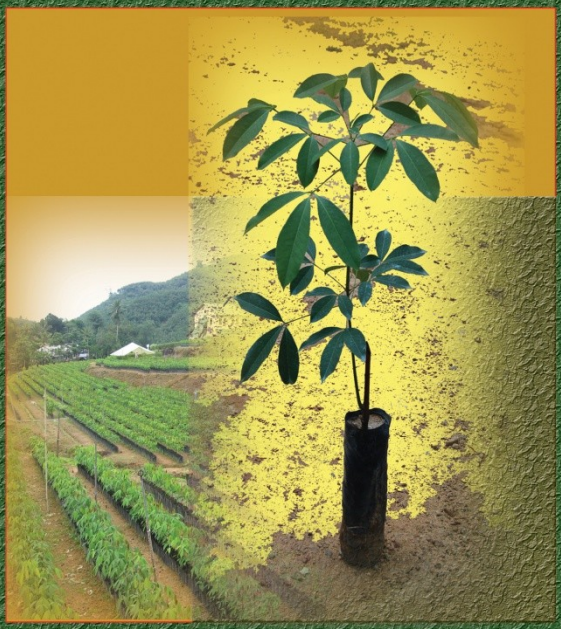
Advisory Circular No.2016/09

Production of Budded Plants



Rubber Research Institute of Sri Lanka

Production of good quality budded plants

An important factor

The productivity of most of the RRISL recommended clones is in the range of 1500 –3000 kg/ha/year. But what is harvested in most fields is far below than this. One of the main reasons for this is the use of very poor quality plants in almost all the planting programmes in the country. Productivity can be increased only by using high quality plants along with adopting recommended agromanagement practices, from the establishment of the clearing.

What is a high quality plant?

A selected vigorous rootstock plant bud grafted with a bud from a good quality budwood plant which possess a high growth rate leading to a minimum immature period, can be defined as a high quality plant (Fig. 1).

Fig. 1

What are the requirements?

In order to produce high quality budded plants, both the rootstock and the budwood should be of high quality. Quality of a seedling or a rootstock depends on the selection procedure followed. For budwood, the budwood plants should be less than 10 years of age and manured, annually pollarded and authenticity preserved.

Where to find the seeds?

Good quality seeds for rootstock nurseries are hardly found in wet areas such as Kalutara, Ratnapura, Galle and Colombo districts. Therefore, for nurseries in the wet region of the country, arrangements should be made to collect and transport fresh seeds from Warakapola, Polgahawela, Kurunagala or Gampaha areas, with the onset of the seed fall in July/August. It is also possible to obtain seeds from Monaragala and Bibile areas in January/February. The most important factor is to collect the total seed requirement at the beginning of the seed fall.

Are the seeds good?

The only test available to date for nursery managers to check whether the seeds are good or bad is to sow them in a sand bed or a germination bed and to see whether they would germinate within 7-14 days.

What is a sand bed or a germination bed?

It is just a layer of pure river sand spread in a shady place to a thickness of 5 cm (2 inches) and width of 1 m (3 ft) (Fig. 2). One square metre area holds about 1000 seeds (4 kg) and therefore the length of the bed should be made according to the number of seeds to be sown. There should be only one layer of seeds, slightly covered, with sand. The sand should be kept well moist throughout by watering twice daily, for the seeds to germinate. Water logged condition or sprinkler irrigation, throughout the day may cause pathogenic problems.

Fig. 2

When to harvest germinated seeds?

Germination will start after about 7-10 days of seed sowing if the seeds are fresh. Germinated seeds should be harvested every other day, only for three rounds. The ideal time to harvest is as the radical is growing out (Fig. 3). Planting them in poly bags can be delayed if necessary but, late germinators should be discarded to prevent mixing them with early germinators**.**

Fig. 3.

Why we should use the germination bed?

The only purpose is to select vigorous stock plants through harvesting early germinated seeds.

What percentage should be harvested?

The maximum number of seedlings that should be harvested from a germination bed is only 50% of the number of seeds sown, even if the entire population germinates. Therefore, the number of seeds sown in the bed should be as twice as the number of rootstock plant requirement, if the seeds are fresh.

A tip for success

If only this selection of early germinators can be made successfully, by the effective use of the sand bed, the nursery should be continued. Failure to select the vigorous rootstocks, will lead to produce weak budded plants later. Failure to select vigorous plants at this stage cannot be compensated by any other agronomic practice.

No more ground nurseries!

Ground rootstock nurseries are no longer recommended to raise root stock plants as the quality of the plants cannot be detected or guaranteed. Further, the age of the budded plant can be kept below one year only through young budding plants.

Polybag rootstock nursery

6" x 15" black polybags with gauge 300 for nurseries less than one year or 7" x 15" gauge 500 for nurseries more than a year (Monaragala and Ampara areas) are suitable for this purpose. Gusseted and perforated bags are available in the market at a reasonable price. Recycled material is not suitable and should not be used as there is no guarantee for their durability. Life span of polybags should be guaranteed by the manufactures to be more than one year.

Soil for filling bags

Where ever possible, top soil of loamy texture should be used. It is important to add 50-100g of dry organic manure (compost) and 50 g of High Grade Eppawala Rock Phosphate (HERP) per bag prior to filling.

Nursery site

An open area away from mature rubber fields should be selected. Access to a good source of water is a requirement. Lands with shallow soil are not suitable.

Nursery layout

Soil filled bags are placed in shallow trenches close to each other, as single rows. The recommended distance between single rows is 1½'. Double rows have may disadvantages.

Transplanting (Planting germinated seeds in bags)

Seedlings should be planted in bags as they germinate. One germinated seed should be planted in one bag. If the weather conditions are adverse, seedlings should be shaded with bracken or alternatively transplanting can be delayed until the shoot of the seedling is about 5-6 cm long.

Fertilizer for young budding nurseries

The suitable fertilizer mixture for the soil type should be selected from the Table below.

Table 1. *Mixtures of fertilizer for different soil types*

District/Region	Soil type	Mixture
Kegalle/Kurunegala	Parambe	R/YB 13:17:6:3
Matale	Matale	R/YB 13:16:16
Galle, Kalutara, Ratnapura, Badulla and Monaragala	All other soils	R/YB 9:11:11:4

(R/YB – Rubber/Young budding)

The fertilizer mixtures are available in the market, or else they can be mixed as per the following formulae according to the mixture.

Table 2. *Composition of different fertilizer mixtures*

Mixture	Sulphate of Ammonia	Diammonium Phosphate	Sulphate of Potash	Epsom salt	Total
R/YB 13:17:6:3	31	38	13	18	100
R/YB 9:11:11:4	23	25	23	29	100
R/YB 13:16:16	32	35	33	-	100

Pre cut – back period

Application of fertilizer should be started 2 weeks after planting of geminated seeds in bags. 112 grams (4 ounce) of mixture is dissolved in 4.5 litres of water (1 gallon). 50 ml of this solution should be applied per bag at 2 week intervals (4.5 litres is sufficient for 90 plants).

Post cut-back period

After cut back a higher dose, *i.e.* 168 g of the same mixture is dissolved in 4.5 litres of water and 50 ml of this solution is applied to a plant at 2 week intervals.

If the labour demand is high, 100 ml of above fertilizer mixture can be applied per plant at 4 week intervals.

Important facts to remember in manuaring the plants

The total quantity of the fertilizer should be completely dissolved in water before applying. This is achieved by pre-soaking them for a few hours and stirring throughout the manuaring process.

Management of nursery diseases

It is recommended to apply fungicides regularly before symptoms of diseases are seen. Prevention is always better than cure.

It is advisable to adhere strictly to RRISL recommendation on correct cultural practices to prevent most of the maladies in nurseries. For further information, please refer the pamphlet on "Maladies of Rubber Nurseries".

Group A

Mancozeb/ Propineb/ Ridomil/ Captan/ Antracol (3g per liter).
or carbendazium - *systemic fungicides (0.5-1.0g per litre).

Group B

Copper containing Fungicides (3.0g per litre)

- Spray one fungicide from each group alternatively at weekly intervals. Frequency of application depends on the weather factors/stage of the disease severity level.
- During heavy rains, use a *systemic fungicide as contact fungicides may easily get washed off.
- Apart from the above applications, a sulphur containing fungicide at a concentration of 3g/ litre is recommended only during the Oidium season.

What about budwood?

Presence of a budwood nursery adjoining to the stock nursery is a basic requirement to produce good quality plants.

Quality of budwood

Quality of budwood is equally important for the production of high quality budded plants. If you do not use good quality budwood, the pain taken to select vigorous rootstock plants will just be in vain.

The more juvenile the budwood the faster the growth rate of the budded plants in the field.

Requirements need to be fulfilled in a budwood nursery

- Age of the nursery should be below 10 years.
- Age of budwood should be less than 3 months.
- Budwood plants should be pollarded every year whether the budwood is used or not.
- Clones should be demarcated without mixing.
- Manuring and disease control should be carried out according to the recommendations.

Budwood nursery

The spacing of the budwood nursery can be 4' x 4' or 3' x 6' according to the bed size and the terrain. More number of buds can be obtained from 9-10 weeks old new shoots obtained by cutting the branches where the bark is brown and just above a leaf whorl.

The axillary buds can also be used by cutting the leaves with a piece of petiole attached, about 3 weeks before they are required.

It is very important to manure the budwood plants once they are pollarded. This will not only increase the number of shoots but also of the healthiness of the shoots.

Suitable fertilizers and quantities could be selected from the Table 3 below. These quantities should be applied in 4 applications during the 1st year as at the time of pollarding from the 2nd year onwards.

Table 3. *Manuring schedule for budwood nurseries*

Year	**Frequency**	**Quantity (g/tree)**			
		Urea based		**SA based**	
		Group I &III	**Group II**	**Group I &III**	**Group II**
1st	4 app./year	275 R/U Mix. + 75/50[a] KIE	275 R/U Mix.	450 R/SA Mix.	375 R/SA Mix.
2nd on wards	2 app./year	550 R/U Mix. + 150/75[a] DOL[b]	550 R/U Mix.	900 R/SA Mix.	750 R/SA/Mix

SA - Sulphate of Ammonia
KIE - Kieserite
Dol - Dolomite
R/U - Rubber/Urea
R/SA - Rubber/Sulphate of Ammonia

Bud grafting

Well maintained stock plants become buddable in 3-4 months. Plants should be more than 6 mm in diameter at the time of bud grafting. Bud sticks of 9-10 weeks of age of similar size in diameter can be used.

Growth stage, *i.e*. whether they have a mature top whorl of leaves or not, of the stock plant does not affect the success of bud grafting. Therefore, even the plants with tender leaves can be budgrafted.

Main steps of bud grafting procedure are given in Figure 4.

Fig. 4.

Cutting of the rootstock

The rootstock of the successfully bud grafted plants can be cut backed after one month of the graft at 6" above the bud patch. It is essential to apply a fungicide (Candarsan or Barkosan) on the cut surface.

Restacking causes a severe set back

Some nursery managers prefer to move the successful plants to another location at the time of cut back. If the seed selection was adopted properly at the germination bed, and if the plants were properly manured and the bud grafting was planned to carry out after 4 months, more than 80% of the rootstock plants become buddable. Then the unbudded 20% or less should be moved to another location or should be discarded as weak plants.

From the nursery to the field

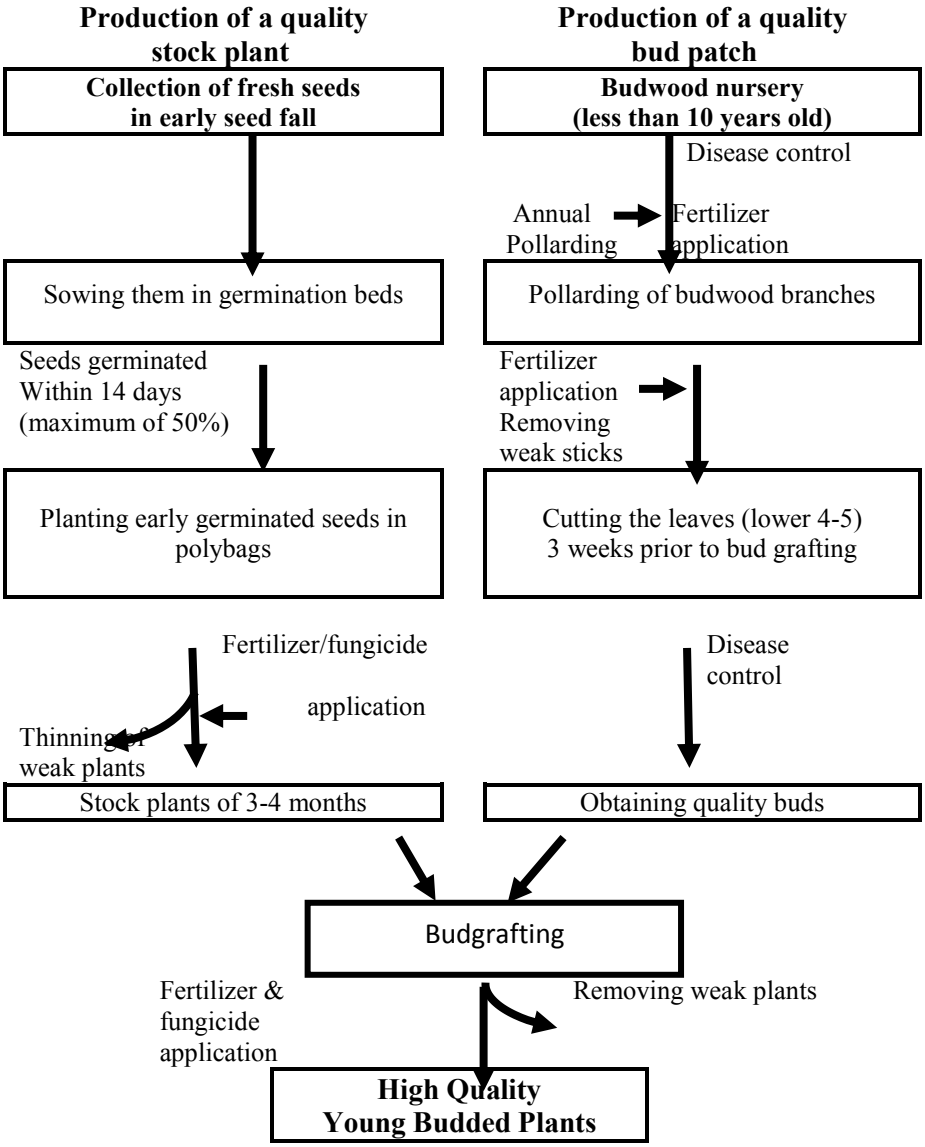
It is very important that the roots that have emerged outside from the bottom of the bag are cut at the base of the bag, about 10 days prior to the date of planting them in the field. Any transportation involved should be done during this period with care, and plants should never be exposed to direct sunlight.

Can a healthy plant in the nursery, die soon after planting it in the field?

This is possible if;

- the root system was not pruned properly 10 days prior to planting.
- the root system was damaged during transportation or at planting.
- the weather conditions were unfavourable and sufficient rain was not received soon after planting.
- the plants had an immature top whorl of leaves at planting.
- the plants were very weak and diseased at planting or diseases/pest problems in the field.

How to produce high quality plants?



Action Plan for Plant Production

Work to be done	For August Nurseries											
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
Filling of bags												
Seed collection & germination												
Transplanting in bags												
Application of fertilizer												
Disease management												
Cut back of budwood												
Budgrafting												
Cutting back												
After care												
Field planting												
	Dec.	Jan.	Feb.	Marc	April	May	June	July	Aug.	Sept.	Oct.	Nov.
	For January nurseries											

Plant Science Department
Rubber Research Institute of Sri Lanka
Dartonfiled
Agalawatta

January 2016