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Root trainer technique in rubber:

It's modern, cost-effective and labour-friendly

The root trainer technique, which is gaining wide currency among the rubber nurseries all over the State of Kerala, holds great promise, as being modern, cost-effective and labour-friendly and in view of the expansion of rubber cultivation to India's non-traditional areas with climatic constraints

The Para rubber tree, the major source of natural rubber and nature's most versatile product with manifold applications, is a perennial species. This means, the rubber tree, once planted, will have to face the onslaught of climatic forces for years. The fact that rubber is extracted from the tree by a process of controlled wounding for years together at regular intervals makes it all the more important that the rubber tree has to get fully equipped to withstand adverse conditions.

Good root system, vital

A good root system, for instance, makes sure the tree is properly anchored to the ground against heavy winds and a well-developed tap root that explores deeper layers of the soil will ensure anchorage and sufficient moisture for growth and rubber production, while well-developed laterals will help replenish the nutrients lost through tapping and ensure a steady supply of water and elements essential for rubber production and tree growth.

India holds a sizeable share globally in terms of acreage and production of natural rubber. But the winds of change in the present day high literacy social set up of Kerala, the cradle of rubber cultivation in the country, have created acute labour shortages in the plantation sector. This is likely to attain alarming magnitude in the coming years and thereby affect the tempo of growth in rubber production. The rubber grower is

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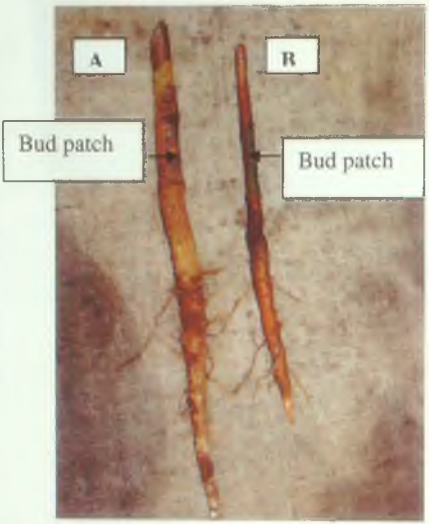
Figure 1: Budded stumps of rubber
A: Brown budded stump; B. Green budded stump



forced to adapt to the changing times with mechanisation in labour-intensive field operations like land preparation and pitting. However, the process of planting is still to be handled by manual labour.

Novel method

The Rubber Research Institute of India, the premier organisation involved in natural rubber research has been able to enhance rubber productivity in India to hitherto unprecedented levels by using the high-yielding clones evolved through well-planned and systematic long-term crop improvement efforts. Modern day clones are, in general, more productive than trees raised from seedlings which can be raised *in situ* in spite of the good undisturbed root system of the latter. Clonal propagation methods like green budding, brown budding, young budding, bench grafting etc. have been subject to detailed investigation in terms of the quality of planting material generated. The RRII has now come out with a novel method of raising budded stumps in root trainers, a nursery technique which is set to bring about a sea-change in rubber planting operations and help the rubber planter through the hard times of labour shortages ahead.

The procedure

Rubber clones are conventionally multiplied by grafting the bud of a desired clone which constitutes the scion component of the bud graft onto the basal portion of a seedling root stock. The two major types of budding are brown budding and green budding depicting the age of stock seedlings and stage of maturity of the bud used. The successfully budded plants are uprooted from the nursery around one month after budding, the shoot above the newly attached bud is cut at a height of 7.5 cm away from the new bud patch, the main tap root is pruned at a length of 25 cm below the collar region, with the lateral roots also pruned at a length of 2.5-5 cm. This constitutes a budded stump (Figure1).

The budded stumps are then planted in polybags filled with soil. Proper manuring, irrigation and plant protection measures are the major nursery practices followed thereafter, until the grafted bud sprouts and grows into a plant with two to three storeys of leaves which is the right stage for field planting (Figure 2).

Retaining the plants for longer periods in polybags leads to coiling of the tap root and scanty growth of lateral roots. Field planting is effected by the process of transporting the

Figure 2 : A polybag plant ready for transplanting

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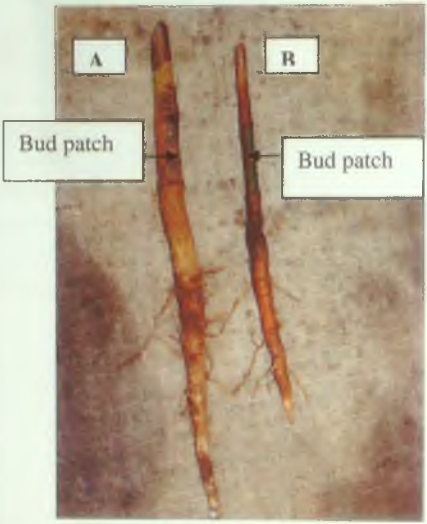

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Figure 3 : Root trainer plants stacked on carriers

polybag plant to the field where pits of suitable size are dug well in advance, stripping away the polybag surrounding the soil core and gently lowering the plant, with the soil core intact, into the pit which is then covered with soil and pressed into position from the sides.

What is root trainer?

A root trainer is simply a black conical polypropylene cup scientifically designed and fabricated with a drainage hole at the bottom and vertical ridges inside to ensure proper growth and orientation of roots. Green budded stumps could be planted in root trainers of length 26 cm and capacity 600cc whereas brown budded stumps require larger containers of length 30cm and capacity 800cc. The potting medium used in a root trainer is cured coir pith which is properly sieved, soaked and cleaned so as to be free from tannins, phenols, chitin etc. that may inhibit root growth. This is achieved by simply immersing the coir pith in water for a month and draining off the chemicals that leach out. The process is to be repeated, after which the excess water is squeezed out and the cured coir pith partially dried under shade.

Table 1
Cost of transportation, distribution and field planting of 1000 polybag and root trainer plants

Particulars of expenditure	Labor required (man days)		Cost (Rs.)	
	Polybag	Root trainer	Polybag	Root trainer
Extraction of plants from trench, transport to vehicle and stacking	8	2	*1,097.20	*274.30
Unloading, distribution and out-planting to pit	24	8	*3,291.60	1,097.20
Cost towards hiring vehicle	-	-	*1428.00	*400.00[1]
		Total cost	5,816.80	1,771.50

*At the rate of Rs. 137.15 per day

Table 2
Girth and tappability of trees raised from polybag and root trainer plants

Stage of growth	Polybag plants	Root trainer plants
At the time of transplanting	3.41cm ± 0.71	3.20cm ± 0.66
One year after transplanting	6.11cm ± 0.11	6.30cm ± 2.89
Six years after transplanting	40.31cm ± 11.2	43.3cm ± 9.64
Tappable trees at sixth year	38.2 %	73.4 %

The cured coir pith which is an inert material devoid of any nutrients is then supplemented with fertilisers like rock phosphate and bone meal, insecticides like neem cake and malathion and the fungicide Dithane M-45. The root trainer cups are filled by firmly pressing the mixture into the bottom, the green budded stump planted in the centre and the remaining part of the cup is filled up again firmly pressing the potting mixture around, leaving a space of 3 cm between the rim of the cup and the top surface of the potting mixture, for watering. The root trainers are then stacked in carriers made of iron rods or bamboo splints (Figure3).

A space of 3-5 cm is left between the ground and the bottom of the root trainers. Soil is then

Figure 4 : A root trainer plant ready for transplanting

heaped around the root trainer stands so as to cover the tips of the cups. This is for the geotropic tendency of the roots to take over so that the roots grow fast to reach the soil. This process takes a period of 3- 4 months by which time the roots would have reached soil level and the plant would have produced two storeys of leaves. The plants are irrigated daily and a 2 per cent spray of fertiliser mixture is given at weekly intervals. Water logging is prevented and shading and plant protection measures are adopted as in a polybag nursery. Coir pith may attract termites if not properly treated. This is mitigated by application of a solution of 0.1 per cent Chlorpyriphos at fortnightly intervals.

Once the plants have attained the growth of two storeys of leaves (Figure 4), the soil at the bottom is removed to expose the tips of the root trainer cups. Roots that have overgrown the tips of the cup to reach the soil are to be gently pruned. Thereafter, the root trainers with the plants are kept suspended above ground for the process known as hardening (Figure 5).

During this process, the roots, which have all along been guided by the ridges within the container to grow downwards and not get coiled, are subjected to natural air pruning. Being genetically tuned to positive geotropism, the roots do not venture into the air outside the hole at the bottom of the root trainer cup. Keeping the plants thus suspended imparts an artificial stress leading to the emergence of numerous lateral roots into the well-aerated potting medium. Natural air pruning prevents coiling of the tap root and promotes its fast growth deep into the

Figure 5: Root trainer plants kept suspended for hardening

soil on transplanting leading to 100% establishment success in the main field.

Hardening is a pre-planting cultural operation by which the plants are made capable of facing unexpected stress situations which may occur on transplanting. Thereafter, until the time of field planting, irrigation is reduced to bi-weekly intervals, while fertiliser sprays and plant protection measures are continued.

Advantages

The most fascinating feature of this technique is the extremely simple process of field planting. While transporting the bulky polybag plants weighing over 10 kg to the field and their planting requires a large component of labour, the transportation and planting of the compact root trainer plants which weigh less than 600g are relatively easy and, to say the least, economical (see Table 1 for a comparison).

Figure 6: A : Root plug of a root trainer plant with well formed roots
B : Root system of a polybag plant with coiled tap root and scanty laterals

Statistics reveal that the cost involved in transportation and planting of polybag plants is over three times that of root trainer plants. Planting is done by separating the root plug (Figure 6A) from the container by keeping the plant upside down and gently tapping the rim of the cup against a hard surface. Then the root trainer cup is pressed into the centre of the pit that is kept filled and ready for planting to make a hole just large enough to insert the root plug. After placing the root plug with the plant in the centre of the pit, the soil is pressed firmly around. The simplicity of this process enables farmers to carry out planting even without dependence on skilled labour. A two-whorl stage root trainer plant is at least 20 times lighter than a two-whorl stage polybag plant.

Summing up

The advantages of a root trainer plant as compared to a polybag plant can be summed up as follows: The technique avoids deformity and coiling of taproot and laterals, while inducing growth of three times more lateral roots than polybagplants (Figure 6A & B). The technique helps to induce prolific root growth. The better root development that is facilitated by the root trainer leads to better field establishment and growth resulting in early and higher percentage tappability (See Table 2), better anchorage and better wind fastness.

Cost-saving

It is expected that root trainer plants will perform well in drought-prone locations owing to the profuse development of roots consequent on the hardening process. The repeatedly reusable root trainer cups and savings in nursery practices like weeding make the technique cost-effective while the compactness and light weight of such plants result in enormous saving in labour requirement. The cost required towards transportation, distribution and field planting of root trainer plants is estimated to be only one-third of that of polybag planting. Littering of the landscape of rubber plantations with discarded polybags, which pose an environmental hazard, could be avoided and this technique provides a means to utilise coir pith which is otherwise dumped as an industrial waste polluting the environment.

The root trainer technique is gaining wide acceptance by the rubber nurseries that have mushroomed all over the State of Kerala. In view of the expansion of rubber cultivation in India to less favoured environments with climatic constraints like drought and high velocity winds, this technique holds great promise, as being modern, cost-effective and labour-friendly. Research is still on to further refine the technique and raise stock seedlings in root trainers so that budding could be undertaken with even less disturbance to the root system and also to identify alternate potting media which are locally available in the various rubber growing tracts, both traditional and non-traditional. ■

(Credit for the adoption and standardization of this technique in rubber to raise advanced planting material of superior quality at a lower cost goes to the keen observation, research acumen and perseverance of the author, Dr. T.A Soman).