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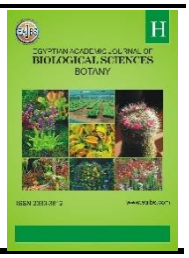

Impact of Soil Application of Farm Yard Manure, Pigeon Wilt and Humic Acid on Vegetative Growth, Yield and Fruit Quality of "Kiet" Mango Cultivar

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ABSTRACT

This study was carried out during two successive seasons 2021 and 2022 on the Thirteenth-year-old Mango (*Mangifera indica* L.). cv. Keit cultivar trees grafted on sokary stone and grown in Al-Busaili - Central Laboratory for Agricultural Climate of the Agricultural Research Center at the North West of the Nile Delta, Rashid Center, Beheira governorate, Egypt. The trees are grown in a greenhouse to impact the soil application of farmyard manure, pigeon wilt and humic acid on vegetative growth, yield and fruit quality of "Kiet" mango cultivar. The distance between trees was 2.0 m and the distance between rows is 2.0 meters. This factorial experiment consisted of thirteen treatments arranged in a Randomized Complete Block Design (RCBD) design with five replicates for each treatment and one tree for each replicate. The treatment consisted of 13 treatments (control, farmyard (5, 10 and 15kg), mixture of farmyard with pigeon wilt and humic acid). Results showed that the treatment of OM at 15 kg + 1/2 kg HA+ 3.5 kg Pio. recorded the best values of fruit weight, the number of fruit and yield/plant, physical characters i.e. (fruit length, fruit width, pulp weight and fruit firmness), and all chemical compositions i.e. (TSS, TSS/ acidity, vitamin C content, total sugars, reducing sugar and non-reducing sugar percentage), as compared with the control treatment which recorded the minimum values of this studied characters, during both seasons.

INTRODUCTION

Mangoes (*Mangifera indica* L.) belong to the family Anacardaceae. native to South-Eastern Asia and considered one of the most important fruits of the tropical and sub-tropical countries. Mango trees are evergreen and so they consume large amounts of nutrients per year as the best growth and yield require the availability of micro and macronutrients with perfect availability (Paull and Duarte, 2011). Mango also called the "King of Tropical Fruits" is widely distributed in tropical and subtropical regions from 30°S to 30°N. Mango was introduced to China from India during the Tang Dynasty, having a cultivation period longer than 1300years (Hu *et al.*, 2015).

Mango orchard soils of Malihabad belt Uttar Pradesh are poor in soil organic matter and essential nutrients (Sangha *et al.*, 2012).

The acreage of mango in the world reached about 5681310 hectares, with a production of 50649147 tons. The main producing countries are India than China, Indonesia,

Pakistan and Brazil (FAO, 2017). Because of the constant population increase, the consumption of food resources is more, resulting there is a lack of food resources. Nitrogenous fertilizers known as chemical fertilizers are inorganic in nature and contain high cost, cause considerable damage to soil, and the environment and also harm human health when it is used in high quantity. Recently, most countries moved for searching natural alternatives which are able to replace the use of chemical/ inorganic fertilizers or pesticides and can reduce the pollution of the environment as well as the cost of agricultural production (Alalaf, 2019).

Biostimulants are synthetic or natural substances that can be applied to soil and plants that cause change to structural or vital physiological processes to enhance plant growth by improving resistance to abiotic stresses Bio stimulants such as humic acid and vermiwash have proven to be beneficial organic amendments to be used in the current scenario of an increasing trend of organic farming. It has reduced the dependency on inorganic fertilizers in order to achieve sustainability without compromising the quality and quantity. Humic acid is a natural resource that can be used as an alternative to inorganic fertilizers. Humic acid is a naturally existing polymeric organic compound that is converted due to the decay of organic matter and initiated in humus, peat as well as lignite (Sharif *et al.*, 2002). Humic acid consists of a combination of organic acids which are aromatic in nature and contain various heterogeneous functional groups that have impervious interaction with different metal ions such as Mg, Zn, Ca and Cu (Piccolo 2012).

Humic acid and vermiwash play a vital role in the improvement of growth and high yield without compromising quality if supplemented with the nutrients. They are of organic origin, thus ensuring sustainability and rich in essential nutrients, ensuring proper nutrition availability. The incorporation of humic acid and vermiwash is done in two ways viz. foliar application and soil amendment. The effect of these biostimulants was studied in various crops by using different methods of incorporation at different doses. This review focuses on the research done on the usage of these biostimulants and evaluates the result of various studies for future reference and research (Hudda *et al.*, 2020).

Therefore, the main objective of this research was to study the impact of soil application of farm yard manure, pigeon wilt and humic acid on vegetative growth, yield and fruit quality of the "Kiet" mango cultivar

MATERIALS AND METHODS

This study was carried out during two successive seasons 2021 and 2022 on the Thirteenth-years-old Mango (*Mangifera indica* L.). cv. Keit cultivar trees grown in Al-Busaili - Central Laboratory for Agricultural Climate of the Agricultural Research Center at the North West of the Nile Delta, Rashid Center, Beheira governorate, Egypt. The trees are grown in the greenhouse to impact the soil application of farm yard manure, pigeon wilt and humic acid on vegetative growth, yield and fruit quality of “Kiet” mango cultivar. This factorial experiment consisted of thirteen treatments arranged in a Randomized Complete Block Design (RCBD) design with five replicates for each treatment and one tree for each replicate.

Experimental Design:

The experiment was arranged in a Factorial experiment Randomized Complete Block Design (RCBD) design with 13 treatments were applied and each treatment comprised five trees arranged randomly in blocks.

The treatments of this experiment could be summarized as follows:

1. Control
2. 5kg faramyard manure (FYM)
3. 5kg faramyard +1/2 kg humic acid

4. 5 kg faramyard + 3.5 kg pigeon wilt
5. 5 kg faramyard + 1/2 kg humic acid + 3.5 kg pigeon wilt
6. 10 kg faramyard manure (FYM)
7. 10 kg faramyard +1/2 kg humic acid
8. 10 kg faramyard + 3.5 kg pigeon wilt
9. 10 kg faramyard + 1/2 kg humic acid + 3.5 kg pigeon wilt
1o.15 kg faramyard manure (FYM)
11.15g faramyard +1/2 kg humic acid
12.15kg faramyard + 3.5 kg pigeon wilt
13.15kg faramyard + 1/2 kg humic acid + 3.5 kg pigeon wilt

Data Recorded:

Samples from five trees of each experimental plot were taken to determine growth parameters at the end of the season as follows:

A) **Yield:**

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

The yield of each treatment was recorded as yield weight/tree by the multiplying number of fruits × average weight of fruit.

B) Fruit Physical Characteristics:

A sample of 5 fruits per tree from each replicate was collected randomly, i.e. 25 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 physical fruit characteristics the following parameters were determined: Average fruit weight (g/ fruit):

Fruit samples were weighted and the average fruit weight for each replicate was calculated.

Average fruit length (L) and diameter (D) in cm: were measured by using a hand caliper.

Fruit firmness: was expressed as (pound / $Inch^2$) according to (Magness and Taylor, 1982). Flesh firmness was measured on two opposite sides of the fruit using a Magness Taylor pressure tester.

Fruit Chemical Characteristics:

Regarding chemical fruit characteristics, samples of 5 fruits from each replicate tree i.e., 25 fruits for each of the applied treatment was picked randomly at harvest to determine the following parameters:

Total soluble solids of fruit juice (TSS %): were used to determine the percentage of TSS by hand refractometer according to Chen and Mellenthin (1981).

The percentage of 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 of fruit juice.

TSS/ acid ratios: were calculated for each replicate of the applied treatments.

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–molybdate colorimetric methods for total and reducing sugars, respectively. The non-reducing sugars were calculated by the difference between total sugars and reducing sugars.

Vitamin C (Ascorbic acid): The ascorbic acid content of the juice was determined by titration with 2, 6 dichloro phenol-indo-phenol (A.O.A.C., 1985**)** and calculated as milligrams per 100 ml of juice.

NPK (%):

The NPK contents were determined in the dry leaves and fruits. Their dry weights were determined following drying in a drying chamber to a constant weight of 75℃ for 72 hours according to Tandon (1995). After dryness, the plant samples were milled and stored for analysis as reported. However, 0.5 g of the leaves and fruits powder was wet-digested with H_2SO_4+ H_2O_2 mixture according (Lowther, 1980) and the concentrations of nitrogen (N), Phosphorous (P) and potassium (K) were determined.

Total Nitrogen:

Total nitrogen was determined in digested plant material calorimetrically by Nessler`s method (Chapman and Pratt, 1978). Nessler solution (35 IK/100 ml d. w. + 20g $HgCl_2$ / 500 ml d. w.) +120 g NaOH / 250 ml d. w. Reading was achieved using a wavelength of 420 nm and N was determined as a percentage at the three growth stages as follows:

% N = NH_4 % x 0.776485

Phosphorus:

Phosphorus was determined by the Vanadomolyate yellow method as given by **Jackson (1973)** and the intensity of color developed was read in a spectrophotometer at 405nmat during the three growth stages.

Potassium:

Potassium was determined according to the method described by **Jackson (1973)** using Beckman Flame photometer at the three growth stages.

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:

Results in Table (1) show the effect of farmyard manure, pigeon wilt and humic acid on fruit weight, the number of fruits/ tree and the yield/tree of mango during the 2021 and 2022 seasons**.** Results observed that in the first and second season FYM was affected significantly by the treatment of FYM at 15 kg + 1/2 kg HA+ 3.5 kg Pio. which recorded the higher values of fruit weight, the number of fruits/ tree and yield/tree than other treatments (610.63 and 683.91 g, 58.07 and 65.04 and 35.46 and 44.48kg/ tree), followed by FYM at 10 kg + 1/2 kg HA+ 3.5 kg Pio. (549.57 and 615.51 g, 54.32 and 60.84 and 29.85 and 37.45kg/tree), as compared with the control treatment which recorded the lower fruit weight, the number of fruits/ tree and yield/tree(342.53 and 383.64 g, 33.79 and 37.85 and 11.57 and 14.52 kg/tree), during both 2021 and 2022 seasons.

Marzouk and Kassem (2011) found that, the application of organic manures (chicken manure, cow dung and composted domestic refuse either alone or in combinations with mineral NPK on Zaghloul dates did not differ from each other in their effect on yield and fruit quality. While, Magda *et al.* (2012) found that, increasing humic acid doses from 32 to 48g/tree enhanced the yield and fruiting parameters of Manfalouty pomegranate trees.

These results agree with those obtained by El-Mohamedy and Ahmed (2009) concluded that humic acid caused the highest yield in a number of fruits/tree or weight (kg/tree) compared with untreated trees of mandarin. In this respect, Abbas *et al.,* (2013) showed that kinnow mandarin tree received humic acid at 30 ml and exhibited the highest number of fruits per tree. The positive effect of chicken manure on tree yield could be due to a higher content of organic matter and nitrogen and some nutrients leading to improve the nutritional status of trees surely reflected in tree yield (Kannaiyan, 2002).

Table 1: Effect of farmyard manure, pigeon wilt and humic acid on fruit weight, number of fruit/tree and yield/tree during 2021 and 2022seasons.

Treatments	Fruit weight (g)		Number of fruit /trees		Yield (Kg/tree)	
	2021	2022	2021	2022	2021	2022
Control	342.53j	383.64g	33.79j	37.85j	11.57m	14.52m
FYM at 5 kg	380.59i	426.27i	37.55i	42.05i	14.29l	17.92l
FYM at 5 kg + 1/2 kg HA	422.89g	473.63g	41.72g	46.72g	17.64j	22.13j
FYM at 5 kg + 3.5 kg Pio.	469.87e	526.26e	46.36e	51.92e	21.78g	27.32g
FYM at 5 kg + 1/2 kg HA+ 3.5 kg Pio.	522.09c	584.74c	51.51c	57.69c	26.89d	33.73d
FYM at 10 kg	401.63h	449.83h	39.52h	44.27h	15.87k	19.91k
FYM at 10 kg + 1/2 kg HA	445.15f	498.57f	43.92f	49.19f	19.55h	24.52h
FYM at 10 kg + 3.5 kg Pio.	494.61d	553.96d	49.84d	55.82d	24.65e	30.92e
FYM at 10 kg + 1/2 kg HA+ 3.5 kg Pio.	549.57b	615.51b	54.32b	60.84b	29.85b	37.45b
FYM at 15 kg	445.00f	498.40f	41.60g	46.60g	18.51i	23.23i
FYM at 15 kg + 1/2 kg HA	494.61d	553.96d	46.29e	51.85e	22.90f	28.72f
FYM at 15 kg + 3.5 kg Pio.	549.57b	615.51b	51.36c	57.53c	28.23c	35.41c
FYM at 15 kg + 1/2 kg HA+ 3.5 kg Pio.	610.63a	683.91a	58.07a	65.04a	35.46a	44.48a
$LSD_{(0.05)}$	**1.48**	**1.66**	**1.03**	**1.16**	**0.58**	**0.73**

B.Fruit Physical Characteristics:

The effect of farmyard manure, pigeon wilt and humic acid on fruit physical properties expressed as fruit length, fruit width, firmness and pulp weight of mango Kiett trees during 2021 and 2022 seasons are presented in Table (2) FYM at 15 kg + 1/2 kg HA+ 3.5 kg Pio. which recorded the higher values of fruit length, fruit width, firmness and pulp weight than other treatments (14.76and 16.53g, 10.78and 12.07,35.38 and 39.63 and 517.98and 580.14), followed by FYM at 10 kg + 1/2 kg HA+ 3.5 kg Pio. (14.01 and 15.70 g, 10.24 and 11.46, 29.25and 32.76 and 450.50 and 507.56), as compared with the control treatment which recorded the lower fruit length, fruit width, firmness and pulp weight (8.73 and 9.78 g, 6.31 and 7.06 and 15.63 and 17.51and 242.09 and 271.14), during both 2021 and 2022 seasons.

These results are in agreement with those reported by El-Kosary *et al*. (2011) on mango fruits, Fathy*et al*. (2010) on' apricot trees, Ferrara and Brunetti (2010) on table grapes and Hagagg*et al*. (2013) on olive trees. They found that the highest average fruit size (volume), weight, and shape index (length\ diameter) were recorded from trees that were sprayed with humic. Chen *et al*. (2004) explained the effect of humic substances as the increase in fruit weight and fruit dimensions as a consequence of HA-S application after fruit set is probably ascribed to the uptake of mineral nutrients by the grapevines, but the possible hormone-like activity of the HA-S (*i.e.*, auxin-, gibberellin- and cytokinin-like activity).

Table 2: Effect of farmyard manure, pigeon wilt and humic acid on fruit length, fruit width, firmness and pulp weight during in 2021 and 2022seasons.

Treatments	Fruit length (cm)		Fruit width (cm)		Firmness (Ib/ inch^2)		Pulp weight (g)	
	2021	2022	2021	2022	2021	2022	2021	2022
Control	8.73m	9.78m	6.31j	7.06j	15.63g	17.51g	242.09m	271.14m
FYM at 5 kg	9.70l	10.87l	7.01i	7.85i	21.81f	24.43f	279.77l	313.34l
FYM at 5 kg + 1/2 kg HA	10.78i	12.07i	7.72g	8.65g	24.24ef	27.15ef	321.34j	359.92j
FYM at 5 kg + 3.5 kg Pio.	11.97f	13.41f	8.65e	9.69e	26.93cde	30.16cde	366.95g	411.00g
FYM at 5 kg + 1/2 kg HA+ 3.5 kg Pio.	13.31c	14.91c	9.62c	10.77c	29.93bc	33.52bc	417.15d	467.20d
FYM at 10 kg	10.22k	11.44k	7.45h	8.35h	24.18ef	27.08ef	306.54k	343.34k
FYM at 10 kg + 1/2 kg HA	11.35h	12.71h	8.28f	9.28f	26.64cde	29.83cde	349.59i	391.54i
FYM at 10 kg + 3.5 kg Pio.	12.61e	14.12e	9.20d	10.31d	29.60bc	33.15bc	394.85f	442.24f
FYM at 10 kg + 1/2 kg HA+ 3.5 kg Pio.	14.01b	15.70b	10.24b	11.46b	29.25bcd	32.76bcd	450.50c	507.56c
FYM at 15 kg	10.76j	12.05j	7.84g	8.78g	25.79de	28.88de	360.19h	403.42h
FYM at 15 kg + 1/2 kg HA	11.95g	13.38g	8.73e	9.77e	28.65bcd	32.10bcd	407.79e	456.72e
FYM at 15 kg + 3.5 kg Pio.	13.28d	14.87d	9.70c	10.86c	31.84b	35.67b	460.09b	515.30b
FYM at 15 kg + 1/2 kg HA+ 3.5 kg Pio.	14.76a	16.53a	10.78a	12.07a	35.38a	39.63a	517.98a	580.14a
LSD$_{(0.05)}$	**0.02**	**0.02**	**0.13**	**0.15**	**3.53**	**3.95**	**3.90**	**4.37**

C.Fruit chemical characteristics:

Results pertaining to the effect of farmyard manure, pigeon wilt and humic acid on total soluble solids (TSS), acidity, TSS/acidity, vitamin c, total sugars, reducing sugar and non-reducing sugar of mango Kiett trees during 2021 and 2022 seasons are given in Table (3).

It is apparent from the table that significantly maximum total soluble solid, TSS/acidity and vitamin c were observed in the treatment of FYM at 15 kg + 1/2 kg HA+ 3.5 kg Pio. (19.68 and 22.04 %, 24.86 and 27.85, 44.88 and 50.27, 15.74 and 17.63, 8.56 and 9.58 and 7.19 and 8.05), respectively, as compared with control treatments which recorded the lowest mean values of total soluble solids, TSS/acidity and vitamin c (9.62 and 10.78%, 6.55and 7.33, 25.62 and 28.70, 9.32 and 10.44, 5.07 and 5.67 and 4.25 and 4.76), while significantly maximum of acidity percentage was noted under the control treatment (1.47 and 1.64 %) whereas significantly minimum of acidity percentage recorded with FYM at 15 kg + 1/2 kg HA+ 3.5 kg Pio. (0.79 and 0.89 %), during 2021 and 2022 seasons

TSS was observed under the control treatment (9.62 and 10.78 %), during both seasons, respectively. The increase in TSS might be due to the accumulation of sugars and other soluble components from hydrolysis of protein and oxidation of ascorbic acid as reported by Pandey *et al.* (1990) in ber.

Acidity was slightly decreased with increasing levels of humic acid in both seasons. These results are in accordance with Ferrara and Brunetti (2010) and Abbas *et al.*, (2013) on different fruit crops.

The improvement in the sugar of fruits may be due to the balanced absorption of macro and micronutrients which have exerted a regulatory role as an important constituent of endogenous factors in affecting the quality of the fruits. The carbohydrate reserves of the roots and stems are drawn upon heavily which might have resulted in higher sugar contents in fruits. These findings are in alignment with Dey *et al.* (2005) in guava.

Table 3: Effect of farmyard manure, pigeon wilt and humic acid on TSS %, acidity, TSS-acidity and VC during an 2021 and 2022seasons.

Treatments	TSS (%)		Acidity (%)		TSS/acidity (%)		VC (mg/ 100 g F.W.)	
	2021	2022	2021	2022	2021	2022	2021	2022
Control	9.62g	10.78g	1.47a	1.64a	6.55k	7.33k	25.62j	28.70j
FYM at 5 kg	11.76f	13.17f	1.40b	1.56b	8.42j	9.43j	27.84i	31.19i
FYM at 5 kg + 1/2 kg HA	13.07e	14.64e	1.32c	1.48c	9.88i	11.07i	31.09g	34.82g
FYM at 5 kg + 3.5 kg Pio.	14.52d	16.26d	1.26d	1.41d	11.53h	12.92h	34.87e	39.06e
FYM at 5 kg + 1/2 kg HA+ 3.5 kg Pio.	16.13c	18.07c	1.20e	1.34e	13.50g	15.12g	38.75c	43.40c
FYM at 10 kg	13.46e	15.07e	1.14f	1.27f	11.84h	13.25h	29.74h	33.31h
FYM at 10 kg + 1/2 kg HA	14.95d	16.75d	1.08g	1.21g	13.85g	15.52g	33.05f	37.01f
FYM at 10 kg + 3.5 kg Pio.	16.61c	18.61c	1.02h	1.15h	16.24e	18.19e	36.72d	41.13d
FYM at 10 kg + 1/2 kg HA+ 3.5 kg Pio.	18.46b	20.67b	0.97i	1.10i	18.96c	21.24c	40.80b	45.70b
FYM at 15 kg	14.34d	16.07d	0.93j	1.04j	15.50f	17.36f	31.58g	35.37g
FYM at 15 kg + 1/2 kg HA	15.94c	17.85c	0.88k	0.98k	18.16d	20.34d	36.55d	40.94d
FYM at 15 kg + 3.5 kg Pio.	17.71b	19.84b	0.83l	0.93l	21.25b	23.80b	40.16B	44.98b
FYM at 15 kg + 1/2 kg HA+ 3.5 kg Pio.	19.68a	22.04a	0.79m	0.89m	24.86a	27.85a	44.88a	50.27a
$LSD_{(0.05)}$	**0.79**	**0.89**	**0.01**	**0.01**	**0.58**	**0.65**	**0.90**	**0.01**

Table 4: Effect of farmyard manure, pigeon wilt and humic acid on total sugar, reducing sugar and non-reducing sugar during 2021 and 2022seasons.

Treatments	Total sugar (%)		Reducing sugar (%)		Non-reducing sugar (%)	
	2021	2022	2021	2022	2021	2022
Control	9.32m	10.44m	5.07h	5.67i	4.25h	4.76h
FYM at 5 kg	10.36l	11.60l	5.63g	6.31h	4.73g	5.29g
FYM at 5 kg + 1/2 kg HA	11.51i	12.89i	6.06f	6.78g	5.44f	6.10f
FYM at 5 kg + 3.5 kg Pio.	12.78f	14.32f	6.95d	7.78e	5.84de	6.54de
FYM at 5 kg + 1/2 kg HA+ 3.5 kg Pio.	14.21c	15.91c	7.72c	8.65c	6.48c	7.26c
FYM at 10 kg	10.90k	12.21k	5.92fg	6.63gh	4.98g	5.58g
FYM at 10 kg + 1/2 kg HA	12.11h	13.57h	6.58e	7.37f	5.53ef	6.20ef
FYM at 10 kg + 3.5 kg Pio.	13.46e	15.07e	7.41c	8.30d	6.05d	6.77d
FYM at 10 kg + 1/2 kg HA+ 3.5 kg Pio.	14.96b	16.75b	8.13b	9.10b	6.83b	7.65b
FYM at 15 kg	11.48j	12.85j	5.91fg	6.62gh	5.56ef	6.23ef
FYM at 15 kg + 1/2 kg HA	12.75g	14.28g	6.93d	7.76e	5.82de	6.51de
FYM at 15 kg + 3.5 kg Pio.	14.17b	15.87d	7.70c	8.62cd	6.47c	7.25c
FYM at 15 kg + 1/2 kg HA+ 3.5 kg Pio.	15.74a	17.63a	8.56a	9.58a	7.19a	8.05a
$LSD_{(0.05)}$	**0.02**	**0.02**	**0.31**	**0.35**	**0.31**	**0.35**

D.NPK In Leaves:

Results concerning the effect of treatments of farmyard manure, pigeon wilt and humic NPK in leaves during 2021 and 2022 seasons are listed in Table (5). Results cleared that, the available nitrogen, phosphorus and potassium were significantly affected by various treatments. However, the maximum NPK percentages in leaves were observed in the treatment of FYM at 15 kg + 1/2 kg HA+ 3.5 kg Pio. (1.70 and 1.91, 0.598 and 0.670 and 2.88 and 3.22%), followed by FYM at 10 kg + 1/2 kg HA+ 3.5 kg Pio. (1.62 and 1.81, 0.568 and 0.637 and 2.74 and 3.06 %), respectively, whereas significantly minimum NPK percentages were observed under the control treatment (1.00 and 1.12, 0.354and 0.397 and 1.72 and 1.91%), during both seasons, respectively acidon.

The role of humic acid in physiological processes comes through the promotion of enzymes and the transfer of photosynthesis products as well as a role in the division and elongation of cells (Fawzy*et al.*, 2007), leading to increased growth, thus increased leaves mineral content. As well as the role of humic acid in improving the properties of soil, and containing this acid on a number of nutrients (Harper *et al.*, 2000) and therefore increased concentration of these elements in the leaves. These results are in harmony with those reported by EL-Kheshin (2016) on mango trees, (El-Salhy, 2017) on Balady Mandarin. The reasons behind these results might also be that due to that the effect of adding humic acid is limited to its high content of nutrient elements as well as providing a nutrient base that increases the activity of the microorganisms (Tisdale *et al*., 1997).

Khattak and Muhammad (2010) reported that humic substances can ameliorate negative soil properties and improve nutrient uptake under salinity conditions. Humic acid can be improved the efficiency of program fertilization, due to microbiological activity can be stimulated by humic substances, by which it is possible to enhance the uptake of minerals. If an adequate amount of humic substances is present within the soil, then it is fertile soil. So, it can be concluded that humic acid may enhance growth, the uptake of some nutrients, reduce the uptake of toxic elements and could improve plant response to salinity.

Table 5: Effect of farmyard manure, pigeon wilt and humic acid on NPK percentages in leaves during 2021 and 2022seasons.

Treatments	In leaves					
	N (%)		P (%)		K (%)	
	2021	**2022**	**2021**	**2022**	**2021**	**2022**
Control	1.00j	1.12j	0.354m	0.397m	1.72j	1.91j
FYM at 5 kg	1.12i	1.26i	0.394l	0.441l	1.89i	2.12i
FYM at 5 kg + 1/2 kg HA	1.24g	1.39g	0.431i	0.489i	2.10g	2.35g
FYM at 5 kg + 3.5 kg Pio.	1.38e	1.55e	0.486f	0.544f	2.34e	2.62e
FYM at 5 kg + 1/2 kg HA+ 3.5 kg Pio.	1.54c	1.72c	0.539c	0.605c	2.54c	2.85c
FYM at 10 kg	1.18h	1.32h	0.414k	0.464k	1.99h	2.23h
FYM at 10 kg + 1/2 kg HA	1.31f	1.47f	0.460h	0.516h	2.22f	2.49f
FYM at 10 kg + 3.5 kg Pio.	1.46d	1.63d	0.511e	0.573e	2.46d	2.76d
FYM at 10 kg + 1/2 kg HA+ 3.5 kg Pio.	1.62b	1.81b	0.568b	0.637b	2.74b	3.06b
FYM at 15 kg	1.24g	1.39g	0.436j	0.488j	2.14g	2.35g
FYM at 15 kg + 1/2 kg HA	1.38e	1.55e	0.485b	0.543b	2.38e	2.46e
FYM at 15 kg + 3.5 kg Pio.	1.53d	1.72c	0.538d	0.602d	2.43e	2.68e
FYM at 15 kg + 1/2 kg HA+ 3.5 kg Pio.	1.70a	1.91a	0.598a	0.670a	2.88a	3.22a
$LSD_{(0.05)}$	**0.01**	**0.01**	**0.001**	**0.001**	**0.07**	**0.08**

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ARABIC SUMMARY

تأثير الإضافة الأرضية بالسماد البلدي وزرق الحمام وحامض الهيوميك على النمو الخضري والمحصول وجودة الثمار لصنف المانجو كيت

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أجريت هذه الدراسة خلال موسمين متتاليين 2021 و2022 على أشجار المانجو عمرها ثلاثة عشر عاماً صنف كيت المطعومه على أصل سكرى المزروعة في البوصيلي - المعمل المركزي للمناخ الزراعي التابع لمركز البحوث الزراعية شمال غرب دلتا النيل، مركز رشيد، محافظة البحيرة، مصر. تنمو الأشجار تحت ظروف الصوب لدراسة تأثير إستخدام السماد البلدى وزرق الحمام وحامض الهيوميك على النمو الخضري والمحصول وجودة الثمار لصنف المانجو "كيت". كانت المسافة بين الأشجار 2.0 متر والمسافة بين الصفوف 2.0 متر. تكونت هذه التجربة العاملية من ثلاثة عشر معاملة مرتبة في تصميم القطاعات العشوائية الكامله مع خمس مكررات لكل معاملة وشجرة واحدة لكل مكررة. تتكون المعاملات من 13 معاملة (كنترول، سماد بلدى (5،10 و15 كجم)، خليط من سماد المزرعه مع زرق الحمام وحامض الهيوميك). أظهرت النتائج أن المعاملة 15 كجم سماد بلدى + 2/1 كجم حامض الهيومك +3.5 كجم زرق حمام. سجلت أفضل قيم لوزن الثمار، وعدد الثمار والمحصول / شجره، والخصائص الفيزيائية مثل (طول الثمرة، عرض الثمرة، وزن اللب وصلابة الثمار) ، وجميع المكونات الكيميائية مثل (المواد الصلبة الذائبة، المواد الصلبة الذائبة / الحموضة ، محتوى فيتامين ج، السكريات الكلية، السكريات المختزلة، السكريات غير المختزلة) مقارنة بمعاملة الكنترول التي سجلت أقل القيم لهذه الصفات المدروسة خلال الموسمين.