

Promising Unique Accession of Arecanut (*Areca Catechu*)

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Abstract

Thirty -year-old arecanut palms were evaluated for growth and yield performance at ICAR- Central Island Agricultural Research Institute, Port Blair. The study comprised of three accessions/cultivars Viz., Andaman Arecanut Dwarf-1 (AAD-1), Mangala and Samrudhi. The highest plant height (9 m), was recorded in Samrudhi, while the highest number of nodes/100 cm length (46), number of leaf in the crown leaf length (11) and leaflet length (125 cm) was recorded in AAD-1. The AAD-1 selection had attained its typical dwarf nature by recording the lowest plant height and Leaf length (3.25 m). Significantly highest mean single green fruit weight (75.44 g) and dry fruit weight (30.17 g) was recorded in Mangala variety followed by Samrudhi variety. The highest single fruit mean chali recovery (6.74 g) was recorded in AAD-1 followed by Samrudhi (6.32 g). The AAD-1 seedlings showed 50 % lesser height in the initial stages of growth upto 3 to 4 leaf stage and also recorded higher collar girth and produced dark green leaves than Samrudhi and Mangala. AAD-1 was equally performed well and this selection may be exploited for cultivation in the Island condition. Further, the unique AAD-1 accession has immense potential for utilization in breeding for dwarfness in arecanut and has great opportunity to use for ornamental planting owing to the beautiful appearance of foliage and bunches at incredibly lower height.

Key words: *Arecanut, Andaman Arecanut Dwarf-1, growth performance, fresh bunch yield, chali, Andaman and Nicobar Islands*

Introduction

Arecanut (*Areca catechu* L.) is considered as one of the most profitable plantation crops grown in humid tropics of India. It is mainly grown for its nuts popularly known as “betelnut” or “supari” in India. The crop performs well in a variety of soils; the laterites of West Coast, the red loams of Tamil Nadu, alluvial soils of Assam and West Bengal and the Andaman and Nicobar Islands. In India, the annual production of arecanut is around 7.44 lakh tonnes from an overall acreage of 12.65 lakh ha with the productivity of 1700 kg per ha. Arecanut palm is the predominantly grown crop in Andaman and Nicobar Islands next to Coconut palm which gives much remuneration to farmers. In Andaman and Nicobar Islands, the area under this crop is about 4125 ha, with production of 14086 tonnes and productivity of 3140 kg per ha (Anon., 2021). Arecanut is a cross pollinated crop with heterogenous population, majority of the places the ruling varieties are tall in nature. Arecanut has an important place in the Indian system of medicine such as Ayurveda,

Unani and Homeopathy. It is traditionally reported to be used to treat several ailments and has reportedly possess laxative, digestive, carminative, antiulcer, antidiarrhoeal, anthelmintic, antimalarial, antihypertension, diuretic, pro healing, antibacterial, hypoglycaemic and anti-heartburn properties (Bhat et al., 2017). Though tall varieties possess high yield potential, they are prone to wind damage and further the tall nature of the palm hinders various operations like spraying and harvesting which are quite labour intensive and cumbersome. Identification of dwarf varieties with high yielding potential will directly benefit the growers by way to enhanced returns and reduced cost of various cultural operations like harvesting and spraying, in addition to minimizing damages to palms due to heavy wind owing to greater mechanical support of the stem. With the background we have compared a conserved accession of unique Andaman Arecanut Dwarf (AAD) along with recommended varieties and characterized its nut and seedling characters for the further use inbreeding programmes.

Material and methods

The present study was conducted at Sipighat research farm of ICAR- Central Island Agricultural Research Institute, Port Blair, South Andaman which is situated at 11° 36' 30.11"N latitude and 92° 40' 33.82" E longitude with mean altitude of 12 m from MSL. The average annual rainfall in the region is 3300 mm. The Unique dwarf arecanut was collected in the year 1985 from hilly terrain of South Andaman District and conserved at the research farm. After 30 years the average height of the palm is 3.8 m with short internodes, dense crown with closely arranged leaves and short inflorescences producing bolder nuts. Similarly, Samrudhi and Mangala palms were also used for comparison.

The palm morphological parameters viz., number of nodes/100 cm length, height of the palm (m), number of leaves in the crown, leaflet length (cm), leaf length (m), number of inflorescence, number of fruiting bunches and number of fruits/bunch were recorded. The fruit physical characters such as fruit length (cm), Fruit breadth (cm) and fresh fruit weight per fruit (g) and dry weight per fruit were recorded. The yield data in terms of chali (dehusked nuts in kg) per palm was recorded. Observations on seedling growth parameters namely plant height (m), basal girth (cm), number of leaves, leaf length (cm), leaf breadth (cm). The data were analyzed as per the procedure given by Panse and Sukhatme (1985) and the results are given below.

Results and discussion

Palm and fruit morphology

The vegetative growth parameters varied significantly among the varieties (Table 1). The highest plant height (9m) was recorded in Samrudhi, while the highest number of leaf in the crown leaf length (11), number of nodes/100 cm length (46) and leaflet length (125 cm) was recorded in AAD-1. All the three genotypes recorded six inflorescence and the highest number of nuts per bunch (323) was recorded in Mangala followed by Samrudhi. Similar results have been reported by many workers

under different agro climatic conditions (Ananda et al., 2000a and 2000b, Anuradha Sane et al., 2002, Salvi et al., 1985, Ray et al., 2008 and Manasa et al., 2021). The AAD-1 selection had attained its typical dwarf nature by recording the lowest plant height (3.8 m), Leaf length (3.25 m) and highest number of nodes/100 cm length (46). The AAD-1 palms observed to produce bunches within 60 cm of height with closely arranged leaf scars. Other unique features such as compact canopy with shorter, dark green leaves, shorter inflorescences and highly fragrant flowers make this dwarf type distinct from the commonly grown tall cultivars.

Observations on the fruit and nut traits showed (Table 2) the Highest mean fruit length (6.14 cm) and breadth (5.86 cm) was recorded in Samrudhi, the characteristic round shape fruits (5.32 cm length and 5.04 cm breadth) was recorded in AAD-1. Significantly highest mean single green fruit weight (75.44 g) and dry fruit weight (30.17 g) was recorded in Mangala variety followed by Samrudhi variety. The highest single fruit mean chali recovery (6.74 g) was recorded in AAD-1 followed by Samrudhi (6.32 g). This wide variation in the fruit characters could be attributed to the genetic make-up of different arecanut cultivars under the study. Such variations in the fruit characteristics were also reported by Sane et al. (2002) and Chandrashekhar and Bhattacharjee (2019). Even though the chali recovery is high in AAD-1, the total yield per palm is comparatively lesser than the existing tall varieties due to total number of fruits per bunch was more in tall varieties. Comparison of 30 years old tall and this AAD-1 dwarf type palms revealed that the dwarf palms reached a height of 4.6 m whereas the tall type palms reached 9 m height and above. It was observed that the performance of Mangala and Samrudhi varieties were good as these varieties released for coastal tract India (Ray et al., 2008) the AAD-1 was also equally performed well and this selection could be exploited for cultivation in the Island conditions. Further, the unique AAD-1 accession has immense potential for utilization in breeding for dwarfness in arecanut and has great opportunity to use for ornamental planting owing to the beautiful appearance of foliage and bunches at incredibly low height.

Table 1. Morphological parameters (mean value) of different varieties of arecanut under Island system

Variety/Cultivar	No. of nodes/100 cm length	Height of the palm (m)	No. of leaves in the crown	Leaflet length (cm)	Leaf length (m)	No. of inflorescence	No. of bunches	No. of fruits/ bunch
Andaman Arecanut Dwarf - 1	46	3.8	11	125	3.25	6	6	125
Mangala	8.5	9.5	8	110	4.12	6	6	323
Samrudhi	9.0	11.6	7.5	115	3.95	6	6	233

Table 2. Fruit and nut characters of arecanut varieties

Variety/Cultivar	Fruit Characters						Dry weight per fruit (g)						
	physical characters			Fresh weight per fruit (g)			Husk			Kernel			
	Length (cm)	Breadth (cm)	Height (cm)	Husk (g)	Kernel (g)	Total (g)	Husk (g)	Kernel (g)	Total (g)	Husk (g)	Kernel (g)	Total (g)	Husk:Kernel
Andaman Arecanut Dwarf - 1	5.32	5.04	5.04	34.76	16.06	50.82	46.20	12.86	6.74	20.32	18.48	20.32	18.48
Mangala	6.1	5.62	5.62	64.32	11.12	75.44	17.29	23.79	4.67	30.17	6.92	30.17	6.92
Samrudhi	6.14	5.86	5.86	50.14	15.06	65.2	30.03	18.55	6.32	26.08	12.01	26.08	12.01
CV	5.31	5.47	5.47	11.82	18.29	12.03	31.79	21.63	21.67	16.49	31.78	16.49	31.78
SE(m)	0.139	0.135	0.135	2.631	1.15	3.43	4.47	1.77	0.56	1.86	1.79	1.86	1.79

Table 3. seedling characters of different arecanut varieties under Island condition

Traits / accession/ Days of observation	Andaman Arecanut Dwarf - 1						Samrudhi						Mangala						
	150	210	270	330	Mean	SE	150	210	270	330	Mean	SE	150	210	270	330	Mean	SE	
Plant height (cm)	33.8	41.4	47.8	57.2	45.05	50.1	56.3	62.8	70.5	59.93	52.2	59.1	66.3	75.6	63.30	63.30	63.30	63.30	63.30
Girth (cm)	3.67	4.01	4.32	4.76	4.19	3.28	3.54	3.85	4.11	3.70	3.64	3.98	4.32	4.68	4.16	4.16	4.16	4.16	4.16
No.of leaves	3.2	4.1	3.6	4.2	3.78	3	4.1	3.8	3.6	3.63	3.1	4.7	4.1	3.8	3.93	3.93	3.93	3.93	3.93
Leaf length (cm)	15.4	22.1	28.1	32.2	24.45	22.6	27.4	29.7	32.2	27.98	22.5	27.1	30.8	33.8	28.55	28.55	28.55	28.55	28.55
Leaf width (cm)	9.09	10.3	12	13.6	11.25	10.6	11.7	12.3	13	11.90	12.3	12.7	13.6	14.2	13.20	13.20	13.20	13.20	13.20

Seedling characters

Observations on seedling parameters revealed that more than 80% of the progenies of these dwarf type palms were uniform for seedling traits such as germination, seedling height, number of leaves and collar girth. The progressive growth rate of AAD-1 seedlings was compared with Samrudhi and Mangala arecanut seedlings. Significantly lower height increment was noticed in AAD-1 in 11 months, whereas number of leaves produced was non significant indicating the dwarfness of AAD-1 at early seedling stage itself (Table 1). The AAD-1 seedlings showed 50 % lesser height in the initial stages of growth upto 3 to 4 leaf stage and also recorded higher collar girth and produced dark green leaves than Samrudhi and Mangala. Preliminary observations on growth parameters recorded in the compact block of this dwarf arecanut along with the hybrids using Dwarf with local and the local tall have revealed marked differences in the leaf

length, petiole length, leaf lamina and palm height. All the observed parameters plant height (45.05 cm), basal girth (4.76 cm), number of leaves (4.2), leaf length (24.45 cm) and leaf width (11.25 cm) were recorded lowest in AAD-1 compared to all other varieties. The hybrid seedlings have exhibited vigorous growth over the dwarf parent.

Conclusion

Comparison of released varieties Mangala and Samrudhi with AAD-1 selection for seedling traits, stem traits, palm morphology, fruit and yield traits highlight the uniqueness of AAD-1 for its dwarfness, dense canopy, higher chali yield content and flowering at very low height. The Chali of AAD-1 also has unique shape when compared to the released varieties. Careful inter se mating and progeny selection are suggested to further exploit this unique dwarf accession of arecanut for use in breeding programmes for use in ornamental planting in landscapes.



Fig. 1. Seedlings of the AAD1 and Samrudhi



Fig 2. Unique AAD-1 selection palm with other varieties

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