

PRELIMINARY STUDIES IN VEGETATIVE PROPAGATION OF *PIPER NIGRUM*

BY B. G. KAMP.*

INTRODUCTION.

Pepper (*Piper nigrum*) is normally propagated vegetatively.

Sickey (1968) reported 95.7 per cent. success using the 'peat-pot' method. However, the majority of recent authors recommend the planting of cuttings into unshaded gardens, and under such conditions it is imperative that the cuttings be hardened off before field planting. The reaction of the pepper cuttings to hardening off appears to depend largely on the method of propagation.

To investigate propagation methods suitable for smallholder use, a comparison was made between a bush bed method and a bamboo pot method in relation to losses involved in striking, hardening and field establishment, and field establishment following propagation in the mist propagator. Mist propagation is the method used at the Lowlands Agricultural Experiment Station at Keravat, New Britain.

MATERIALS AND METHODS.

Prior experiments with various methods of vegetative propagation had indicated that the best results were obtained by using 6 to 12 month old primary vine material with six nodes, in a rooting medium of black 'bush' top soil. The medium was selected after comparative tests on the following criteria :—

- Three parts topsoil/one part gravel ;
- Three parts sawdust/one part gravel ;
- Sawdust ; and
- Vermiculite.

It was decided to compare two root-inducing hormones, Seradix No. 1 and Seradix No. 2, as these hormones have been used very successfully with other crops. Thus comparisons were made between three methods of propagation (bush bed and bamboo pot and mist propagator), three hormone treatments (nil, Seradix No. 1

and Seradix No. 2), and two hardening treatments (cuttings left in original propagator and cuttings potted out in plastic bags filled with the same medium as in the propagators). Sixty cuttings were used in the bush and bamboo propagators while 100 cuttings were used under the mist method.

Details of the three methods of vegetative propagation are given below.

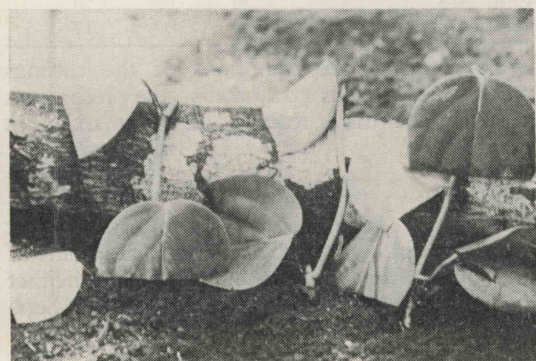
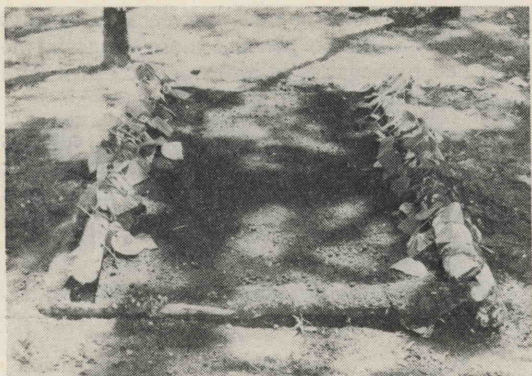
Bush Bed Propagation.

A rooting bed was prepared under *Leucaena* shade by arranging four logs about six in. in diameter into a rectangle and placing two others lengthwise on the bottom frame to form 'pillows', on which to rest the tops of the cuttings. The rooting medium was placed in this frame to a depth of about seven in. The three lowest leaves were removed from each of the six-node pieces of primary vine material, and the three top leaves were reduced to half their size. The lower half of each cutting (three nodes) was laid in a shallow furrow and pegged down with a piece of wire and covered with rooting medium. The cuttings were spaced about one in. apart. The top of each cutting was placed on the pillow (*Figure 1*). The whole bed was then thoroughly watered and covered with a piece of clear plastic which was nailed down to minimize evaporation. Care was taken to ensure that at least one of the halved leaves touched the plastic to allow absorption of the moisture which condensed on the underside of the sheet. Cuttings were not watered subsequently. The light intensity under the plastic sheet was estimated at between 30 to 40 per cent. of full sunlight.

Bamboo Pot Propagation.

Bamboo pots with a diameter of four in. and a length of ten in. were prepared by drilling a hole through the bottom septum and filling the pots with potting medium. Cuttings of *Piper nigrum* were prepared as described above, and planted one per pot. After inserting the cuttings, the pots were thoroughly watered and

* Experimentalist, Lowlands Agricultural Experiment Station, Keravat, New Britain.



each was covered with a plastic bag (11 in. x 22 in.), the open end of which was fastened around the mouth of the bamboo pot to prevent evaporation. Care was taken to ensure that one of the halved leaves touched the plastic bag to allow absorption of condensed water. A wire frame was made up (Figure 2) to prevent the bag from collapsing, and to act as a support to which to tie the vine. The pots were placed under *Leucaena* shade estimated at between 30 and 40 per cent. of full sunlight. Vines in the propagator were not watered again.

Mist Propagator.

Single node cuttings were taken from primary vines three to nine months old. The one leaf remaining on each node was reduced to two-thirds of its original length. The cuttings were then inserted in a well-rotted sawdust medium. Misting was carried out continuously between 7 a.m. and 5 p.m. for three weeks, after

which root development was sufficient to allow the cuttings to be planted individually into potting soil in plastic bags. These were placed under *Leucaena* shade for three to four months, depending on the length of the new primary shoot. Of the many thousands of cuttings prepared at Keravat by this method, about 95 per cent. strike has been obtained while 85 per cent. of original cuttings have been successfully hardened.

RECORDINGS.

Initial recordings were taken after one month in the propagator. The cuttings were then transferred to the hardening section and recorded after another month after which cuttings were field planted and a final recording made at the end of a subsequent month.

The following data were recorded :—

Percentage survival ;

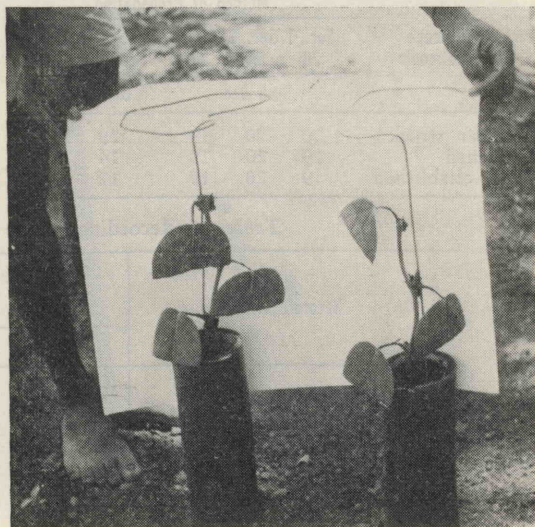
Number of new shoots per cutting ;

Average length of new shoots ;

Number of new leaves ; and

Average length of new leaves.

Percentage of cuttings with complete leaf-drop of original leaves.



All cuttings were left under shade for 14 days and then removed to an unshaded area for another 14 days during the hardening period. During the latter period, all cuttings were watered on two occasions as weather conditions were extremely dry.

At the same time 100 single node cuttings from the mist propagator (which had undergone a four month hardening period under *Leucaena* shade) were field planted.

RESULTS.

The number of cuttings that were struck, hardened and successfully established in the field (after one month) are shown in *Table 1*.

Table 1.—Total number of cuttings struck, hardened and field established.

Method of Propagation	Bush Bed 60 cuttings	Bamboo Pot 60 cuttings	Mist Prop. 100 cuttings
Total strike	59	59	95
Hardened	58	34	85
Field established	58	32	80

Relevant figures for various hormone treatments are shown in *Table 2* (Seradix No. 1 and Seradix No. 2 were compared only in the bush bed propagator).

Table 2.—Number of cuttings struck, hardened and field established.

Hormone Treatments	Method of Propagation					
	Ser. 1 20	Ser. 2 20	Nil 20	Ser. 2 30	Nil 30	
	Bush Bed			Bamboo Pot		
Number struck	20	20	19	29	30	
Hardened	19	20	19	14	20	
Field established	19	20	19	12	20	

Table 4.—Recordings taken one month after field planting.

Recordings	TREATMENTS				
	Method of Propagation				
	Bush Bed		Bamboo Pot		Mist Prop.
	Hormone	Untreated	Hormone	Untreated	Untreated
Percentage survival	96.7	96.7	40.0	66.7	80.0
Number of new shoots per plant	1.30	1.30	2.08	2.05	1.00
Average length of shoots (in.)	7.00	7.30	5.25	5.70	7.50
Number of new leaves per plant	8.90	6.70	7.16	9.45	5.00
Average length of new leaves (in.)	1.9	1.7	2.3	1.9	1.5
Percentage of cuttings with complete leafdrop	17.2	6.9	83.3	60.0	60.0

Differences were obvious between the cuttings struck in the bambo pot and those struck in the bush bed propagator, in terms of successful field establishment

There was no real difference in cuttings hardened in plastic bags and those left in their original medium although the former method is more convenient. Figures for survival are given in *Table 3*.

Table 3.—Survival one month after field planting.

Method of Propagation	Hardening Treatment	
	Plastic Bags 30 cuttings	Original medium 30 cuttings
Bush Bed	29	29
Bamboo Pot	19	17

To illustrate the conditions of the cuttings under the various treatments the recordings made at the third reading are summarized in *Table 4*.

DISCUSSION.

Both the bush bed and the bamboo pot methods were very successful from the point of view of *striking* of cuttings. With neither method was there any advantage in using Seradix No. 1 or Seradix No. 2.

However, there were marked differences in losses during hardening between the bush bed and bamboo pot methods of propagation. In spite of dry conditions during the last fortnight of hardening, 58 of all cuttings from the bush bed were successfully hardened while only 34 from the bamboo pots survived to the end of the hardening period. Losses with the bamboo pot method can be related to premature leafdrop, as 68 per cent. of cuttings had

dropped all three original leaves at three months after striking, while only 12 per cent. of the cuttings in the bush bed had lost all original leaves over the same period. Following total leafdrop the main stem dehydrated, causing collapse of newly developed leaves.

Virtually all cuttings which had survived hardening were successfully field established. A few deaths occurred with the hormone treated cuttings. It appears that for the bamboo pot method, the use of Seradix No. 2 may have been detrimental.

With a single node cutting as used in the mist propagator the first pruning is made traditionally when the primary shoot has developed ten nodes. Seven of these are removed leaving three to develop one new primary shoot each. This normally occurs about five months after striking. The author favours the use of six-node cuttings, as with bush bed and bamboo propagation methods, as it obviates the first pruning. The cuttings immediately have the potential to form the three primary shoots required. In practice, however, three primary shoots are not formed sometimes. All three buds will begin to grow but usually one or two primaries dominate. However, the other buds will develop immediately if the developing primary shoot or shoots are pruned. In the course of the trial 1.3 primary shoots were developed naturally per plant on those cuttings from the bush bed propagator, 2.0 per plant on those from the bamboo pots, and as expected one per plant from the single node mist propagator cuttings. Cuttings with three primary shoots were established from six-node material three months after striking. For single node cuttings the period is six months. The use of six-node cuttings, where suitable propagating material is freely available, would save three months.

The author considers that planting three nodes of a six-node cutting upright below the soil surface minimizes the chance of a cutting drying out and also provides a greater root 'feeding' area.

Table 5 sets out the approximate material cost per 100 rooted cuttings involved in the three methods of propagation.



Plates IV and V.—Six-node Cuttings.

SUMMARY.

The striking, hardening and field establishment of cuttings of *Piper nigrum* were compared using three methods of propagation. These were in bush beds and bamboo pots as well as

Table 5—Comparative material costs of propagating 100 pepper cuttings.

Material	Method		
	Bush Bed	Bamboo Pot	Mist Propagator
Clear plastic sheet	6 ft. x 6 ft. = \$0.40		Available only from the Agricultural Station
Plastic planting bags	\$0.55	\$0.55	
Plastic bags 11 x 22		\$1.90	The price is \$0.05 per cutting
Fencing wire for frame at \$7.91 per cwt.		\$0.70	
TOTAL	\$0.95	\$3.15	\$5.00

under a mist propagator. The first proved best because cuttings rooted by that method suffered fewer losses during the subsequent hardening period. Treatment with root-inducing hormones (Seradix No. 1 or Seradix No. 2) gave striking percentages no better than control treatments. Further slight losses appeared to occur following field planting when treated with hormones.

Mist propagated cuttings were established in the field as successfully as those from the bush bed propagator.

On the basis of percentage survival and physiological condition of cuttings after successful field establishment there was no difference between those potted in plastic bags and those remaining in the propagators during hardening. On a material cost basis the bush bed method is far cheaper than the other two.

It is recommended that *Piper nigrum* cuttings be propagated by the bush bed method, that no hormone treatment be applied and that cuttings be transplanted into plastic planting bags following striking (for convenience). A hardening-off period of about one month appears to be adequate.

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