Development of rubber planting materials

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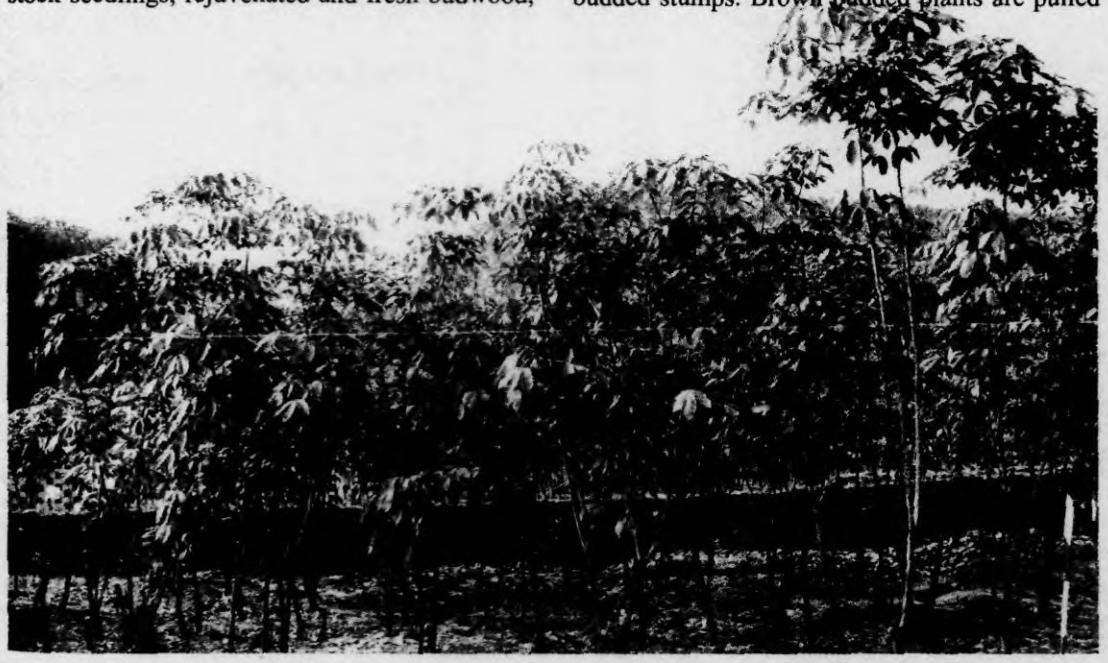
Introduction

In order to improve the production and productivity from rubber plantations, selection of quality planting materials is very important. The best plants of uniform growth and vigour are produced by following the recommended nursery practices. The correct identity of clone that is being used for grafting should be confirmed. Budwood should be collected from well maintained budwood nurseries. Budding should be carried when the bark of stock and budwood peels off easily. Peeling is usually good when the top whorl of leaves are fully matured. Other factors affecting peeling quality are health of stock seedlings, rejuvenated and fresh budwood, properly developed cambium, adequate soil moisture content and cool atmosphere.

Bud-grafted plants can be introduced to the field as budded stumps, brown budded polybag/root trainer plants, green budded polybag/root trainer plants, polybag budded plants, young budded plants and stumped buddings. Planting materials produced by different budding techniques are equally suitable for realizing optimum potential of clones.

1. Budded stumps for direct planting

Brown budded plants prepared for planting by pruning the stem and roots are known as brown budded stumps. Brown budded plants are pulled



out from ground nurseries and their stock is cut back at a height of about 7.5 cm above the budpatch with a 45° slope towards the opposite side of the bud. The cut end is then dipped in molten wax to check prevention of water loss from the stump. Budded stumps having straight taproot are pruned to a length of 45 - 60 cm and the laterals to a length of 7.5 - 10.0 cm for direct field planting.

Budded stump planting is the easiest and cheapest method to establish a rubber plantation. Brown budded stumps can be planted directly in the field during the onset of southwest monsoon. As the chance for field establishment depends greatly on weather conditions, the success rate may be low if monsoon fails. Growth of budded stumps may become uneven depending on the time of emergence of buds and its growth rate. If budded stumps are used casualty is likely to be more as compared to poly bag planting. Vacancies should be filled as early as possible to achieve uniformity.

However, if vacant points are filled in time and also if weaker plants are replaced with vigorous plants, the stand and the growth of the clearing from budded stumps can be as good as that of a

Table 1. Details of different budding techniques in rubber

Parameters	Brown buddings	Green buddings	Young buddings (modified)
Age of the stock	10-12 months	In India 5-6 months growth in the ground nursery. Raised in ground nursery/ polybags	Below two months. Raised in ground nursery/ polybags
Girth of the stock	About 7.5 cm	About 2.5 cm	About 1.5 cm
Buds	Auxiliary buds from bud-wood aged 1-1$^{1}/_{2}$ year old	Scale buds taken from the shoots aged 6-8 weeks	Scale buds taken from the shoots aged 4-6 weeks
Budding time	April to September	December to February	August to September
Nursery care	Normal	High	High
Snag length	7.5 cm	7.5cm-10.0 cm	7.5cm-10.0 cm
Planting in polybags	August to January	February and March	February and March
Field planting	June to August	June to August	June to August

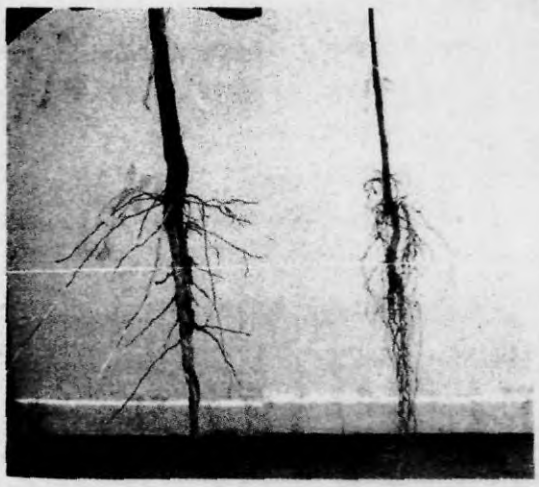
clearing established with polybag plants or root trainer plants. Direct budded stump planting is not suitable for drought prone areas.

2. Advanced planting materials

Planting Budded stumps directly in the field could result in casualties and uneven growth of plants. To avoid this, techniques have been developed to grow green /brown budded stumps in polybags/ root trainer cups to a certain extent and are field planted usually at 2-3 whorl stage (Table 1). Stock plants can also be raised directly in the polybags for green budding. Such green budded plants are called polybagged budded plants. Since these materials are used for planting are in an advanced state of growth when compared to conventional budded stumps they are called advanced planting materials.

Scope for selection of plants with uniform growth for field planting, early establishment, less casualties and reduction in cost on supplying vacancies in the field are the advantages of advanced planting materials. Authenticity of the clones can also be assured as the budded plants have a growth of 2-3 whorl stage. As compared to one whorl plant, two – three whorl plants ensure sufficient number of leaves and roots to feed the plants adequately (RRIM 1964). Hence, survival rate of two to three whorl plants in the field is better under unfavorable weather and climatic conditions.

One whorl plants are not suitable for late planting.



Root system of brown budded and green budded plants (polybagged)

2.1. Brown budded plants

Advantages

- Since climate is favourable, irrigation is not required at the time of budding
- Root system is more hardy and strong compared to green budded plants (see the fig. below)
- Better survival and establishment in adverse conditions of the field
- Suitable in area with suboptimal climatic conditions

Disdvantages

- Total nursery time required is 20-22 months and hence higher cost of production in the nursery.
- Planting in polybags soon after budding lead to production of overgrown plants since main planting season is only in next June- August.

2.2. Green budded plants

Advantages

- Most vigorous and healthy stock plants for budding from a large population in the ground nursery can be utilized.
- Budded plants can be raised in polythene bags or root trainer cups either by sowing directly or transplanting stumps. Will be ready for field planting in the same year.
- Two- three whorled grafted plants are available within 10-12 months. Hence reduction in nursery cost.

Disdvantages

- Since green budding is carried out in summer proper irrigation or shading with irrigation before and after budding is essential.

• Die-back of scion followed by death of stock occurs in the polybags owing to dehydration on delayed planting/lack of initiation of root development.

• More care and attention is required in the polybag nursery and field compared to brown budded plants as stock seedlings are very young with little starch reserve.

2.3. Polybagged budded plants

Advantages

• Eliminates seedling nursery.

• Minimum disturbance in root system of stock plants.

• Within 10-12 months two whorled polybag plants with intact soil core are ready for transplanting to the field.

• Field establishment is better if adverse climatic conditions prevail soon after planting.

Disdvantages

• Source of water and its efficient management are essential through out the period of growth.

• Chances of more wastage of bags due to budding failure or weak scion growth.

2.4. Young budded plants

In young budding, stock seedlings less than two months old raised in small bags of 33 x 15 cm size are used.

Advantages

• Two whorled plants can be raised within seven months.

• Since the smaller bags are used for production of plants, transportation is easier.

• Plants have a well developed root system which prevents breaking of soil core.

Disdvantages

• Intensive nursing of the plants before and after budding is essential (Mercykutty *et al.*, 2004). In our country plants produced in bags by young budding are ready for field planting during February. Since the climate during this time is unfavorable for field planting, planting has to be delayed till June.

To a certain extent, trunk and branch snap are clonal characters (eg: PB 311) and in those locations where wind is a matter of concern, clones showing better tolerance to wind such as RRII 414, RRII 417, RRII 422, RRII 430, PB 217, PB 260, GT1 and RRII 203 are advisable for planting.

2.5. Stumped buddings

Preparation of stumped budding

Healthy and successful grafts in the ground nursery are cut back four weeks later and scion is allowed to grow in the nursery for about 2.5 m in height without branching. Before field planting the plants are tailed (taproot is severed at the depth of 60 cm 5-6 weeks before planting), pollarded (stem cut back at a height of 2.5 m two weeks before planting) and whitewashed with lime. Field planting is done on the onset of monsoon.

Advantages

Stumped buddings are used to fill causalities in 2-3 year old plantations and replacing of weak plants in the field.

Disdvantages

Stumped buddings solely depend on wet weather for successful field establishment.

2.6. Budding on two year old stock plants

Reports reveal that after 3- 4 rounds of budding, leftover two year old stock seedlings in nursery are used for raising 1-2 whorl polybag plants for field planting. Since the starch reserve of the stock plants is high, initial growth rate of scion will be better. Owing to inherently poor quality of

Grafted plants on two year old stock

stock plants, unhealthy root system may reduce growth rate in the field in addition to difficulties encountered in pulling out, transportation and planting in polybags. Moreover, excess removal of taproot and development of weak lateral roots are deleterious to the plants as it may lead to uprooting of trees in the field owing to poor anchorage.

Root trainer plants

2.7. Root trainer plants

This is a modern technology for development of grafted plants (Soman *et al.*, 2003). The specific features of cup like tapering shape, vertical ridges in the container walls, drainage hole at the bottom are all incorporated with the purpose of properly training the structural development of root system.

Advantages

- Root coiling is avoided.
- Well established lateral root system.
- Easy to transport and field planting.
- Better and uniform growth in the field.

Disdvantages

The management of nutrient supply and pest control measures against termites for the proper development of the plants is extremely important.

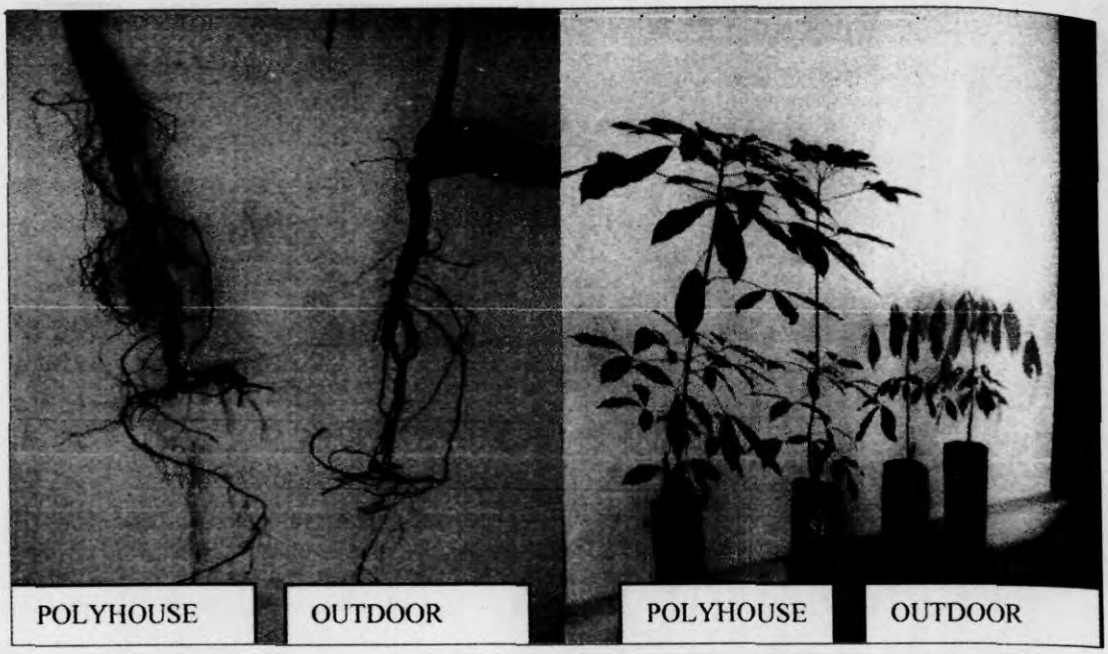
3. Recommended nursery practices for production of healthy planting materials

- Use of fresh seeds preferably from a mixed clone plantation.
- Selection of 50-70% seeds sprouted within three weeks from a germination bed for transplanting.
- Selection of vigorous root stock seedlings.
- Application of fertilizer and chemicals according to recommendations.
- Grafting using the buds obtained from well maintained authentic budwood plants on to stock plants that are of correct age and size.
- Safe handling and transportation of planting materials.

Failure in any step results in production of inferior quality plants

4. Quality planting materials

It is difficult to judge the quality by the external features of a plant. In fact, good quality plants show a luxurious growth throughout the period. Poor growth of planting materials is evident by



short inter nodal length, reduced girth and small and deformed leaves. Different clones by nature have different architecture.

Criteria for selection of ideal plants are as follows

1.Scion showing superiority in height and diameter

2. Straight, non forking, non twisting stem

3. Wider inter nodal region

4. Good apical dominance

5. Healthy and large leaves

6. Free from pest and diseases

7. Free from genetical disorder

8. Compact soil core with good root growth

5. Polyhouse technology

This is a modern technology for production of healthy planting materials (Mercykutty *et al.*,2012). Green budding is the most commonly practiced propagation method in other rubber producing countries. But in Indian conditions, tender and young green budded stumps when planted in polybags/root trainer cups often show higher percentage of casualty due to poor sprouting, die back of scion and incidence of diseases compared to brown budded stumps.

The polyhouse technology resolves the main problems associated with the establishment of green budgrafts.

Leaf diseases caused by *Colletotrichum* spp. and *Oidium heveae* can also be prevented due to better environmental conditions within the polyhouse ensuring healthy and uniform scion growth as compared to those grown outdoors.

Colletotrichum leaf disease caused by *C. gloeosporioides* and *C. acutatum* was absent in grafted plants grown in the polyhouse, whereas it was high in plants maintained outdoor (50-60%).

Since incidence of diseases in polyhouse is less and establishment of plants are easy, total recovery and usage of budgrafted polybag plants/root trainer plants are significantly high in polyhouse than in outdoor conditions.