

Variability and Correlations Among Growth Attributes in Sapota

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Abstract: The data on growth attributes, of four-year-old pre-bearing sapota (*Achras zapota* L.) trees planted in 1991 at the experimental orchard of Agriculture Research Center, Rumais, Sultanate of Oman, were subjected to analysis of variability and correlations. Among the five growth attributes studied, canopy volume had the highest range of variability (16.70 to 47.50 m³) followed by E-W spread (2.90 to 4.40 m), tree height (2.06 to 3.44 m), N-S spread (2.90 to 4.40 m) and trunk girth (0.230 to 0.380 cm). Of the fifteen character associations (r values), the correlations associated with the canopy volume were found to be positive and significant, which could be used in predicting behavior of plant in terms of its future growth and development.

Key words: Growth attributes, variability, correlations, sapota.

Sapota (*Achras zapota* L.) is one of the important tropical fruit crops grown in the Sultanate of Oman. It is rich in carbohydrates with 18-21% total sugars (Singh *et al.*, 1963). Its tolerance to high salinity, upto 8 dS m⁻¹ of irrigation water, is reported earlier (Ahmad and Ismail, 1991; Ayers and Westcot, 1985). Under prevailing highly saline conditions in different regions of Oman (Zidgali *et al.*, 1993), growing sapota appears to be one of the viable alternatives to other salt sensitive fruit crops such as mango. Although sapota attains initial bearing from second or third year of planting, the economic yields can be obtained from seventh year onwards (Bose and Mitra, 1985). Growth attributes such as tree height, trunk girth, N-S spread, E-W spread and canopy volume were observed to have genetic association with fruit yield

(Reed, 1928) and these associations would be valuable in predicting yields in fruit trees (Shikhamany *et al.*, 1978). Such information, especially on pre-bearing stage of the tree, could be more useful in forecasting its future yielding ability well in advance. In addition, growth characters would act as potential phenotypic indices for selection of trees in a large population. Information on this aspect in sapota is limited and hence the present investigation was undertaken, utilizing pre-bearing sapota trees, to know the nature of variability and correlations among growth attributes.

Materials and Methods

The study was carried out on four-year-old pre-bearing sapota trees in the experimental orchard of Agriculture Research Center, Rumais, Sultanate of Oman. The maximum and minimum temperatures, and relative humidity during the period of study

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Table 1. Range, mean, standard error and coefficient of variation for growth attributes in sapota

Character	Range	Mean	SEm±	C.V.%
Tree height (m)	2.06-3.44	2.85	0.09	13.00
Trunk girth (cm)	0.23-0.38	0.30	0.01	15.20
N-S spread (m)	3.20-4.30	3.57	0.08	8.80
E-W spread (m)	2.90-4.00	3.65	0.10	10.50
Canopy volume (m ³)	16.70-47.50	29.88	2.03	26.40

was 30-35°C, 12-28°C and 43-90%, respectively. The soil at the experimental site is sandy loam in nature (EC 2.5, pH 7.3, available P 3.4 mg kg⁻¹ soil, available K 58.5 mg kg⁻¹ soil, CaCO₃ 38% antisol). The experimental trees were planted during 1991 at a spacing of 8 x 8 m and were irrigated with water of 8 dS m⁻¹ through bubblers laid in between two basins. Each tree was fertilized with the recommended dose of 500 g N, 200 g P and 300 g K each year. The tree basins were covered with a black polythene mulch of 300 gauge to conserve soil moisture and reduce weed population. The observations in respect of growth characters such as tree height (m), trunk girth (cm), N-S spread (m), E-W spread (m) and canopy volume (m³) were recorded during August 1995 on ten representative sapota trees. Tree height was measured from base to tip of the last leaf, whereas, trunk girth was recorded at a height of 45 cm above the ground level (Pearce, 1953). Tree spread on N-S and E-W were

measured from last tip of the leaves on both the directions. The experimental data were subjected to both, analyses of variability and simple correlations according to Gomez and Gomez (1984) with the aid of M Stat computer programme.

Results and Discussion

The data on the range, mean, standard error (S.E.) and coefficient of variation (CV %) in respect of growth attributes such as tree height, trunk girth, N-S spread, E-W spread and canopy volume are presented in Table 1, while all possible correlation coefficients (r) among five growth attributes are given in Table 2. The canopy volume had the highest range of variability (16.70 to 47.50 m³ with 2.03 S.E.) followed by trunk girth (23.00 to 38.00 cm with 1.01 S.E.), E-W spread (2.90 to 4.40 m with 0.10 S.E.), tree height (2.06 to 3.44 m with 0.09 S.E.) and N-S spread (2.90 to 4.40 m with 0.08 S.E.). Canopy volume had the mean of 29.88 m³, while trunk

Table 2. Correlation coefficients among growth attributes

Character	Trunk girth	N-S spread	E-W spread	Canopy volume
Tree height	0.674*	0.080	0.447	0.728**
Trunk girth	0.445	0.493	0.734**	
N-S spread	0.360	0.615*		
E-W spread	0.832**			

*Significant at 0.05%; ** Significant at 0.01%.

girth had 30 cm. E-W spread recorded the highest mean (3.65 m) followed by N-S spread (3.57 m) and tree height (2.85 m). Among the fifteen character associations (r values), only five correlations were positive and significant. Of them, four correlations were associated with the canopy volume. Canopy volume had the highest and positive correlation with E-W spread (0.832**) followed by that with trunk girth (0.734**) and tree height (0.728**) while it is positively associated with N-S spread (0.615*). Similarly, trunk girth was positively associated with tree height (0.674*). Such associations involving growth attributes and also yield in sapota were earlier reported by very few authors (Reed, 1928; Sudds and Anthony, 1928; Shikhamany *et al.*, 1978) and these can be applied, not only in predicting future growth behavior of trees in terms of their yielding ability at the stage of their economic bearing, but also as phenotypic indices for selection and improvement as inferred in earlier investigations.

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