

Table 1. Released varieties conserved at National Genebank

Crop Group	Accession numbers* deposited with NGB			Total
	Before 30 th CNRVC Meeting	After 30 th CNRVC Meeting	Against Proposal for Notification	
		For LTS		
Cereals	492	32	61	585
Millets and Forages	159	28	19	206
Pseudo cereals		1	3	4
Grain Legumes	222	31	44	297
Oilseeds	222	76	31	329
Fibre Crops	96	6	17	119
Vegetables	100	1	8	109
Spices and Condiments	3	5	13	21
Medicinal and Aromatic Plants	7	3	-	10
Others	75	4	6	85
Total	1376	187	202	1765

* As on 31st March 2001

a total of 124 potentially valuable germplasm accessions in 30 crop species have been registered (Table 2).

Conservation of released varieties and value-added registered germplasm in the National Genebank helps in bringing all the elite plant material to a central repository and facilitate availability of these varieties to researchers to meet various interests, such as evaluation, molecular characterisation *etc.* The conservation of varieties shall also facilitate their restoration in various production systems, if needed. From exchange of

Table 2. Number of crop germplasm registered under national mechanism of documentation under ICAR

Crop Group	Source wise No. of Accessions					Total
	ICAR	SAU	State Dept. of Agriculture	Seed Company	Others	
Millets		10	1			11
Cereals	16	19				35
Oilseeds	14	9			5	28
Ornamental	1				4	5
Beverages			5			5
Fruits		4				4
Forages					1	1
Legumes	3	9				12
Fibres	3	1		2		6
Vegetables	8	7			2	17
Total	44	56	6	2	12	124

germplasm point of view at international level, the distribution of released varieties has also received approval of international community. Hence, these materials can be easily made available for sharing as the part of the international multilateral system of germplasm exchange. Inventorisation of released varieties and potentially valuable germplasm with National Genebank and its record will provide greater publicity and exposure to these materials to the users worldwide for their effective use and provide a soft protection.

Evaluation of Germplasm for Yield Traits in Arecanut (*Areca catechu* L.)

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Key Words: Arecanut, Evaluation trials, Nut yield, Yield traits

The Arecanut palm (*Areca catechu* L.) is an important plantation crop in India and is grown in the states of Karnataka, Kerala, West Bengal, N.E. Region and Andaman and Nicobar group of Islands. It is an essential requisite for several religious and social ceremonies in India and extensively used by all sections of the society as a masticator. Arecanut is one of the few examples wherein crop improvement work combined with improved input technologies have contributed to revolutionize the production and productivity within the last 40 years

(Nair, 1999). Genetic manipulations for higher yield and quality through varietal evaluation and selection is one of the earliest and known methods of crop improvement. One such attempt by Bavappa (1977) with several cultivars of arecanut including exotic types led to the isolation of Mangala (VTL-3) for better yields and early bearing. In subsequent studies critical observations recorded for yield and its component characters on exotic accessions showed that the cultivars introduced from Indonesia (VTL-11) and Singapore

(VTL-17) have higher yield potential and released as Sumangala and Sreemangala for West Coast of India in 1985. The evaluation of indigenous cultivars resulted in identification of high yield potential Mohitnagar and Calicut-17 cultivars and same were released in 1991 for coastal Karnataka, Kerala and West Bengal and in 1995 for Andaman and Nicobar (A&N) group of Islands, respectively. The present study was undertaken to evaluate the germplasm collected from A & N group of Islands for yield performance, consistency in their yielding behaviour and identifying desirable donor genes present in the collections.

Evaluation trial was laid out during 1985 at the Central Plantation Crops Research Institute, Regional Station, Vittal, Dakshina Kannada, Karnataka with seventeen arecanut indigenous accessions collected from A&N group of Islands along with check Mangala in a randomized block design with three replications and each treatment consisted of nine palms. Since the objectives of the study were to evaluate accessions for economic traits such as yield and its component characters and consistency of the collections, the observations on palm height (m), crown length (m), stem girth (cm), number of leaves, leaf length (cm), leaf breadth (cm), and internodal length (cm) were recorded after stabilization of the yield (eighth year of planting). The yield parameters viz.- number of nuts produced/palm/year and weight of

fresh nuts (kg)/palm/year have been recorded from 1990-91 to 1997-98. Twenty nuts from each accessions have been sampled randomly for fruit component studies. Fruit characters such as fruit length (cm), fresh fruit weight (g), kernel breadth (cm), dry kernel weight (g) and recovery of chali/kernel from the fresh fruit were measured. All the morphological, yield and fruit characters were statistically analyzed and interpreted. Variety x year interaction was also worked out to assess the consistency of the accessions.

Growth parameters: The observations recorded on growth characters such as plant height, crown length, stem girth above the fixed mark, internodal length, leaf length, leaf breadth and number of leaves, revealed the significant differences among the accessions in respect of plant height, stem girth and crown length while the accessions did not differ for number of leaves and internodal length (Table 1). Accession Cal-10 grew tallest (11.06 m) followed by accessions Cal-33 (10.40 m) and Cal-4 (10.31 m). Accession Cal-17 recorded higher values for stem girth (19.76 cm), internodal length (21.08 cm) and leaf production (10.20 nos). While maximum crown length was noticed in Cal-5 (3.55 m) and Cal-32 (3.48 m). Among the accessions, check Mangala recorded significantly lower height (5.4 m) and least internodal length (13.44 cm), however, produced maximum mean number of leaves (10.23). Similar trend was observed

Table 1. Growth performance of arecanut accessions

Accessions/ Character	Plant ht. (m)	Crown length (m)	Stem girth (cm)	Internodal length(cm)	No.of leaves	Leaf length (cm)	Leaf breadth (cm)
Calicut-1	9.31	2.83	16.63	18.86	9.35	189.13	97.00
Calicut-2	9.65	3.28	15.32	19.75	9.14	201.66	106.25
Calicut-4	10.31	3.38	2.15	20.61	9.80	220.24	95.56
Calicut-5	7.90	3.55	16.50	12.91	9.75	160.25	83.87
Calicut-6	6.55	3.47	17.85	14.50	10.00	156.50	91.75
Calicut-7	9.67	2.90	14.43	17.73	10.15	186.33	116.65
Calicut-10	11.06	2.67	13.90	27.76	9.34	166.15	92.68
Calicut-17	9.86	3.40	19.76	21.08	10.20	227.00	94.67
Calicut-21	8.10	3.20	21.01	17.78	9.18	189.15	114.66
Calicut-27	7.49	2.85	19.06	16.64	8.60	220.50	106.50
Calicut-29	8.05	2.89	13.82	15.80	9.72	209.67	99.00
Calicut-32	9.98	3.48	13.80	17.73	9.66	233.67	118.20
Calicut-33	10.40	3.28	13.46	19.18	8.66	216.90	83.60
Calicut-35	9.42	2.82	13.10	18.06	8.67	228.33	106.75
SCRDTC-18	9.88	3.24	13.33	16.13	8.34	201.55	105.60
SCRDTC-43	9.34	3.46	15.36	17.60	9.46	236.15	118.50
SCRDTC-92	9.42	2.82	13.10	18.06	8.67	228.33	106.75
Mangala	5.45	3.10	18.70	13.44	10.23	145.78	86.87
GM	8.99**	3.14	16.07**	17.97**	9.38	200.96**	101.38**
CV(%)	10.06	11.96	12.43	14.96	8.33	22.68	16.95
CD(0.05)	4.07	NS	0.22	3.61	NS	45.71	39.32

by Salve *et al.* (1985), Rekha *et al.* (1991) and Ananda *et al.* (2000) wherein Mangala palm attained lower height compared to other varieties in Konkan region of Maharashtra and Malnad tracts of Karnataka. This indicates semi-tall nature of Mangala, which is also expressed under coastal agro-climatic conditions. From the results of morphological parameters, accession Cal-10 appears to be vigorous in terms of taller palms and more internodal length (27.76 cm) while check Mangala and accession Cal-17 were found to be superior for the trait, production of more number of leaves.

Yield characters: The yield parameters viz.- number of nuts produced/palm and ripe nut weight/palm of the seventeen indigenous accessions collected from Andaman and Nicobar group of Islands along with check Mangala are presented in Table 2 and 3. The mean number of nuts/palm and ripe nut weight (kg)/palm revealed significant differences among the accessions. The performance of the accession Cal-33 was better as it has produced maximum number of nuts/palm (280.15 nuts/palm/year) and the second best accession was Cal-17, which produced 274.62 ripe nuts/palm/year. The check Mangala also showed superiority for this yield trait with 259.38 nuts/palm/year. About 7.14% and 5.54% increase in production of nuts/palm over Mangala (check) were noticed in accessions Cal-33 and Cal-17, respectively. Accessions SCRDTTC 18 (218.46 nuts) and

Cal-1 (218.33 nuts) were found to be medium yielders while poor yield (147.47 nos.) was noticed in accession Cal-21.

With regard to the character ripe nut yield/palm, accession Cal-33 exhibited maximum mean yield of 9.27 kg/palm/year followed by the accession Cal-17 (9.02 kg/palm/year) among the Calicut series of collections. Accession Cal-33 registered 4.60% increase in yield over the check Mangala. The check Mangala showed its superiority for mean ripe nut yield with 9.17 kg/palm/year since Mangala is a high yielding and early stabilizing variety (Bavappa and Nair, 1982, Ananda, 1999; Ananda *et al.*, 2000; Bavappa, 1977). Consistency in the performance among the selected high yielding accessions in the present study in respect of ripe nut yield/palm showed that the accessions SCRDTTC 18, Cal-2 and Cal-17 exhibited linear trend giving consistently higher ripe nut yield/palm over the years (Fig. 1) and significant accessions x year interaction was observed in respect of both number of nuts/palm and ripe nut weight/palm. The performance of the accessions Cal-33 and Cal-17 were found to be superior among the Calicut series of indigenous accessions evaluated for their yield traits in the present study.

Nut component traits: There were significant variations observed among the accessions for all the nut characters studied except for fruit length and breadth

Table 2. Yield performance of arecanut accessions (number of nuts/palm)

Accessions/Year	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	Mean	% ↑ or ↓ over Mangala
Calicut-1	168.51	196.70	212.83	237.18	242.07	191.33	177.67	320.33	218.33	-18.80
Calicut-2	141.70	174.49	200.67	232.33	187.67	214.67	167.60	180.45	186.20	-39.30
Calicut-4	126.80	131.05	139.30	261.67	130.67	134.67	260.00	290.23	184.30	-40.73
Calicut-5	160.00	165.55	189.17	213.00	213.20	164.33	167.67	144.33	177.16	-46.41
Calicut-6	170.85	195.50	210.00	212.83	151.66	268.17	120.52	323.35	206.61	-25.53
Calicut-7	153.67	161.42	186.50	232.16	195.60	177.33	221.67	206.27	191.83	-35.21
Calicut-10	145.00	150.70	155.00	197.33	135.60	174.00	186.90	176.00	165.07	-57.13
Calicut-17	245.80	280.02	305.50	298.67	210.10	260.33	286.00	310.60	274.62	+05.54
Calicut-21	115.80	153.65	160.13	180.00	184.97	134.33	117.53	111.33	147.47	-75.88
Calicut-27	126.97	140.67	168.70	202.67	179.08	144.00	186.17	113.33	158.20	-63.95
Calicut-29	120.50	112.90	121.63	191.00	77.40	170.67	231.33	286.98	164.05	-58.10
Calicut-32	160.60	146.00	157.70	211.17	172.68	145.67	215.83	298.00	188.46	-37.63
Calicut-33	256.50	281.58	308.50	318.17	358.25	255.68	239.20	226.33	280.15	+07.41
Calicut-35	206.60	211.83	222.85	214.83	129.67	182.58	235.17	193.83	199.67	-29.90
SCRDTTC-18	215.00	202.56	225.03	246.85	242.28	212.03	187.17	216.74	218.46	-18.72
SCRDTTC-43	164.33	140.47	155.33	204.00	181.03	134.00	197.50	211.40	186.13	-39.34
SCRDTTC-92	199.59	173.00	184.70	215.33	217.33	154.67	181.06	171.40	187.17	-38.47
Mangala (check)	197.66	229.39	237.63	303.55	270.82	211.83	329.00	295.33	259.38	-
GM	169.92*	185.19*	203.15*	233.32*	196.21*	187.01*	219.15*	241.43*	204.42*	
CV(%)	11.83	13.79	8.87	6.74	11.49	8.70	7.31	5.44	9.14	
CD(0.05)	33.14	42.11	29.73	25.92	37.07	26.82	26.39	21.65		

Table 3. Yield performance of indigenous germplasm (ripe nut yield(kg)/palm)

Accessions/Year	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	Mean	% ↑ or ↓ over Mangala
Calicut-1	4.85	6.03	6.80	7.67	8.73	4.94	5.96	8.68	6.71	-23.04
Calicut-2	3.96	5.47	5.78	6.95	5.39	5.60	6.31	8.07	5.94	-34.56
Calicut-4	4.00	4.02	4.54	8.46	4.88	4.40	9.11	8.72	6.02	-30.87
Calicut-5	4.25	4.95	5.57	7.03	5.71	5.46	6.29	5.11	5.55	-36.40
Calicut-6	3.85	5.43	6.19	6.76	6.19	8.15	6.43	10.76	6.72	-28.57
Calicut-7	4.35	5.06	6.14	7.82	7.50	5.12	7.67	6.67	6.29	-27.64
Calicut-10	3.41	3.67	4.18	6.41	4.01	4.48	7.29	6.00	4.93	-43.31
Calicut-17	6.58	7.18	9.12	9.11	8.04	7.13	8.73	9.88	8.22	-5.52
Calicut-21	2.95	3.85	3.78	5.38	4.34	3.25	4.38	4.88	4.27	-51.15
Calicut-27	3.33	3.67	4.69	6.68	5.32	4.10	7.06	3.86	4.86	-44.23
Calicut-29	3.87	3.91	4.76	6.84	2.75	5.61	8.73	9.56	6.65	-35.02
Calicut-32	4.21	8.23	4.53	6.62	5.38	3.78	7.32	9.26	5.62	-35.48
Calicut-33	7.56	6.15	9.91	10.95	2.08	7.82	9.12	7.23	9.11	4.60
Calicut-35	4.37	6.31	4.74	7.23	4.20	5.41	8.45	5.25	5.48	-36.86
SCRDTC-18	5.95	4.91	7.08	7.51	5.61	6.86	6.56	7.14	6.63	-23.46
SCRDTC-43	4.34	4.02	5.24	7.11	6.24	4.26	7.35	9.77	6.15	-29.49
SCRDTC-92	4.43	8.53	4.46	6.05	4.98	4.11	5.32	4.60	4.75	-45.62
Mangala (check)	6.48	8.55	9.21	10.36	10.19	6.99	11.60	9.80	9.05	
GM	4.72**	5.51**	6.21**	7.68**	6.19**	5.47**	7.90**	7.81**	6.44**	
CV(%)	12.98	17.19	11.91	10.67	14.22	9.58	8.25	5.73	11.40	
CD(0.05)	1.01	1.21	1.22	1.35	1.85	0.86	1.08	0.74		

Table 4. Fruit component traits of arecanut accessions

Accessions/Character	Fruit length (cm)	Fruit breadth (cm)	Fresh fruit wt. (g)	Kernel length (cm)	Kernel breadth (cm)	Dry kernel wt. (g)	Kernel recovery (%)
Calicut-1	5.28	4.43	37.15	2.12	2.88	9.52	24.38
Calicut-2	4.82	3.91	41.50	2.28	3.08	12.67	26.55
Calicut-4	4.75	3.66	37.14	2.54	2.67	9.95	26.85
Calicut-5	5.29	3.98	35.10	2.75	2.78	8.50	24.22
Calicut-6	5.28	4.60	32.60	2.55	2.88	7.80	23.92
Calicut-7	5.18	3.94	33.80	2.06	2.23	8.84	24.30
Calicut-10	4.56	4.29	35.65	2.41	2.99	8.91	24.90
Calicut-17	5.43	4.34	38.54	2.58	2.81	9.42	27.73
Calicut-21	4.15	4.18	31.96	1.83	2.91	6.22	27.11
Calicut-27	4.49	3.53	19.08	1.78	2.20	4.85	25.16
Calicut-29	4.85	3.65	35.20	2.30	2.42	7.19	20.45
Calicut-32	4.61	4.36	33.80	1.82	2.59	7.96	23.56
Calicut-33	5.90	4.10	40.06	2.48	2.12	10.60	26.46
Calicut-35	5.94	4.15	36.87	2.10	2.29	6.58	22.76
SCRDTC-18	5.34	3.53	37.30	2.50	2.20	7.46	20.00
SCRDTC-43	5.84	4.30	32.59	2.15	2.92	7.48	22.95
SCRDTC-92	4.20	3.40	32.60	1.90	2.70	8.00	24.57
Mangala	5.10	4.02	36.07	2.56	2.75	8.60	24.32
GM	5.30**	4.04**	34.64**	2.20**	2.55**	7.80**	24.29**
CV(%)	4.52	2.97	7.19	3.85	3.10	8.19	4.96
CD(0.05)	0.36	0.23	4.05	NS	NS	0.93	2.65

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

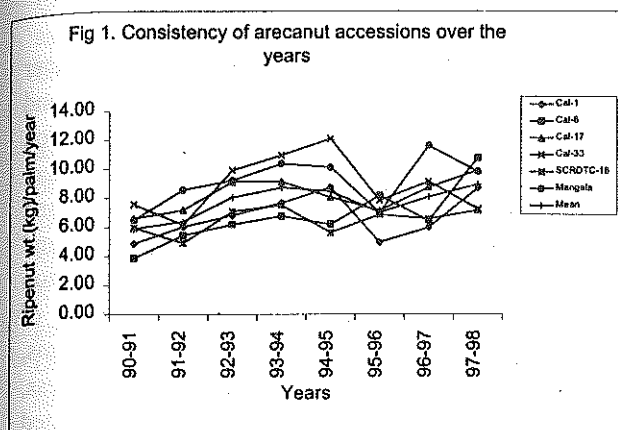


Fig. 1. Consistency in field of arecanut accessions over the years

(Table 4). The fresh weight of nuts ranged between 19.08 g (Cal-27) and 41.50 g (Cal-2) with a mean of 34.64 g, while for the dry kernel weight minimum weight of 4.85 g and maximum of 12.67 g were observed in Cal-27 and Cal-2, respectively with a mean being the 7.80 g/nut. The maximum fruit length of 5.94 cm was measured in accession Cal-35 while the accession Cal-6 recorded highest fruit breadth (4.60 cm). The maximum kernel length (2.74 cm) was noticed in Cal-5, while maximum kernel breadth (3.08 cm) was observed in Cal-2 accession. Accessions Cal-17 (27.73%), Cal-4 (26.85%), Cal-2 (26.55%), Cal-21 (27.11%) and Cal-

33 (26.46%) showed significantly higher recovery of chali/dry kernel from the fresh fruit compared to other accessions. The high recovery may be due to low content of husk in the nuts of these accessions and similar results were obtained for fruit component traits in dwarf arecanut hybrids by Ananda (2000). Overall the accession Cal-2 was found to be superior for most of the fruit component characters studied in the present collections. Thus, nuts with less husk is a desirable trait and such accessions could be utilized as donor parents for improvement of arecanut.

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Plant Genetic Resources of Spiti – a Cold Desert in the Western Himalaya

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Key Words: PGR, Medicinal Plants, Himalayas

For centuries a mystic area surrounded the trans-Himalayan tracts of Tibet, Lahaul and Spiti. Spiti is an introversive culture of life focussed around its several monasteries and faith as deep as the river swift. Spiti a sub division of Lahaul and Spiti district of Himachal Pradesh is lying at the extreme North-East corner between 31°49' and 33°00' N latitude, and 77°37' and 78°35' E longitude. It is bordered by Ladakh on the west, Lahaul on the

south and Kinnaur on South-East, covering an area of 7,460 Km². Mountain ranges belong to the great and middle Himalayas. The sub-division lies at a mean elevation of about 4,570 m and average elevation of mountain ranges is over 5,485 m above mean sea level (msl). The whole area is drained by Spiti river and its tributaries and finally merges into Sutlej at Khab in Kinnaur. Villages are established on flat pieces of land