Re-Print, Indian Coconut Journal, April 1984, Vol. XIV. No. 12

NURSERY STUDIES IN WEST COAST TALL COCONUT

2. SEEDLING GROWTH AND OUTPUT OF QUALITY SEEDLINGS IN SEEDNUTS GERMINATED DURING DIFFERENT MONTHS

K. Satyabalan,

Central Plantation Crops Research Institute Kasaragod - 670 124, Kerala, India

Abstract

Studies on growth characters like collar girth and leaf production in seedlings from seednuts sown in June or July but germinated during different months indicate that there is slight difference between them which leaves one to doubt whether selection of seedlings in West Coast Tall is effective in improving the yield. The output of quality seedlings will be high if the seedlings are studied for their growth characters from the time of germination of each seednut whether they are sown in June or July depending on the onset of the South West monsoon on the West Coast of India.

In the first paper under this series, it was reported that the seednuts of West Coast Tall coconut harvested during January to May and sown in the nursery either in June or July germinated during the months of July to February in the case of June-sowing and from July to January in the case of July sowing (Satyabalan, 1983). In this experiment, an attempt has been made to study the growth pattern of seedlings germinated during different months in the seednuts harvested during January to May, and to assess the percentage recovery of quality seedlings in them. In the nursery studies conducted earlier, the seedlings were studied for their growth characters after a period of 9 months, 10 months, about a year or 13 months from the date of sowing (Krishna Marar & Rama Varma, 1958; Krishna Marar & Balakrishnan, 1963, Krishna Marar & Shambu, 1961; and Krishna Marar & Kunhiraman, 1963) and not from the date of germination of each seednut. Since the seednuts germinate during different periods, the seedlings studied after a particular period from the sowing date will be of different age or maturity. Hence a correct comparison of the seedlings is not possible. Only if they are studied for their growth characters from the date of germination to a particular period, a correct comparison of seedlings raised from nuts germinated during different months can be made for a rigorous selection of seedlings in the nursery. Besides, the output of selected seedlings will be more if the age of seed-

ling is calculated from the date of germination. In this paper, results of studies made on the growth of seedlings from the date of germination of nuts harvested in different months have been presented and discussed with reference to the vigour of seedlings and percentage of output of quality seedlings.

EXPERIMENTAL RESULTS

1) June sowing

In this study conducted over a period of three years, open-pollinated seednuts collected during the months January to May from high yielding West Coast Tall palms were planted in the nursery in June. The seednuts were kept in the open under shade till the husk became dry and were stored in sand under shade before planting in the nursery in June. The seednuts harvested during January to May were marked separately before they were stored and planted horizontally in the nursery. The seedlings were irrigated during the summer season and shaded to avoid sun scorch. The date of germination of each nut was noted and recorded for a period of one year from the date of sowing in the nursery. Based on the observations recorded, the date of germination of nuts of each month of harvest was grouped into months in which the germination had taken place. A total of 780 seedlings was studied at random comprising of 127 from nuts harvested in January, 241 from February harvest, 173 from March harvest, 193 from April harvest and 46 from May harvest. These seedlings were scored for collar girth and leaf production exactly at the sixth month and twelfth month from their respective dates of germination. The mean data on collar girth and leaf production in seedlings from seednuts harvested during January to May are presented in Table 1. The data indicate a decreasing trend in collar girth and leaf production at the sixth as well as twelfth month in seedlings derived from nuts harvested during January to May which may be due to the different storage periods the seednuts had undergone before being planted in the nursery, as well as due to the effect of climatic factors during the development of the seedlings. Similar data on the same 780 seedlings but which had germinated during different months July to December worked out separately from the collected data are presented in Table 1-A. Out of 780 seedlings 94 had germinated in July, 167 in August, 193 in September, 242 in October, 80 in November and 4 in December. Here also the data on collar girth and leaf production indicate the same decreasing trend both at the sixth month and twelfth month from the time of germination in seedlings germinated during July to December. The growth differences may be due to the storage period as well as to the effect of climatic factors during development of seedlings.

2) July sowing

Similar studies were conducted over a period of two years on seedlings from seednuts collected during the months January to May and planted in the nursery in July. As described earlier the seednuts were marked separately before they were stored and planted in the horizontal position in the nursery. The date of germination of each nut was noted and recorded for a period of one year from the date of sowing in the nursery. Based on the observations recorded the date of germination of nuts of each month of harvest were grouped into months in which the germination had taken place. A total of 839 seedlings studied at random comprised of 221 from nuts harvested in January, 186 from February harvest, 223 from March harvest, 177 from April harvest and 32 from May harvest. These seedlings were studied for their growth characters, collar girth and leaf production exactly at the sixth and twelfth month from their respective dates of germination. The mean data on collar girth and leaf production in seedlings from seednuts harvested during January to May are presented in Table 2. In this case also the data indicate a decreasing trend in collar girth and leaf production at the sixth and twelfth month which may again be attributed to different storage periods the seednuts had undergone as well as to the effect of climatic factors during development of seedlings. Similar data of the same 839 seedlings germinated during different months from July to January and worked out from the collected data are presented in Table 2-a. Out of 839 seedlings, 28 had germinated in July, 202 in August, 294 in September, 165 in October, 91 in November, 46 in December, 13 in January. In this case the collar girth in seedlings germinated during October, November and and January is high at the sixth month when compared to those

germinated during July, August, September and December whereas it shows a decreasing trend in seedlings germinated during July to January at the twelfth month. The differences can be only attributed to changes in weather factors during development.

Rigorous selection of seedlings is made in the nursery on the basis of growth characters, collar girth and leaf production for planting in the field. It is generally believed that late germinated seedlings are inferior to early germinated ones and this is one of the points taken into consideration in the selection of good seedlings. It has also been reported that early germinated nuts produce seedlings having a faster rate of leaf production and that early germination is an important criterion to be adopted in the selection of seedlings (Thampan, 1981). The data presented in Tables 1 a and 2 b indicate that under June sowing the collar girth varied from 7.7 cm in seedlings obtained from nuts germinated in November of May harvest, 10. 2 cm in those from nuts germinated in July and September months, of January and February harvests respectively. Leaf production varied from 5. 0 in seedlings germinated in November in nuts of May harvest, to 6 . 9 in seedlings germinated in September in nuts of February harvest at the sixth month. At the twelfth month the collar girth varied from 11.8 cm in seedlings germinated in December in nuts of April harvest, to 15.6 cm in seedlings geminated in July in nuts of January harvest. Leaf production varied from 7.4 in seedlings germinated in October of May harvest to 9.7 in seedlings germinated in July of both January and February harvests. The increase in collar girth from sixth to twelfth month varied from 3.4 cm in the seedlings germinated in December in nuts of April harvest to 5.4 in those germinated in July in nuts of January harvest. In leaf production, the increase varied from 1.9 in seedlings germinated in September and November in nuts of May harvest to 3.1 in those germinated in July in the nuts of February harvest. In the case of July sowing at the sixth month the collar girth varied from 8.8 cm in seedlings germinated in July in nuts of February harvest to 12.0 cm in those germinated in November in the nuts of May harvest. Leaf production varied from 5.1 in seedlings germinated in January in nuts of April harvest to 7.0 in those germinated in December in nuts of May harvest. At the twelfth month the collar girth varied from 12.1 cm in seedlings germinated in January and December months in the nuts of February and April respectively to 16.2 cm in those germinated in July in nuts of January harvest. Leaf production varied from 7.3 in seedlings germinated in January in nuts of February harvest to 9.6 in those germinated in July in nuts of January harvest. The increase in collar girth from sixth to twelfth month varied from 1.8 cm in seedlings germinated in November in nuts of May harvest to 6.7 cm. in those germinated in July in nuts of January harvest. The increase in leaf production varied from 1.0 in those germinated in December in nuts of May harvest to 3.5 in those germinated in August in nuts of May harvest.

Statistical analysis of the data has indicated that there is significant difference in the growth characters of seedlings from seednuts sown in June and July months, at the sixth month from the time of germination. In the case of June sowing, the girth at collar of seedlings is significantly lower than in July sowing whereas in leaf production a reverse trend is noticed irrespective of the month of harvest. In the case of month of germination the collar girth of seedlings germinated in October, November and January is higher at the sixth month in the seedlings raised from seednuts sown in July. The variation in collar girth and leaf production both at the sixth month and twelfth month in the seedlings germinated in different months in the nuts of different harvests can be attributed to only changes in the climatic factors during the development of the seedling. Hence, it seems that the earlier belief that late germinated seedlings are inferior to early germinated ones is not correct. If the growth characters are taken at a particular period from the time of germination giving the same period to all the seedlings germinated at different times, there may be slight differences between them. The performance of these seedlings, vigorous and less vigorous, has been studied by Kannan and Narayanan Nambiar (1979) who have reported that yield difference between vigorous and intermediate seedlings is not significant and that seedlings selection need not be stringent as is advocated at present and that only poor seedlings should be rejected. This leaves one to doubt whether selection of seedlings in West Coast Tall coconut

is effective in improving the yield and indicates that stress should be given for the rigorous selection of mother palms.

Regarding rejection of seedlings, earlier workers have reported different figures on the percentage of rejection of seedlings. According to Patel, (1938) the percentage of rejection may be as high as fifty if stringent selection is done. Menon and Pandalai (1958) have stated that about 40 to 50 per cent may have to be discarded. It has also been reported that if the selection criteria prescribed are adopted, about 20 to 40 per cent of the seedlings get rejected (Anon, 1949; John 1970). Fremond *et al.* (1966); have stated that one should not reject in the end more than 50 per cet of the material to start with. Child (1974) has mentioned that the percentage of rejection may be as high as fifty if stringent selection is done. Details of seednuts sown, seednuts germinated, germination percentage, seedlings selected and percentage of selected seedlings of nuts sown obtained from the seednuts of different harvests sown in June and July months are presented in Tables 3 and 4. The data indicate that the germination percentage was high varying from 89.7 in April nuts to 95.8 in March nuts and low (73.9) in May nuts in June sowing and was high varying from 83.3 in April nuts to 96.2 in March nuts and low (52.2) in May nuts in July sowing. The percentage of selected seedlings of nuts sown was high varying from 79.7 in April nuts to 90.3 in March nuts and low (54.6) in May nuts in June sowing. In July sowing also it was high varying from 71.3 in April nuts to 90.1 in March nuts and low (35.3) in May nuts. In the total nuts sown, 80.3 per cent of quality seedlings was obtained in June sowing and 78.9 in July sowing. These data also indicate that in the case of nuts harvested in May whether sown in June or July both the germination percentage and percentage of recovery of quality seedlings is low when compared to other months. Hence it is advisable to prefer January nuts to May nuts for sowing in June or July months on the West Coast of India. Based on the results of studies made in Nileshwar and Pattambi in Kerala and Coimbatore and Pattukottai in Tamil Nadu, Aiyadurai (1954) had recommended that procurement of seednuts should be done from February to May in West Coast and from March to June in East Coast since best germination and percentage of seedlings are obtained during these months. Later studies by Sundaresan *et al.* (1974) in Tamil Nadu have indicated that in East Coast of Tamil Nadu, nuts harvested from June to August gave more than 85 per cent of quality seedlings and those from March to May planted one or two months after harvest gave similar out-turn of quality seedlings. Results of the study on germination and output of selected seedlings for two seasons at Ambajipeta in Andhra Pradesh indicate that seednuts maturing during January to June are suitable as they gave a mean germination percentage of 87.5 and 78.5 per cent output of selected seedlings (Kailasa Rao & Srirama Rao, 1968). All these studies indicate that a high percentage of quality seedlings can be obtained if the seedlings are studied for their growth characters from the time of germination of each seednut whether the seednuts are sown in June or July depending on the onset of the S. W. monsoon on the West Coast of India.

REFERENCES

Aiyadurai, SG (1954) A note on the nursery studies on coconut seedlings. *Indian Coconut J.* 7 : 156-163.

Anonymous (1949) Raising coconut seedlings of guaranteed quality. *Coconut Bull.* 2 : 101-104.

Child R (1974) *Coconuts*, Second Edition. Longman Group Ltd., London. pp. 335.

Fremond, Y, Ziller R and De Nuce de Lamothe, M. (1966). *The Coconut Palm.* International Potash Institute, Berne / Switzerland. pp. 227.

John, CM (1970) *Coconut Cultivation.* Indian Council of Agricultural Research, New Delhi. pp. 72.

Kailasa Rao T and Srirama Rao T (1968) Influence of the month of seednut maturity on germination and vigour of coconut seedlings. *Andhra Agric. J.* **15** : 18-20.

Kannan K and Narayanan Nambiar PK (1979) Mother palm and seedling selection in coconut. *Agri. Res. J. Kerala.* **17** : 1-6.

Krishna Marar MM and Rama Varma (1958) Coconut nursery studies. Effect of maturity of seednuts on germination and vigour of seedlings. Indian Coconut *J.* **11** : 81-86.

Krishna Marar MM and Shambu, K (1961) Coconut nursery studies. III. vigour of seedlings in relation to the floating position of seednuts in water. *Indian Coconut J.* **14** : 45 - 48.

Krishna Marar MM and Balakrishnan V (1963) Coconut nursery studies. IV. Suitability of West Coast variety nuts harvested in the different months of the year for seednut purposes. *Indian Coconut J.* **16** : 137 - 145.

Krishna Marar MM and Kunhiraman CA (1963) Coconut nursery studies. V. Comparative study of some of the methods of germinating coconuts. *Indian Coconut J.* **16** : 167 - 173.

Menon KPV & Pandalai KM (1958) *The Coconut Palm - A Monograph.* Indian Central Coconu Committee, Ernakulam. pp. 384.

Patel JS (1938) *The Coconut - A Monograph.* Govt. Press, Madras. pp. 313.

Satyabalan K (1983) Nursery studies in West Coast Tall Coconut 1. Germination of seednuts harvested during January to May, *Indian Coconut J.* **14** (6) : 3-10.

Sundaresan N, Rangaswamy M and Mohammed Ibrahim PA. (1974) Suitable season for the collection of seed coconut in the East Coast of Tamil Nadu. *Madras agric. J.* **61** : 525 - 530

Thampan PK (1981) *Hand Book on Coconut Palm.* Oxford and IBH Publishing Co., New Delhi pp. 311.

Table I

Growth characters in seedlings from seednuts harvested during January to May and sown in June

Month of harvest	Girth at collar (cm) (6th month from the date of germination)	Number of leaves	Girth at collar (cm) (12th month from the time of germination)	Number of leaves	No. of seedlings studied
January	9.9	6.6	14.7	9.4	127
February	9.7	6.4	14.4	9.1	241
March	9.4	6.5	14.1	9.0	173
April	9.2	6.2	13.7	8.9	193
May	8.3	5.5	12.5	7.5	46
General Mean	9.5	6.4	14.1	8.9	780

Table I-a

Growth characters in seedlings from seednuts sown in the nursery in June and germinated during July to December

Month of germination	Girth at collar (cm) (6th month from the time of germination)	Number of leaves (6th month from the time of germination)	Girth at collar (cm) (12th month from the time of germination)	Number of leaves (12th month from the time of germination)	No. of seedlings studied
July	9.9	6.6	15.1	9.6	94
August	9.8	6.5	14.8	9.3	167
September	9.6	6.5	14.3	9.2	193
October	9.0	6.2	13.4	8.7	242
November	8.7	5.8	13.0	8.2	80
December	8.4	6.0	11.8	8.3	4
	9.3	6.4	14.1	8.9	780

Table I-b

Growth characters in seedlings from seednuts sown in the nursery in June and germinated during July to December.

Month of harvest	Month of germination	Girth at collar (cm) (6th month from the date of germination)	No. of leaves (6th month from the date of germination)	Girth at collar (cm) (12th month from the date of germination)	No. of leaves (12th month from the date of germination)	Increase in girth at collar	Increase in No. of leaves
1	2	3	4	5	6	7	8
January	July (44)	10.2	6.7	15.6	9.7	5.4	3.0
	Aug. (35)	10.1	6.6	14.8	9.5	4.7	2.9
	Sep. (24)	10.1	6.8	14.4	9.4	4.3	2.6
	Oct. (11)	8.8	5.9	13.4	8.4	4.6	2.5
	Nov. (13)	8.9	6.1	13.2	8.5	4.3	2.4
	Mean (127)	9.9	6.6	14.7	9.4	4.8	2.8
February	July (46)	9.8	6.6	14.6	9.7	4.8	3.1
	Aug. (90)	9.9	6.6	15.2	9 3	5.3	2.7
	Sep. (41)	10.2	6.9	14.8	9.4	4.6	2.5
	Oct. (48)	8.9	5.8	12.9	8.1	4.0	2.3
	Nov. (16)	8.7	5.8	12.7	8.1	4.0	2.3
	Mean (241)	9.7	6.4	14.4	9.1	4 7	2.7
March	July (4)	8.9	6.3	13.9	9 3	5.0	3.0
	Aug. (22)	9.2	6.2	14.0	9.0	4.8	2.8
	Sep. (69)	9.6	6.5	14.5	9.2	4.9	2.7
	Oct. (71)	9.3	6.6	13.7	8.9	4.4	2.3
	Nov. (7)	9.4	6.1	13.8	8.3	4.4	2.2
	Mean (173)	9.4	6.5	14.1	9.0	4.7	2.5
April	Aug. (20)	9.5	6.7	14.0	8.9	4.5	2.2
	Sep. (47)	9.1	6.0	13.7	9.0	4.6	3.0
	Oct. (89)	9.3	6.3	13.8	9.1	4.5	2.8
	Nov. (33)	8.9	5.8	13.2	8.5	4.3	2.7
	Dec. (4)	8.4	6.0	11.8	8.3	3.4	2.3
	Mean (193)	9.2	6.2	13.7	8.9	4.5	2.7
May	Sep. (12)	8.9	6.2	13.1	8.1	4.2	1.9
	Oct. (23)	8.3	5.3	12.5	7.4	4.2	2.1
	Nov. (11)	7.7	5.0	12.1	6.9	4.4	1.9
	Mean (46)	8.3	5.5	12.5	7.5	4.2	2.0
General	Mean (780)	9.3	6.4	14.1	8.9	4.8	2.5

(Figures given in parenthesis donote the number of seedlings studied.)

Table 2

Growth characters in seedlings from seednuts harvested during January to May and sown in July

Month of harvest	Girth at collar (cm) (6th month from the date of germination)	Number of leaves	Girth at collar (cm) (12th month from the time of germination)	Number of leaves	No. of seedlings studied
January	10.1	6.2	15.4	8.5	221
February	10.1	6.0	14.9	8.5	186
March	10.2	5.9	14.7	8.2	223
April	9.8	5.7	13.7	8.3	177
May	9.4	5.8	14.2	8.4	32
General Mean	10.0	5.9	14.6	8.3	839

Table 2-a

Growth characters in seedlings from seednuts sown in the nursery in July and germinated during July to January

Month of germination	Girth at collar (cm) (6th month from the time of germination)	Number of leaves	Girth at collar (cm) (12th month from the time of germination)	Number of leaves	No. of seedlings studied
July	9.0	6.3	15.6	8.9	28
August	9.9	6.0	15.3	8.6	202
September	9.9	5.9	14.6	8.3	294
October	10.1	5.8	14.7	8.3	165
November	10.3	5.8	14.1	8.0	91
December	9.8	5.8	12.8	7.9	46
January	10.4	5.3	12.5	7.9	13
	10.0	5.9	14.6	8.3	839

Table 2-b

Growth characters in seedlings from seednuts sown in the nursery in July and germinated during July to January

Month of harvest	Month of germination	Girth at collar (cm) (6th month from the date of germination)	No. of. leaves	Girth at collar (cm) (12th month from the date of germination)	No. of leaves	Increase in girth at collar	Increase in no. of leaves
1	2	3	4	5	6	7	8
January	July (10)	9.5	6.5	16.2	9.6	6.7	3.1
	Aug. (80)	10.0	5.9	15.1	8.6	5.1	2.7
	Sep. (81)	9.9	5.8	14.8	8.4	4.9	2.6
	Oct. (25)	10.4	5.9	15.2	8.3	4.8	2.4
	Nov. (15)	10.6	6.2	15.1	8.3	4.5	2.1
	Dec. (7)	10.9	6.0	13.9	8.3	3.0	2.3
	Jan. (3)	10.7	5.7	13.1	8.7	2.4	3.0
	Mean (221)	10.1	5.9	14.9	8.5	4.8	2.6
February	July (18)	8.8	6.2	15.4	8.5	6.6	2.3
	Aug. (60)	9.9	5.9	15.2	8.6	5.3	2.7
	Sep. (62)	10.4	6.0	14.6	8.5	4.2	2.5
	Oct. (30)	10.6	5.9	15.4	8.4	4.8	2.5
	Nov. (9)	10.8	6.3	15.3	8.4	4.5	2.1
	Dec. (4)	10.1	6.0	13.8	8.0	3.7	2.0
	Jan. (3)	9.7	5.3	12.1	7.3	2.4	2.0
	Mean (186)	10.1	6.0	14.9	8.5	4.8	2.5
March	Aug. (54)	9.9	6.0	15.5	8.5	5.6	2.5
	Sep. (69)	10.0	5.9	14.6	8.1	4.6	2.2
	Oct. (55)	10.2	5.9	14.7	8.2	4.5	2.3
	Nov. (34)	10.4	5.8	13.9	7.9	3.5	2.1
	Dec. (11)	9.6	5.9	12.9	7.8	3.3	1.9
	Mean (223)	10.2	5.9	14.7	8.2	4.5	2.3
April	Aug. (6)	9.7	6.3	15.4	8.5	5.7	2.2
	Sep. (70)	9.8	5.8	14.3	8.1	4.5	2.3
	Oct. (41)	10.1	5.8	14.1	8.3	4.0	2.5
	Nov. (31)	9.8	5.6	12.6	7.9	2.8	2.3
	Dec. (22)	9.4	5.6	12.1	7.8	2.7	2.2
	Jan. (7)	10.6	5.1	13.0	7.9	2.4	2.8
	Mean (177)	9.8	5.7	13.7	8.3	3.9	2.6
May	Aug. (2)	9.1	6.0	15.5	9.5	6.4	3.5
	Sep. (12)	9.4	5.8	15.0	8.6	5.6	2.8
	Oct. (14)	9.0	5.6	13.4	8.2	4.4	2.6
	Nov. (2)	12.0	6.0	13.8	8.5	1.8	2.5
	Dec. (2)	10.5	7.0	13.7	8.0	3.2	1.0
	Mean (32)	9.4	5.8	14.2	8.4	4.8	2.6
General Mean (839)		10.0	5.9	14.6	8.3	4.6	2.4

(Figures given in parenthesis denote the number of seedlings studied)

Table - 3

Germination and output of selected seedlings in nuts harvested during January to May and sown in the nursery in June

Month of harvest	Seednuts sown	Seednuts germinated	Germination %	Seedlings selected	Quality seedlings (% nuts sown)
January	448	408	91.1	390	87.1
February	985	929	94.3	877	89.1
March	860	824	95.8	777	90.3
April	1622	1455	89.7	1292	79.7
May	753	557	73.9	411	54.6
	4668	4173	89.4	3747	80.3

Table - 4

Germination and output of selected seedlings in nuts harvested during January to May and sown in the nursery in July

Month of harvest	Seednuts sown	Seednuts germinated	Germination %	Seedlings selected	Selected seedlings (% nuts sown)
January	418	363	86.6	351	83.9
February	525	490	93.3	472	89.9
March	686	659	96.2	618	90.1
April	867	722	83.3	618	71.3
May	207	107	52.2	73	35.3
	2703	2340	86.7	2132	78.9