Correlation among Growth, Yield and Quality Characters in *Cucumis melo* L.

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Abstract: Correlation among growth, yield and quality attributes in *Cucumis melo* L. was estimated using the randomized complete block design (RCBD). Thirteen variable lines representing different melon types were used in this study. Positive and significant associations were found between the number of fruits/vine with the number of primary branches (+0.82), netting development with number of primary branches (+0.69), netting development with total soluble solids (+0.67), number of primary branches with number of secondary branches (+0.63), fruit weight with plant length (+0.59), earliness with flavor (+0.42), and netting development with flesh thickness (+0.39). Earliness with netting development (-0.82), total soluble solids with earliness (-0.71), and the number of primary branches with stem length (-0.55) were found to be negatively associated.

Introduction: Information on the correlation and linkage among different horticultural characteristics is of primary importance in the field of crop improvement. Linkage relationships can be used to increase breeding efficiency by allowing earlier selection and reducing plant population size during selection (5). Linkage has been reported between yellow fruit color and absence of sutures on the rind (3). Linkage studies were also undertaken with genes that control disease resistance, flower biology, or vegetative characters of *Cucumis melo* L. and eight linkage groups were identified (4). Much research in melon genetics is now focusing in gene mapping and development of marker-assisted selection (MAS).

In correlation studies with melon, yield per plant has been reported to be positively correlated with the number of fruits, average fruit weight, number of nodes on the main stem, stem length, internode length, and fruit shape index (8). Fruits per vine and fruit weight were positively correlated with yield and they were recommended as selection criteria for yield. High fruit density is correlated with thick flesh and small seed cavity in melon (7). The seed size of melon cultivars differed significantly with fruit size (2). The main objective of this research was to study the correlation among different agronomic and horticultural characteristics of melon.

Materials and Methods: Thirteen breeding lines representing different melon types were grown in replicated trials to estimate correlation coefficients among different agronomical and horticultural characteristics in melon, using a RCBD design with three replicates. Experiments were conducted twice in winter seasons of 1999 and 2000. The land was disc plowed, harrowed, and then divided into growing units (10 x 2.5 cm^2). Three seeds were planted per hole with 40 cm spacing between holes. Plants were thinned to two plants per hole 20 days after sowing. One dose of superphosphate was added pre-sowing and two doses of urea were added 15 and 45 days after sowing. The crop was irrigated at an interval of five to seven days in the first two months, after which the irrigation interval was increased gradually up to ten days at the maturity stage. Hand weeding and chemical spraying against insects and fungal diseases was done whenever necessary.

Plant Material: To diversify the plant material, thirteen lines representing different melon types were selected and used in this study. The plant material included: 'PMR 5', 'PMR 45', and 'Hale's Best Jumbo' (American types); 'Nantais Oblong', 'Cantalon', 'Vedrantais', 'Virgos', and 'Charentais' (Charentais or French types); 'Amarillo' and 'Rocket' (Spanish types); 'Ananas' (Ananas type); 'Ogen' (Ogen type); and 'U.G. 00171' (local Sudanese type).

Characters studied were: (a) number of fruits per plant; (b) earliness – ET. 40 (referring to the time elapsed until 40% of the fruits of each line in each replication were harvested (1)); (c) netting development of different fruits of a given line; (d) fruit weight; (e) total soluble solids; (f) flavor; (g) cavity/diameter ratio of the fruit; (h) average plant

Table 1. Simple correlation coefficients on pairs of different characteristics affecting yield and quality of melon.[z]

Character	Yield/plant	Earliness	Netting Development	TSS	Flavor	Plant Length	Primary branches	Secondary branches	Cav./Dia.	F. wt
Yield/plant		+0.07	-0.03	-0.37	+0.12	+0.05	+0.73**	+0.1	-0.14	+0.05
Earliness	+0.09		-0.82**	-0.62**	+0.42*	+0.28	+0.03	+0.03	+0.38	+0.08
Netting Development	-0.01	-0.75**		+0.60**	-0.08	-0.22	+0.69**	+0.37	+0.39*	-0.53*
TSS	-0.42	-0.71**	+0.67**		-0.36	-0.01	+0.08	+0.32	-0.04	-0.14
Flavor	+0.13	+0.37*	-0.13	-0.17		-0.15	+0.17	+0.45*	-0.01	+0.07
Plant Length	+0.14	+0.32	-0.15	-0.03	-0.03		-0.55**	-0.32	-0.20	+0.48*
Primary branches	+0.82**	+0.06	+0.58**	+0.13	+0.10	-0.43**		+0.47*	-0.03	+0.27
Secondary branches	+0.15	+0.04	+0.21	+0.20	+0.23	-0.12	+0.63*		-0.56**	-0.15
Cav./Dia.	-0.09	+0.34	+0.32*	-0.10	-0.16	-0.03	-0.01	-0.26		-0.02
F. wt	+0.01	+0.15	-0.19	-0.07	+0.03	+0.59**	+0.35	-0.27	-0.23	

[z] Upper figures in the diagonal represent results of the first season, whereas the lower figures represent results of the second season. TSS = total soluble solids; Cav. = cavity; Dia. = diameter; F. wt = fruit weight.

Table 2. Correlations among pairs of the major characteristics in melon.

Character	Netting development	TSS (%)	Flavor	Earliness	Fruit weight
Netting development		+ H[z]	- L	- V.H	- H
TSS (%)			- M	- H	+ L
Flavor				+ M	+ L
Earliness					+ L
Fruit weight					

[z] Where V.H = very high coefficient of correlation (ranging from 1.0 to 0.8); H = high (ranging from 0.8 to 0.6); M = moderate (ranging from 0.6 to 0.3); L = lw (ranging from 0.3 to 0.1); and V.L = very low (< 0.1).

length; (i) number of primary branches; and (j) number of secondary branches. Simple correlation coefficients (6) were estimated among pairs of ten parameters.

Results and Discussion: The correlation coefficients among the major characteristics are given in Table 1. Results were almost the same for the two seasons with slight differences. A character by character examination showed that different characters were differentially associated with each other. Number of fruits/vine and earliness (ET. 40) were found positively correlated with plant length, number of primary branches, number of secondary branches, fruit weight, and flavor. They were found negatively correlated with netting development and TSS. Most of the coefficients of correlation showed non-significance except in the number of fruits/ vine with the number of primary branches (+0.82), earliness with flavor (+0.42), earliness with TSS (-0.71), and earliness with netting development (-0.82). Results indicated the importance of the number of primary branches as one of the main yield components. It was obvious that selection for earliness might negatively affect TSS and netting development of fruits with a moderate improvement on flavor.

TSS, number of primary branches, number of secondary branches, and cavity/diameter ratio were found positively correlated with netting development; however, flavor, plant length and fruits weights were found negatively correlated with netting development. The correlation of netting development was significant with the TSS (+0.67) and number of primary branches (+0.69).

Correlation between fruit weight and plant length was found significant (+0.59). This might be due to the increase in the rate of photosynthesis as the plant length increased. Correlation among the major quality attributes in melon were demonstrated and symbolized in Table 2. In general, non-significant coefficients of correlation indicate that selection for the different characteristics could be done simultaneously and independently. Results indicate the possibility to produce high yielding and quality melon with moderate earliness and fruit size.

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