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EFFECT OF LEVELS AND METHODS OF FERTILIZATION ON GROWTH AND RECOVERY OF VIGOROUS SEEDLINGS IN WCT COCONUT NURSERY*

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ABSTRACT

The effect of graded levels and methods of fertilizer application on growth characters and recovery of vigorous seedlings in WCT coconut nursery was studied. The results of two year experiments revealed that growth characters did not differ significantly due to fertilization. However, most of the parameters particularly collar girth and leaf area/seedling were relatively better with fertilizer applied treatments compared to no-fertilizer. Drymatter production above ground and number of roots/seedling were significantly superior in T-8 (FYM 25 t/ha + N and K-160 kg each/ha as soil application) and T-7 (FYM 25 t/ha + N and K-80 kg each/ha as soil application) treatments in both the years. Although recovery per cent of vigorous seedlings from total germinated nuts was non significant due to various treatments, higher mean recovery of 80% was obtained with T-8 followed by 76.6% in T-7 treatment than 66.4% in control. Inspite of higher cost of cultivation at Rs 3,60,357/ha for T-8 and Rs 3,58,918/ha of nursery for T-7 treatments, the cost of production per seedling was worked out as Rs 9.76 and Rs 10.17, respectively for T-8 and T-7 treatments as compared to Rs 11.07/seedling in unfertilized treatment.

INTRODUCTION

In coconut nursery, manuring is not recommended as it is feared that it will mask the intrinsic quality of the seedlings to some extent, making it difficult for proper selection of seedlings. But studies of Foale (1968) indicated that the contribution of nutrients from the endosperm to the growing seedling was reduced from the fourth month after germination thereby necessitating fertilization if seedling vigour is to be maintained in the nursery. In Philippines, experiments on N and K fertilization in coconut nursery resulted in production of taller seedlings with bigger girth and greater vigour index (Almaden and Santiago, 1980). In India also application of NPK fertilizers in combination with Ca+Mg improved seedling vigour and quality as indicated by higher chlorophyll content and nutrient concentration in leaves (Nelliat *et.al.*1976). Further, Veloso and Tung Ly, (1982) reported application of 30 g ammonium sulphate and 30 g NaCl per seedling produced taller seedlings with greater girth and lesser degree of leaf spot/blight disease infection compared to unfertilized seedlings. However, experimental findings on effectiveness of methods of manuring are very limited and hence this study was undertaken to work out an optimum fertilizer schedule and method of application for the WCT coconut seedlings in the nursery.

MATERIALS AND METHODS

The experiment was laid out in a Randomised Block Design in CPCRI farm at Kasaragod under adult coconut garden

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shade in 1992-93 and again repeated in 1994-95. There were eight treatments with 100 nuts/treatment and each treatment has a bed size of 1.6 m width and 15 m length and replicated thrice. The treatments were, T1-Control (no fertilizer), T2-FYM (25 t/ha), T3-N and K-80 kg each/ha as soil application in three splits, T4-N and K-80 each/ha as foliar spray in three splits, T5-N and K-160 kg each/ha as soil application in three splits, T6-N and K-160 kg each/ha as foliar spray in three splits, T7, FYM 25t/ha + N and K - 80 Kg each/ha as soil application in three splits and T8-FYM 25 t/ha + N and K-160 kg each/ha as soil application in three solits at 5th, 7th and 9th months after sowing.

All the treatments except control (T1) were given a common dose of 80 kg/ha P_2O_5 as basal dose in the form of mussorie phos. The FYM was applied at the time of sowing for treatments having FYM application. The N and K fertilizers were applied in the form of urea and muriate of potash in three equal splits at 5th, 7th and 9th months after sowing. The nuts were sown at a spacing of 40 x 30 cm and for calculating the fertilizer dose, it was assumed that one hectare can accommodate 60,000 nuts. Germination count was recorded at 5th month after sowing and growth characters such as seedling height, girth at collar and number of leaves/seedling were recorded at 9th and 12th months. Drymatter production above ground, leaf area and per cent seedlings showing leaf splitting were recorded at 12th month. Leaf area was estimated by considering number of leaves (B) and product of length and width of 3rd leaf (X) by equation Log (Y) = 0.819-0.041 Log (N) + 0.915 Log (X) as given by Satheesan *et al.* (1983). The leaf samples were also collected at 12th month and analysed for N and K concentrations. The cost of cultivation was estimated by considering the prevailing market prices for labour and inputs during 1996 and interest on capital invested at the rate of 13% per annum, which closely approximates the opportunity cost of capital. The cost of production per seedling was worked out by considering the mean germination and recovery percentages from two year experiments and cost of cultivation in different treatments.

RESULTS AND DISCUSSION

The germination percentage of seednuts ranged from 71 to 83% in the first year and 62 to 74.7% in the second year. Growth characters such as seedling height, girth and number of leaves/seedling at 9th and 12th months did not differ significantly in both the years. However, in general most of the growth characters were relatively superior in fertilizer applied treatments compared to control (no fertilizer) in both the years (Table 1). Between levels of fertilizers and between method application, there is no consistant response in any of the growth characters investigated at both stages and in both years. Among the fertilizer treatments, seedling collar girth at 12th month was observed to be better with application of FYM (25 t/ha)+N and K @ 80 and 160 kg each/ha as soil application compared to rest of the treatments at both the stages (Table 1). Ramadasan *et al.* (1985) also reported that girth at collar is mostly contributed to seedling vigour thus suggesting choosing girth at collar alone as seedling selection character.

Leaf area also did not differ significantly due to various treatments at 12th month in both the years. However, highest leaf area of 5244.7 cm^2/seedling in the first year in T8 and 3865.9 cm^2/seedling in the second year in T7 was recorded. The mean leaf area/seedling for the two years indicated 29.3% increase in leaf area in T8 treatment over control treatment (T1). All the treatments which received fertilizers recorded fairly higher number of seedlings showing leaf splitting at 12th month in both the years as compared to unfertilized control treatment. Drymatter production above

Table 1. ***Effect of different levels and methods of N & K fertilization on growth characters at 9th and 12th months and leaf area and splitting in WCT coconut nursery***

Treatments	Height at 9th month (cm)		Collar girth at 9th month (cm)		Leaves/ seedling at 9th month		Height at 12th month (cm)		Collar girth at 12th month (cm)		Leaves/ seedlong at 12th month		Leaf Area/ seedling at 12th month (cm^2)		Seedlings showing leaf splitting (%)	
	1993	1995	1993	1995	1993	1995	1993	1995	1993	1995	1993	1995	1993	1995	1993	1995
T1	90.9	90.9	9.4	8.1	4.0	2.8	120.0	118.7	11.8	11.8	5.6	4.8	3358.6	3505.2	2.0	2.9
T2	96.9	96.9	9.5	8.1	4.2	2.7	127.7	131.0	11.8	12.3	5.4	4.9	3956.0	3799.0	3.0	3.6
T3	90.2	90.2	9.1	8.1	3.8	2.5	120.4	126.4	11.4	12.4	5.3	4.8	4128.9	3731.9	3.6	2.4
T4	91.5	91.5	9.3	8.5	3.9	2.8	114.6	121.3	11.5	13.0	5.4	5.1	3633.2	3370.8	4.6	5.0
T5	93.0	93.0	9.4	8.5	3.9	2.8	123.2	135.2	11.2	12.7	5.1	5.1	4434.8	3809.3	5.0	4.1
T6	94.7	94.7	9.6	8.2	3.8	2.6	124.2	126.8	11.7	12.7	5.4	4.9	3313.0	3141.1	3.0	5.6
T7	95.5	95.5	9.8	8.5	4.3	2.8	127.7	132.5	12.0	12.8	5.7	5.0	3386.0	3865.9	6.0	5.0
T8	101.0	101.0	9.6	7.9	3.8	2.6	130.5	126.0	11.9	13.0	5.4	4.9	5244.7	3629.6	6.0	6.1
S.Em ±	4.3	4.3	0.3	0.2	0.2	0.09	5.2	4.0	0.3	0.3	0.2	0.11	485.8	184.6	-	-
C.D (5%)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-	-

ground was significantly higher in T8 (179.4 g/seedling) and T7 (178.6 g/seedling) treatments compared to rest of treatments in 1993 (Table 2). However, in the second year significantly higher drymatter was recorded in T6 (195.9 g/seedling) followed by T8 (147.9 g/seedling) compared to only 64.0 g/ seedling in T1 (control). The better growth characters and the leaf area contributed to the significantly higher drymatter production. Ramadasan *et al.* (1980) also reported that the girth at collar and the leaf area contributed mostly to the dry weight of shoot. However, number of leaves and height of seedlings did not significantly contribute to vigour of seedlings. The number of roots/seedling also recorded significantly higher in T7 (12.6) in the first year and T8 (12.2) in the second year compared to T1 (8.1 in first year and

Table 2. ***Effect of levels and methods of N & K fertilization on drymatter production, number of roots, leaf nutrient concentration and recovery of vigorous seedlings at 12th month in WCT nursery***

Treatments	DM production (g/seedling)		No. of roots/seedling		Nutrient content of leaves (%)				Recovery of vigorous seedlings (%)			Recovery from total sown nuts (%)
					N		K					
	1993	1995	1993	1995	1993	1995	1993	1995	1993	1995	Mean	Mean
T1	115.4	64.0	8.1	7.2	1.82	1.61	1.48	2.32	66.0	66.8	66.4	50.9
T2	129.7	71.2	9.5	6.0	1.94	1.56	1.47	2.25	82.0	70.0	73.2	54.7
T3	122.8	108.9	10.6	8.7	1.72	1.60	1.68	2.23	65.0	77.9	71.5	50.8
T4	136.1	138.0	9.3	9.7	1.88	1.64	1.67	2.33	53.3	78.1	65.7	44.5
T5	156.6	133.5	9.6	6.5	1.85	1.59	1.72	2.32	57.3	80.1	68.7	50.5
T6	151.6	195.9	11.4	8.5	1.87	1.56	1.65	2.22	70.0	76.9	73.5	52.5
T7	178.6	122.7	12.7	9.2	1.86	1.58	1.53	2.35	72.0	81.2	76.6	58.8
T8	179.4	147.9	10.9	12.2	1.93	1.67	1.57	2.20	72.3	87.6	80.0	61.5
S.Em ±	8.7	21.9	0.8	1.4	0.06	0.04	0.05	0.09	7.1	5.6	-	-
C.D 5%	26.5	55.8	2.4	3.7	NS	NS	0.16	NS	NS	NS	-	-

7.2 in second year). The total leaf N concentration at 12th month did not differ significantly due to various fertilizer treatments in both the years (Table 2). The total leaf-K was significantly higher in T5 treatment (1.72%) as compared to control (1.48%) in the first year. However, in the second year experiment leaf-K concentration did not differ significantly due to fertilizer treatments and control (Table 2).

The mean recovery of good seedlings from the germinated nuts ranged from 66.4% to 80% and from total nuts, it ranged from 44.5% to 61.5% under different treatments. In general, relatively higher percentage of good seedlings from the germinated nuts were obtained due to fertilizer application compared to no fertilizer (Table 2). The mean recovery of good seedlings from two years was 80% in T8, followed by 76.6% in T7 as against only 66.4% in control. Application of FYM alone (T2) has recorded 73.2% recovery, which was equal or even some times better compared to application of N and K @ 80-160 kg each/ha as soil or foliar application (65.7 to 73.5%). The mean recovery of vigorous seedlings from total nuts sown was maximum in T8 (61.5%) followed by T7 (58.8%) compared to the rest of treatments. The cost of cultivation/ha of nursery was lowest for control (unfertilized) treatment at Rs. 3,38,084 and it was highest for T-8 treatment at Rs 3,60,357/ha. The recovery of vigorous seedlings/ha from total sown nuts were 36,900 with T-8 and 35,280 with T-7 treatments, which were 20.9% and 15.5% higher as compared to control treatment (30,540 seedlings/ha). As a result the cost of production per seedling was lowest with T-8 treatment at Rs 9.76 followed by T-7 treatment at Rs. 10.17 as compared to Rs 11.07/seedling with control treatment (Table 3). When large scale production of seedlings are involved, the net saving from seedlings of T-8 treatment will be substantial besides vigorous growth than the unfertilized treatment (T-1).

Table 3. ***Recovery of vigorous seedlings, cost of cultivation and production in WCT coconut nursery as influenced by fertilization.***

Treatments	Recovery of Vigorous seedlings/ha	Cost of cultivation Rs/ha	Cost of production (Rs/seedling)
	Mean	Mean	Mean
T1	30540	338084	11.07
T2	32820	353776	10.78
T3	30480	337071	11.06
T4	26700	334398	12.52
T5	30300	340372	11.23
T6	31500	338671	10.75
T7	35280	358918	10.17
T8	36900	360357	9.76

CONCLUSION

From the foregoing discussion it could be inferred that application of FYM (25 t/ha)+N and K-80 to 160 kg each/ha as soil application in 3 splits was found to perform relatively better for all the growth parameters investigated, particularly, girth at collar and leaf area and drymatter production/seedling, and recovery of good seedlings with higher number of seedlings showing split leaves. The cost of production per seedling was lowest with the application of FYM (25 t/ha) + N and K - 160 kg each/ha as soil application at Rs 9.76 as compared to Rs 11.08/seedling with unfertilized treatment. Hence, application of FYM (25 t/ha) in conjunction with N and K at the rate of 160 kg each/ha may be followed for production of vigorous seedlings in WCT coconut nursery. However, this requires further investigation in the field performance of the above produced seedlings.

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REFERENCES

ALMADEN, E.A. and SANTIAGO, R.M., 1980. Response of coconut seedlings to spacing and application of nitrogen and potassium. *Annals Trop. Res.* **2**(2):89-95

FOALE, M.A., 1968. Seedling growth pattern. *Aust. J. Agric.*, **19**;781-789.

NELLIAT, E.V., NAIR, P.K.R. and KUSHWAHA, B.L., 1976. Effect of month of harvest of seednuts and fertilizer application to nursery on vigour and quality of coconut seedlings. *J. Plantn. Crops* **4**(1):16-20.

RAMADASAN, A., SATHEESAN, K.V. and BALAKRISHNAN, K., 1980. Leaf area and shoot dry weight in coconut seedling selection. *Indian J. Agric. Sci.*, **50**: 553-554.

RAMADASAN, A., KASTURI BAI, K. V., SHIVASHANKAR, S. and VIJAYA-KUMAR, K., 1985. Heritability of seedling vigour in coconut palm. *J. Plantn. Crops*, **13:** 136-138.

SATHEESAN, K.V., NARASIMHAYYA, G. and RAMADASAN, A., 1983. A rapid method for estimation of leaf area of one year old seedlings of all variety of coconut palm. *J. Plantn. Crops* **11** (1):47-49.

VELOSO, A.V. and TUNG LY, 1982. Effect of chlorine source and ammonium sulphate on the growth of coconut seedlings grown on four soil types. *Annals Trop. Res.***4**(3):224-230.