

Comparing between four Mango Cultivars Growing in Four Egyptian Governorates

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ABSTRACT

Field work of this investigation was carried out during 2014 and 2015 seasons to evaluate the performance of four mango cultivars (Timor, Ewis, Cobania and Zibda) grown under four Governorates (El Giza, El-Sharkia, El – Monifia and El – Fayum) Egypt. Flowering properties, total fruit number, yield/tree as well as Physical and chemical characteristics were determined of four Mango cultivars at harvesting stage grown in four Governorates. El Fayum Governorate produced the lowest number and percentage of malformed panicles under all cultivars without significant differences between them in most cases. Indicating that the Governorate is the main factor in decreasing number of malformed panicles. The highest total yield/tree (98.26 and 91.84 kg) was produced by Zibda cultivar under El Sharkia Governorate in the first season and El Giza Governorate in the second one, respectively. Timor cultivar with El Fayum Governorate in the first season and El Monifia Governorate in the second season gained the lowest total yield/tree (28.85 and 23.06 kg), respectively. The fruit length, thickness and width did not follow any particular trend since it fluctuated through the Governorates condition. This indicated that the variation in data return to cultivars genetics. Physical fruit properties confirm the previous trend of each individual factor. The highest average fruit weight (686.0 and 688.6 g) was recorded for Zibda cultivar under El Sharkia Governorate while, the highest pulp percentage (79.05 and 78.18 %) gained by Timor cultivar under El Sharkia condition in the first and second seasons, Ewis cultivar gained the highest total soluble acid, total sugar and ascorbic acid content under all Governorates in both seasons. Indicating that cultivars are the main factor effecting of Chemical properties

Key words: Mango Local cultivars (Timor, Ewis, Cobania and Zibda), Flowering properties yield/tree, Physical and chemical characteristics

Introduction

Mango (*Mangifera indica* L.) belongs to the family Anacardiaceae, considered as one of the most important fruits of the tropical and subtropical countries of the world. It grows under a wide range of climatic and soil conditions. Mango (*Mangifera indica* L.) is a delicious fruit which belongs to the family Anacardiaceae. The principal mango producing countries are India, China, Thailand, Indonesia, and Pakistan in Egypt, mango ranks the third after citrus and grapes, whereas its total area of fruitful orchards reached approximately 101303 ha producing about 712537 tons annually (FAO, 2016). Central and South America, Australia, Southeast Asia, Hawaii, Egypt and South Africa are outside the traditional geographical regions for mango production and are increasing the mango cultivations especially for export markets (Tharanathan *et al.*, 2006).. The growth of the mango trees is usually given by cycles with short repetitions throughout the year and it is depending on the cultivar, climate conditions and agriculture management (Davenport and Núñez-Elisea, 1997). There are many factors that influence yield, maturity and quality of fruits also, differed in same cultivar characteristics in different growing conditions. Even in the same region, different environmental conditions at different years can affect maturity and quality of the fruit (De Villiers, 1998). Optimizing and integrating various key management practices such as fertilizer application, irrigation, foliar sprays of KNO₃ or urea, and soil drench application of paclobutrazol might extend the availability period and increase yield and quality (Sarker *et al.*, 2016). There are many varieties of mangoes. Each variety produces fruits of distinctive appearance, texture, flavour, and aroma. The

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yield capacity of a tree is dependent on variety, tree age, tree size, seasonal conditions and previous cropping history (Bally, 2006).

The objective of this study was to assess the sensory attributes and physical and chemical quality of various mango cultivars grown in four Governorates of the most producing area “El Giza, El-Sharkia, El – Monifia and El – Fayum” to recommend a comparatively better mango cultivars for each Governorate to processing and export purposes.

Materials and Methods

Field work of this investigation was carried out during 2014 and 2015 seasons to evaluate the performance of four mango cultivars (Timor, Ewis, Cobania and Zibda) grown under four Governorates (El Giza, El-Sharkia, El-Monifia and El -Fayum Governorate) Egypt. The four different Mango cultivars could be distinguished according to high yield, peel color, free malformation and good fruit taste. Mango cultivars trees were 20 years age, grown in sandy soil at 7× 7 meters apart and were thoroughly subjected to the daily cultural practices followed by the orchard management such as irrigation, fertilization and pest control through their life. The trees were evaluated relative to the following aspects:-

1 - Flowering properties: -

Total number of panicles were counted after full flowering also, normal and malformed panicles were recorded and the percentage of malformation was calculated with respect to the total number of panicles as follow:-

$$\text{Floral malformation \%} = \frac{\text{Malformed panicles}}{\text{Total number of panicles}} \times 100$$

2 - Ripening date and total yield:-

- The beginning and the end of commercial harvest of fruits were recorded.
- Number of fruits/tree was counted after June drop.
- The total yield of each tree/Kg was estimated by
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$$\text{Total yield/Kg} = \frac{\text{Number of fruits per tree} \times \text{the average fruit weight (gm)}}{1000}$$

3 - Fruit characteristics:-

Representative samples of fifteen mangoes fruits from each variety were randomly chosen to studying the following properties:-

- Average fruit dimension; Fruit length (cm.); fruit thickness (cm); and fruit width (cm).
- Average fruit weight (gm).
- Average pulp weight (gm) and its percentage was calculated

$$\text{Percentage of pulp weight (\%)} = \frac{A}{B} \times 100$$

A: Pulp weight

B: Total fruit weight

- Average Seed weight (gm)

4 - The chemical fruit characteristics: -

- Total soluble solids (TSS) of the fruit juice using Abb refractometer
- The titrable acidity of the fruit juice was determined (as citric acid) according To (A.O.A.C, 2000).The TSS/acid ratio was also calculated.
- Vitamin C (ascorbic acid) content as mg/100 gm fresh weight according to (A.O.A.C. 2000).

- Percentage of total sugars according to Lans & Eynon volumetric method that outlined in A.O.A.C (2000).

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Statistical layout and analysis:

The experimental layout was (CRD) in factorial treatments (Snedecor and Cochran, 1980) completely randomized design. New L.S.D. at 5% test was used for comparison between means of the studied treatments (Waller and Duncan 1969).

Results and Discussion

Flowering properties:

Number of panicles and number of malformed panicles as well as malformed panicles during 2014 and 2015 seasons are presented in Tables (1).

Total number of panicles: -

Regarding total number of panicles, the data cleared that significant differences between the four cultivars. Zibda cultivar gained the highest total number of panicles in the two seasons (383.85 & 375.65) followed by Timor cultivar (356.90 & 341.60). Ewis cultivar gave the lowest total number of panicles (308.75 & 313.00) in both seasons, respectively.

The data showed significant differences between the studies Governorates in the two seasons. The highest number of panicles were recorded for El Giza Governorate in the first season (391.10) while, the highest number was gained for El Monifia Governorate (359.70) in the second one. The lowest number was recorded for El Sharkia Governorate (300.4 & 298) in the first and second seasons, respectively.

The interaction between cultivars and Governorates was significant in the two seasons. The total number of panicle fluctuated between all treatments during the two seasons. In this respect, zibda cultivar gained the highest number of panicle/tree under all Governorates conduction in the two seasons. The highest number (412.0 & 406.8) was gained under El Giza Governorate conduction in the first season and under El Monifia Governorate conduction in the second one, respectively. The lowest number of panicle were recorded for El Sharkia Governorate with Cobania cultivar in the first season and with Ewis cultivar in the second one (257.4 and 259.6 in the two seasons, respectively).

Number of malformed panicles: -

As shown in Table (1), the number of malformed panicles differed significantly concerning mango cultivars in the two experimental seasons. However, the highest number of malformed panicles (57.65 & 52.95) were produced on Taimor trees in the first and second seasons, respectively followed by Ewis cultivar. The lowest number of malformed panicles (27.8 & 26.30) was recorded for Zibda and Cobania cultivars in the two seasons, respectively.

As for Governorates effect, the obtained data clear that significant differences between the four Governorates. The highest number of malformed panicles was recorded by El Giza Governorate (56.2 & 48.00) in both seasons, respectively. Whereas the lowest value (12.50 & 10.85) was gained by El Fayum Governorate in the first and second seasons, respectively. El Sharkia and El Monifia Governorates came in between.

The interaction between cultivars and Governorates was significant in both seasons and confirm the previous trends of each individual factor on number of malformed panicles. Anyhow, El Fayum Governorate produced the lowest number of malformed panicles under all cultivars without significant differences between them in most cases. Indicating that the Governorate is the main factor in decreasing number of malformed panicles. The highest number of malformed panicles (88.0 and 74.8) was recorded for Timor cultivar with El Giza Governorate through the two seasons,

respectively. Zibda cultivar under El Fayum Governorate produced the lowest number of malformed panicles (8.8 and 8.2) in both seasons, respectively.

Malformed percentage: -

Concerning malformed percentage, it take the similar trend of number of malformed panicles in both varieties, governorates and interaction between them.

Table 1: Flowering properties of four mango cultivars grown in four governorates during 2014 and 2015 seasons.

Properties	Governorate (B)	El Giza	El-Sharkia	El-Monifia	El-Fayum	Av.	El Giza	El-Sharkia	El-Monifia	El-Fayum	Av.	
	Cultivars (A)	2014					2015					
Total Number of panicles	Timor	408.6	335.8	343.4	339.8	356.90	358.4	296.8	363.8	347.4	341.60	
	Ewis	349.6	281.4	301.0	303.0	308.75	339.4	259.6	345.4	307.6	313.00	
	Cobania	394.2	257.4	342.4	332.2	331.55	346.6	287.8	322.8	376.8	333.50	
	Zibda	412.0	327.0	399.8	396.6	383.85	365.8	347.8	406.8	378.2	374.65	
	Av.	391.10	300.40	346.65	342.90		352.55	398.00	359.70	352.50		
	New L.S.D at 5%		Var. 7.24		Gov. 6.11		inter. 9.15		Var. 6.99		Gov. 5.43	
Number of Malformed panicles	Timor	88.0	60.6	69.6	12.4	57.65	74.8	52.4	73.0	11.6	52.95	
	Ewis	37.2	33.2	39.6	15.4	31.35	34.0	30.0	42.0	13.2	29.80	
	Cobania	66.8	20.4	29.0	13.4	29.90	53.8	18.2	23.0	10.2	26.30	
	Zibda	32.8	26.2	43.4	8.8	27.80	29.4	28.8	44.2	8.2	27.65	
	Av.	56.2	35.10	45.4	12.50		48.00	32.35	45.55	10.85		
	New L.S.D at 5%		Var. 4.30		Gov. 5.30		inter. 6.34		Var. 3.22		Gov. 4.41	
Malformed percentage	Timor	21.59	18.20	19.71	3.67	15.79	20.88	17.79	20.05	3.67	15.59	
	Ewis	10.64	11.79	13.15	5.08	10.17	10.02	11.56	12.16	4.29	9.51	
	Cobania	16.84	7.90	8.50	4.03	9.32	15.52	6.32	7.13	2.71	7.92	
	Zibda	7.96	8.01	10.89	2.22	7.27	8.03	8.31	10.43	2.17	7.24	
	Av.	14.26	11.48	13.06	3.75		13.61	10.99	12.44	3.21		
	New L.S.D at 5%		Var. 2.34		Gov. 2.11		inter. 2.56		Var. 2.54		Gov. 2.64	

Total fruit number / tree

The available data of the total fruit number/tree and total yield/tree are presented in Table (2). Total fruit number/tree differed significantly concerning the four mango cultivars in both seasons. Ewis cultivar was gained the highest Total fruit number/tree (189.74 and 197.46), whereas the lowest Total fruit number/tree (76.52 and 67.39) was recorded for Taimor cultivar in the first and second seasons, respectively.

Comparing Governorate effect, the data showed significant differences between the four Governorates during the two seasons. Anyhow, El Sharkia Governorate gained the highest Total fruit number/tree (135.09 and 136.40), whereas El Fayum Governorate recorded the lowest Total fruit number/tree in the first and second seasons, respectively. Other two Governorates came intermediate between them in both seasons.

The interaction between cultivars and Governorate was significant in the two seasons. The data indicated that the Total fruit number/tree take the similar trend of its cultivars and fluctuated under the four Governorates in both seasons. In this respect, the highest Total fruit number/tree (198.99 and 214.57) was recorded by Ewis cultivars under El Sharkia Governorate during the first and second seasons, respectively, while the lowest Total fruit number/tree was gained by Timor cultivar under El Fayum Governorate (69.48) in the first season and under El Giza Governorate (59.66) in the second one. In agreement with the present results Said and El Masry (1992) and Boshra *et al.*, (2007).

Total yield / tree:

The data reported that the effect of four mango cultivars differed significantly concerning of total yield in both seasons. Zibda cultivar produced the highest total yield / tree (86.64 and 82.80 kg), followed by Cobania cultivar (59.84 and 61.08 kg) as well as, Ewis cultivar (46.23 and 46.91 kg), while the lowest total yield / tree (31.30 and 26.36 kg) was gained by Taimor cultivar in the two seasons, respectively.

Regarding Governorates effect, the data revealed that significant differences between the four Governorates in both seasons. El Sharkia Governorate recorded the highest total yield / tree (59.76 and 57.76 kg), while the lowest total yield / tree (51.52 and 51.90 kg) was gained for El Monifia Governorate in the first and second seasons, respectively. The two anther Governorates came in between.

The interaction between cultivars and governorates was significant in the two seasons. However, Zibda cultivar gained the highest total yield / tree with the four Governorates in the two seasons. The highest total yield / tree (98.26 and 91.84 kg) was prduced by Zibda cultivar under El Sharkia Governorate in the first season and El Giza Governorate in the second one, respectively. Timor cultivar with El Fayum Governorate in the first season and El Monifia Governorate in the second season gained the lowest total yield / tree (28.85 and 23.06 kg), respectively.

Table 2: Total fruit number and yield/tree of four Mango cultivars at harvesting stage grown in four governorates during 2014 and 2015 seasons.

Properties	Governorate (B)	El Giza	El-Sharkia	El-Monifia	El-Fayum	Av.	El Giza	El-Sharkia	El-Monifia	El-Fayum	Av.
	Cultivars (A)	2014					2015				
Total fruit number / tree	Timor	89.19	71.58	85.84	69.48	76.52	59.66	80.94	61.49	67.48	67.39
	Ewis	189.03	198.99	182.03	188.90	189.74	192.93	214.57	183.28	199.06	197.46
	Cobania	116.52	126.53	111.91	98.24	113.3	125.15	134.12	117.59	114.29	122.79
	Zibda	137.00	143.24	138.63	122.65	129.38	139.66	131.96	123.35	103.26	127.06
	Av.	132.94	135.09	129.60	119.82		129.35	136.40	121.43	121.02	
	New L.S.D at 5%	Var. 2.89	Gov. 3.74		inter. 3.92		Var. 2.41	Gov. 2.89		inter. 3.11	
Total yield (kg/tree)	Timor	35.71	29.25	31.40	28.85	31.30	22.67	29.38	23.06	30.31	26.36
	Ewis	45.22	45.13	45.58	49.00	46.23	42.83	45.06	46.37	53.39	46.91
	Cobania	55.18	66.38	55.35	62.44	59.84	61.52	65.72	56.42	60.67	61.08
	Zibda	93.85	98.26	73.75	80.68	86.64	91.84	90.87	81.76	66.73	82.80
	Av.	57.49	59.76	51.52	55.24		54.72	57.76	51.90	52.78	
	New L.S.D at 5%	Var. 3.34	Gov. 4.23		inter. 7.29		Var. 3.12	Gov. 3.33		inter. 7.54	

Fruit length:-

As shown in Table (3) mango cultivars effect significantly in the fruit length in both seasons. However, the highest fruit length (13.15 and 13.32cm) was recorded for Zibda cultivar followed by Cobania cultivar (12.00 and 12.71 cm) in the first and second seasons, respectively. Ewis cultivar gained the lowest fruit length (10.62 and 10.93 cm) in both seasons, respectively.

Concerning Governorates and the interaction effects, the data showed that no significant differences between them in both seasons.

Fruit thickness:-

The data in Table (3) revealed that the four mango cultivars effect significantly in fruit thickness in both seasons. Zibda cultivar gained the highest fruit diameter (9.27 and 9.17 cm) without significantly differences with Cobania cultivar (9.16 and 9.30 cm) while, the lowest fruit thickness (6.93 and 7.10 cm) was recorded for Ewis cultivar in the first and second seasons, respectively.

Fruit thickness differed insignificantly as for Governorates effect and the interaction between cultivars and Governorates during the two seasons.

Fruit width:-

The data in Table (3) cleared that fruit width differed significantly in both seasons for mango cultivars. The highest fruit width (8.80 and 8.03 cm) was recorded for Zibda cultivar in the first and second seasons, respectively. Ewis cultivar gave the lowest width (5.28 and 5.74 cm) in both seasons, respectively. Taimor and Cobania cultivars came in between.

As for Governorates effect, the data clarified significant differences between four Governorates in the two seasons. In this respect, the highest width (7.38 cm) was recorded for El Sharkia Governorate in the first season while, in the second one (7.66 cm) it was gained by El Fayum Governorate. The lowest width (6.81 and 6.94 cm) gained by El Monifia and El Sharkia Governorates in the first and second seasons, respectively.

The interaction between mango cultivars and Governorates was significant in the two seasons and followed a similar trend of its average cultivars. Cobania cultivar under El Fayum Governorate was recorded the highest fruit width (8.72 and 8.58 cm) in the two seasons, respectively. The lowest fruit width (5.28 and 5.70 cm) was recorded for Ewis cultivar with El Fayum Governorate in both seasons, respectively.

As a whole, the fruit length, diameter and width take the similar of its cultivars. Therefore, it did not follow any particular trend since it fluctuated through the Governorates condition. This indicated that the variation in data return to cultivars genetics.

Table 3: Fruit dimension and shape of four mango cultivars at harvesting stage grown in four governorates during 2014 and 2015 seasons.

Properties	Governorate (B)	El Giza	El-Sharkia	El-Monifia	El-Fayum	Av.	El Giza	El-Sharkia	El-Monifia	El-Fayum	Av.
	Cultivars (A)	2014					2015				
Length (cm)	Timor	11.76	12.38	11.02	12.34	11.87	11.12	11.68	11.02	12.7	11.63
	Ewis	10.94	10.34	10.74	10.48	10.62	11.06	10.76	10.90	11.30	10.93
	Cobania	12.18	12.62	11.78	11.42	12.00	12.68	12.80	13.10	12.26	12.71
	Zibda	14.02	13.12	12.36	13.10	13.15	13.02	13.94	13.36	12.96	13.32
	Av.	12.22	12.11	11.47	11.83		11.97	12.29	12.09	12.30	
	New L.S.D at 5%	Var. 1.40	Gov. N.S			inter. N.S	Var. 1.60	Gov. N.S			inter. N.S
Diameter (cm)	Timor	8.36	8.24	7.38	8.64	8.16	7.6	8.36	7.70	8.96	8.15
	Ewis	7.68	6.56	6.98	6.48	6.93	7.68	6.22	7.50	7.00	7.10
	Cobania	8.80	9.26	9.18	9.38	9.16	9.22	9.38	9.36	9.26	9.30
	Zibda	9.74	9.14	8.74	9.46	9.27	8.86	9.52	9.08	9.22	9.17
	Av.	8.65	8.30	8.07	8.49		8.34	8.37	8.41	8.61	
	New L.S.D at 5%	Var. 0.84	Gov. N.S			inter. N.S	Var. 0.74	Gov. N.S			inter. N.S
Width (cm)	Timor	7.34	7.48	6.52	7.68	7.26	7.42	7.28	6.76	8.26	7.43
	Ewis	5.66	5.72	5.78	5.28	5.61	6.00	5.18	6.10	5.70	5.74
	Cobania	7.56	8.26	8.10	8.72	8.16	7.70	7.28	8.08	8.58	7.91
	Zibda	8.02	8.04	6.82	8.33	8.80	7.96	8.02	8.02	8.10	8.03
	Av.	7.15	7.38	6.81	7.50		7.27	6.94	7.24	7.66	
	New L.S.D at 5%	Var. 0.94	Gov. 0.65			inter. 0.98	Var. 0.86	Gov. 0.74			inter. 0.89

Total fruit weight: -

The data in Table (4) cleared that, the average fruit weight differed significantly in both seasons. The highest average fruit weight (640.20 and 663.80g / fruit) was gained Zibda cultivar, whereas the lowest average fruit weight were recorded by Ewis cultivar (243.95 and 238.30 g / fruit) in the first and second seasons, respectively.

The data obtained also, significant differences between average fruit weight for the Governorates conditions in the two seasons. El Fayum Governorate recorded the highest average fruit weight (466.55 and 473.60 g / fruit), whereas El Monifia Governorate had the lowest one (410.70 g / fruit) in the first season and in the second one it gained under El Giza Governorate condition without significant differences between it and El Sharkia Governorate.

The interaction between cultivars and Governorates conditions was significant during the two seasons. The average fruit weight take the similar trend of its cultivars and fluctuated under Governorates conditions. The highest average fruit weight (686.0 and 688.6 g / fruit) was recorded for Zibda cultivar under El Sharkia governorate in the first and second seasons, respectively. Ewis variety Sharkia Governorate was recorded the lowest averaged fruit weight (226.8 and 210.0 g / fruit) in both seasons, respectively.

Fruit pulp weight:-

The data in Table (4) showed that the fruit pulp weight of four mango cultivars differed significantly in both seasons. The Zibda cultivar gained the highest fruit pulp weight (469.40 and 487.80 g) followed by Cobania cultivar (361.10 and 327.55 g) in the first and second seasons, respectively. The lowest fruit pulp weight was recorded for Ewis cultivar (176.55 and 166.55 g) followed by Timor cultivar (303.8 and 293.55 g) in the two seasons, respectively.

Significant differences in the weight of fruit pulp could be traced between Governorates conditions during the two studied seasons. In this respect, the data cleared that fruit pulp weight fluctuated between the four Governorates in both seasons. The highest fruit pulp weight (342.4 and 344.7 g) gained by EL Fayum Governorate condition, whereas the lowest one (293.25 and 297.05 g) was recorded for El Monifia and El Sharkia Governorates in both seasons, respectively.

The interaction between cultivars and Governorates was significant in the two seasons. Zibda cultivar gave the highest fruit pulp weight followed by Cobanha cultivar and the lowest one was gained for Ewis cultivar under all Governorates conditions in both seasons. The highest fruit pulp weight (517.4 and 500.4 g) were recorded for Zibda cultivar in both seasons under El Giza Governorate in the first season and El Sharkia Governorate in the second one, respectively. The lowest pulp fruit weight (158.0 and 146.4 g) was recorded by Ewis cultivar under El Giza Governorate condition.

Seed weight: -

The data in Table (4) mentioned that seed weight differed significantly under four mango cultivars in both seasons. The highest seed weight (65.80 and 67.40 g) was gained by Zibda cultivar whereas, the lowest one (33.75 and 35.30 g) was recorded for Ewis cultivar in the first and second seasons, respectively.

Concerning Governorates effect, the data clarified that insignificant differences between four Governorates through the two seasons.

The interaction between cultivars and Governorates conditions was significant during both seasons. The data revealed that the fruit seed weight fluctuate between the four in the two seasons. The highest fruit seed weight was recorded for Zibda cultivar with El Sharkia Governorate while the lowest one recorded by Ewis cultivar under El Giza Governorate in the first and second seasons, respectively.

Pulp percentage:-

The data in Table (4) cleared that significant differences for pulp percentage in both seasons. The highest pulp percentage (76.45 and 74.99 %) with Timor cultivar in both seasons, respectively. While the lowest one (71.22 and 69.79 %) was gained for Cobania and Ewis cultivars in the first and second seasons, respectively.

As for Governorates conditions, the data differed significantly during two seasons. In this respect, pulp percentage fluctuated between the four Governorates. The highest pulp percentage was recorded for El Giza and El Sarkia Governorates in both seasons, respectively.

The interaction between cultivars and Governorates conditions differed significantly in the two seasons. Pulp percentage confirm the previous trend of each individual factor. The highest pulp percentage (79.05 and 78.18 %) gained by Timor cultivar under El Sharkia condition in the first and second seasons, respectively. Cobania cultivar with El Monifia Governorate was recorded the lowest pulp percentage (68.01 and 68.67 %) in the two seasons, respectively.

Table 4: Physical fruit properties of four mango cultivars at harvesting stage grown in four governorates during 2014 and 2015 seasons.

Properties	Governorate (B)	El Giza	El-Sharkia	El-Monifia	El-Fayum	Av.	El Giza	El-Sharkia	El-Monifia	El-Fayum	Av.
	Cultivars (A)	2014					2015				
Fruit weight (g)	Timor	400.4	408.6	365.8	415.2	397.5	380.0	363.0	375.0	449.2	391.8
	Ewis	239.2	226.8	250.4	259.4	243.95	222.0	210.0	253.0	268.2	238.30
	Cobania	473.6	524.6	494.6	533.8	506.65	491.6	490.0	479.8	530.8	498.05
	Zibda	685.0	686.0	532.0	657.8	640.20	657.6	688.6	662.8	646.2	663.80
	Av.	449.52	461.5	410.7	466.55		437.8	437.9	442.65	473.6	
	New L.S.D at 5%	Var. 6.34	Gov. 5.14			inter. 7.14	Var. 7.04	Gov. 5.81			inter. 7.13
Pulp weight (g)	Timor	303.0	323.0	282.4	306.8	303.8	282.8	283.8	274.6	333.0	293.55
	Ewis	172.6	158.0	181.8	193.8	176.55	154.0	146.4	175.8	190.0	166.55
	Cobania	346.4	376.0	336.4	385.6	361.10	345.8	257.6	330.0	376.8	327.55
	Zibda	517.4	503.6	372.4	483.4	469.40	481.4	500.4	490.4	479.0	487.80
	Av.	334.85	340.15	293.25	342.4		318.00	297.05	317.7	344.7	
	New L.S.D at 5%	Var. 5.48	Gov. 5.01			inter. 6.14	Var. 5.91	Gov. 5.24			inter. 6.03
Seed weight (g)	Timor	44.0	40.6	38.8	40.2	40.9	45.6	36.6	48.8	36.0	41.75
	Ewis	31.4	34.2	34.6	34.8	33.75	31.8	33.2	37.4	38.8	35.30
	Cobania	56.6	63.6	62.8	60.2	60.80	57.0	64.0	65.4	58.4	61.20
	Zibda	63.6	67.0	66.8	65.8	65.80	64.2	71.2	71.2	63.0	67.40
	Av.	48.90	51.35	50.75	50.25		49.65	51.25	55.70	49.05	
	New L.S.D at 5%	Var. 4.41	Gov. N.S			inter. 5.81	Var. 4.64	Gov. NS			inter. 6.04
Pulp %	Timor	75.67	79.05	77.20	73.89	76.45	74.42	78.18	73.22	74.13	74.99
	Ewis	72.14	69.58	72.75	74.68	72.29	69.35	69.59	69.37	70.85	69.79
	Cobania	73.12	71.55	68.01	72.21	71.22	70.26	72.78	68.67	70.96	70.67
	Zibda	75.45	73.41	69.89	73.43	73.05	73.19	72.63	74.00	74.07	73.47
	Av.	74.09	73.40	71.96	73.55		71.81	73.30	71.32	72.50	
	New L.S.D at 5%	Var. 2.51	Gov. 2.44			inter. 2.74	Var. 2.39	Gov. 2.83			inter. 2.62

Chemical fruit properties:-

Total soluble solids (TSS):-

As shown in Table (5) cultivars and Governorates significantly affected of average total soluble solids in both experimental seasons. The highest total soluble solids (22.3 and 23.0 %) was recorded Ewis cultivar in the two seasons, respectively. Zibda and Cobania cultivars gave the lowest TSS (19.9 and 19.6 %) in the first and second seasons, respectively.

Comparing Governorates, the data showed that total soluble solids (TSS) gave the highest value (21.6 and 21.7 %) with El Giza Governorate, while the lowest value (20.1 and 20.5 %) was gained for El Fayum Governorate in both seasons, respectively.

The interaction between cultivars and Governorates differed significantly in the two seasons. In this respect, total soluble solids gained the highest values with Ewis cultivar under the four Governorates in both seasons. The highest total soluble solids (22.8 and 23.2%) was recorded for Ewis cultivar under El Giza Governorate in the first and second seasons, respectively. Cobania

cultivar under El Fayum Governorate was recorded the lowest TSS (17.8 and 17.6%) in both seasons, respectively.

Titration acidity (TA):-

The data in Table (5) indicated that cultivars affect significantly of total acidity percentage. In the two seasons, the percentage of total acidity gained the lowest value (0.20 and 0.21 %) with Ewis cultivar, while Cobania cultivar recorded the highest total acidity (0.44 and 0.45 %) in both seasons, respectively.

Regarding Governorates effect, the data showed insignificant differences between the four Governorates.

The interaction between cultivars and Governorates differed significantly in both seasons. The data also mentioned that, the lowest total acidity percentage was recorded for Ewis cultivar and the highest value was gained by Cobania cultivar with the four Governorates in both seasons.

Table 5: Chemical properties of four mango cultivars at harvesting stage grown in four governorates during 2014 and 2015 seasons.

Properties	Governorate (B)	El Giza	El-Sharkia	El-Monifia	El-Fayum	Av.	El Giza	El-Sharkia	El-Monifia	El-Fayum	Av.
	Cultivars (A)	2014					2015				
Total soluble solid (TSS)	Timor	22.2	21.0	20.4	20.8	21.1	22.6	21.0	21.2	20.4	21.3
	Ewis	22.8	22.0	22.6	21.8	22.3	23.2	22.8	22.8	23.0	23.0
	Cobania	20.8	21.4	20.8	17.8	20.2	20.6	20.6	19.4	17.6	19.6
	Zibda	20.6	20.6	18.6	19.8	19.9	20.4	21.0	21.2	20.8	20.9
	Av.	21.6	21.3	20.6	20.1		21.7	21.4	21.2	20.5	
New L.S.D at 5%	Var. 0.29		Gov. 0.21			inter. 0.29	Var. 0.24		Gov. 0.21		inter. 0.31
Total acidity (TA)	Timor	0.21	0.21	0.22	0.22	0.22	0.20	0.21	0.22	0.22	0.21
	Ewis	0.19	0.21	0.21	0.20	0.20	0.20	0.21	0.20	0.21	0.21
	Cobania	0.44	0.42	0.45	0.46	0.44	0.45	0.45	0.44	0.44	0.45
	Zibda	0.34	0.32	0.35	0.33	0.34	0.32	0.30	0.35	0.35	0.33
	Av.	0.30	0.29	0.31	0.30		0.29	0.29	0.30	0.31	
New L.S.D at 5%	Var. 0.16		Gov. N.S			inter. 0.19	Var. 0.13		Gov. N.S		inter. 0.15
Sugar percentage	Timor	17.87	18.16	18.09	18.37	18.12	17.64	17.77	17.75	18.57	17.93
	Ewis	19.55	19.91	19.77	19.56	19.70	19.64	19.78	19.87	19.48	19.69
	Cobania	16.63	17.47	16.79	17.77	17.17	16.60	17.23	16.87	17.65	17.09
	Zibda	16.77	16.63	16.15	16.96	16.63	16.67	17.33	15.61	16.64	16.56
	Av.	17.71	18.04	17.70	18.17		17.64	18.03	17.53	18.09	
New L.S.D at 5%	Var. 0.17		Gov. 0.24			inter. 0.31	Var. 0.19		Gov. 0.21		inter. 0.35
Ascorbic acid (V.C.)	Timor	27.17	25.92	25.22	25.27	25.90	24.97	26.01	24.12	25.92	25.26
	Ewis	31.79	32.22	27.05	34.25	31.33	33.26	29.95	26.52	27.10	29.21
	Cobania	26.23	26.94	24.05	26.15	25.84	26.53	26.70	24.39	24.93	25.64
	Zibda	26.82	25.21	23.43	26.37	25.46	25.56	26.24	23.90	24.11	24.95
	Av.	28.00	27.57	24.94	28.01		27.58	27.23	24.73	25.52	
New L.S.D at 5%	Var. 0.23		Gov. 0.34			inter. 0.39	Var. 0.26		Gov. 0.28		inter. 0.31

Sugar percentage:-

The data in Table (5) mentioned that significant differences between the four mango cultivars in the two seasons. However, the highest total sugar percentage (19.7 and 19.69 %) was gained by Ewis cultivar and the lowest percentage (16.63 and 16.65 %) was recorded for Zibda cultivar in the first and second seasons, respectively.

Regarding Governorates effect, the data revealed that Governorates conditions differed significantly in both seasons. The highest total sugar percentage (18.17 and 18.09 %) was recorded for

El Fayum Governorate without significant differences with El Sharkia Governorate, while El Monifia and El Giza Governorates gave the lowest percentage without significant differences between them in the two seasons, respectively.

The interaction between cultivars and Governorates was significant in the two seasons. However, total sugar percentage took a similar trend of its individual factors. In the two seasons, Ewis cultivar gained the highest total sugar percentage under all Governorates. Zibda cultivar with El Monifia Governorate gained the lowest percentage (16.15 and 15.61 %) in the first and second seasons, respectively.

Ascorbic acid: -

In Table (5), the data mentioned that significant differences between cultivars in both seasons. However, Ewis cultivar gained the highest ascorbic acid content (31.33 and 29.21 mg/100g) while, the lowest value (25.46 and 24.95 mg / 100 g) was recorded for Zibda cultivar in the first and second seasons, respectively.

Comparing Governorates effect, the data indicated that the differences in ascorbic acid content between Governorates conditions were significant during the two seasons. In this respect, ascorbic acid content gained the highest value (28.00 and 27.58 mg /100g) under El Giza Governorate but the lowest value (24.94 and 24.73 mg / 100 g) was recorded for El Monifia Governorate in the first and second seasons, respectively.

The interaction between cultivars and Governorates differed significantly in both seasons. Anyhow, Ewis variety gained the highest ascorbic acid content under all Governorates in both seasons. Indicating that cultivar is the main factor effecting of ascorbic acid content in the fruit juice. The highest ascorbic acid content (34.25 and 33.26 mg / 100g) was gained by Ewis cultivar under El Fayum and El Giza Governorates while, the lowest value (23.43 and 23.90 mg / 100g) was recorded for Zibda cultivar under El Monifia Governorate condition in the two seasons, respectively.

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