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Genetic variability and correlation studies for fruit physico-chemical properties of some mango cultivars grown under new Alluvial zone of west bengal

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ABSTRACT

An experiment was carried out with 9 mango cultivars at Varietal Block of Horticultural Research Station, Mondouri, BCKV, Nadia, W. B. with Randomized Block Design to determine the genetic variability and correlation coefficient for among different fruit physico chemical characteristics. Among the various different characters the lowest range was recorded with acidity and it was highest for weight. Phenotypic co-efficient of variation was more than that of genotypic counter part for each of the characteristics. The estimated heritability showed a wide range of variation, *i.e.*, 37.10 – 95.41 per cent. The genetic advance as percentage of mean also revealed high degree of variation (9.03 – 33.93). Magnitude of all most all correlation of genotype coefficient was more than that of phenotypic correlation coefficient. There was a significant positive correlation of fruit weight with pulp content, breadth and significant negative co-relation with peel and acid content. Total soluble solids (TSS) showed high positive correlation with total sugar and non reducing sugar. Whereas, acidity showed high negative correlation with non reducing sugar, fruit weight, pulp content, TSS, Sugar and reducing sugar content. These selection criteria indicated the basis for further improvement of mango.

Key words : Mango, Genetic variability, Correlation, Physico-chemical property.

Mango (*Mangifera indica* L.) is the choicest and popular fruit among the people of orient and is designated as the 'king of fruits' because of its excellent flavours, attractive fragrances, beautiful shades of colour and delicious taste with high nutritive values. No other fruit has such combination of beauty and grace; and variety in colour, taste, size and shape as mango. Mango cultivars differ for different physico-chemical properties. Several workers have tried to determine the genetic diversity and correlation studies among different physical and bio-chemical properties of mango fruit (Yadav *et al.*, 1995; Yadav *et al.*, 2003; Attri *et al.*, 1999). This aspect is lacking for the new alluvial zone of West Bengal. The present investigation was undertaken to study the variability and the correlations among the different fruit characters of nine mango cultivars grown in New Alluvial Zone of West Bengal.

MATERIALS AND METHODS

The present experiment was carried out at Varietal Block of mango with 9 mango cultivars of 27 years old (Meghlanthan, Totapari, Kishanbhog, Langra, Bombay Yellow, Bombay Green, Himsagar, Neelum and Alphonso) at Horticultural Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India. The Research Station is situated at 22.43^0N latitude and 88.34^0E longitude with an average altitude of 9.75 m above mean sea level. The experiment was carried out in Randomized Block Design with three replications from each of treatment (cultivar) and single plant under each replication. For determining different physico-chemical parameters, four fruits were collected randomly at maturity stage and then the fruits were brought to the laboratory of Department of Fruits and Orchard Management, Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya. After proper ripening the twelve different physical and bio-chemical parameters were recorded gradually. Total sugar, reducing sugar, acidity were estimated by the method described in A.O.A.C. (1984). Total soluble solids (TSS), non-reducing sugar were analyzed through the method described by Mazumdar and Mazumder (2003) and ascorbic acid was determined through the procedure mentioned by Rangana (1977). Other parameters were estimated by specified standard methods. The genotype and phenotypic co-efficient of variation, heritability (%), genetic advance and correlation coefficient were estimated by the method described by Singh and Chaudhary (1996).

RESULTS AND DISCUSSION

There was a significant variation in fruit physico-chemical properties among the cultivars (Table 1). The maximum range of variation (293.00) was recorded for weight (g), followed by pulp percentage (77.02) and ascorbic acid content (54.00), whereas, lowest range of variation (0.544) was recorded for acidity (%). The

Table 1 : Different physico-chemical traits of fruits among different mango cultivars grown under New Alluvial Zone of West Bengal

Characters	Mean ± Standard Error	Range		C.D. (P=0.05)	S.E. ±
		Min	Max		
Length (cm)	8.52 ± 0.16	6.49	10.23	0.31	0.11
Breadth (cm)	6.43 ± 0.08	5.26	7.54	0.25	0.09
Weight (g)	216.83 ± 7.27	139.00	293.00	30.20	10.35
Pulp (%)	68.25 ± 0.88	56.83	77.02	5.19	1.78
Peel (%)	16.14 ± 0.53	12.10	23.13	2.87	0.98
Stone (%)	15.67 ± 0.48	10.88	22.52	3.33	1.16
TSS (^{0}Brix)	17.65 ± 0.20	15.80	20.60	0.61	0.21
Total Sugar (%)	13.82 ± 0.25	11.11	16.67	1.59	0.54
Reducing Sugar (%)	4.65 ± 0.03	3.57	5.71	0.59	0.20
Non Reducing Sugar (%)	8.71 ± 0.28	5.92	12.32	1.73	0.59
Acidity (%)	0.327 ± 0.016	0.128	0.544	0.111	0.038
Ascorbic acid (mg/100g pulp)	30.06 ± 1.48	14.63	54.00	10.55	3.61

phenotypic co-efficient of variation was comparatively higher than genotypic co-efficient of variation (Table 2) which indicated that masking influence of environmental factor in the expression of different fruit physico-chemical parameters (Yadav *et al.*, 1995) studied under the experiment. Comparatively high co-efficient of variation was recorded for ascorbic acid, acidity and fruit weight, non-reducing sugar, peel percentage and stone percentage. Fruit length, total sugar and reducing sugar showed moderate variability; where as narrow range of variation was recorded for fruit breadth, pulp percentage and total soluble solids. There was a wide range of estimated heritability (37.1% - 95.41%) among the different fruit characters (Table 2). High heritability was recorded with length (95.41%), breadth (89.41%), TSS (88.5%) and fruit weight (79.0%). Moderate heritability was recorded with peel, pulp percentage, non-reducing sugar and total sugar, whereas, lowest heritability was recorded with stone percentage (37.1%). The genetic advance as percentage of mean varied from 9.03 to 33.93 and was high for fruit weight, acidity (%), ascorbic acid content (Table 2). The high degree of co-efficient of variation combined with high to moderate estimated heritability in addition linked with moderate to high genetic advance as percentage of mean exhibited the possibility of useful favourable selection basis for the parameters like fruit weight, peel percentage, non-reducing sugar content, acidity (%) and ascorbic acid content (Table 2).

The present experiment also revealed that the magnitude of genotypic correlation coefficients were higher than that of phenotypic correlation coefficients (Table 3), might be due to a strong inherent affinity among

Table 2 : Genotypic and phenotypic co-efficient of variation, heritability (H%), genetic advance (GA) and genetic advance as % of mean among different mango cultivars

Characters	Co-efficient of variation		Heritability (%)	Genetic Advance value (GA)	Genetic advance as percentage of mean
	Phenotypic	Genotypic			
Length (cm)	11.57	11.30	95.41	1.94	22.77
Breadth (cm)	8.13	7.68	89.41	0.96	14.93
Weight (g)	20.84	18.53	79.0	73.58	33.93
Pulp (%)	7.96	6.02	57.1	6.39	9.36
Peel (%)	19.61	15.38	61.5	4.00	24.78
Stone (%)	18.67	11.38	37.1	2.24	14.29
TSS (^{0}Brix)	7.01	6.59	88.5	2.25	12.75
Total Sugar (%)	11.33	8.15	51.7	1.67	12.08
Reducing Sugar (%)	11.24	7.06	39.4	0.42	9.03
Non Reducing Sugar (%)	19.88	14.45	52.8	1.88	21.58
Acidity (%)	30.68	20.02	42.6	0.09	27.52
Ascorbic acid (mg/100g pulp)	31.10	20.28	42.5	8.13	27.05

Table 3 : Matrix of Correlation Coefficients for Physico-chemical Properties of Fruits

Characters		Length (cm)	Breadth (cm)	Weight (g)	Pulp (%)	Peel (%)	Stone (%)	TSS (^{0}Brix)	Total Sugar (%)	Reducing Sugar (%)	Non reducing sugar	Acidity (%)	Ascorbic acid
Length (cm)	P	1.000	-0.193	0.345	0.019	0.032	-0.070	0.130	0.087	-0.183	0.126	-0.359	0.020
	G	1.000	-0.236	0.347	0.033	0.022	-0.107	0.160	0.171	-0.335	0.227	-0.607	-0.020
Breadth (cm)	P		1.000	0.742	0.514	-0.555	-0.356	0.305	0.199	0.027	0.163	-0.299	0.198
	G		1.000	0.793*	0.667*	-0.734*	-0.519	0.342	0.246	0.034	0.201	-0.594	0.330
Weight (g)	P			1.000	0.488	-0.514	-0.352	0.461	0.308	0.086	0.239	-0.542	0.144
	G			1.000	0.703*	-0.690*	-0.661	0.557	0.534	-0.130	0.485	-0.945**	0.234
Pulp (%)	P				1.000	-0.902**	-0.885*	0.487	0.489	0.047	0.406	-0.450	0.237
	G				1.000	-0.975**	-0.951*	0.715*	0.717*	-0.029	0.616	-0.794*	0.454
Peel (%)	P					1.000	0.597	-0.634	-0.570	0.080	-0.512	0.509	-0.208
	G					1.000	0.858*	-0.839**	-0.837**	0.300	-0.785*	0.838**	-0.381
Stone (%)	P						1.000	-0.221	-0.293	-0.175	-0.201	0.287	-0.217
	G						1.000	-0.481	-0.490	-0.348	-0.330	0.667*	-0.515
TSS (^{0}Brix)	P							1.000	0.788*	-0.349	0.777*	-0.505	-0.116
	G							1.000	0.981**	-0.478	0.989**	-0.835**	-0.033
Total Sugar (%)	P								1.000	-0.368	0.964**	-0.399	-0.100
	G								1.000	-0.518	0.977**	-0.936**	0.041
Reducing Sugar (%)	P									1.000	-0.602	0.039	0.039
	G									1.000	-0.687*	0.972**	0.257
Non reducing Sugar	P										1.000	-0.354	-0.097
(%)	G										1.000	-0.989**	-0.028
Acidity (%)	P											1.000	0.013
	G											1.000	-0.328
Ascorbic acid	P												1.000
(mg/100g pulp)	G												1.000

* and ** indicates significance of values at P=0.05 and P=0.01, respectively

the different cultivars (Kumar and Kumar, 2000; Yadav *et al.*, 2003). Fruit weight showed positive and significant correlation (genotypic) with fruit breadth (0.793) and pulp percentage (0.703), whereas, it showed significant negative correlation (genotypic) with acid content (-0.945) and peel percentage (-0.690) of fruits. Pulp percentage showed positive and significant correlation (genotypic) with fruit weight (0.703), breadth (0.667), TSS (0.715), total sugar content (0.717) and it has negative, high significant correlation (genotypic and phenotypic) with peel (-0.902 and -0.975), stone (-0.885 and -0.951) and acid content (-0.794, genotypic). Total soluble solids showed positive and significant correlation (phenotypic and genotypic) with total sugar (0.788 and 0.981), non-reducing sugar content (0.777 and 0.989), whereas, it had significant negative correlation (genotypic) with peel percentage (-0.893), acid content (-0.835) of fruit. Undesirable characters like acidity showed positive and significant correlation (genotypic) with peel (0.838), stone (0.667), reducing sugar (0.972) content and showed negative and significant correlation (genotypic) with fruit weight (-0.945), pulp content (-0.794), TSS (-0.835), total sugar (-0.936) and non-reducing sugar content (-0.989). Undesirable other characters like peel and stone percentage showed negative correlation with most of the parameters like breadth, weight, pulp percentage, TSS, total sugar and non-reducing sugar content.

Thus the significant correlation among different characters like: fruit weight showed positive and significant correlation (genotypic) with fruit breadth, pulp content and negative correlation with peel and acidity content; TSS showed positive correlation with pulp and total sugar content and negative correlation with peel and acidity. Pulp content showed positive correlation with breadth, weight, TSS, total sugar and negative correlation with peel, stone, acidity; and negative, significant correlation of acidity with fruit weight, pulp content, TSS, total sugar, non-reducing sugar which indicated the basis for further improvement. The present experiment supported more or less similar findings observed by Yadav *et al.* (2003); Attri *et al.* (1999), Yadav *et al.* (1995) and Prasad (1987).

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REFERENCES

A.O.A.C. (1984). *Official Methods of Analysis*, 14th Edition, Association of Official Agricultural Chemist, Washington, D.C. p. 16.

Attri, B.L., Sharma, T.V.R.S., Singh, D.B. and Nagesh, P. (1999). Genetic variability and correlation studies in mango collections of South Andaman. *Indian J. Hort.,* **56** (2) : 144-148.

Kumar, Rajendra and Kumar, R. (2000). Analysis of fruit weight components in mango. *Orissa J. Hort.,* **28** (2) : 70-72.

Mazumdar, B.C. and Majumder, K. (2003). Determination of chemcal constituents. In : *Methods of Physico Chemical Analysis of Fruits*. Daja Publishing House, Delhi. pp. 93-139.

Prasad, A. (1987). Correlation studies on growth, behaviour and fruit characters with yield components in mango. *Indian J. Hort.,* **44** : 183-193.

Rangana, S. (1997). Ascorbic Acid. In : *Manual of Analysis of Fruits and Vegetable Products*, Tata and Mc. Graw Hill Publishing Company Limited, New Delhi, India. pp. 94-101.

Singh, R.K. and Chaudhary, B.D. (1996). In: *Biometrical Methods in Quantitative Genetic Analysis*, Kalyani Publishers, New Delhi.

Yadav, K.S., Singh Mahabir and Yadav, H.S. (1995). Genetic variability and correlated response for physico-chemical traits in mango. *Crop Research,* **9** (2) : 277-282.

Yadav, V.B., Wangchu, Singh B., Ali Sajeed and Mitra S.K. (2003). Correlations studies among fruit characters of different clones of mango cv. LANGRA. *Environment & Ecology*, **21**(1) : 119-122.

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