



Short communication

Variability in physico-chemical characteristics of mango genotypes in northern Kerala

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Abstract

Physico-chemical properties of the fruits of 31 mango genotypes from north Kerala were evaluated. Based on the physical and chemical characteristics, these genotypes formed four homogenous clusters. Large table fruit varieties like 'Mulgoa', 'Phirangiladua', and 'Banganapalli' formed a single group, while 'Bangalora', 'Gudad', and 'Chotta Jehangir' deviated from that considerably. The highest significant correlation was noted between fruit length and pulp weight. Clustering pattern obtained in this study can be used for future genetic improvement of these cultivars.

Keywords: *Mangifera indica* L., Cluster analysis, Genetic improvement.

North Kerala, which experiences a humid tropical climate, is an ecozone of considerable genetic variability in mango (*Mangifera indica* L.; Kannan, 1982). In view of this, mango orchards were established at Padannakkad and Karimbam using grafts and seedlings during the British period itself preserve these genotypes. In addition to the predominant local genotypes, rare ones such as 'Phirangiladua', 'Himayuddin' x 'Neelum' and 'Himayuddin' x 'Kalapady' were also included in these collections. We studied the physico-chemical properties of these diverse mango types.

Twenty three genotypes from Padannakkad and eight genotypes from Karimbam were evaluated (Table 1). For this, green mature fruits from 60 and 65 year-old trees respectively at Padannakkad and Karimbam were harvested during the summer season of 2004 and 2005. Twenty fruits of each variety (in triplicate sets) from the first two harvests at these locations were analyzed for ripened fruit weight, stone weight, TSS (Ranganna, 1986), fruit length, perimeter, peel weight, acidity, ascorbic acid levles (AOAC, 1984), and pulp weight.

Hierarchical cluster analysis using average linkage between groups was performed to gather information about the divergence among mango genotypes in SPSS version 10 (SPSS, 1999). The distance measure used was squared Euclidean distance and a dendrogram constructed.

Results showed considerable variability in fruit characters (Table 1). Maximum variability was noted for acidity (CV=26.38%) and minimum for fruit perimeter (CV=7.08%). TSS of the 31 north Kerala mango genotypes ranged between 12.7 and 25.2° brix. This is consistent with the findings of Satyavati et al. (1972), who reported that TSS of ripe fruits of local varieties of Kerala ranged between 10 and 24° brix. 'Heralappa' (25.2° brix) and 'Kalapady' (24.7° brix) were the two top genotypes in this respect. Fruits of 'Ratnagiri Alphonso' showed higher acidity and lower TSS than the popular variety 'Alphonso'. TSS of 'Alphonso' was 21.8° brix, which incidentally was higher than value reported by Anila and Radha (2003) for this cultivar (19.6° brix). Overall, the established varieties from other

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Table 1. Physico-chemical characters of mango genotypes grown at Padannakkad and Karimbam in northern Kerala.

Varieties	Mature green fruit wt. (g)	Ripe fruit wt. (g)	Stone wt. (g)	TSS (^o Brix)	Fruit length (cm)	Fruit perimeter (cm)	Peel wt.(g)	Acidity (%)	Ascorbic acid (mg 100g ⁻¹)	Pulp wt. (g)
'Alampur Baneshan'	450.0	387.0	42.0	12.7	12.7	24.8	37.0	0.34	13.3	308.0
'Alphonso'	195.0	197.0	33.0	21.8	8.5	22.0	11.7	0.45	106.0	152.2
'Banganapalli'	414.0	375.0	41.0	22.0	12.6	28.8	19.0	0.36	45.2	315.0
'Bangalora'	555.0	498.2	52.5	17.8	16.9	26.5	23.3	1.42	33.9	422.7
'Bennet Alphonso'	203.5	172.0	34.5	20.1	9.0	19.4	22.5	0.67	31.5	114.9
'Cherimanga'	273.5	245.0	52.5	17.6	11.0	17.6	18.0	0.36	57.5	174.5
'Cherukkurasam'	392.5	341.0	21.7	13.1	14.7	24.5	43.0	0.73	34.4	276.2
'Chinnarasam'	356.0	325.0	61.3	24.0	10.2	26.0	26.5	0.21	134.7	237.2
'Chittor'	333.5	298.0	45.0	14.5	9.5	24.5	23.5	0.73	23.1	229.5
'Chotta Jehangir'	723.5	686.0	66.5	18.7	12.2	34.7	75.5	0.36	58.8	544.0
'Gomanga'	163.5	134.0	21.5	15.5	7.7	19.2	7.0	0.65	136.9	114.5
'Gudad'	618.0	546.5	48.0	19.0	11.2	27.3	38.5	0.72	52.0	460.0
'Heralappa'	207.5	176.0	24.0	25.2	8.4	17.9	11.5	0.52	164.4	140.5
'Himayuddin'	318.0	258.5	37.0	18.5	12.1	22.3	21.0	0.28	34.1	200.5
'Himayuddin' x 'Kalapady'	322.5	215.6	36.3	23.2	12.2	23.0	13.7	0.50	41.8	165.7
'Himayuddin' x 'Neelum'	425.5	353.0	41.5	23.2	12.4	22.6	29.0	1.65	108.0	282.5
Hybrid-56	325.5	278.5	28.5	18.5	9.1	25.8	39.0	0.13	21.0	211.0
'Kalapady'	215.0	170.0	26.9	24.7	8.5	20.8	9.2	0.94	115.6	161.0
'Kalluneelum'	452.0	401.5	20.0	13.5	8.7	24.9	32.5	0.67	9.2	349.0
'Karpooram'	439.0	438.5	30.5	15.8	9.2	29.2	20.6	0.27	139.1	387.3
Lord	270.5	234.0	35.5	19.0	10.3	22.0	19.4	0.59	67.4	179.0
'Mulgoa'	501.0	438.5	52.5	25.2	9.6	29.5	45.0	0.52	66.5	341.0
Mercury	236.0	212.0	26.5	23.1	8.2	22.7	15.0	0.31	51.5	170.5
'Mundappa'	312.0	247.5	27.0	18.5	7.9	24.8	18.5	0.37	28.5	202.0
'Neelum'	234.5	226.0	40.0	20.9	9.0	20.3	13.5	0.57	116.1	172.5
'Panakkalu'	384.0	325.0	59.0	17.5	7.6	25.3	33.0	0.71	52.5	233.0
'Panchadharakalasangam'	313.0	262.0	36.0	18.5	9.5	23.9	33.5	0.25	33.8	192.5
'Phirangiladuva'	506.5	413.5	55.0	22.0	13.1	27.6	28.5	0.33	45.4	330.0
'Prior'	270.5	262.0	39.5	17.7	9.8	23.0	19.5	0.32	33.6	203.0
'Ratnagiri Alphonso'	215.5	166.0	19.9	17.2	11.0	20.8	11.9	0.92	70.5	134.1
'Suvarnarekha'	292.5	260.9	44.3	16.7	11.4	22.4	18.9	0.60	46.0	197.6
Mean	352.2	307.8	38.6	19.2	10.5	24.0	25.1	0.56	63.6	245.2
CV (%)	16.39	17.96	12.76	7.43	6.88	7.08	10.89	26.38	16.23	20.8
SD	138.3	130.1	13.1	3.6	2.2	3.85	13.8	0.34	42.37	111.2

south Indian states such as 'Alphonso' and 'Kalapady' yielded superior quality fruits implying the potential for developing commercial orchards in north Kerala with these varieties. 'Phirangiladuva' is another promising cultivar producing high quality fruits.

None of the chemical characteristics, however, exhibited significant correlation with fruit weight (Table 2). Nonetheless, stone weight and fruit length expressed

significant correlation with pulp weight (0.513 and 0.474 respectively), while ascorbic acid exhibited negative correlation with fruit length ($r = -0.312$) and peel weight ($r = -0.360$).

Hierarchical cluster analysis using average linkage between genotypes showed that there are four distinct clusters (at a rescaled distance of 5) for the mango genotypes of northern Kerala (Fig. 1). Cluster segregation

Table 2. Correlation coefficients among different pairs of characters in mango genotypes of northern Kerala.

Parameter	Ripe fruit wt.	Stone wt.	TSS	Fruit length	Perimeter	Peel wt.	Acidity	Ascorbic acid	Pulp wt.
Ripe fruit wt.	1.000								
Stone wt.	0.599**	1.000							
TSS	-0.133	0.164	1.000						
Fruit length	0.480**	0.324**	-0.140	1.000					
Perimeter	0.850**	0.483**	-0.056	0.323**	1.000				
Peel wt.	0.758**	0.464**	-0.204	0.303*	0.708**	1.000			
Acidity	0.065	-0.011	0.027	0.266*	-0.177	-0.114	1.000		
Ascorbic acid	-0.213	-0.080	0.460	-0.312*	-0.222	-0.360**	0.118	1.000	
Pulp wt.	0.989**	0.513**	-0.143	0.474**	0.838**	0.694**	0.102	-0.180	1.000

**significant at 0.01 level (2-tailed test); * significant at the 0.05 level (2-tailed test).

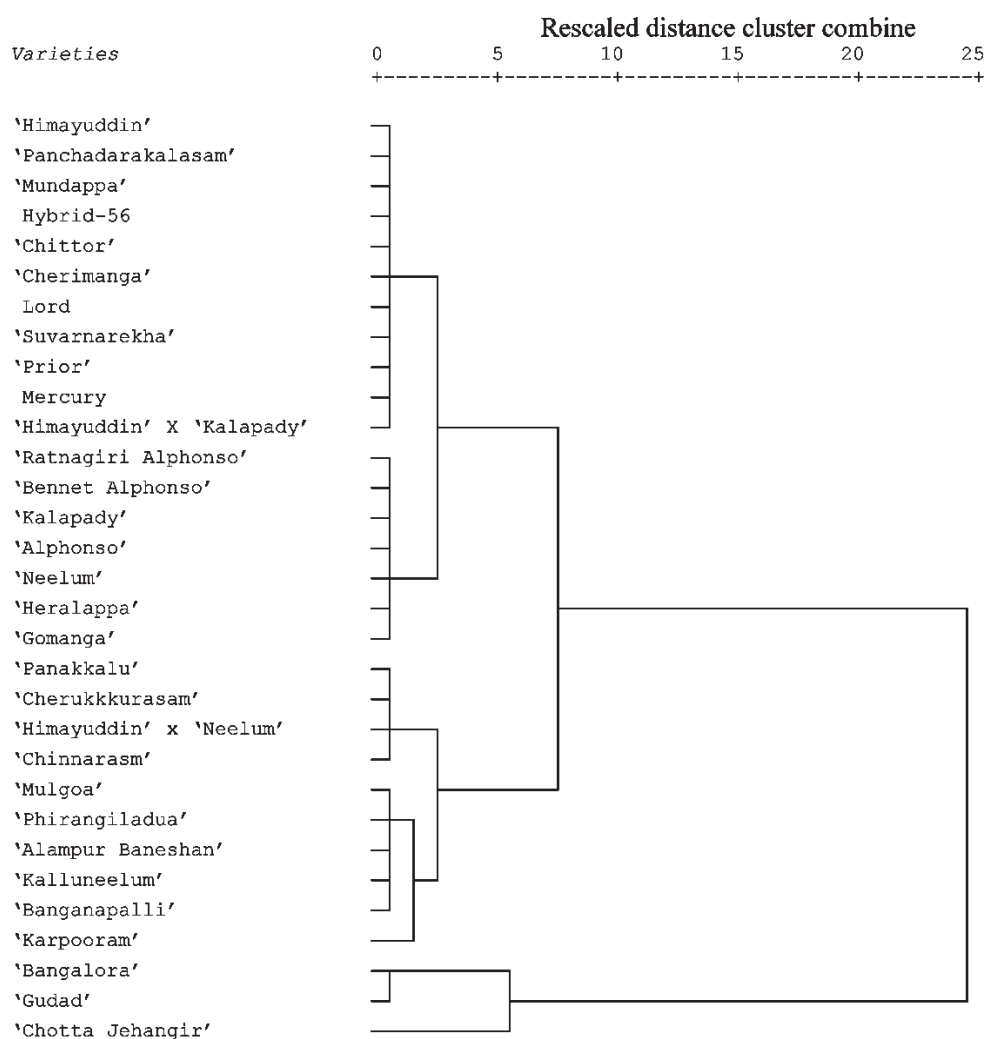


Figure 1. Dendrogram using average linkage between groups for comparing divergence among the mango genotypes of northern Kerala.

was mostly along expected lines. That is, all the choicest large-sized table varieties, viz., 'Mulgoa', 'Phirangiladua' and 'Banganapalli' formed a single group. Conversely, the low quality large fruited varieties viz, 'Bangalora', 'Gudad' and 'Chotta Jehangir' deviated considerably from the other mango cultivars. Furthermore, 'Phirangiladua', the most popular cultivar found in Padannakkad, exhibited a close linkage with 'Banganappalli' and 'Alampur Baneshan'. Diversity analysis of this type is useful in breeding programmes especially in view of the importance of such genotypes as a source of obtaining transgressive segregants with desirable combinations.

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