Yield Performance of Exotic Accessions of Arecanut (*Areca catechu* L.)

KS Ananda, B Rajesh and D Shobha
Central Plantation Crops Research Institute, Regional Station, Vittal, Dhaula Kaun-574243, Karnataka

Key Words: Arecanut, Kernel Yield, Nut Traits, Consistency

Introduction

Arecanut (*Areca catechu* L.) is considered as one of the important cash crops of India cultivated in an area of 3.72 h with the production of about 4.15mt of chali yield. It is mainly used as masticatory and is an essential requisite for several religious and social ceremonies. Crop improvement work in arecanut combined with improved input technologies has contributed to achieve the self-sufficiency within the last 50 years (Nair, 1999). Genetic manipulation for high yield and quality through varietal evaluation and selection is one of the known methods of crop improvement. The evaluation of arecanut accessions resulted in identification of five high yielding varieties and same were released for different agro-climatic conditions of the country. The present study was undertaken to evaluate the accessions for different yield component traits and also to study the genetical parameters and nature and magnitude of relationships among the different traits collected from different areca growing countries especially from South East Asian region.

Materials and Methods

The trial was laid out during 1978 with the seventeen exotic accessions introduced from the South East Asian Countries of the world along with the check South Kanara Local in order to evaluate for yield and component traits. The yield parameters *viz.*, dry kernel (chali) yield per palm per year (kgs) was recorded for seven consecutive years from1986-1993. Ten fruit component traits were also studied by sampling randomly twenty nuts per accessions. Data on chali yield (dry kernel weight) and nut components traits were subjected to statistical analysis and suitably interpreted. Correlation coefficients were computed to establish the relationships between yield and nut components. Also, genetic parameters such as genetic advance (GA-% of mean), heritability (Broad Sense), and genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were estimated for chali yield and nut characters.

Results and Discussion

The mean performance of seventeen exotic accessions introduced from South Asian countries along with the check South Kanara Local in respect of chali (dry kernel) per palm (kg) for seven consecutive years are presented in the Table 1. The chali yield per palm revealed the significant differences among the accessions. The variation for chali yield ranged from 2.46 to 4.26 kg/palm with a mean of 3.11 kg/palm. The maximum chali yield of 4.26 kg/palm was noticed in the accession VTL-28III (introduced from Saigon) followed by the accession VTL-18I (British Solomon Islands) which recorded 3.90kg/ palm and VTL-11 (Indonesia). The accessions VTL-17 (Singapore), VTL-28I (Saigon) and VTL-12 (Saigon) have also showed their superiority with the yield potential of 3.67, 3.63 and 3.41 kgs of chali/ palm, respectively. About 54.91, 41.09, 33.45 32.0 and 82.0 per cent increase in yield were observed in VTL-28III, VTL-18I, VTL-11, VTL-17 and VTL-28I accessions, respectively. The present observation confirms the earlier findings in high yielding varieties (Ananda, 1999), some accessions in respect of chali yield per palm (Ananda and Rajesh, 2004) and in Mangala (Rekha *et al.*, 1991). The lowest chali yield was observed in the accession VTL-18II. The consistency in the performance of chali yield over the seven years period was noticed in accessions VTL-28III and VTL-18I. The accession VTL-12 showed linear trend with moderate chali yielding ability. Similar results were obtained in indigenous germplasm (Ananda, 2001), Mangala *inter se* combinations (Ananda *et al.*, 2004) and in different arecanut accessions (Bavappa, 1980).

The estimates of range and mean performance for 10 fruit components are presented in the Table 2. The range of variation for fruit length was from 4.66 to 6.31cm. The lowest was recorded in VTL-1 and highest in VTL-28III with an overall mean of 5.49. The maximum fruit breadth was recorded in VTL-15(4.64cm) while minimum in VTL-1(3.06cm). An average of dry kernel weight was 8.11g and it ranged from 5.11g (VTL-5) to 10.40g (VTL-12). The recovery of dry kernel from fresh fruit varied from 18.61 percent in VTL-18II to 27.30% in VTL-11 with an average of 23.42 percent. In earlier study similar trend has been reported for fruit component traits in dwarf hybrids of arecanut and its

Table 1. Mean chali (dry kernel) yield/ palm (kg) in exotic accessions of arecanut

Accessions/year	1	2	3	4	5	6	7	Mean	% increase/ decrease over check SK Local
VTL-1	2.14	2.76	2.65	3.05	3.11	2.86	3.36	2.85	3.64
VTL-3	2.21	3.43	2.75	2.60	3.85	3.00	4.65	3.21	16.73
VTL-5	1.53	2.85	3.00	4.12	2.97	2.30	3.64	2.92	6.18
VTL-9	1.85	2.90	2.25	1.99	3.18	2.42	3.95	2.65	-3.64
VTL-11	2.91	4.02	3.63	3.95	4.21	3.28	5.13	3.88	41.09
VTL-12	2.20	3.18	3.18	4.18	3.68	3.20	4.15	3.41	24.00
VTL-13	1.67	2.78	2.19	2.12	3.35	2.81	3.89	2.69	-2.18
VTL-14	1.32	2.49	2.38	3.33	3.05	2.44	3.66	2.67	-2.90
VTL-15	1.98	2.61	2.61	3.25	3.09	2.95	3.23	2.82	2.55
VTL-17	2.56	3.61	3.49	4.30	3.92	3.18	4.65	3.67	33.45
VTL-18I	2.31	3.51	3.66	5.17	4.08	3.82	4.74	3.90	41.82
VTL-18II	1.60	2.37	2.31	2.95	2.67	2.20	3.14	2.46	-10.55
VTL-18III	1.31	2.14	2.73	4.73	1.59	2.21	2.97	2.53	-8.00
VTL-26	2.02	3.41	3.07	3.77	3.74	2.65	4.83	3.36	22.18
VTL-28I	2.45	3.15	3.70	5.50	3.53	3.20	3.85	3.63	32.00
VTL-28II	1.96	2.07	2.21	2.60	2.61	2.22	2.79	2.35	-14.55
VTL-28III	2.52	3.86	4.09	5.91	4.49	3.69	5.25	4.26	54.91
S.K.Local (C)	1.87	2.68	2.58	3.20	2.98	2.49	3.48	2.75	–
Mean	2.02	2.99	2.92	3.71	3.34	2.83	3.96	3.11	–
CD(+/ -0.05)	0.31	0.26	0.43	0.69	0.58	0.47	0.62	–	–

Table 2. Genetical parameters and correlation between nut traits and chali yield per palm in exotic accessions of arecanut

Characters	Corr. (r) with chali yield	Mean	Range	GA	Heritability (BS) %	PCV %	GCV %
Fresh fruit length (cm)	0.009	5.49	4.66-6.31	1.289	51.45	9.22	7.01
Fresh fruit breadth (cm)	0.233 *	3.91	3.06-4.64	1.180	66.70	8.50	7.40
Fresh fruit weight (gm)	0.483 **	35.51	23.47-41.19	13.08	97.80	19.80	18.75
Husk thickness (cm)	– 0.124	0.64	0.37-0.95	0.826	46.80	64.00	45.80
Dry kernel length (cm)	0.537 **	2.35	1.80-2.90	1.513	64.10	14.15	11.85
Kernel breadth (cm)	0.486 **	2.49	1.89-3.22	1.384	80.30	12.65	11.16
Dry fruit weight (gm)	0.683 **	13.9	8.99-19.4	4.910	51.60	21.76	15.05
Dry kernel weight (gm)	0.795 **	8.11	5.11-10.4	5.08	84.85	22.90	20.80
Dry husk weight (gm)	0.538 **	5.88	3.49-9.00	3.10	73.90	26.15	22.90
Recovery %	0.737 **	23.42	18.61-27.30	2.28	50.76	07.10	5.25

** – Significant at 1% level, * – Significant at 5% level

parents (Ananda, 2002). The maximum recovery of dry kernel/ chali from the fresh fruit may be due to low content of husk in the accession VTL-11. Hence the accessions with low content of husk are preferred and such palms could be used as potential source for improvement of arecanut crop.

The estimates of genotypic and phenotypic coefficients of variation, heritability (broad sense) and genetic advance (% of mean) for various nut component traits are given in the Table 2. High estimates of GCV and PCV were observed for husk thickness followed by dry husk weight; moderate for dry fruit weight, dry kernel weight and fresh fruit weight and low estimates for recovery percentage, fresh fruit length and fresh fruit breadth. Fruit traits *viz.*, fresh fruit weight, dry kernel weight, kernel breadth and dry husk weight showed high estimates of heritability whereas estimates for genetic advance were high for fresh fruit weight, dry kernel weight and dry fruit weight. The characters showing high estimates of both heritability and genetic gain are desirable and can thus be improved through simple selection. Ananda *et al.* (2000) also reported moderate GCV and PCV for fresh fruit weight and dry kernel weight and moderate to high heritability with high genetic advance for these traits in high yielding arecanut varieties.

The correlation coefficients between eleven characters are presented in Table 2. The dry kernel weight, recovery percentage, dry fruit weight, kernel length and breadth were found to be positively and significantly correlated with chali yield while the husk thickness had negative association with chali yield. Bavappa and Ramachandra (1967) reported similar results while studying the correlation of different characters associationships such as number of branches produced, number of nuts/ bunch and percent nutset with dry kernel yield. The characters

such as dry kernel weight, recovery percentage, dry fruit weight, kernel length and breadth showed considerable increase in the magnitudes of correlation with chali yield, thus highlighting the favourable impact on yield performance of the accessions and making indirect selection to yield through these components.

Among the accessions VTL-28III and VTL-18I were found to be superior for chali yield performance and also showed consistency in yielding behaviour over the years compared to other accessions evaluated in the present study. The high heritability and genetic gains estimated in fresh fruit weight, dry kernel weight and dry fruit weight, which can be improved through simple selection method. Characters such as dry kernel weight, chali yield, dry fruit weight, kernel length and breadth showed high magnitude of correlation with dry kernel yield. The high yielding promising accessions identified in this study can be utilized either to develop varieties/ hybrids through suitable breeding programme or recommended for commercial cultivation.

References

Ananda KS (1999) Genetic improvement in Arecanut. *In:* MJ Ratnambal *et al.*, (eds) *Improvement of plantation crops.* Central Plantation Crops Research Institute, Kasaragod. p 52-57.

Ananda KS (2001) Evaluation of germplasm for yield traits in arecanut (*Areca catechu* L.). *Indian J. Plant. Genet. Resour.* **14:** 261-265.

Ananda KS (2002) Exploitation of heterosis for yield and nut characteristics in Dwarf hybrids of Arecanut (*Areca catechu* L.). *In*: Rethinum P *et al.*, (eds) *Plantation crops research and development in the New millennium.* CDB, Cochin. p 227-231.

Ananda KS and B Rajesh (2004) Variability and characters association among the nut traits in accessions of arecanut (*A. catechu* L.). *In:* Bhat R and Sujatha S (eds) *National Workshop on "Arecanut Production–Aspects and Prospect".* Central Plantation Crops Research Institute, Kasaragod. pp 63-66.

Ananda KS, B Rajesh and BS Chaudhary (2004) Secondary selection in Mangala (VTL-3) cultivar of arecanut (*Areca catechu* L.). *J. Plantn Crops.* **32(2):** 39-44.

Ananda KS, Anuradha Sane and BS Choudhary (2001) Initial bearing tendency of arecanut (*Areca catechu* L.) varieties in coastal region of Karnataka. In: MC Karkwal and RB Mehra (eds) *Hundred Years of Post Mendelian Genetics and Plant Breeding – Retrospect and Prospects* (abstract). Indian Society of Genetics and Plant Breeding, New Delhi. p 112.

Bavappa KVA and PR Ramachandra (1967) Improvement of arecanut palm, *Areca catechu* L. *Indian J. Genet.* **27:** 93-100.

Bavappa KVA and MK Nair (1982) Cytogenetics and Breeding. *In:* KVA Bavappa, MK Nair and T Prem Kumar *(eds) The Arecanut Palm.* Central Plantation Crops Research Institute, Kasaragod. p 51-96.

Nair MK (1999) Coconut and Arecanut development- A futuristic approach. *In:* Ratnambal MJ *et al.*, (eds) *Improvement of Plantation crops.* Central Plantation Crops Research Institute, Kasaragod. p 4-11.

Rekha A, KB Abdul Khadar and BS Chaudhary (1991) Yielding behaviour of 'Mangala' arecanut in comparison with local South Kanara types. *J. Plantn Crops.* **18(suppl):** 47-51.

Evaluation and Utilization of Introduced Coconut Germplasm

V Niral, K Samsudeen, B Augustine Jerard and PM Kumaran
Central Plantation Crops Research Institute, Kasaragod-671 124, Kerala

Coconut, *Cocos nucifera* L., is an important crop of the hot and humid tropics. In India, it is grown in an area of 18.4 lakh hectares with an annual production of 12,597 million nuts. The national productivity is about 6,846 nuts/ ha and 39 nuts/ palm/ year, indicating the vast potential available for increasing the productivity in this crop. However, the improvement of plantation crops, in general, and coconut in particular is tedious and difficult because of the long gestation period, the heterozygosity, large area required for experimentation and the perennial nature of the crop. In spite of these limitations, the Central Plantation Crops Research Institute (CPCRI), Kasaragod (Kerala), has been involved in the improvement of coconut and has released three hybrids and three varieties for cultivation in the coconut growing regions of the country.

Coconut, though belonging to a monotypic species, exhibits a lot of variability. Coconut varieties are broadly grouped into talls and dwarfs. Talls referred to as var. *typica* and are the most commonly cultivated for commercial production in all coconut growing regions of the world. Tall palms grow to a height of 20-30m and commence flowering 6-10 years after planting. The talls are sturdy and may attain an age of 80-100 years. These palms are normally cross-pollinated and hence highly heterozygous. The dwarfs referred to as var. *nana*