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VARIABILITY AND CORRELATION ANALYSIS IN SAPOTA (*MANILKARA SAPOTA*) UNDER COASTAL ECOSYSTEM

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Abstract

An investigation on the "Evaluation of sapota cultivars for growth, yield and quality" was undertaken at the Department of Horticulture, Faculty of Agriculture, Annamalai University during 2014-2015. The performance of eight sapota cultivars, *viz.*, PKM 1, Virudhunagar, Kirthibarthi Round, Cricket Ball, CO_2, Pala, Oval and Kirthibarthi Oval was studied in two seasons *viz.*, February to April (peak season I) and July to September (peak season II). The experiment was laid out in randomized block design (RBD) in three replications. Higher PCV and GCV were recorded for the characters *viz.*, fruit length to diameter ratio, fruit girth, fruit volume, mature fruit weight, specific gravity, ripe fruit weight, fresh weight of pulp, dry weight of pulp, peel weight, pulp to peel ratio, number of seeds per fruit, weight of seeds, seed percentage, weight of granules, latex flow from fruits, number of fruits per tree, number of fruits per kg, yield per tree, acidity, ascorbic acid content, juice content and juice percentage, while moderate PCV and GCV were observed for fruit length, fruit diameter, pulp percentage, peel percentage, total sugar content, reducing sugar content, non- reducing sugar content and TSS : acid ratio. Lowest PCV and GCV were observed for TSS. Results of the correlation analysis indicated that yield was found to be significantly and positively correlated with fruit length, fruit diameter, mature fruit weight, ripe fruit weight, fresh weight of pulp and number of fruits per tree and due weightage should be given for these characters in selection of genotypes in future breeding programme.

Key words: *Manilkara sapota,* coastal ecosystem, specific gravity

Introduction

Sapota (*Manilkara sapota*), known as sapodilla or chiku, is one of the prominent fruit species belonging to the family Sapotaceae. It is a native of Mexico and Central America and is now widely cultivated in West Indies, India, Mexico and other tropical countries. Sapodilla is grown on a commercial basis in India, the Philippines, Sri Lanka, Malaysia, Mexico, Venezuela, Guatemala, and some other Central American countries. India is the largest producer of sapodilla fruit with current production area around 24,000 ha and annual production around 14, 42,000 metric tons (Bijoy Kumar *et al.,* 2011). Sapota is a minor crop but of high nutritive value. It is mainly consumed in a fresh state as a table fruit in many countries where it is produced (Kute and Shete, 1995). In general, the sapota fruit requires from 100 to 165 days to mature after anthesis, depending on the cultivar, the agro climatic location and the temperature of the environment (Sulladmath *et al.,* 2004). However, since the tree bears flowers all year round, fruits of all stages of maturity can be found on the tree at the same time, making it difficult to determine the optimum maturity date for harvesting. In addition, the climacteric nature of sapota fruits necessitates careful postharvest handling to reduce losses, further hindering the storage and distribution of sapota fruits.

Characterization is an important aspect for documentation of the performance of the studied cultivars which subsequently will help to introduce, select and improve existing sapota varieties. Attempts have been made to evaluate the sapota germplasm for different agronomic traits so that recommendations for cultivation could be made in different areas. The preference of a particular cultivar in sapota varies based on the fruit shape, size and yield characters. In some areas, the consumers prefer oval or egg shaped fruits while in other parts of India, round and bigger sized fruits are preferred. Developmental studies in sapota under local agro climatic conditions of this region is not available. Therefore, it was decided to undertake a systematic investigation to

find out suitable cultivars with higher production and better size and quality of fruits.

Materials and methods

The experiment was carried out in Randomized Block Design in three replications. Healthy trees of eight cultivars grown in the orchard were identified. Three trees were selected in each variety in each replication and used for the study. Biometric observations like plant height (m), stem circumference (cm), plant spread (m), plant shoot length (cm), plant shoot girth (cm), number of leaves per shoot, leaf length (cm), leaf breadth (cm). The differences exhibited by the genotypes for various characters studied were tested for significance by using analysis of variance technique (Snedecor and Cochran, 1967). The correlation co-efficients are calculated to determine the degree of association of characters between themselves and with yield. In this study, correlation co-efficient were worked out for phenotype, genotype and environment by using the formula outlined by Johnson *et al.* (1955).

Results and Discussion

Variability studies

A critical estimate of genetic variability among the cultivars is a prerequisite for initiating appropriate breeding procedures in crop improvement programmes. A cultivar with relatively high variability coupled with high mean is desirable for implementing selection procedure in future generations.

In the present study, the variation that existed among the cultivars were estimated as co-efficient of variation. PCV and GCV estimated were computed for thirty one characters in different cultivars. Since the variance involves units, the estimates like phenotypic co-efficient of variation (PCV) and genotypic co-efficient of variation (GCV) which are devoid of measurements are essential for valid comparison of different characters. The data on PCV and GCV for different traits that are presented in Table 1 further confirm the existence of variation.

In the present study, it was observed that the PCV was higher than their respective GCV for all the characters, which reflect the influence of environmental effect on the phenotypic expression of a character. High GCV observed in the present study for fruit length to girth ratio, fruit girth, fruit volume, mature fruit weight, specific gravity, ripe fruit weight, fresh weight of pulp, dry weight of pulp, peel weight, pulp to peel ratio, number of seeds per fruits, weight of seeds, seed percentage weight of granules, latex flow from fruits, number of fruits per tree, number of fruits per kg, yield per tree and juice percentage also confirm the presence of fixable variation among the cultivars which can be exploited. Similar findings were also reported by Ponnuswami and Irulappan (1989), Gohil *et al.* (2006) in sapota, Mathura Rai *et al.* (2001) and Das *et. al.* (2007) in mango.

Correlation

Yield being a complex character is influenced by many yield components. Knowledge on the impact of various components on yield is essential before selection of desirable traits. In this context, correlation analysis which indicates possible association between any two characters will be much useful although it is influenced by environment to a certain extent. This is unavoidable in a perennial crop like sapota wherein systematic progeny

Table 1: Phenotypic and genotypic co-efficient of variation of various characters in sapota

S.No	Characters	Co- efficient of variation (%)	
		PCV	GCV
1	Fruit length	18.80	18.22
2	Fruit girth	21.50	20.35
3	Fruit length to girth ratio	73.82	73.45
4	Fruit diameter	17.03	16.70
5	Fruit volume	40.18	40.17
6	Specific gravity	37.27	36.53
7	Mature fruit weight	40.31	39.50
8	Ripe fruit weight	43.05	41.90
9	Fresh weight of pulp	41.13	34.13
10	Dry weight of pulp	42.86	40.43
11	Pulp percentage	15.20	10.91
12	Peel weight	58.08	45.82
13	Peel percentage	19.30	14.01
14	Pulp to peel ratio	35.87	34.48
15	Number of seeds per fruit	32.55	31.17
16	Weight of seeds	36.71	36.04
17	Seed percentage	30.28	30.82
18	Weight of granules	25.82	24.58
19	Latex flow from fruits	28.51	27.40
20	Number of fruits per tree	62.32	42.22
21	Number of fruits per kg	33.61	33.14
22	Yield per tree	44.05	31.40
23	TSS	2.70	2.31
24	Acidity	21.05	20.51
25	TSS: acid ratio	19.98	19.15
26	Ascorbic acid content	27.74	27.54
27	Total sugar content	16.54	16.48
28	Reducing sugar content	18.02	17.98
29	Non- reducing sugar content	15.29	15.15
30	Juice content	53.66	53.40
31	Juice percentage	51.46	50.01

trials with sufficient replication to eliminate the influence of the environment cannot be taken up. The knowledge on association of characters among themselves and with fruit yield is important for selection in the genetic improvement programmes. It is influenced by diverse environment, seasonal characteristics and spatial heterogeneity, which in turn, interacts with the cultivars chosen and cultural practices adopted.

In the present investigation, the genotypic correlation co-efficient (table 1) was found to be higher in magnitude than phenotypic correlation co-efficient, indicating a strong inherent association among various characters. Further it has been observed that most of the economic traits were positively correlated. Highly significant and positive correlation was observed between yield per tree and fruit length, fruit diameter, and number of fruits per tree at both the genotypic and phenotypic levels. Mature fruit weight was positively correlated with ripe fruit weight, fresh weight of pulp, dry weight of pulp and peel weight at both genotypic and phenotypic levels.

Correlation analysis clearly brought out that number of fruits per tree had significant positive correlation with yield indicating that during selection of high yielding trees in sapota, due weightage should be given to trees bearing more number of fruits. The findings of this study are in agreement with the results reported by Rekha *et al.* (2011) in sapota, Singh *et al.* (2004c), Pradeepkumar *et al.* (2006) and Bhowmick and Banik (2008) in mango.

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