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Evaluation of some Guava Clones under Water Preventing Condition at Qalyobia Governorate

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EVALUATION of five guava clones under water preventing condition in order to produce guava in winter at Qalyobia governorate were conducted during 2005 and 2006 seasons. Guava clones were investigated to phonological phases, fruiting, fruit physical (Fruit weight, fruit dimensions, fruit index, fruit volume, fruit thickness, fruit specific gravity and fruit firmness) and chemical characteristics (Total soluble solids, acidity and ascorbic acid) also, seed and leaf properties were studied. This study revealed that clone 1 and 2 were the most productive clones, in addition, physical and chemical characteristics of their fruits were suitable for exporting and local markets.

Guava (*Psidium guajava* L.) is the most popular fruit. It is a delicious fruit that is highly nutritious and rich in ascorbic acid (Vitamin C) and several minerals useful for human health (Wilson, 1980). In addition to, its penetrating aroma. Besides its exceptionally high nutritive values, guava also is a prolific and regular bearing tree fruit that could produce fruit year-round (Thonte and Chakrawar, 1982).

In Egypt, guava is a popular fruit, cultivated in a wide range of soil types because of its tolerance to drought and salinity compared to most of the fruit trees under the same conditions.

Guava is generally propagated from seeds and the trees raised from seedlings are known to be variable in plant and fruit characteristics (Yadava 1996) in Qalyobia governorate, where guava is cultivated in a large scale. There are some local clones selected by the growers and take local names but not evaluated yet. This work aimed to evaluate this clones in order to find a good clones and spread it for guava growers.

Material and Methods

This investigation was carried out during two successive seasons of 2005 and 2006 at a private farm in Qalyob, Qalyobia governorate to evaluate five selected clones of guava. The selected trees were healthy, nearly uniform in growth vigor, propagated by suckers, planted at 5 x 5m. apart on a clay soil, subjected to flood irrigation and received the regularly cultural practices.

The trees were forced to flowering in September through preventing irrigation for three months starting from mid-April till mid-July, then manually defoliated, ploughed, fertilized and irrigated, harvesting was conducted in March.

The obtained data were handled as follows

Leaf characteristics

Twenty leaves from each tree were randomly sampled and investigated to some morphological measures and leaf area.

- Leaf area was determined using planemeter .

Flowering

The date of flowering starting, full bloom and the end of flowering were recorded and flowering duration were calculated for each clone.

Fruiting

Fruit set: In both seasons (2005 & 2006) thirty flowers distributed around each tree were numbered and tagged, after petal fall number of remained tagged fruitlets on each tree was counted.

$$\text{Fruit set} = \frac{\text{No. of developing fruitlets}}{\text{Total No. of flowers}} \text{ X } 100$$

Fruit drop : Every fifteen days, the remained tagged fruits were counted and recorded, till harvesting and fruit drop was calculated.

Yield: On March, 15^{th} harvesting was conducted, fruits of each tree were picked, counted and weighted in Kgs.

Fruit quality

Twenty fruits from each tree were randomly sampled and both physical and chemical properties were measured.

Fruit physical properties: Fruit weight (g), fruit dimensions (cm), fruit index (L/D), fruit volume (cm^3), fruit thickness (cm), fruit specific gravity and fruit firmness (gm/cm^2) were calculated.

Fruit firmness were determined by Lfra analyzer using a penetrating needle of 1mm of diameter, 5 mm in distance, speed 2mm per second and the peak of resistance was recorded per gram/cm2.

Fruit chemical properties: Total soluble solids (TSS) were determined by a'bbe refractometer according to (A.O.A.C., 1980) .

Acidity was estimated as the percentage of anhydrous citric acid according to Vogel, (1968).

Ascorbic acid was estimated according to (Horwitz, 1970). Furthermore, TSS/Acid ratio was calculated.

Seeds parameters

Seeds were extracted from mature fruits of the tested trees, then washed with tap water and air dried, then counted and weighted.

Seeds % were calculated as follows:

$$\text{Seed } \% = \frac{\text{Seeds weight/fruit}}{\text{Fruit weight}} \times 100$$

Design and statistical analysis

The complete randomized block design was followed, 5 clones were tested each of three replicates, each replicate was one tree. The obtained data were subjected to statistical analysis according to Snedecor and Cochran (1980). Means were separated using Duncan's multiple range test (Duncan, 1955) .

Results and Discussion

Leaf characteristics

Leaf petiole

Table 1 shows clearly that clone 1 was superior to other clones followed by clone 2, whereas, clone 4 came at last. Other clones came in between.

Leaf Rachis length

It is obvious that clone 1 had a tallest leaf as compared with the others, followed by clone 5, while the fewest values was for clone 3. Other clones came in between (Table, 1).

Leaf width

Table 1 shows that clones 1 and 5 had the widest leaves followed by clone 2. Other clones came in between.

Leaf area

It is clear that clone 1 gave the largest leaf area in comparison with other clones. Clone 2 came in the second order whereas clone 3 came at last. other clones came in between.

Leaf shape index

It is obvious that leaves of clone 3 were more oblong than those of other clones in both seasons (2005 & 2006), descending followed by clone 1, followed by clone 4, while the least values of leaf shape index came from clones 2 & 5 without significant differences between them (Table, 1).

The obtained results of leaf characteristics are in harmony with the findings of Al-Mounify (1988) and Yadava (1996). They reported that seedling trees of guava varies in leaf length, width and leaf area.

TABLE 1. Leaf characteristics of some guava clones (2005 & 2006 seasons).

Clones	Petiole length (cm)		Rachis length (cm)		Leaf width (cm)		Leaf area (cm^2)		Leaf shape (L/D)	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Clone 1	0.84A	0.84A	13.30A	13.20A	5.42B	5.50A	47.16A	47.04A	2.45B	2.40B
Clone 2	0.70B	0.69B	10.73D	10.67D	5.19C	5.10B	36.53C	36.48C	2.06D	2.09D
Clone 3	0.65C	0.66C	10.43E	10.43E	4.06E	4.00D	27.86E	27.95E	2.57A	2.61A
Clone 4	0.56E	0.55E	10.97C	10.95C	4.70D	4.77C	33.97D	33.97D	2.33C	2.30C
Clone 5	0.61D	0.61D	11.50B	11.41B	5.56A	5.58A	41.83B	41.91B	2.07D	2.04D

Means followed by the same letter (s) within each column are not significantly different at 5% level.

Flowering

Data of Table 2 shows that the beginning of flowering in the two seasons (2005 & 2006) was in end of September for studied clones, clones 1 & 2 were superior to the others. As for blooming period. Clones 1 & 2 showed the shortest period of blooming (12 days); the corresponding blooming period for the others was (16 days).

Tree fruiting

Fruit set

It is obvious that clone 1 recorded the highest value of fruit set in both seasons (2005 & 2006) descendingly followed by clone 2, followed by clone 5, followed by clone 3 whereas clone 4 came at last order (Table 3). Rokba *et al.* (1976) studies the fruit set as one of the bases of selection of guava clones.

TABLE 2. Dates of phynological phases of some guava clones (2005 & 2006 seasons).

Clones	Beginning of flowering		Full bloom		Blooming end		Blooming duration (days)		
	2005	2006	2005	2006	2005	2006	2005	2006	Mean
Clone 1	28/9/04	30/9/05	5/10/04	7/10/05	10/10	11/10	13	11	12
Clone 2	//	//	//	//	//	//	//	//	//
Clone 3	30/9/04	1/10/04	8/10/04	10/10/04	15/10/04	17/10/04	15	17	16
Clone 4	//	//	//	//	//	//	//	//	//
Clone 5	//	//	//	//	//	//	//	//	//

Means followed by the same letter (s) within each column are not significantly different at 5% level.

Fruit shedding

Table 3 shows that in both seasons (2005 & 2006), clone 2 gave the least values of fruit shedding, followed by clone 1 while, clone 4 recorded the highest values of fruit shedding. On the other hand, clones 3&5 came in between.

No. of fruits/tree

Table 3 clearly shows that clone 2 borne a higher number of fruits, followed by clone 1, followed by clone 3, whereas, clones 4 & 5 came at last without significant differences between them, that is true in both seasons (2005 & 2006). This parameter of selection go in harmony with Amin and Jaisval (1988).

Yield (Kg/tree)

Clone 1 gave the highest yield (Kgs/tree), then clone 2 followed by clone 3, while, clones 4 & 5 recorded the least yields in both seasons (Table 3).

The obtained results of tree fruiting are in line with those of Al-Mounify (1988), Amin & Jaisval (1988) and Yadava (1996), they who reported that seedling trees of the majority of guava display great genetic diversity in bearing habit and fruit yield.

TABLE 3. Fruiting characteristics of some guava clones (2005 & 2006 seasons).

Clones	Fruit set (%)		Fruit shedding (%)		No. of fruits/tree		Yield (Kg/tree)	
	2005	2006	2005	2006	2005	2006	2005	2006
Clone 1	95.87A	97.7A	5.97D	4.83D	883B	1169B	107.2B	127B
Clone 2	92.9B	95.8B	4.63E	3.23E	1335A	1896A	137.7A	158.2A
Clone 3	81.3D	82.5D	12.07B	11.33B	316C	441C	57.2C	68.5C
Clone 4	78.27E	78.7E	24.83A	24.43A	303CD	401CD	47.7D	50.8D
Clone 5	87.37C	88.4C	10.25C	9.9C	282D	352D	46.00D	47.00E

Means followed by the same letter (s) within each column are not significantly different at 5% level.

Physical characteristics of fruits

Fruit weight

The obtained results indicated that clone 3 gave the highest fruit weight, while, clone 2 gave the least values in this respect. Clones 4 & 5 came in between without significant differences between them. Such results were detected during 2005 & 2006 seasons (Table, 4).

Fruit volume

Table, 3 shows that clone 3 was superior to other clones while clone 2 gave the least values of fruit volume followed by clone 1. The other clones came in between in both seasons.

Fruit specific gravity

Clones 3, 4 and 5 recorded the least value of fruit specific gravity without significant differences between them in both seasons, while, clone 1 gave the highest values in this respect. Whereas, clone 2 came in between (Table, 4).

Fruit length

It is clear that clone 4 gave longer fruit than other clones, followed by number, 5 one. Clone 2 gave the least values of fruit length whereas clones 1& 3 came in between (Table, 4).

Fruit width

Table 4 shows that clone 5 gave wider fruits in comparison with other clones, followed by clone 4 while, clone 2 gave the least values of fruit width. Clones 1 & 3 came in between in both seasons

Fruit shape

It is obvious that clones 1 & 4 gave more oblong fruits than the others. Other clones i.e. 2,3 and 5 gave similar fruit shape without significant differences between them in both seasons (Table, 4). Fruit shape is used by Velez *et al.*, (2003) in the selection of guava.

Fruit hardness

Table 4 clearly indicated that clone 2 gave the highest values of fruit firmness followed by clone 1 & 3 recorded the least values, whereas, other clones came in between in both seasons.

Flesh thickness

It is clear that clone 5 exerted the highest values of flesh thickness as compared with the other clones, followed by clone 4. The least values came from clone 3. Other clones came in between. Such results were detected during 2005 and 2006 seasons. Babu *et al.* (2002) reported that the fruit physical characteristics is one of the important aspects of guava selection

Fruit chemical characteristics

TSS

Table 5 clearly shows that clones 3&4 had the highest TSS values without significant differences between them in the first season while there were a significant differences between them in the second one. Clone 2 had the least values in this respect. Other clones came in between that is true in both seasons (2005 & 2006).

Acidity

It is obvious that clone 5 had the least values of fruit acidity in both seasons .followed by clone 1. Other clones had similar values of fruit acidity (Table, 5).

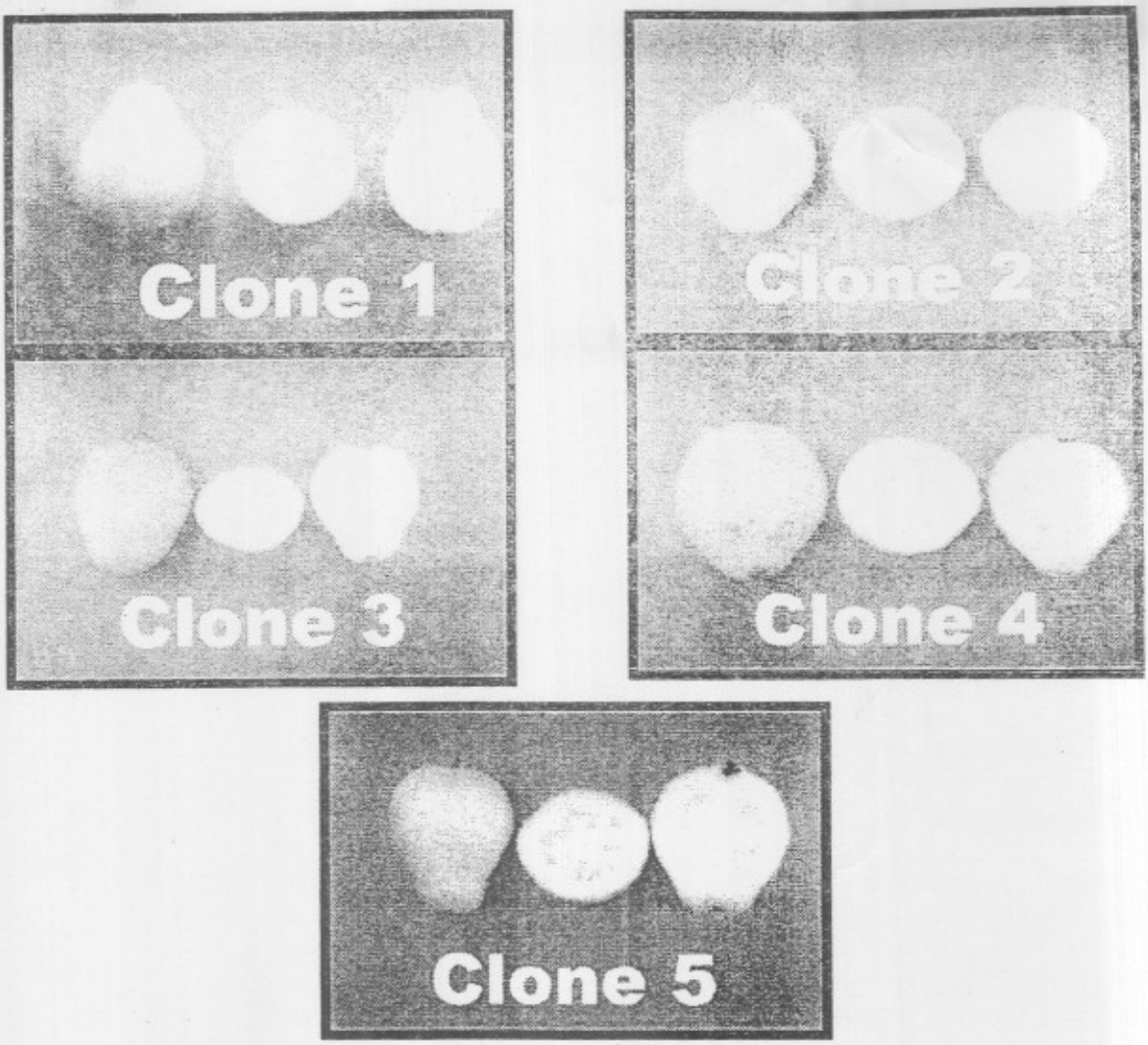
Ascorbic acid

Table 5 shows that clone 1 exerted the highest values of fruit content of fruit content of ascorbic acid values as compared with other clones in both seasons . In the first season, clone 2 recorded the second order of fruit content of Ascorbic acid, descending followed by clone 5, followed by clone 3 whereas, clone 4 came at last. While, in the second season, no significant differences were detected between this clones.

TABLE 4. Fruit physical characteristics of some guava clones (2005 & 2006 seasons).

Clones	Fruit weight (g)		Fruit volume (cm^3)		Fruit specific gravity (w/v)		Fruit length (cm)		Fruit width (cm)		Fruit shape (L/D)		Hardness (g/cm^2)		Flesh thickness (cm)	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Clone 1	128.5D	108.57C	108.1D	97.4C	1.19A	1.1A	8.2C	7.9C	5.8B	5.6D	1.42A	1.41A	306.2B	297.1B	0.99B	1.20C
Clone 2	88.1E	83.4D	80.7E	82.8D	1.09B	1.08B	6.6E	6.9E	5C	5.4E	1.33B	1.28B	317.6A	308.7A	0.86C	1.10D
Clone 3	180.7A	166.2A	175.4A	158.5A	1.03C	1.04C	7.5D	7.4D	5.9B	5.9C	1.28B	1.25B	298C	275.8E	0.75D	1.03D
Clone 4	157.6C	126.6B	154.1C	122.9B	1.02C	1.03C	9.4A	8.9A	6.6A	6.3B	1.42A	1.41A	306B	287.2D	1.52A	1.33B
Clone 5	163.3B	129.3B	158.8B	126B	1.03C	1.03C	8.9B	8.3B	6.7A	6.6A	1.34B	1.25B	298.3C	295.3C	1.53A	1.54A

Means followed by the same letter (s) within each column are not significantly different at 5% level.



TSS/ acid ratio

It is clear that clone 2 gave the lowermost values of TSS/acid ratio in both seasons. In first season, clone 5 exerted the highest values, followed by clone (4) without significant differences between them.

Clones 1 & 3 came in between without significant differences between them. On the other hand, no significant differences were noticed between the three clones *i.e.* clones 1, 3 & 5 in the second season (Table, 5).

The obtained results of fruit quality are in harmony with the findings of Al-Mounify (1988), Amin & Jaisval (1988), Yadava (1994) and Yadava (1996). They found that size, shape, acidity, ascorbic acid, quality, ripening of guava fruits varies among cultivars and cultivated guava types.

TABLE 5. fruit chemical characteristics of some guava clones (2005 & 2006 seasons).

Clones	TSS		Acidity (%)		Ascorbic acid mg/100 ml		TSS/acid ratio	
	2005	2006	2005	2006	2005	2006	2005	2006
Clone 1	8.2B	9.72C	0.43B	0.40C	282.00A	289.00A	19.26B	24.32A
Clone 2	7.84C	8.40E	0.48A	0.42B	276.33B	277.30B	16.22C	19.84C
Clone 3	8.97A	10.33A	0.49A	0.43A	237.67D	280.00B	18.32B	24.22A
Clone 4	9.02A	10.04B	0.44B	0.43A	226.00E	274.00B	20.50A	23.17B
Clone 5	8.31B	9.36D	0.39C	0.39D	266.33C	276.70B	21.31A	24.02A

Means followed by the same letter (s) within each column are not significantly different at 5% level.

Seed parameters

No. of seeds/fruit

It is quiet from Table 6 that clone 2 exerted the lowermost number of seeds/fruit in both seasons (2005&2006). No significant differences were noticed between other clones in the first season, while in the second one, clone 5 gave the highest number of fruit seeds, whereas, other clones came in between without significant differences between them (Table, 5).

Seeds weight /fruit

Table 6 shows that clone 5 exerted heaviest seeds/fruit in comparison to other clones in both seasons (2005 & 2006), descendingly followed by clone 3, followed by clone 1, followed by clone 4 while, clone 2 recorded the lightest seeds/fruit in this respect.

Seeds %

It is obvious that clone 1 gave a higher percentage of seeds in comparison to other clones, descending followed by clone 2 in both seasons. Other clones i.e. clones 3,4 and 5 exerted unclear trend (Table, 6).

The obtained results of seeds parameters are in accordance with the findings of El-Agamy (1970), Khamis (1974), Thonet & Chakrawar (1982) and Al-Mounify (1988). They reported that guava fruits varies in its contain of number and weight of seeds.

TABLE 6. Seed parameters of some guava clones (2005 & 2006) seasons.

Clones	No. of seeds/fruit		Seed weight/fruit (gm)		Seeds (%)	
	2005	2006	2005	2006	2005	2006
Clone 1	350.4A	317B	3.60C	3.16AB	2.8A	2.92A
Clone 2	251.8C	237C	2.25D	2.22C	2.55B	2.66B
Clone 3	336.5A	324B	3.90B	3.25A	2.25C	1.96E
Clone 4	343.3A	324B	3.53C	3.14B	2.24C	2.47D
Clone 5	323.1AB	342A	4.07A	3.34A	2.09D	2.59C

Means followed by the same letter (s) within each column are not significantly different at 5% level.

References

A.O.A.C. (1980) Association of Official Agriculture Chemists, "*Official Methods of Analysis*" 13th ed. Washington D.C.

Al-Mounify, M.A.A. (1988) Evaluation of some seedling guava trees and their vegetative propagation by cuttings. *M.Sc. Thesis*. Fac. Agric. Moshtohor, Zagazig Univ. Egypt.

Amin, M.N. and Jaisval, V.S. (1988) Micropropagation as an aid to rapid cloning of guava cultivars. *Scientia Hort.* 36, 89-95.

Babu, K.D., Dubey, A.K. and Yadav, D.S. (2002) Evaluation of guava cultivars for their performance under mid hill altitude of Meghalaya. *Indian J. of Hill Farming*, **15** (1), 119-121.

Duncan, D.B. (1955) Multiple range and Multiple F. test. *Biometrics*, **11**, 1.

El-Agamy, S.Z. (1970) Studies on propagation, pruning, irrigation and flower bud induction in guava. *M. Sc. Thesis*. Fac. Agric. Alex. Univ. Egypt.

Horwitz, W. (1970) "*Official Methods of Analysis*" 11th ed. Association of Official Analytical Chemists Washington, D.C.

Rokba, A.M., Ezzat, A.H. and El-Wakeel, T.A. (1976) "Bassateen" Edfinaa new selected guava variety, *Egypt. J. Hort.* 3 (2) 209-219.

Khamis, M. (1974) Studies on growth and Flowering of guava trees. *M. Sc. Thesis*, Fac. Agric., Ain Shams Univ.

Snedecor, G.W. and Cochran, W.G. (1980) "*Statistical Methods*." 7th ed. Iowa Univ., Press Ames., Iowa, U.S.A. p. 507.

Thonte, G.T. and Chakrawar, V.R. (1982) Physico-chemical characters of the certain types/ strains of guava (*Psidium guajava* L.) *Progressive Hort.* **14**, 269-272.

Velez, C.R. Henriquez, S.A. and Macchiavilli, R. (2003) Prelimenary evaluaton of guava (Psidium guajava L) Genotype on the southcast of Peurtoreco Rico. J. of agriculture, **87** (3/4), 149-153.

Vogel, A. (1968) "*A Text Book of Quantitative Inorganic Analysis*". Longmans. New York, p.1216.

Wilson, C.W. (1980) Guava, In: *Tropical and Sub-tropical Fruits: Composition, Properties, and Uses*. S. Nagy and Shaw, P.E. (Ed.), pp. 279-299. AVI, Westport, Conn.

Yadava, U.L. (1994) Physicochemical properties of guava produced in Georgia. *Hort Science*, **29**, 536-537.

Yadava, U.L. (1996) Guava (*Psidium guajava* L.) an exotic tree fruit with potential in the Southeastern United States. *Hort Science*, **31** (5), 789-794.

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تقييم بعض سلالات الجوافة تحت ظروف التصويم بمحافظة القليوبية

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أجريت هذه الدراسة خلال موسمين متتالين هما ٢٠٠٥ ، ٢٠٠٦ علي أشجار خمس سلالات من الجوافة عمرها ٩ سنوات ، متكاثرة بالسرطانات منزرعة بمحافظة القليوبية تحت ظروف التصويم لإنتاج الجوافة في فصل الشتاء في أرض طينية علي مسافة ٥ × ٥م وكل سلالة كانت أشجارها متماثلة في قوة النمو الخضري وتتلقى نفس المعاملات الزراعية المعتادة بالمزرعة وذلك بغرض تقييم هذه السلالات من الجوافة لإكثار ونشر الأفضل منها .

وكان أهم النتائج المتحصل عليها كالتالي :

١- تفوقت السلالة رقم ١ ، ٢ في كل من النسبة المئوية لعقد الثمار وكمية المحصول عددا ووزنا وأظهرت أقل نسبة لتساقط الثمار بينما كان أقل السلالات إنتاجا هي السلالة رقم ٤ .

٢- أظهرت السلالات رقم ٣ ، ٤ ، ٥ تفوقا في معظم الصفات الطبيعية للثمار عدا الصلابة التى تفوقت فيها السلالة رقم ٢ ثم رقم ١ .

٣- أظهرت السلالة الأولى تفوقا في محتوي ثمارها من حمض الاسكوربيك وكذلك نسبة المواد الصلبة الكلية إلي الحموضة في حين كانت ثمارها ذات محتوي قليل من الحموضة. يليها في ذلك السلالات ٥ ، ٤ ، ٣ ثم ٢ علي الترتيب .

٤- أنتجت السلالة رقم ٢ ثمارا ذات بذور قليلة العدد والوزن في حين لم يوجد اختلاف واضح بين باقى السلالات في هذا الخصوص . أما النسبة المئوية للبذور فكانت السلالة رقم ١ أعلاها تليها السلالة رقم ٢ بينما كانت باقى السلالات متشابهة في ذلك.

٥- السلالة رقم ١ كانت متميزة في كل من طول عنق الورقة وطول العرق الوسطي وعرض الورقة وكذلك مساحة الورقة حيث سجلت أعلا قيم في هذا الصدد.

توصى الدراسة بإكثار ونشر السلالتين ١ ، ٢ لإنتاجهما الغزير وتفوقهما في معظم صفات الجودة ذات الأهمية في التصدير والاستهلاك المحلى.