Effect of Organic and Mineral Fertilization on Yield and Fruit Quality of Ewaise Mango Cultivar

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ABSTRACT: This investigation was conducted during two successive seasons 2016 and 2017 on ten years old mango (*Mangifera indica* L.), cv. Ewaise cultivar trees grown in Idku Center (Sand Basin No. 1) El- Behaira Governorate, Egypt. Ewaise mango trees grafted on Zebda seedlings grown at a distance of 6 x 4 m to study the effect of organic and mineral fertilization on yield and fruit quality of Ewaise mango cultivar. The experiment consisted of 8 treatments arranged in a randomized complete block design with 5 replicates for each treatments and one tree for each replicate. 1- Control 100% NPK, 2- 50% NPK+ 100% plant compost (P.C), 3- 50% NPK+ 100% animal compost (A.C.), 4- 100% (P.C.), 5- 100% (A.C), 6- 50% P.C. + 50 % A.C., 7- 50% (NPK+ P.C. + A.C.) 8- 100% (NPK+ P.C. + A.C.). Results revealed that, 100% of (NPK+ P.C. + A.C.) followed by 50% (NPK+ P.C. + A.C.) gave the highest mean values of number of fruit/tree and yield/tree as compared to other treatments and control, also, gave the maximum values of fruit physical characteristics: fruit weight (g/ fruit), fruit length (cm), fruit diameter (cm), fruit volume (cm^3) and pulp%. On the other hand, 100% of (NPK+ P.C. + A.C.) followed by 50% (NPK+ P.C. + A.C.) gave the higher fruit chemical characteristics total sugar %, reducing sugar %, non- reducing sugar %, vitamin C (m g/ 100 ml juice), total acidity (%), TSS (%) and nitrogen, phosphorus and potassium % in leaves and fruits as compared with the control and other treatments, during both seasons, respectively.
Keywords: Mango, plant compost, animal compost, mineral fertilizer, NPK, yield, fruit quality.

INTRODUCTION

Mangoes *(Mangifera indica* L.) belong to family *Anacardaceae*. Native to South Eastern Asia and considered one of the most important fruits of the tropical and sub-tropical countries. Mango trees were introduced to Egypt around year 1825. It ranks the third after citrus and grape. The total cultured area in Egypt reached about 240804 feddans that produced about 4.29 tons/feddan with total fruit production 786533 tons from produced area 183341 feddans (FAO, 2013). It is very delicious tropical fruit, also considered as the queen of the fruits as it is very popular world-wide. Mango fruit is an abundant source of vitamins, minerals and is famous for its excellent flavour, attractive fragrance and nutritional value. It is as an emerging tropical export crop and is produced in about 90 countries in the world with a production of over 820.877 MT (Abbasi *et at.,* 2011).

Mango is now commercially grown in more than 110 countries of the world, but nowhere is it so extensively cultivated as in India. India ranks first among world's mango producing countries, it occupies an area of 22.97 lakh ha with an annual production of 151.88 lakh tons. Other major mango producing countries include China, Indonesia, Brazil, Thailand, Mexico, Pakistan, Philippines, Nigeria and Egypt. India is share is around 58 (%) of world production i.e. 12.7 million tons against world's production of 27.96 million ton (Anonymous, 2011).

Organic amendments in the form of compost, manure, and cover crops are a source of plant nutrients that also improve the quality of the soil. Improvement in soil quality increases crop yield and can help mitigate climate change by sequestration of carbon. The addition of organic amendments is essential for sustainable soil fertility management and crop production, but can increase greenhouse gas (GHG) emissions (Shrestha *et al*., 2013).

Intelligent usage of organic manure and inorganic fertilizers is essential to augment productivity and input use efficiency and safeguard soil health (Bandyopadhyay *et al*., 2010). The application of organic fertilizers has been shown to affect the structure of the microbial community differently than application of solely mineral fertilizers (Wu *et al*., 2012). Integrated application of organic and inorganic fertilizer improves soil fertility and crop yield at long-term (Fereidooni *et al.,* 2013). Pramanik *et al.* (2007) demonstrated that the presence of several enzymes in vermicompost ultimately lead to improvement in health of the soil.

The main objective of this study is to compare the use of organic fertilizers or inorganic fertilizers (NPK) or combine them as a source of soil fertilization (NPK) and food steroids in order to know which fertilizer (NPK) source and actual nutrition and demand to be more useful for mango trees produced, better control (NPK). Management is responsible for getting health and safety. It is also a fundamental goal of preserving human health, society and the environment that God has commanded us to protect. For this purpose, the best mango" Ewaise" have been studied in healthy ways to achieve economic returns in the manner of rationalization of the use of chemicals and compensation using organic fertilization together.

MATERIALS AND METHODS

This study was carried out during two successive seasons 2016 and 2017 on ten years old mango (*Mangifera indica* L.). cv. Ewaise cultivar trees grown in region - Idku Center (Sand Basin No. 1), El- Behaira Governorate, Egypt. Ewaise mango trees grafted on Zebda seedlings grown at a distance of 6 x 4 m to study the effect of organic and mineral fertilization on yield, fruit quality and mineral content of Ewaise mango cultivar.

A surface soil sample (0-30cm depth) was collected before starting the experiment to identify some physical and chemical properties of this soil as shown in Table (1).

Table (1). Some chemical and physical soil properties of the experimental site analyzed before cultivation.

Parameter	Sample	Unit
Mechanical Analysis		
Sand	95.52	%
Silt	--	%
Clay	4.48	%
Textural class	**Sand**	
pH(1:1)water suspension	8.4	--
EC(1:1, water extract)	0.28	ds/m
O.M	3.3	%
$CaCO_3$	1.05	%
Soluble cations		
Ca^{2+}	24.0	mg/L
Mg^{2+}	9.7	mg/L
Na^{+}	54.9	mg/L
K^{+}	7.1	mg/L
Soluble anions		
HCO_3^{-}	97.6	mg/L
Cl^{-}	47.0	mg/L
SO_4^{2-}	14.4	mg/L
Available nutrients		
Nitrogen (N)	161	mg/kg
Phosphorus(P)	21	mg/kg
Potassium(K)	130	mg/kg

All trees received the traditional and regular fertilization program, of which chemical fertilizers were ammonium sulphate (20.5 % N), calcium superphophate (15.5 %P_2O_5) and potassium sulphate (48 % K_2O), as recommended dose (Shala, 2007). Plant and animal compost were added at rats 30 kg/tree, analysis of plant and animal compost shown in Table (2).

Forty trees were chosen for carrying out 8 treatments in this study. Each treatment was replicated five times (one tree for each replicate) according to complete randomized block design. The investigated treatments were arranged as follows:

1. 100% mineral fertilizers (NPK) as control
2. 50% NPK+ 100% plant compost (P.C)
3. 50% NPK+ 100% animal compost (A.C)
4. 100% plant compost (P.C)
5. 100% animal compost (P.C)
6. 50% plant compost +50% animal compost
7. 50% (NPK+ plant compost+ animal compost)
8. 100% (NPK+ plant compost+ animal compost)

Table (2). Analysis of plant and animal Compost of the tested fertilizers.

Analysis	unit	Plant compost	Animal compost
Weight per cubic meter	kg	475	580
Moisture	%	22	19
pH (1:10)		8.12	8.25
EC (1:10)	ds/m	5.4	4.5
Total nitrogen	%	1.29	1.29
Ammonium Nitrogen	mg/kg	1550	920
Nitrogen Nitrate	mg/kg	31	22
Organic matter	%	37.43	29.72
Organic carbon	%	21.71	17.24
Ash	%	62.57	70.28
Ratio C:N		16.83:1	13.36:1
Total phosphorus	%	1.7	1.6
Total potassium	%	0.78	0.83

Data were recorded for this studied two seasons on:

A) Yield

The produced fruit yield on each replicate tree resulting from the applied treatments was expressed as number of fruits/tree and weight of fruits (kg/ tree) which was attained at harvest stage.

At harvest time, yield of each treatment was recorded as yield weight/tree by the multiplying number of fruits × average weight of fruit.

B) Fruit physical characteristics:

Sample of 10 fruits per tree from each replicate was collected randomly, i.e. 50 fruits for each of the applied treatment was picked randomly at harvest when the fruits were yellow colored in both seasons, then transported quickly to the laboratory to determine physical and chemical fruit characteristics. Regarding the physical fruit characteristics the following parameters were determined:

- Average fruit weight (g/ fruit):
- Average fruit length (cm)
- Average Fruit diameter (cm)
- Average Fruit volume (cm^3): the volume of five fruits was measured with the water displacement method.
- Pulp (%).

C) Fruit Chemical characteristics:

Regarding chemical fruit characteristics, samples of 10 fruits from each replicate tree i.e. 50 fruits for each of the applied treatment was picked randomly at harvest to determine the following parameters:

Total soluble solids (TSS %): the percentage of TSS was determined by hand refractometer according to Chen and Mellenthin (1981).

Total acidity (%): was determined in fruit juice according to Chen and Mellenthin (1981). Five milliliters from the obtained juice were used to determine the titratable acidity. The titratable acidity was expressed as grams citric acid/ 100 milliliters fruit juice.

- Total sugars (%): were determined in fresh fruit samples according to Malik and Singh (1980). Sugars were extracted from 5 gram fresh weight and determined by phenol sulfuric and Nelson arsenate –molybadate colorimetric methods for total and reducing sugars, respectively. The non-reducing sugars were calculated by difference between total sugars and reducing sugars.
- Vitamin C (mg/100 ml juice): the ascorbic acid content of the juice was determined by titration with 2, 6 dichloro phenol-indo-phenol (AOAC, 1985) and calculated as milli-grams per 100 ml of juice.

D) NPK contents in leaves and fruits:

The NPK contents as percentages were determined in the dry leaves and fruits. Their dry weights were determined following drying in a drying chamber to a constant weight at 75^{o}C for 72 hour according to Tandon (1995). After dryness, the plant samples were milled and stored for analysis as reported. However, 0.5g of the leaves and fruits powder was wet-digested with H_2SO_4–H_2O_2 mixture according (Lowther, 1980) and the following determinations were carried out in the digested solution to determine the following:

- **Nitrogen (N %):**

Total nitrogen was determined in digested plant material colorimetrically by Nessler`s method (Chapman and Pratt, 1978). Nessler's solution (35 KI/100 ml + 20 g $HgCl_2$ / 500 ml) +120 g NaOH / 250 ml Reading was achieved using wave length of 420 nm and N was determined as percentage as follows:

% N = NH_4 % x 0.776485

- **Phosphorus (P %):**

Phosphorus was determined by the Vanadomolyate yellow method as given by Jackson (1973) and the intensity of color developed was read in spectrophotometer at 405nm wave length.

- **Potassium (K %):**

Potassium was determined according to the method described by Jackson (1973) using Beckman Flame photometer.

- **Statistical analysis:**

Results of the measured parameters were subjected to computerized statistical analysis using MSTAT package for analysis of variance (ANOVA) and means of treatments were compared using LSD at 0.05 according to Snedecor and Cochran (1990).

RESULTS AND DISCUSSION

A) Yield

- **Number of fruits/ tree**

Mango crop is highly responsive to nutrient applications. The data revealed that the increasing level of nutrient application either chemical or organic sources increased the number of fruits. The data on number of fruits per tree as influenced by different organic practices and mineral fertilization are presented in Table (3). The data on number of fruits per tree showed significant differences among the treatments. The treatment 100 % combination of (NPK, plant compost and animal compost) recorded maximum number of fruits per tree (324.3 and 427.0) which was followed by treatment 50 % combination of (NPK, plant compost and animal compost) (304.0 and 411.5). However, control treatment recorded minimum number of fruits per tree (207.3 and 298.5), during both experimented seasons. These results are in agreement with those obtained by Nasreen *et al.* (2014), Baiea *et al.* (2015) and Sharma *et al.* (2016) on mango.

- **Yield (kg/tree)**

Data presented in Table (3) showed that 100 % combination of (NPK, plant compost and animal compost) significantly increased yield (87.1 and 124.6 kg/tree) followed by 50% combination of (NPK, plant compost and animal compost) (78.3 and 113.9 kg/tree) during both seasons, while, the control treatment recorded the lower yield (43.0 and 68.8 kg/tree) than the others treatments under the study, in 2016 and 2017 seasons. These results are in agreement with those obtained by Nasreen *et al.* (2014), Krishnamoorthy and Hanif (2015) and Khamis *et al.* (2017) on mango.

Table (3). Effect of organic and mineral fertilization on the number of fruit/tree and yield (kg/tree) of Ewaise mango during 2016 and 2017 seasons.

Treatments	No. fruit/Tree		Yield (kg/Tree)	
	2016	2017	2016	2017
Control (100% NPK)	207.30	298.50	43.00	68.80
50 % NPK + 100 % P.C	236.00	336.50	54.00	83.20
50 % NPK + 100 % A. C	241.00	345.00	57.10	86.70
100% P.C	233.50	334.50	48.70	75.00
100 % A.C	227.50	332.30	49.50	79.20
50% (P.C + A. C)	216.00	302.00	48.60	71.10
50% (NPK+P.C+A.C)	304.00	411.50	78.30	113.90
100 % (NPK+P.C+A.C)	324.30	427.00	87.10	124.60
LSD (0.05)	**6.30**	**7.80**	**0.20**	**0.10**

B) Fruit physical characteristics

- **Average fruit weight (g)**

Data tabulated in Table (4) indicated that average fruit weight differed significantly among the treatments. The treatment 100 % combination of (NPK,

plant compost and animal compost) recorded highest average fruit weight (327.0 and 339.0 g), which was followed by treatment 50 % combination of (NPK, plant compost and animal compost) (297.0 and 313.0 g). The lowest average fruit weight was observed in treatment 100 % plant compost (243.3.0 and 254.0 g), in the first and second seasons, respectively. These results are agreement with those obtained by Yadav *et al.* (2011), Nasreen *et al.* (2014), Krishnamoorthy and Hanif (2015) and Sharma *et al.* (2016) on mango.

- **Fruit length (cm)**

The data in Table (4) indicated that, the maximum fruit length (11.7 and 12.6 cm) was found in treatment 100 % combination of (NPK, plant compost and animal compost) and which was followed by the treatments 50 % combination of (NPK, plant compost and animal compost) (11.2 and 11.6 cm) were on par with each other. 100 % plant compost treatment recorded the minimum fruit length of (10.1 and 10.2 cm), during both studied seasons.These results are agreement with those obtained by Krishnamoorthy and Hanif (2015), Reddy and Singh (2015) on mango.

- **Fruit diameter (cm)**

The results Table (4) demonstrated that, the maximum fruit diameter (8.3 and 8.8 cm) was found in treatment 100 % combination of (NPK, plant compost and animal compost) and which was followed by the treatments 50 % combination of (NPK, plant compost and animal compost) (7.8 and 8.2 cm for the 1^{st} and 2^{nd} seasons, respectively). In addition, treatment 100 % plant compost recorded minimum fruit diameter of (6.9 and 7.2 cm), during both seasons, respectively. These results are agreement with those obtained by Taha *et al.* (2014), Krishnamoorthy and Hanif (2015) and Reddy and Singh (2015) on mango.

- **Fruit volume (cm^3)**

Table (4) indicated that, the maximum fruit volume was observed in the treatment 100 % combination of (NPK, plant compost and animal compost) (295.0 and 363.0 cm^3), followed by 50 % combination of (NPK, plant compost and animal compost) (275.0 and 321.8 cm^3). While, the minimum fruit volume was recorded in the treatment 50 % combination of (plant compost and animal compost) (210.0 cm^3) in the first seasons and treatment100 % plant compost (225.0 cm^3) in the second season. These results are agreement with those obtained by Taha *et al.* (2014) and Reddy and Singh (2015) on mango.

- **Pulp (%)**

Analysis of data presented in Table (4) revealed that the maximum pulp percentage (80.4 and 81.6 %) was recorded with an application of 100 % combination of (NPK, plant compost and animal compost), whereas, control treatment recorded minimum pulp percentage (77.7 and 77.8 %) during both seasons, respectively. These results are agreement with those obtained by Dinesh *et al*. (2008), Baiea *et al.* (2015) and Krishnamoorthy and Hanif (2015) on mango.

Table (4). Effect of organic and mineral fertilization on fruit weight (g), fruit length (cm), fruit diameter (cm), fruit volume (cm^3) and pulp (%) of Ewaise mango during 2016 and 2017 seasons.

Treatments	Fruit weight (g)		Fruit length (cm)		Fruit diameter (cm)		Fruit volume (cm^3)		Pulp (%)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Control (100% NPK)	270.00	287.30	10.80	10.90	7.4	7.60	251.30	273.00	77.70	77.80
50 % NPK+100 % P.C	265.00	280.00	10.70	11.20	7.20	7.60	225.30	252.80	78.90	79.60
50 % NPK+100 % A.C	273.00	285.00	10.80	11.20	7.40	7.80	218.30	265.80	78.80	79.60
100% P.C	243.30	254.00	10.10	10.20	6.90	7.20	216.30	225.00	79.90	79.80
100 % A.C	254.00	268.00	10.20	10.60	7.20	7.30	217.30	235.00	79.40	79.80
50% (P.C+A.C)	256.00	266.00	10.10	10.40	7.10	7.20	210.00	230.30	79.40	79.20
50% (NPK+P.C+A.C)	297.00	313.00	11.20	11.60	7.80	8.20	275.00	321.80	80.20	80.50
100 % (NPK+P.C+A.C)	327.00	339.00	11.70	12.60	8.30	8.80	295.00	263.00	80.40	81.60
LSD (0.05)	**2.10**	**1.60**	**0.10**	**0.10**	**0.10**	**0.10**	**2.50**	**1.90**	**0.70**	**0.70**

C) Fruit chemical characteristics

- **Total sugars (%)**

A perusal of data pertaining to influence of different treatments on total sugars percentage of mango fruits are presented in Table (5).Total sugars were significant over the treatments and found to be higher at 100 % combination of (NPK, plant compost and animal compost) as (20.15 and 20.33**%),** followed by 50 % combination of (NPK, plant compost and animal compost) was recorder (18.13 and 18.28 **%),** lower total sugars (14.30 and 14.40 **%)** were recorded in recommended dose of fertilizers (control). These results are agreement with those obtained by Omar and Belal (2007), Baiea *et al.* (2015), Khamis *et al.* (2017) and Kumar *et al.* (2018) on mango.

- **Reducing sugars (%)**

The reducing sugar was determined from ripe fruits during each year and presented in Table (5). Data revealed significant improvement in reducing sugar content with application of 100 % combination of (NPK, plant compost and animal compost) as (8.18 and 8.20%), followed by 50 % combination of (NPK, plant compost and animal compost) was recorder (7.70 and 7.63 %), though lower reducing sugar content (6.15 and 6.28 %) were recorded with 100 % plant compost, during both seasons, respectively. These results are agreement with those obtained by Omar and Belal (2007), Baiea *et al.* (2015), Khamis *et al.* (2017) and Kumar *et al.* (2018) on mango.

- **Non-reducing sugars (%)**

The non-reducing sugar was computed by subtracting reducing sugar from the total sugar value obtained during both the year as well as in pooled data Table (5). The data indicated that the maximum non reducing sugar content (11.95 and 12.15 %) was recorded with 100 % combination of (NPK, plant compost and animal compost) followed by 50 % combination of (NPK, plant compost and animal compost) was recorder (10.40 and 10.63 %), Whereas, the minimum non reducing sugar content of 7.73 and 7.90% was noted with recommended dose of chemical fertilizer (control), during both seasons, under this study. These results are agreement with those obtained by

Omar and Belal (2007), Baiea *et al.* (2015), Khamis *et al.* (2017) and Kumar *et al.* (2018) on mango.

- **Vitamin C (mg/100 ml juice)**

Results in Table (5) revealed that significant improvement in ascorbic acid content with application of 100 % combination of (NPK, plant compost and animal compost) (57.8 and 59.3 mg/ 100 ml juice) followed by 50 % combination of (NPK, plant compost and animal compost) which recorded (45.7 and 46.6 mg/ 100 ml juice) whereas, the lowest ascorbic acid content (27.5 and 28.5 mg/ 100 ml juice.) was noted with100 % plant compost, during the first and second seasons, respectively. These results are agreement with those obtained by Omar and Belal (2007), Baiea *et al.* (2015), Khamis *et al.* (2017) and Kumar *et al.* (2018) on mango.

- **Total acidity (%)**

The data presented in Table (5) revealed that the maximum acidity content (0.38 and 0.36 %) was recorded with 100% NPK (control treatment), whereas, the minimum acidity content (0.24 and 0.21 %) was recorded with 100 % combination of (NPK, plant compost and animal compost), during both seasons, respectively. These results are agreement with those obtained by Omar and Belal (2007), Baiea *et al.* (2015), Khamis *et al.* (2017) and Kumar *et al.* (2018) on mango.

- **Total Soluble Solid (TSS %)**

It could be noticed from Table (5) that the higher total soluble solid (28.0 and 28.4 %) was noted with application of 100 % combination of (NPK, plant compost and animal compost) followed by 50 % combination of (NPK, plant compost and animal compost) was recorded (27.0 and 28.7 %), whereas, the lower total soluble solid (24.7 and 24.9 %), was recorded with control treatment, during both seasons, respectively. These results are agreement with those obtained by Omar and Belal (2007), Dinesh *et al*. (2008), Nasreen *et al.* (2014), Baiea *et al.* (2015), Krishnamoorthy and Hanif (2015), Khamis *et al.* (2017) and Singh *et al.* (2017) on mango.

Table (5). Effect of organic and mineral fertilization on sugars (%), vitamin C, total acidity % and TSS % of Ewaise mango during 2016 and 2017 seasons.

Treatments	Total sugar (%)		Reducing sugar (%)		Non-reducing sugar (%)		Vitamin C (mg/ 100 ml juice)		Total acidity (%)		T.S.S (%)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Control(100% NPK)	14.30	14.40	6.58	6.50	7.73	7.90	41.10	43.00	0.38	0.36	24.70	24.90
50 % NPK+100%P.C	14.30	14.50	6.25	6.38	8.13	8.15	39.10	39.80	0.34	0.32	25.40	25.80
50 % NPK+100%A.C	16.75	17.18	6.60	6.68	10.33	10.43	42.50	43.40	0.34	0.30	25.50	25.70
100% P.C	14.20	14.20	6.15	6.28	8.08	7.93	27.50	28.50	0.32	0.30	22.40	22.70
100 % A.C	15.60	15.68	6.90	6.83	8.70	8.83	33.10	34.10	0.26	0.26	23.40	23.40
50% (P.C+A.C)	16.18	16.33	6.58	6.60	9.58	9.70	42.20	42.40	0.30	0.28	23.40	24.00
50% (NPK+P.C+A.C)	18.13	18.28	7.70	7.63	10.40	10.63	45.70	46.60	0.21	0.19	27.00	28.70
100%(NPK+P.C+A.C)	20.15	20.33	8.18	8.20	11.95	12.15	57.80	59.30	0.24	0.21	28.00	28.40
LSD (0.05)	**0.12**	**0.24**	**0.06**	**0.06**	**0.15**	**0.24**	**1.20**	**1.60**	**0.03**	**0.04**	**0.60**	**0.50**

D) NPK contents in leaves and fruits

- **Nitrogen (N %)**

The nitrogen content was considerably influenced by different treatments. Data presented in Table (6) indicated that, nitrogen content in leaves of shoot bearing healthy and malformed panicles was almost similar. However, the values were slightly low in leaves of shoot bearing healthy panicles. Further, it was also noted that the increasing dose of fertilizer increased the content of nitrogen in leaves. The highest nitrogen content in the leaves (2.50 and 2.63 %) was recorded in treatment100 % combination of (NPK, plant compost and animal compost) and it was on par with treatment (2.13 and 2.63 %). However, lowest nitrogen content in leaves was registered in treatments 100 % plant compost (1.33 and 1.40 %) and 50 % of plant compost and animal compost (1.33 and 1.40 %), during both seasons, under this study.

On the other hand, it is clear from the results presented in Table (6) that 100 % combination of (NPK+ plant compost + animal compost) significantly improved total nitrogen in fruits (2.80 and 2.88 %) followed by 50 % combination of (NPK+ plant compost + animal compost) (2.40 and 2.50 %) , comparison with 50 % combination of (plant compost and animal compost) (1.50 and 1.60 %) and with 100 % plant compost (1.50 and 1.60 %), in the first and second seasons, respectively. These results are agreement with those obtained by Raheel *et al.* (2011), Faissal *et al.* (2013), Silva *et al.* (2013), Antonio *et al*. (2014), Taha *et al.* (2014) and Baiea *et al.* (2015) on mango.

- **Phosphorous (P %)**

Data presented in Table (6) revealed that the incremental dose of nutrient application increased the phosphorous content in the leaves of shoot bearing healthy and malformed panicles. The content of phosphorous in leaves of shoot bearing healthy and malformed panicles was almost similar. However, there were slight reductions in phosphorous content of leaves of shoot bearing malformed panicles. The maximum content of P (0.42 and 0.44 %) was recorded with 100 % combination of (NPK+ plant compost + animal compost) whereas, it was minimum (0.23 and 0.24%) with 100 % plant compost, during both seasons, respectively.

The highest value of phosphorous content in mango fruits (0.37 and 0.39 %) was recorded with application of 100 % combination of (NPK, plant compost and animal compost) followed by 50 % combination of (NPK, plant compost and animal compost) which recorded (0.32 and 0.34 %), whereas, the lowest mean values of phosphorous content (0.19 and 0.20%) was recorded with 50 % combination of (plant compost and animal compost), in the two seasons under study. These results are agreement with those obtained by Raheel *et al.* (2011), Faissal *et al.* (2013), Silva *et al.* (2013), Antonio *et al*. (2014), Taha *et al.* (2014) and Baiea *et al.* (2015) on mango.

- **Potassium (K %)**

Data presented in Table (6) indicated that the fertilizer dose had significant effect on the potassium content in leaves of shoot bearing healthy and malformed panicles. The maximum potassium content in leaves (2.13 and

2.30 %) were recorded with 100 % combination of (NPK, plant compost and animal compost). Whereas, the minimum potassium content (1.00 and 1.13 %) were recorded with 100 % of plant compost, during both seasons.

In the other side, the combination of different organic and mineral fertilization significantly influenced the potassium content in fruits (%) of Ewaise mango and presented in Table (4). The treatment 100 % combination of (NPK, plant compost and animal compost) recorded significantly superior potassium content in fruits (2.40 and 2.50 %) of followed by treatment 100 % combination of (NPK, plant compost and animal compost) (1.93 and 2. 05 %). The least potassium content was observed with treatment 100 % of plant compost (0.34 %) (1.20 and 1.30 %), during both seasons. These results are agreement with those obtained by Raheel *et al.* (2011), Faissal *et al.* (2013), Silva *et al.* (2013), Antonio *et al*. (2014), Taha *et al.* (2014) and Baiea *et al.* (2015) on mango.

Table (6). Effect of organic and mineral fertilization on NPK contents on fruits and leaves of Ewaise mango cultivar during 2016 and 2017 seasons.

Treatments	Fruits						Leaves					
	N (%)		P (%)		K (%)		N (%)		P (%)		K (%)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Control	1.80	1.93	0.26	0.26	1.60	1.63	1.60	1.70	0.31	0.32	1.40	1.50
50 % NPK+100 % P.C	1.70	1.80	0.24	0.25	1.50	1.60	1.50	1.60	0.30	0.31	1.30	1.50
50 % NPK+100% A.C	1.80	1.93	0.25	0.28	1.60	1.70	1.60	1.80	0.32	0.33	1.40	1.60
100% P.C	1.50	1.60	0.21	0.21	1.20	1.30	1.33	1.40	0.23	0.24	1.00	1.13
100 % A.C	1.60	1.70	0.21	0.22	1.40	1.50	1.43	1.50	0.26	0.27	1.20	1.30
50% (P.C+A.C)	1.50	1.60	0.19	0.20	1.30	1.40	1.33	1.40	0.25	0.26	1.13	1.20
50% (NPK+P.C+A.C)	2.40	2.50	0.32	0.34	1.93	2.05	2.13	2.63	0.36	0.38	1.70	1.93
100 %(NPK+P.C+A.C)	2.80	2.88	0.37	0.39	2.40	2.50	2.50	2.63	0.42	0.44	2.13	2.30
LSD (0.05)	**0.12**	**0.13**	**0.01**	**0.01**	**0.13**	**0.12**	**0.10**	**0.13**	**0.01**	**0.01**	**0.12**	**0.13**

CONCLUSION

The treatments of 100 % combination of (NPK, plant compost and animal compost) followed by50 % combination of (NPK, plant compost and animal compost) gave the best results of yield, fruit quality and chemical composition compared the other treatments and control.

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الملخص العربي

تاثير التسميد العضوى والمعدنى على محصول وجودة ثمار المانجو صنف العويس

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*** طالب دراسات عليا

أجريت هذه الدراسة خلال موسمين متتاليين ٢٠١٦ و٢٠١٧ على أشجار مانجو صنف العويس عمرها عشر سنوات مطعومة على شتلات صنف الذبدة ومزروعة على مسافة ٦ × ٤ م والنامية في منطقة – مركز إدكو (حوض الرمل رقم ١) محافظة البحيرة ، مصر. لدراسة تأثير التسميد العضوي والمعدني على المحصول وجودة ثمار المانجو صنف العويس. تكونت التجربة من ٨ معاملات وقد تم توزيع المعاملات في صورة قطاعات عشوائية كاملة باستخدام ٥ مكررات كل معاملة (شجرة /مكررة) كالتالي: ١- ١٠٠% NPK كنترول ، ٢- ١٠٠% كمبوست نباتي+ ٥٠% NPK ، ٣- 100% كمبوست حيواني + ٥٠% NPK ، ٤- 100% كمبوست نباتي + NPK) ٥٠% كمبوست حيواني ، ٦- ٥٠% كمبوست نباتي +٥٠% كمبوست حيواني ، ٧- ٥٠% كمبوست نباتي+ كمبوست حيواني) ، ٨- ١٠٠% (NPK + كمبوست نباتي+ كمبوست حيواني). أظهرت أهم النتائج أن ١٠٠٪ (NPK + كمبوست نباتي+ كمبوست حيواني) يتبعها ٥٠% (NPK + كمبوست نباتي+ كمبوست حيواني) أعطت أعلى متوسط قيم لعدد الثمار/شجرة وأعلي محصول (كجم/شجرة) مقارنة ببقية المعاملات الأخرى والكنترول، أيضاً أعطي أقصي قيم للصفات الطبيعية للثمار (وزن ، طول، قطر، حجم الثمرة، النسبة المئوية للحم). ومن ناحية أخرى ،١٠٠٪ (NPK + كمبوست نباتي+ كمبوست حيواني) يتبعها ٥٠% (NPK + كمبوست نباتي+ كمبوست حيواني) أعطي أعلي صفات كيمائية للثمار (% للسكريات الكلية والمختزلة وغير المختزلة، الحموضة الكلية، نسبة المواد الذائبة الكلية، محتوي فيتامين سي) كذلك النسبة المئوية النيتروجين والفوسفور والبوتاسيوم في الأوراق والثمار ، مقارنة بالكنترول وغيرها من المعاملات الأخرى، خلال كلا الموسمين.