A study of variability of coconut genotypes in Chelembra village panchayat of Malappuram district, Kerala, India

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The occurrence of genotypes with desirable characters in the heterogeneous and medium to poor managed coconut plots selected presently indicates the scope for ample improvement of the genetic status of the coconut plantations of Kerala by replanting the undesirable plants. The study further shows that nurseries raised locally under scientific supervision are sufficient for the production of seedlings with good potential.

Introduction

Kerala is the land of coconut. Coconut occupies 40 percentage of the total cropped area of the state which comes to about 3.6 lakh hectares and provides livelihood for over 3.5 million families (Anonymous, 2008). However, the productivity of coconut in the state is low because of the wide genetic variability shown by it due to its cross pollinating nature. But the variability which ranges from extremely low yielding and undesirable forms to very good yielders provides scope for study of the variability and selection of desirable types for seed production and also for quality improvement programmes.

Chelembra village panchayat of Malappuram district of Kerala state of India is an agricultural village with coconut as the major crop. The coconut palms of this area show very high variation. Documentation and analysis of this variability may provide rich resources for improvement of the genetic status of the coconut palms cultivated in this area in future and also it may help in the conservation of the genetic diversity of the crop. An experiment was designed and carried out in 2006, to asses the variability and also to identify superior palms for the collection of seed nuts for the development of a coconut nursery subsidized by the Coconut Development Board.

Materials and Method

Chelembra village panchayat of Kerala state is situated towards the northern end of Malappuram district on NH 17. The village panchayat has an undulating topography with tropical monsoon climate. The main profession of the villagers is agriculture in which coconut, vegetable, banana and rice dominate. The present study was carried out based on the data collected from 17 coconut plots selected at random from the panchayat. Ten plants of 20-25 years of age and stabilized yield were selected from each plot. Observations on 10 growth/yield characters were made in September- October 2006 (Table 1). The data were analyzed so as to assess the extent of variability and also to identify superior palms.

Table 1. Major growth and yield characters of the coconut palms studied

Plant No.	Plant height (m)	Number of scars per metre	Stem girth (cm)	Number of leaves per plant	Rachis length (m)	Leaflet length (m)	Number of bnnches per plant	Number of fruits per bunch	Fruit diameter (cm)	Nut yield per plant
1	10.5	11	71	27	4.75	0.76	9	9	45	81
2	10.5	12	74	30	5	0.96	8	8	46	64
3	12	12	70	29	5	0.77	6	7	55	42
4	10	11	64	27	4.5	0.71	8	10	50	80
5	11	11	69	28	5.1	0.78	9	10	49	90
6	13.5	12	79	34	5.4	0.91	12	12	54	144
7	15	12	75	39	5.7	0.8	14	16	52	224
8	11.5	12	68	32	4.9	0.71	9	8	50	72
9	11.5	12	72	35	5	0.76	11	8	48	88
10	15.5	14	69	30	4.2	0.77	11	7	53	77
11	10.5	10	72	30	4.7	0.72	10	6	48	60
12	10	11	68	33	5	0.77	9	7	51	63
13	12.5	12	70	40	4.9	0.83	13	10	50	130
14	10	10	81	35	4.7	0.88	14	16	52	224
15	10.5	11	70	40	5.2	0.81	14	10	52	140
16	9.5	10	73	32	4.9	0.69	11	8	45	88
17	8.5	10	69	28	4.8	0.66	13	10	48	130
18	10.5	11	71	31	5.2	0.69	12	7	56	84
19	10	11	75	45	5.5	0.91	16	17	46	272
20	11	11	68	29	5	0.75	8	10	48	80
21	12.5	12	84	41	5.25	1.1	15	13	53	195
22	7	11	65	33	4.6	0.91	9	9	51	81
23	6.5	10	70	38	4.3	0.74	8	10	50	80
24	7.5	12	81	35	4.8	0.74	8	7	48	56
25	10.5	12	61	31	4.4	0.8	8	5	42	40
26	12.5	12	76	40	4.4	0.88	15	13	44	195
27	12	12	72	30	4.4	0.74	7	7	45	49
28	14	13	79	24	4	0.81	6	4	40	24
29	15	13	72	20	4	0.7	6	4	38	24
30	12	12	70	38	4.8	0.92	8	2	47	16
31	10	11	88	52	6	1.02	14	18	51	252
32	11	11	88	52	5.8	1.1	14	14	51	196
33	10.5	12	61	31	4.4	0.76	8	7	42	56
34	13	12	70	30	4.5	0.84	7	6	45	42
35	8	11	73	46	5.2	0.79	13	11	54	143
36	10	10	71	42	5.1	0.81	12	11	51	132
37	9.5	11	70	46	5	0.85	13	12	48	156
38	8	9	69	24	4.2	0.84	13	12	49	156
39	9	10	83	52	5.8	1.2	16	16	55	256
40	10.5	12	75	46	5.2	0.79	13	11	48	143
41	12	12	73	40	4.9	0.76	9	5	53	45
42	13	14	70	38	4.7	0.75	6	5	42	30
43	11	11	76	49	5.7	1	13	14	47	182
44	10	11	69	31	4.8	0.81	6	2	40	12
45	8.5	9	80	29	5	0.85	7	6	54	42
46	11.5	11	67	40	4.9	0.78	11	6	52	66

Contd.

Plant No.	Plant height (m)	Number of scars per metre	Stem girth (cm)	Number of leaves per plant	Rachis length (m)	Leaflet length (m)	Number of bunches per plant	Number of fruits per bunch	Fruit diameter (cm)	Nut yield per plant
47	7	11	66	36	4.7	0.73	9	7	40	63
48	12	13	70	35	4.7	0.66	5	2	51	10
49	14.5	13	66	26	4.5	0.77	10	7	43	70
50	15.5	14	73	16	3.8	0.58	5	2	51	10
51	16.5	14	75	32	4.9	0.71	8	8	47	64
52	12.5	11	73	43	5.1	0.73	16	16	44	256
53	17.5	16	84	16	3.7	0.69	5	1	48	5
54	11	9	60	24	4.4	0.78	14	4	48	48
55	8	9	64	28	5.1	0.8	9	10	47	90
56	17	14	79	38	4.5	0.89	10	14	49	140
57	10	10	66	16	4.5	0.8	5	11	54	55
58	8.5	11	72	27	4.2	0.71	9	7	51	63
59	12.5	12	80	40	5	0.79	13	14	50	182
60	9.5	11	73	28	4.8	0.7	13	6	48	78
61	15.5	13	76	40	4.8	0.69	15	13	41	195
62	15	13	80	37	4.9	0.78	13	11	37	143
63	17.5	15	85	24	4.9	0.66	5	6	51	30
64	15	12	82	31	4.2	0.73	8	7	41	56
65	18.5	14	78	16	4.2	0.65	5	4	41	20
66	15.5	13	74	27	4	0.69	9	7	46	63
67	12	11	68	38	4.8	0.7	13	10	46	130
68	11	11	76	37	4.6	0.63	13	6	38	78
69	18	14	79	18	3.8	0.67	4	2	57	8
70	17.5	13	78	28	4.2	0.69	6	5	49	30
71	11	11	79	43	5	0.86	14	13	48	182
72	9.5	10	80	34	5.1	0.82	11	10	51	120
73	14	11	75	35	4.4	0.75	12	4	53	48
74	14.5	12	81	36	4.5	0.75	10	6	47	60
75	14	13	78	38	4.9	0.78	11	9	39	99
76	12.5	12	64	34	4.2	0.81	10	7	48	70
77	12	12	75	32	4.2	0.8	9	5	45	45
78	10	11	69	35	3.9	0.79	11	8	46	88
79	10.5	11	73	28	4.1	0.78	6	5	48	30
80	13.5	12	74	30	4.15	0.77	11	9	43	99
81	13	12	72	36	4.2	0.85	10	8	43	80
82	12.5	11	74	40	4.5	0.87	12	6	47	72
83	10.5	11	78	38	4.5	0.88	12	9	44	108
84	15	14	75	23	3.75	0.52	3	2	52	6
85	13	12	70	29	4.1	1.01	7	4	38	28
86	12	11	70	33	4.6	0.86	11	9	47	99
87	12.5	11	69	30	4.5	0.84	9	8	46	72
88	8	9	74	28	4.7	0.84	9	7	49	63
89	11.5	11	70	34	4.6	0.87	10	6	42	60
90	13	12	73	37	4.75	0.77	10	7	44	70
91	13.5	12	67	31	4.4	0.85	10	6	43	60
92	13	12	72	38	4.45	0.87	9	7	43	63
93	14.5	14	75	25	4	0.61	3	1	51	3

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Plant No.	Plant height (m)	Number of scars per metre	Stem girth (cm)	Number of leaves per plant	Rachis length (m)	Leaflet length (m)	Number of bunches per plant	Number of fruits per bunch	Fruit diameter (cm)	Nut yield per plant
94	13	13	74	34	4.2	0.85	12	4	38	48
95	11	11	68	29	5	0.75	8	10	48	80
96	11.5	12	72	40	4.4	0.86	14	10	45	140
97	15	14	73	16	3.4	0.54	5	3	50	24
98	14.5	14	68	22	4.75	0.6	5	5	44	25
99	15	13	75	23	3.8	0.56	7	3	48	21
100	15.5	14	67	18	3.9	0.65	4	6	47	24
101	12.5	11	81	36	4.6	0.85	12	11	44	132
102	12	11	70	32	4.4	0.83	11	7	46	77
103	12.5	12	71	30	4.55	0.76	12	6	43	72
104	10.5	11	68	33	4.45	0.76	8	12	38	96
105	13	12	74	36	4.6	0.88	11	9	51	99
106	12	11	78	38	4.8	0.89	17	14	47	238
107	14.5	14	72	28	4.1	0.85	6	2	53	12
108	14	13	69	32	4.2	0.69	9	6	42	54
109	10	11	79	42	4.7	0.87	14	13	44	182
110	12	11	68	30	4.2	0.9	12	6	39	72
111	13	12	66	22	4.1	0.7	5	2	41	10
112	13.5	12	74	34	4.6	0.86	13	8	44	104
113	10	11	80	44	5.2	1	18	16	45	288
114	13	12	71	32	4.8	0.86	11	9	48	99
115	12	11	72	35	4.2	0.76	13	7	43	91
116	12.5	12	76	38	4.2	0.73	11	6	45	66
117	12.5	12	70	31	4.3	0.79	11	10	47	110
118	11.5	11	69	27	3.9	0.68	8	5	40	40
119	13	12	73	28	4.15	0.75	13	12	47	156
120	12.5	12	70	32	4	0.77	14	4	37	56
121	15	13	76	28	4.1	0.66	6	3	49	18
122	14.5	14	69	17	3.8	0.69	4	2	44	8
123	14.5	14	70	19	3.9	0.66	3	2	45	6
124	15	14	73	24	4	0.7	9	5	46	45
125	12	11	68	34	4.3	0.78	13	14	44	182
126	11.5	11	76	38	4.1	0.83	12	8	46	96
127	12	11	72	31	4.4	0.79	8	8	37	64
128	13	12	70	33	5.1	0.89	16	15	49	240
129	13.5	11	69	27	4.6	0.83	11	9	50	99
130	11	11	79	29	4.9	0.88	10	12	45	120
131	8.5	10	80	29	5.2	0.98	7	9	53	63
132	9.5	11	73	43	5.1	0.93	14	12	48	168
133	16.5	15	69	24	3.9	0.76	4	2	56	8
134	14	14	72	15	3.6	0.65	3	2	50	6
135	15	14	76	22	4.2	0.72	6	3	41	18
136	13	13	79	34	4.9	0.83	12	9	52	108
137	15.5	14	73	30	4.4	0.71	9	7	43	63
138	15	14	78	33	4.9	0.78	14	8	48	112
139	12.5	13	81	30	4.6	0.8	12	7	53	84
140	13	13	72	28	4.7	0.75	7	4	38	28

Contd.

Plant No.	Plant height (m)	Number of scars per metre	Stem girth (cm)	Number of leaves per plant	Raehis length (m)	Leaflet length (m)	Number of bunches per plant	Number of fruits per bunch	Fruit diameter (cm)	Nut yield per plant
141	16	15	69	17	3.8	0.64	3	2	44	6
142	9.5	11	80	34	5.1	0.82	11	10	51	110
143	12	12	68	38	4.8	0.7	13	10	46	130
144	11	11	79	35	4.5	0.96	12	7	38	84
145	13	12	74	36	4.6	0.88	11	9	51	99
146	13	12	72	38	5.2	0.87	9	10	41	90
147	10.5	11	68	33	4.4	0.76	8	12	42	96
148	11.5	11	67	42	4.9	0.72	11	6	52	66
149	12	13	70	35	4.7	0.89	8	9	51	72
150	11.5	11	73	16	3.8	0.7	5	3	51	15
151	16.5	15	69	24	4.2	0.79	8	7	54	56
152	17	15	77	25	4	0.68	5	3	42	15
153	14.5	14	66	26	4.5	0.74	10	7	43	70
154	15.5	14	73	16	3.8	0.68	5	3	51	15
155	12	12	80	38	4.8	0.9	13	10	46	130
156	11.5	12	76	47	4.6	0.87	13	5	38	65
157	9	10	84	36	5.2	0.84	9	7	49	63
158	13	12	72	36	4.3	0.87	10	7	43	70
159	13	12	70	28	4.1	0.69	7	4	38	28
160	10	11	69	35	3.9	0.77	11	8	46	88
161	8	10	73	24	4.25	0.94	13	8	54	104
162	9.5	10	70	40	5	0.81	11	12	48	132
163	13	12	83	32	4.7	0.75	6	2	42	12
164	13	12	80	41	5.3	0.98	13	8	51	104
165	11	12	76	49	5.7	0.99	13	14	47	182
166	12.5	12	76	40	4.4	1	15	14	44	210
167	13.5	13	84	37	5.2	0.94	11	8	48	88
168	12	12	67	30	4.5	0.76	7	8	40	56
169	15	14	72	22	4	0.72	6	4	51	24
170	11.5	11	68	38	4.8	0.78	8	4	42	32
Mean	12.28	11.93	73.14	32.34	4.58	0.79	9.84	7.82	46.69	86.34
Min.	6.5	9	60	15	3.4	0.52	3	1	37	3
Max.	18.5	16	88	52	6	1.2	18	18	57	288
SD	2.56	1.38	5.27	7.81	0.48	0.11	3.33	3.76	4.67	62.02
CV(%)	20.85	11.57	7.21	24.15	10.48	13.92	33.84	48.08	10.00	71.83
Percentage of plants above the mean value	48.00	57.65	40.59	49.41	51.18	44.12	53.52	48.82	54.12	40.00

Results and Discussion

The study revealed very high variability in all the characters under study. The coefficient of variation was the highest in the case of nut yield per plant followed by number of fruits per bunch and number of bunches per plant respectively. Among the growth characters plant height showed the highest variability. Mean nut yield per plant per year was found to be 86 which is a desirable situation under Kerala conditions. Moreover, 40 per cent of the plants selected showed nut yield above the mean and ten plants yielded more than two hundred nuts per year. The highest yield observed was 288 nuts per year. Plant height ranged from 6.5 m-18.5 m among the plants

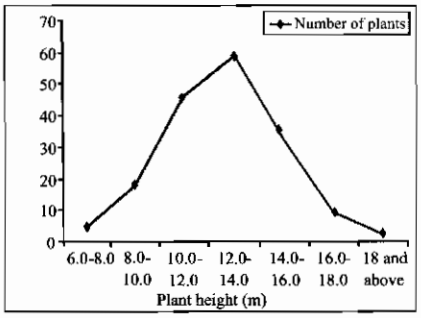
studied, number of leaf scars per metre ranged from 9-16, stem girth from 60 cm- 88 cm, number of leaves per plant from 15- 50, rachis length from 3.4 m- 6 m, leaf let length from 0.52 m-1.2 m, number of bunches per plants from 3-18, number of fruits per bunch from 1-18, fruit diameter from 37 cm- 57 cm and nut yield per plant per year from 3 to 288 (Tables 1& 2). Mean plant height was found to be 12.28 m, mean number of scars 12 per metre, mean stem girth 73.14 cm, mean number of leaves per plant 32.34, mean rachis length 4.58 m, mean leaf let length 0.79 m, mean number of bunches per plant 10, mean number of fruit per bunch 8 and mean fruit diameter 46.69 cm.

Study of frequency distribution of the above characters showed that all the above ten characters were continuously distributed and hence quantitative with polygenic control. In the case of plant height, number of leaves per plant, rachis length and number of fruits per bunch, the distribution was almost normal with half the plants towards the left and right sides of distribution. But in the case of stem girth, leaf let length and annual nut yield per plant higher numbers of plants were distributed to the left side of distribution and in the case of number of scars per meter and fruit diameter, higher numbers of plants were accumulated towards the right side of the distribution.

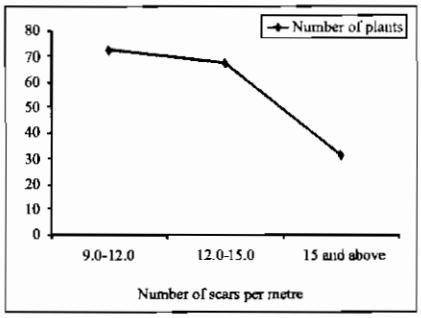
Equal distribution of a quantitative character towards both the side of the distribution shows the panmictic nature of population

Table 2. Frequency distribution of the growth and yield characters of the coconut palms studied

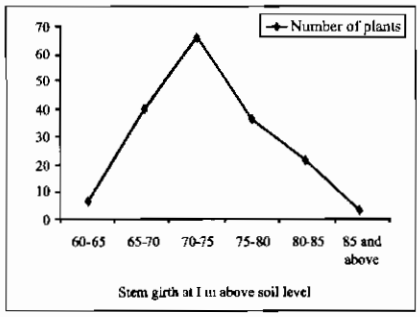
1. Plant height	
Plant height (m)	Number of plants
6.0-8.0	4
8.0-10.0	18
10.0-12.0	46
12.0-14.0	59
14.0-16.0	32
16.0-18.0	9
18 and above	2



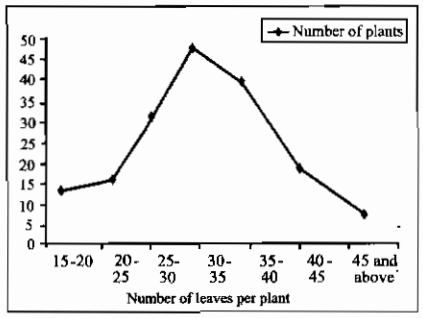
2. Number of scars per metre	
Number of scars per metre	Number of plants
9-12	72
12-15	67
15 and above	31



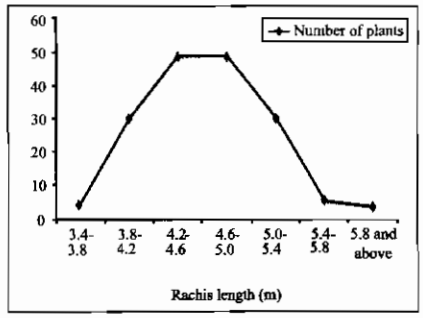
3. Stem girth at 1 m above soil level	
Stem girth at 1 m above soil level (cm)	Number of plants
60-65	6
65-70	38
70-75	66
75-80	36
80-85	21
85 and above	3



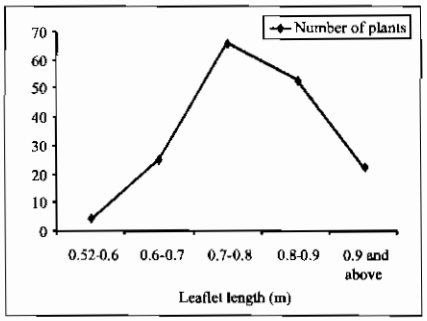
4. Number of leaves per plant	
Number of leaves per plant	Number of plants
15-20	13
20-25	15
25-30	29
30-35	45
35-40	38
40-45	20
45 and above	10



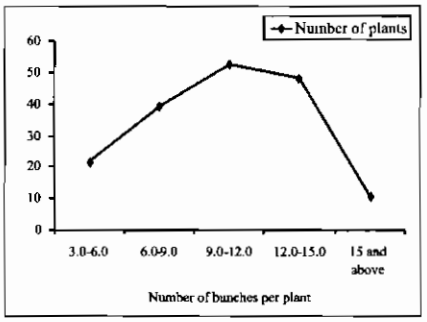
5. Rachis length	
Rachis length (m)	Number of plants
3.4-3.8	4
3.8-4.2	30
4.2-4.6	49
4.6-5.0	49
5.0-5.4	30
5.4-5.8	5
5.8 and above	3



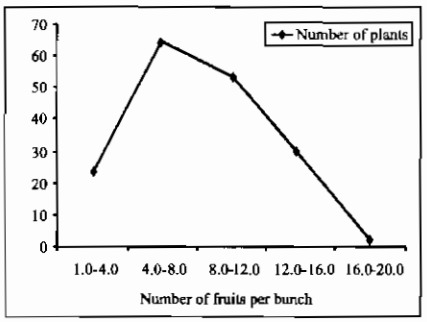
6. Leaf let length	
Leaf let length (m)	Number of plants
0.52-0.6	4
0.6-0.7	25
0.7-0.8	66
0.8-0.9	53
0.9 and above	22



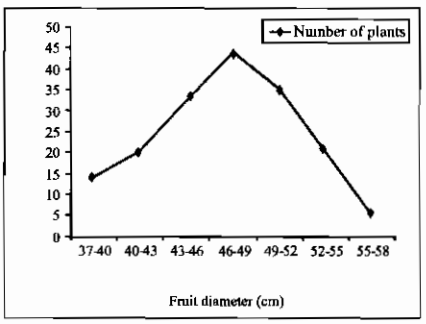
7. Number of bunches per plant	
Number of bunches per plant	Number of plants
3-6	21
6-9	39
9-12	52
12-15	48
15 and above	10



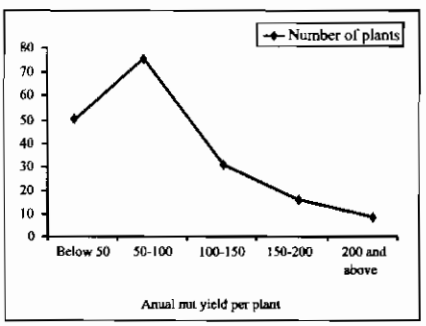
8. Number of fruits per bunch	
Number of fruits per bunch	Number of plants
1-4	23
4-8	64
8-12	53
12-16	28
16-20	2



9. Fruit diameter	
Fruit diameter (cm)	Number of plants
37-40	14
40-43	20
43-46	32
46-49	44
49-52	35
52-55	20
55-58	5



10. Annual nut yield per plant	
Annual nut yield per plant	Number of plants
Below 50	49
50-100	72
100-150	25
150-200	14
200 and above	10



where selection for desirable traits has not operated. Higher frequency of plants towards the left side of the distribution indicates higher frequency of plants with recessive alleles and occurrence of higher frequency of plants towards the right side of the distribution indicates higher frequency of plants with dominant alleles (Umamaheswari and Mohanan, 2004). In the present case, the frequency of plants with desirable traits like higher nut yield per plant are comparatively low. This shows the need of selection for desirable traits at the time of selection of mother palms for any purpose.

However, the occurrence of genotypes with desirable characters in the heterogeneous and medium to poor managed coconut plots selected presently indicates the scope for ample improvement of the genetic status of the coconut plantations of Kerala by replanting the undesirable plants. The study further shows that nurseries raised locally under scientific supervision are sufficient for the production of seedlings with good potential. Moreover such an effort shall conserve the gene pool of the local populations which will other wise be depleted if replanting is carried out using planting materials from other sources.

Referenccs

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