RAPID MULTIPLICATION OF BANANA - SPLIT BUD TECHNIQUE

M. DIONYSIUS[1] AND W.M.K.M. WIJETUNGE[2]
Research Farm, Horticultural Research and Development Institute
Gannoruwa

In Sri Lanka fruit crops are cultivated on an extent of 110,000 ha. Banana occupies 46% of this total extent. Average production is 7.8 mt per ha in 1996 and the expected national average yield is 15 mt. per ha by yer 2005. Banana is mainly grown as a home garden crop. The most important impediment for the expansion of commercial banana cultivation is the shortage of good quality planting materials.

Banana is propagated by suckers. Farmers usually allow 2-3 extra suckers per clump per year for propagation. However, prolonged production of 'seed suckers' along with bunch will lower the yield (Simmonds and Stover, 1992).

The author has observed the following conditions in a field planted with *in vitro* cultured banana plants of varieties Embul, Embon and Gal Anamalu.

- Maximum size of the first bunch was only 4-5 kg with 1-3 hands.
- Bunch variation was about 50-60%
- Higher initial casualties compared to conventional suckers.
- Higher rate of sucker production results in extra labour requirements for their removal
- Massive pseudostem causes problems in crop management.

These problems are probably due to somaclonal variation and the scientists are working on reducing them in *in vitro* planting material production. Therefore, the conventional suckers have become the main source of planting materials at present and their multiplication has assumed importance again.

The 'bits and pieces' technique recommended by the DOA has so far not become popular among farmers. Farmers

[1] Research Officer

[2] Farm Manager

are reluctant to use 7 - 8 months old (before fruits shoot) rhizomes to produce planting materials as they lose bunches and also they do not accept these planting materials as good as the suckers separated from plants.

The research carried out at the research farm of HORDI by the author has proved that the suckers obtained through bits and pieces techniques are equally good as the sword suckers obtained from banana plantations. Further, research has revealed that 'after harvest rhizome' also produces good quality suckers as 7-8 months old rhizomes. This is a significant finding which allows farmers to obtain bunches and produce suckers from unwanted rhizomes.

This techniques too has its own limitation. The author has found in his experiments that about 5 - 6 plants develop from a rhizome and of which usually 60% are maiden suckers and 40% are water suckers. Therefore, one rhizome provides only about 2.5 - 3 plants suitable for field planting thus rendering the efforts worthless.

To rectify the above mentioned shortcomings, a new technique was developed at the horticultural research farm of the HORDI. This 'split bud technique' described below was tested with variety 'Embul' very successfully.

SPLIT BUD TECHNIQUE

- Separate the rhizome of 7 - 8 months old banana plant free of any pests and diseases.
- Clean the surface of the rhizome by removing the outer layer with a sharp knife taking maximum care not to damage the lateral buds and collar region
- Cut the rhizome to pieces of approximately 750 g- 1 kg each containing a dormant lateral bud or eye.

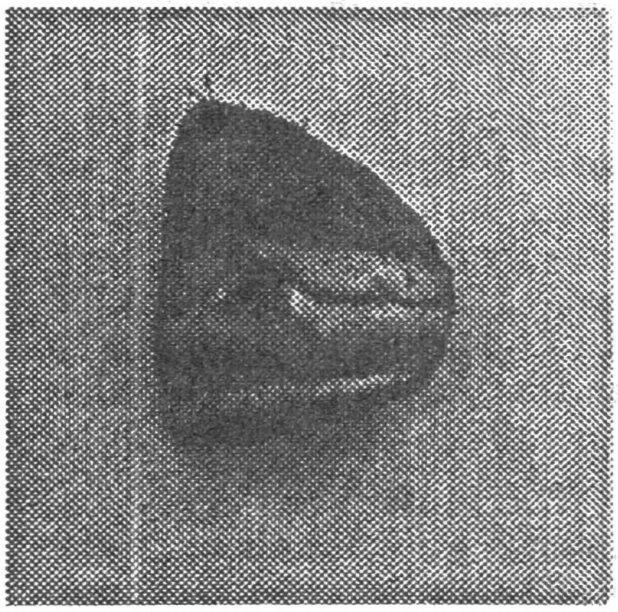

Fig. 1: split corm piece with one active lateral bud

- Immerse the pieces in a slurry prepared by mixing fresh cow dung, kitchen ash, furadan and captan in water

for 5 - 10 minutes and then keep in the shade for 3-5 days before planting. The slurry can be prepared by adding sufficient quantity of water to the mixture of 3-5 parts of cow dung and 1 part of kitchen ash. Add 30 -50 g of furadan and 30 g of captan to 1 gallon of slurry.

- Plant the rhizome pieces in a sterilized bed at a spacing of 20 x 20 cm. The media of this planting bed consists of saw dust 3 parts, river sand 1 part and compost 1/2 part. The bed must be 30 cm deep and 100 cm wide
- The buds start to sprout in 14 - 21 days. Remove the rhizome pieces and cut them through the center of the bud into 4 - 5 pieces in such a way that each piece contains a portion of the sprouting bud.

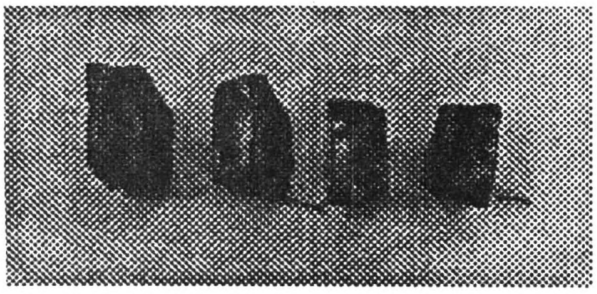

Fig. 2: Active bud cut into 4 pieces with small piece of rhizome (50 - 75 g)

- Immerse these pieces in the mixture of cowdung and kitchen ash mentioned earlier and plant in the same planting beds at a spacing of 15 cm x 25 cm
- Several plantlets develop from each split pieces of the rhizome 18 - 20 days after planting. After about 4-6 weeks when the plantlets reach a height of 10 - 15 cm, carefully separate and plant them in 300 gauge transparent polythene bags of 25 cm width and 35 cm height. Polythene bags are filled with a mixture of river sand, cow dung and top soil at the ratio of 2:1:1.

Fig. 3: Initiation of plantlets from a split bud

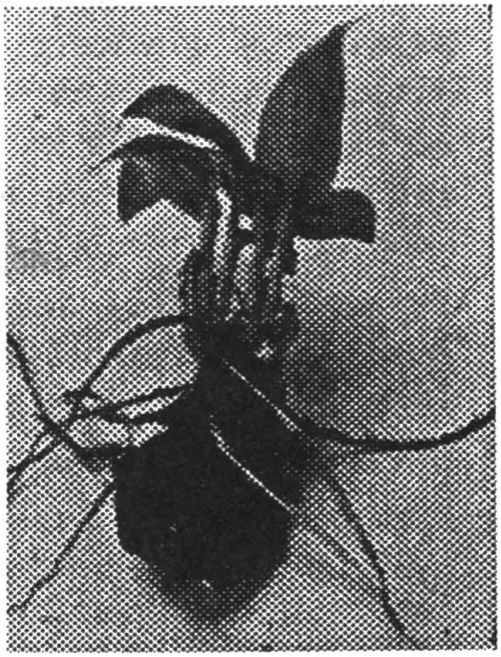

Fig. 4: Eight plantlets developed from a split bud

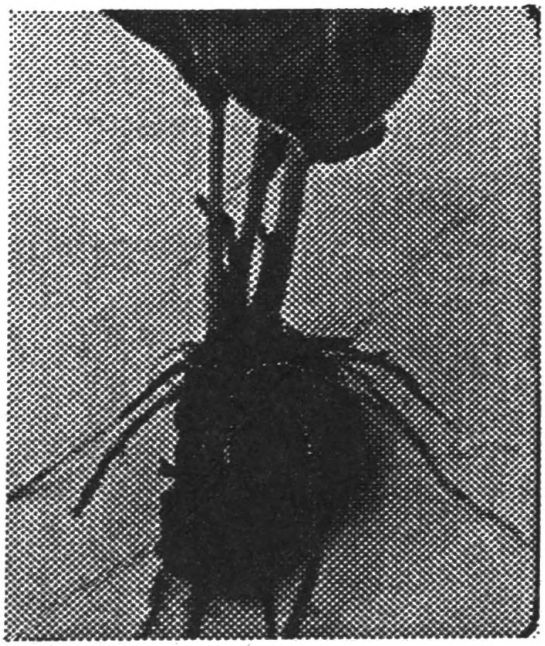

Fig. 5: 30 cm plantlets ready for transplanting in polythene bags

Fig. 6: A plantlet transplanted in polythene bag

- Keep the transplanted plantlets in potting house or shade where no direct sun light reaches the plants for 2 - 3 weeks.
- Transfer the plants in polythene bags to a net house or to a partially shaded place where 50 -60% sun light will reach the plants. Keep the plants there for 4 - 5 months.
- Thereafter keep the plants in open space for hardening for about 1 - 1 1/2 months.
- The plantlets which look like *in vitro* plantlets, will

be ready for field planting in 7 - 7 1/2 months time from the initial planting of rhizome pieces in the bed.

On an average 70% of the split buds sprout to produce 1 - 7 plantlets per piece without any hormonal treatment or nutrient application. Of the sprouted split buds, 68% produce multiple plantlets. Hence 80 - 140 plantlets ready for field planting can be produced from a rhizome within a time period of 7-7 1/2 months using the split bud technique.

Application of hormones and nutrients will increase the number of plantlets. In Nigeria, B.A. Adelaja of fruit division of National Horticultural Institute reported developing 500 plantlets from a single rhizome within a period of 08 months under experimental condition. As no somaclonal variation takes place in this techniques, the problems encountered in the case of *in vitro* plants will not pose any threat.

As the plantlets are kept for long time in polythene bags, application of fertilizers is necessary to produce vigorous plants. Apply 2% urea solution as foliar spray twice at 02 weeks interval starting at 3 - 4 weeks after transplanting in polythene bags. Thereafter, application of 2 - 3 g of banana fertilizer mixture per pot per month will result in faster growth and sturdy pseudostem.

This techniques has the obvious advantages of producing large number of plants per rhizome and therefore, better than the other techniques used for banana planting material production. Unlike other banana planting materials (sword suckers and bits and pieces suckers), these planting materials have well developed root system.

The performance of the plants developed through split-bud technique is comparable to those developed from sword suckers (Table 1).

Table 1: Comparison of performance between plants of split bud technique and 3 1/2 - 4 months old sword suckers.

Features	Sword suckers	Split-bud plants
1. Survival rate in the field	78 - 82%	97 - 98%
2. Planting to flowering months	9 - 10 1/2 months	9 1/2 - 11
3. Shoot to shoot interval		
1st to 2nd bunch	256 days	261 days
2nd to 3rd bunch	280 days	278 days

Rate of growth was equally good as sword suckers. In the first observational trial at Gannoruwa, 56 - 61% plants started flowering 9 1/2 - 11 months after planting, 25 - 30%, 11 - 12 months after planting and the rest 12 - 14 months after planting. Such distribution in flowering is a common feature even in a plantation established with 3 1/2 - 4 months old sword suckers.

The split-bud plants were equally good in growth rate and fruit characteristics compared to the mother plants from which the rhizome was taken for the development of plantlets (Table 2).

FIELD PLANTING OF SPLIT-BUD PLANTS

Unlike the conventional suckers (sword and maiden suckers), split-bud plants are with well developed primary root but with little rhizome like the tissue cultured plants. Therefore, split-bud plants are planted deeper than the conventional suckers so that when the rhizome develops it can be covered with soil.

Prepare planting holes 60 cm square and 75 cm deep and fill with top soil and compost mixture up to 30 cm from the soil surface. Plant the split-bud plants as shown in figure 7 below and gradually fill the rest of the planting hole with top soil when rhizome develops.

Table 2: Comparison of growth rate and fruit characteristics between split-bud plants and their mother plant.

Characteristics	Mother plant	Split-bud plants
1. Height	4.57 m	4.67 m
2. Time period from planting to flowering	09 months	9 1/2 months
3. Average bunch weight	18.4 kg	17.9 kg (1st bunch)
4. Average fruit length	14.5 cm	14.5 cm
5. Average fruit girth	14 cm	13.8 cm
6. Average fruit weight	80 g	82 g

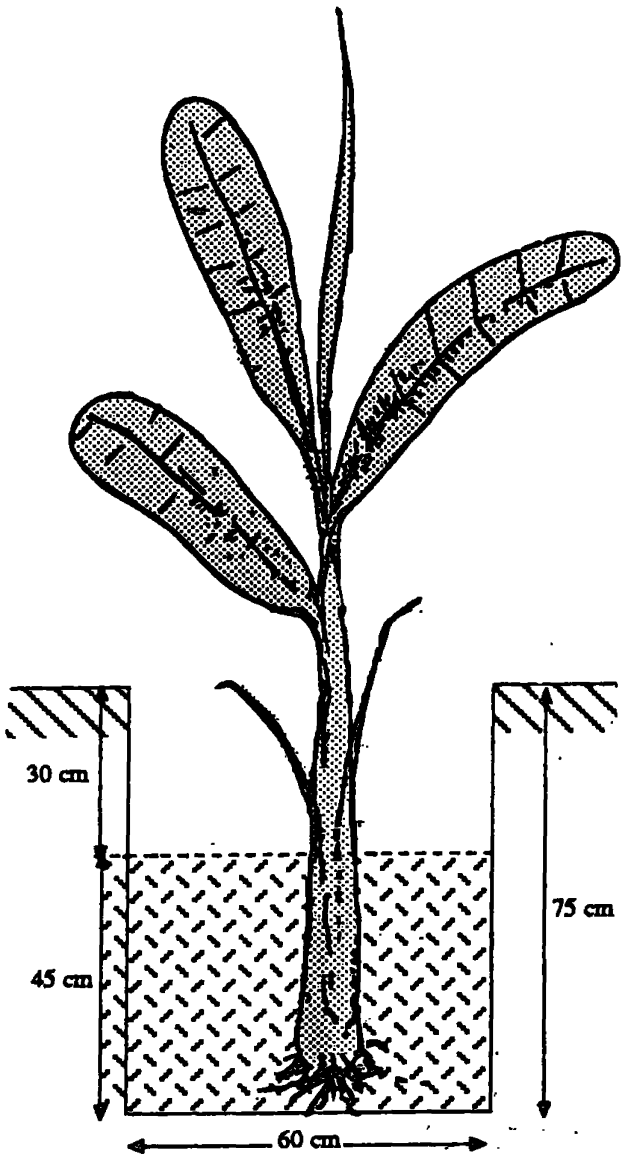

Fig. 7: Field planting of banana plant developed through split - bud technique.

Irrigation or sufficient soil moisture is essential up to a period of 4 - 5 months from planting as the split-bud plants develop sizable rhizome with sufficient food reserves during this period. Thereafter, plants can withstand adverse stress conditions.

As spilt-bud plants have well developed root system the fertilizer application can be started at the time of planting. Application of 250 g banana mixture to the planting hole and another 250 g 2 months later ensure faster early growth and crop establishment. Thereafter, departmental fertilizer recommendation and crop management practices can be adopted.

CONCLUSION

Split-bud technique has the obvious advantage of producing large number of plants from one rhizome. In addition pest and disease free planting material can be produced. Banana plant production can be very profitable with this method.

REFERENCES

Stover, R.H. and N.W. Simmonds. (1992). Bananas. p 55 - 70.