

Coconut nursery studies
V. A comparative study of some of the methods
of germinating coconuts

By

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INTRODUCTION

In the coconut, as a rule, only seedlings are planted out in the field. The age of the seedling at the time of transplantation varies with regions in India. In Tanjore District of Madras State nuts just sprouted and at what is locally called the "Kakka Mookku" or "Crow's beak" stage are generally used for planting. At the other extreme, 3 to 5 year old seedlings are favoured in some parts of the States of Andhra, Mysore and Orissa. The normal practice is to plant seedlings which are from 9 to 18 months in age.

For producing seedlings the nuts should be made to sprout. The usual practice is to sow the seednuts in the nursery near an assured water source and transplant the seedlings in the field at the required age. Some of the other practices in vogue on a small scale are the following (Menon and Pandalai, 1958).

- (i) The nuts are heaped in shade to sprout.
- (ii) The nuts are tied in pairs with a bit of husk split from each and are suspended from branches of trees or other forms of support such as bamboo poles and water is sprinkled over the nuts regularly till they sprout.
- (iii) In Philippines seednuts are reported to be tied round an upright pole in the open for germination.
- (iv) The nuts are left to germinate on the ground where they fall. Many plantations in Andaman and Nicobar Islands seem to have resulted in this manner creating an impression of wild growth.

In the nursery, the nuts are being planted in different positions such as vertical with the stalk end up, horizontal with the nuts lying on its side and oblique with the nuts occupying a position midway between the two. Some

are even of the opinion that 'inverted' (topsy-turvy) position (with the stalk end facing downwards) is better. From the work done in earlier years at the Agricultural Research Stations of the West Coast (previously forming part of the Madras State and now belonging to Kerala State) it has been concluded that since no significant differences are seen in respect of early or total germination of nuts or of performance of resulting seedlings, vertical position may be recommended because it is more convenient for planting in the nursery and for packing and transport of seedlings (Memoirs of the Department of Agriculture, Madras, 1954). Experiments done in Ceylon (Ambrose, 1951) and in Philippines (Espino, 1922) gave results in favour of horizontal position.

When the Indian Central Coconut Committee's Central Coconut Research Station, Kasaragod was established in 1947, as part of a comprehensive study of nursery practices this aspect of nursery work was again subjected to careful investigation adopting larger numbers of seednuts and statistical designs of layout during the years 1948-49, 1949-50 and 1950-51. The conclusion arrived at was that though there was no significant difference in the percentage of germination between the two positions tested, viz., vertical and horizontal, the general development and vigour of seedlings was generally better in the case of horizontally-planted nuts (Annual Progress Report of the Central Coconut Research Station, Kasaragod for the year 1948-49 to 1951-52). It is, however, true that for packing seedlings for transport, vertical position is more convenient.

The information at hand could not answer the queries made regarding the effect of planting seednuts in an inverted position or of suspending them in the air, on germination of nuts and performance of seedlings. Therefore these aspects were investigated at this Research Station during the years 1952-53 to 1954-55. The experiments are summarised hereunder.

Experiment 1.

Study of the performance of nuts suspended in the air as compared to nuts planted in the soil.

In 1952-53, 50 seednuts were suspended in the air on a bamboo pole placed in a horizontal position at the commencement of the monsoon in the month of June and on the same day another lot of 50 nuts was planted in the nursery in the ordinary manner. The date of appearance of sprouts in individual nuts was noted. The suspended nuts were planted in the soil as soon as sprouts appeared, giving the usual spacing and identical treatments were given to the seedlings from both the groups. Thirteen months after the planting of seednuts in the soil, the seedlings were studied for vegetative characters relating to growth. The data are summarised on page 169.

In total germination there is not much of difference between the two lots of nuts; but the nuts planted in the soil have, on the average, germinated about a month earlier than those suspended in the air. In regard to

seedling characters, significant differences are seen only in the height of seedlings.

Characters studied	Nuts planted in soil	Nuts suspended in air	Difference
<i>Seednuts</i>			
Total germination per cent	92	88	
Mean number of days taken for germination	107.0	134.0	27.0** \pm 5.12
<i>Seedlings</i>			
Girth at collar (cm.)	12.1	11.5	0.6 \pm 0.36
Height (cm.)	128.2	112.7	15.5** \pm 4.14
No. of leaves	4.8	4.9	0.1 \pm 0.17

** Significant at 1 per cent level.

As a side observation, the date of emergence of the first root out of the husk was also observed in the nuts suspended in the air. In 70 per cent of the nuts, roots were found to emerge before the appearance of the sprout; the mean interval was 29.0 ± 2.83 days, a highly significant result. The data also appeared to show that there is some relationship between the emergence of the root and that of the sprout. In the case of nuts where roots appeared first, the time taken for germination was significantly less than when sprouts appeared without being preceded by the emergence of the root. The relevant data are summarised below.

	Mean No. of days taken for germination	Difference
Sprouts appeared after the emergence of roots	128.1	20.1** \pm 7.11
Sprouts appeared before the emergence of roots	148.2	

Experiment 2.

The above experiment was repeated during the year 1953-54 when under the main treatments adopted during the previous year, three sub-treatments were introduced, viz., the position of keeping the seednuts such as 'vertical', 'horizontal' and 'inverted' (topsy-turvy). Each sub-treatment had 50 nuts allotted to it at random. The following is a summary of the observations made in the experiment.

Percentage of germination. Data of total germination of nuts recorded in the experiment are given below:

	Nuts suspended in air	Nuts planted in soil	Mean
Vertical	78.0	88.0	83.0
Horizontal	85.4	92.0	88.7
Inverted	40.0	42.0	41.0
Mean	67.6	74.0	

Nuts planted in the soil have recorded in general slightly better germination than those suspended in the air, the mean difference in its favour being 6.4 per cent. These nuts have also germinated, on the average 10 days earlier, the figures obtained being 109 days for the lot planted in the soil and 119 days for the suspended lot.

Among the three positions in which the nuts were kept for sprouting, "inverted" position has recorded the lowest germination, less than half of what has been recorded for the other two positions, the criteria adopted for germination being the emergence of the sprout out of the husk. A detailed examination of the ungerminated nuts however brought out the fact that in the nuts kept inverted almost all the nuts had germinated but that the sprouts in their attempts to turn round and force their way upwards through the entire length of the husk were found stuck up and could not emerge out of the husk as easily as in the other cases.

A study of the resulting seedlings gave the following results.

Seedling characters studied	Vertical	Horizontal	Inverted	Mean
<i>Nuts suspended in air</i>				
Girth at collar (cm.)	12.1	11.2	11.6	11.6
Height (cm.)	109.4	119.3	111.3	113.3
No. of leaves	5.8	5.8	5.4	5.7
<i>Nuts planted in soil</i>				
Girth at collar (cm.)	11.6	11.6	11.8	11.7
Height (cm.)	108.8	113.4	108.5	110.2
No. of leaves	6.3	6.3	5.6	6.1

It may be seen that the seedlings resulting from nuts placed in the 'inverted' position and also from nuts suspended in the air show slight

reduction in the number of leaves produced, when compared to other treatments of the same group, but otherwise their performances are almost similar.

Experiment 3.

In view of the finding from the second experiment that planting seednuts in the 'inverted' position results in considerable delay in the emergence of the sprouts out of the husk, studies were continued in 1954-55 season to find out the effect of keeping the seednuts inverted initially for limited periods only and then keeping them in the vertical position for subsequent development. Thus the nuts were kept inverted for periods varying from 5 to 30 days, just to initiate the process of germination but not giving time for the sprouts produced, if any, to curve upwards.

Nuts were also kept in the 'vertical' and 'horizontal' positions for comparison. Each lot had as before 50 nuts. The experimental data are summarised below.

Treatment	Total germination %	Mean No. of days taken for germination	Seedling characters		
			Girth at collar (cm.)	Height (cm.)	No. of leaves
Vertical	85.4	84	13.1	119.0	5.4
Horizontal	83.4	83	12.7	128.5	5.4
Inverted for 5 days and then kept in the vertical position	91.7	80	12.3	115.1	5.0
Inverted for 10 days and then kept in the vertical position	89.6	85	12.7	105.9	5.4
Inverted for 15 days and then kept in the vertical position	98.0	80	13.2	112.3	5.2
Inverted for 20 days and then kept in the vertical position	91.7	84	12.5	103.6	5.5
Inverted for 25 days and then kept in the vertical position	91.3	83	13.3	114.3	5.7
Inverted for 30 days and then kept in the vertical position	95.0	80	13.1	116.0	5.5

None of the nuts kept inverted had produced sprouts visible outside at the time the position was reversed. It is seen that keeping the nuts inverted for the period covered in the experiment had some favourable effects on total germination but had no consistent effects on seedling performances.

DISCUSSION

The results of the experiments furnished in the previous section have shown that suspending the nuts in the air results in somewhat late emergence of sprouts when compared to the nuts planted in the soil in the conventional way. The resulting seedlings also had slightly reduced number of leaves when compared with the seedlings resulting from nuts planted in the soil. Nuts suspended in the air are likely to feel the adverse effects of the atmospheric climate under dry weather conditions much more quickly than those planted in the soil. The differences between the two methods may be more than those observed under the heavily rainy and highly humid conditions of the experiment under drier weather conditions. Generally speaking it can be concluded that the practice of suspending seednuts as a method of germinating them is not satisfactory.

In regard to the position in which the seednuts have to be kept for germination, 'inverted' position is definitely unsuitable mainly from the consideration of delayed emergence of sprouts. Otherwise germination of nuts placed in the inverted position is equally, if not better, than those kept in other positions and the sprouts also appeared to be thicker and more robust. Between the other two positions, viz., 'vertical' and 'horizontal' the former is a shade better than the latter, a conclusion in conformity with the majority point of view. In the horizontal position, the kernel containing the embryo will be in contact with nut water. Further the stalk position will be lying in a wetter portion of the soil. These two factors provide more favourable environment for the early germination of the nuts. In the horizontal position the roots are also able to penetrate into the ground easily and quickly. However, under certain conditions this position may prove harmful. For example, if the nursery area is affected with soil pests such as white ants, it may be difficult to spot out the damage done to the developing sprout and take prompt control measures at the early stage itself. An instance in point is the case cited from British Guiana by Huggins (1930) of serious ravages of the pest 'Cockles' (*Strategus alocus*) in nuts planted horizontally. For experimental plantings which involve the taking of measurements of girth at collar, vertical position is always to be preferred.

SUMMARY AND CONCLUSIONS

Some methods of germinating coconuts in vogue, such as suspending seednuts in the air, planting seednuts in the soil in different positions such as 'vertical', 'horizontal' and 'inverted' were under comparison from the points of view of germination of nuts and performance of seedlings. It has been concluded that suspending the seednuts in air is not a satisfactory method and

also planting the nuts in the 'inverted' position. For the production of seedlings in bulk, planting nuts in the soil in the horizontal position appears to be the best method, unless other considerations such as the ones indicated were to tilt the balance in favour of the vertical position.

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REFERENCES

1. Ambrose, C., (1951). Vertical or horizontal? Which is the correct method of planting out seednuts. *Ceylon Coconut Quart.*, 2: 169-71.
2. *Annual Reports of the Central Coconut Research Station, Kasaragod for the years 1948-49 to 1954-55.*
3. Espino, R.B., (1922). On the germination of coconuts. *Philipp. Agric.*, 11: 191-200.
4. Huggins, H.D., (1930). Coconut cultivation in British Guiana. *Agric. J. Br. Guiana*, 3: 164-78.
5. *Memoirs of the Department of Agriculture, Madras*, 1954: p. 295.
6. Menon, K.P.V. and Pandalai, K.M., (1958). *The Coconut Palm - A Monograph*. Indian Central Coconut Committee, Ernakulam.