

Influence of nut weight and method of planting on germination and seedling growth of coconut

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ABSTRACT

Investigation was undertaken for two consecutive years at Horticultural Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya West Bengal, India to compare the weight of nuts and method of planting of nuts on germination and seedling growth of coconut cv. ECT. Five nut weights i.e., W_1 : 601g-700g, W_2 : 701-800g, W_3 : 801-900g, W_4 : 901-1000g and W_5 : 1001-1100g and two method of planting (horizontal and vertical) were included in the experiment in factorial RBD with four replication. Irrespective of the weight of nuts the early and higher germination percentage were recorded in horizontal method of planting as compared to vertical method. The final germination percentage (5 months after planting) were 86.80 per cent and 78.67 per cent in horizontal and vertical method of planting respectively. The final observations were recorded after 12 month of planting. The maximum seedling height (93.42 cm), collar girth (11.14 cm), number of leaves (6.50) and length of leaves (87.26 cm) were observed in horizontal planting as compared to vertical planting (87.32 cm, 10.49, 5.55 and 84.34 cm). The seedlings raised from heaviest seed nut (1001-1100 g) group exhibited the maximum seedling height (98.38 cm), collar girth (11.95 cm), number of leaves (6.74) and length of leaves (91.45) as compared to 82.16 cm, 9.70, 5.24, and 82.72 cm in minimum nut weight group (601-700 g). The horizontal method of planting with higher nut weight gave higher germination and better seedling as compared to vertical method of planting under Gangetic plains of West Bengal. Nut weight has positive correlation with germination percentage, collar girth, leaf number, length of leaves and seedling height.

Key words: Germination, horizontal and vertical planting, nut weight

Coconut (*Cocos nucifera* L.) is one of the most beautiful and useful trees in the world. India is one of the largest coconut producing countries in the world. The area, production and productivity of coconut in India during 2008-2009 were 1894.57 thousand hectares, 15729.75 million nuts and 8303 nuts ha⁻¹, respectively (Anon., 2009). It is a perennial oil yielding crop that plays an important role in the socio-economic life of large number people in the country. It exhibits considerable genetic variation and is propagated mainly through seeds. Raising and selection of healthy coconut seedlings in nursery alone ensures 10 % improvement in yield (Liyanage, 1953).

Early germination, rapid growth, early splitting of leaves, vigour, sturdiness and freedom from disease and pests are the characters looked for selection for better seedling. The selection of seed nuts and use of planting materials assume much importance for better growth and higher yield in future. However, literature on the comparative growth of coconut seedling in relation to its weight and method of planting is limited particularly under West Bengal condition. The present experiment was conducted with a view to elucidate the germination and growth of seedlings in relation to the weight and method of planting of seed nut.

MATERIALS AND METHODS

The present study was conducted at Horticultural Research Station, Mondouri, BCKV, West Bengal, India for two consecutive years (2005-06 and 2006-07) with well matured seed nuts (12

months old) cv. East Coast Tall. The soil of the experimental site was sandy loam texture, having good water holding capacity and soil pH of 6.80. The experiment was laid out in a factorial Randomized Block Design with ten treatments (five nut weight i.e., 601g-700 g, 701-800 g, 801-900 g, 901- 1000 g and 1001-1100 g, two method of planting i.e. horizontal and vertical) replicated four times with 100 nuts in each treatment. Nuts were collected from selected healthy mother palm during month of May, stored for thirty days and sown during first fortnight of June in well prepared nursery beds with a spacing of 40 cm × 30 cm in 20 cm deep trenches. Necessary intercultural operations were followed. The nuts started germination 2 months after planting and continued up to 5 months. The observations on germination were recorded fortnightly interval from two months and continued up to five months. The observation on vegetative parameters namely seedling height, collar girth, number and length of leaves were also recorded at monthly interval from early germinated seedling. Ten numbers of plants were selected randomly from each replication. The recording of observations on vegetative parameters were started from nine months after planting and continued up to twelve months. Data were analyzed statistically as per the standard method suggested by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The percentage of germination in both methods recorded an increasing trend with the increase in weight of seed nut. Irrespective of the weight of nuts the early and higher percentage of

germination was recorded in horizontal method of planting as compared to vertical method. In horizontal method of planting highest germination percentage of 31.80, 67.26, 82.27 and 86.80 was recorded as compared to 27.67, 49.20, 68.81 and 78.67 in vertical method of planting during second, third, fourth and fifth month after planting respectively indicating differences between the two methods of planting.

In respect of weight of nut the minimum nut weight(601-700g) recorded lowest germination percentage of 24.84, 50.00, 66.37 and 73.66 during second, third, fourth and fifth month after planting against highest germination percentage of 34.67,69.00,85.67 and 89.01 during second, third, fourth and fifth month after planting under heaviest nut weight (1001-1100g).

In every stage of observation, the higher values were observed in horizontal planting as compared to vertical planting. At 12 month after planting maximum seedling height (93.42cm) was noticed in horizontal planting as compared to vertical planting (87.32cm). Seedlings raised from minimum nut weight group (601-700g) recorded minimum seedling height of 38.11, 49.24, 68.62 and 82.16cm at nine, ten, eleven and twelve month after planting against maximum height of 51.18,63.24 80.24 and 98.38 cm in respective months of heaviest nut weight group (1001-1100g). Maximum collar girth (11.14cm) was noticed with horizontal planting as compared to vertical planting (10.49cm). The collar girth showed an increasing trend with increasing weight of seed nuts irrespective of method of planting (Table1and 2).

Table 1: Effect of method of planting on germination, height and collar girth of coconut seedling

Method of planting	Germination (%)				Height (cm)				Collar girth (cm)			
	MAP				MAP				MAP			
	2	3	4	5	9	10	11	12	9	10	11	12
Horizontal	31.80	67.26	82.27	86.80	46.37	58.24	76.24	93.42	7.36	8.26	10.13	11.14
Vertical	27.67	49.20	68.81	78.67	42.39	55.16	71.14	87.32	7.16	7.85	9.49	10.49
LSD (0.05)	2.44	2.91	2.368	2.41	1.76	1.99	2.21	3.79	NS	0.26	0.25	0.43

Table 2: Effect of nut weight on germination, height and collar girth of coconut seedling

Nut weight (g)	Germination (%)				Height (cm)				Collar girth (cm)			
	2	3	4	5	9	10	11	12	9	10	11	12
W ₁ (601-700)	24.84	50.00	66.37	73.66	38.11	49.24	68.62	82.16	6.61	7.33	8.77	9.70
W ₂ (701-800)	26.50	51.83	71.34	79.51	39.55	52.21	71.94	87.44	7.07	7.7	9.29	10.47
W ₃ (801-900)	30.00	57.66	74.67	82.67	45.14	56.72	73.16	90.32	7.27	8.13	9.89	10.83
W ₄ (901-1000)	32.67	62.65	79.67	86.16	47.91	58.92	76.24	93.16	7.47	8.52	10.37	11.12
W ₅ (1001-1100)	34.67	69.00	85.67	89.01	51.18	63.24	80.24	98.38	7.90	8.60	10.77	11.95
LSD (0.05)	3.85	4.60	3.75	3.81	2.78	3.13	4.81	5.06	0.36	0.40	0.39	0.69

Note: NS-Not-significant, MAP-Months after planting

The data presented in table-3 and 4, recorded the significant variation in respect of number of leaves and length of leaves with different method of planting and weight of seed nuts. During the 4 months of observation i.e. from 9th to 10th months after planting the leaf number increased from 3.68 to 6.50 under horizontal planting as compared to 3.35 to 5.55 under vertical method of planting. Irrespective of month of planting, with the increase of seed weight from 601 to 1100 g, the variation in leaf number were 2.97 to 4.08, 3.62 to 4.86, 4.95 to 5.92 and 5.24 to 6.74 respectively during the 9th,10th ,11th and 12th month

after planting. The 12th month aged seedling exhibited the maximum leaf length (87.26 cm) under horizontal method of planting as compared to vertical method of planting(84.34 cm).The smallest seed nut (601-700 g) recorded the lowest leaf length (82.72 cm) and longest leaf (91.45 cm) was associated with highest seed weight (1001-1100 g) after 12th month after planting. The data presented in table-5 showed that nut weight has positive correlation with germination percentage, leaf number, length of leaves, collar girth and height of seedling.

Table 3: Effect of method of planting on number and length of leaves

Method of planting	Number of leaves				Length of leaves (cm)			
	MAP				MAP			
	9	10	11	12	9	10	11	12
H Horizontal	3.68	4.28	5.73	6.50	45.98	64.24	80.09	87.26
Vertical	3.35	3.92	5.22	5.55	41.55	60.12	72.24	84.34
LSD (0.05)	0.23	0.268	0.789	0.456	2.695	2.988	3.142	2.938

Table 4: Effect of nut weight on number and length of leaves

Nut weight (g)	Number of leaves				Length of leaves (cm)			
	MAP				MAP			
	9	10	11	12	9	10	11	12
W ₁ (601-700)	2.97	3.62	4.95	5.24	39.82	54.82	71.84	82.72
W ₂ (701-800)	3.28	3.94	5.32	5.74	41.54	57.16	72.68	85.16
W ₃ (801-900)	3.44	4.25	5.54	6.02	44.47	62.24	77.07	86.28
W ₄ (901-1000)	3.83	4.63	5.67	6.39	45.30	65.72	79.48	87.56
W ₅ (1001-1100)	4.08	4.86	5.92	6.74	47.71	66.85	82.42	91.5
LSD (0.05)	0.357	0.424	0.430	0.722	4.262	4.851	5.431	5.665

Table 5: Correlation coefficients among growth parameters of coconut seedling

Treatments	Nut weight	No of leaves	Length of leaves	Collar girth	Height of seedling	Germination (%)
Nut weight	1.000					
No. of leaves	0.567**	1.000				
Length of leaves	0.529**	0.348*	1.000			
Collar girth	0.702**	0.501**	0.502**	1.000		
Height of seedling	0.723**	0.685**	0.517**	0.585**	1.000	
Germination (%)	0.629**	0.622**	0.506**	0.591**	0.622**	1.000

Note : *,** Significant at 5% and 1% level of probability, respectively

The results of the present study are in good agreement with the observations of Viswanathan *et al.* (1966) and Muhammad *et al.* (1968). They also found higher germination percentage with more vigorous seedling under horizontal method of planting as compared to vertical method of planting. Feeding the developing seedling by the endosperm is crucial and time bound and characterized by weight and thickness of the endosperm in germinating nut and subsequently growth of seedlings. According to Joseph (1963) under horizontal method of planting the coconut water will be in close proximity with the developing embryo and provides more favorable condition for germination. The seedling raised from heavier seed exhibited the more growth as compared to seedling raised from lighter one. This is also in conformity with the results of Louis *et al.* (1985).

From the experimental findings, it may be concluded that the horizontal method of planting with higher nut weight gave higher germination and better seedling as compared to vertical method of planting.

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