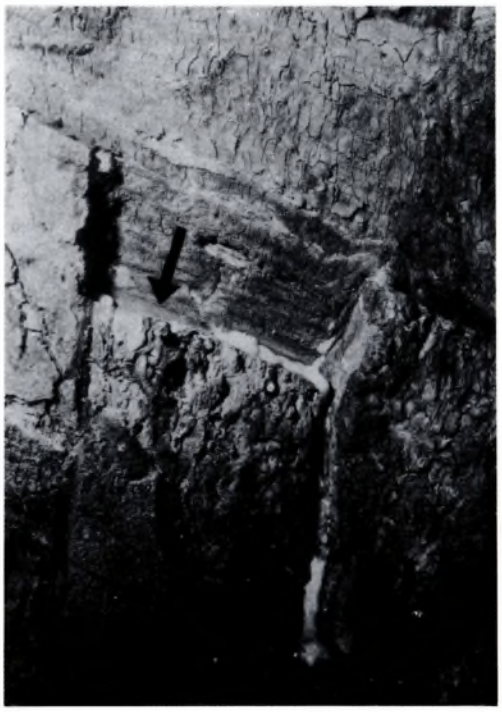

Fig. 2. Bark dryness (at arrow) in the grafted area after regular tapping.

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