

GROWTH AND YIELD OF TWO EGGPLANT CULTIVARS DURING SUMMER PLANTATIONS AFFECTED BY FOLIAR SPRAY WITH SOME SAFETY MATERIALS

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ABSTRACT

Two field experiments were carried out during the two summer seasons of 2019 and 2020 in the private Vegetable Farm, Abou-Hammad District, Sharkia Governorate, Egypt . The aim of this experiment was to study the effect of foliar spray with vermicompost tea (VCT) as a natural fertilizer (2.5 and 5 ml /l) and yeast extract (YE) as bio-stimulant (15 and 30 g /l) , as well as sprayed with water on vegetative growth and yield and its components of two eggplant cultivars (long black and long white as long slender fruits). Foliar spray of two cultivars of eggplant grown in sandy loam soil during summer plantations with vermicompost tea at 2.5 or 5ml /l and yeast extract at 15 and 30 g /l increased vegetative growth and fruit yield compared to foliar spray the same cultivars with water (control) . Spraying long black cultivar plants with vermicompost tea at 5 ml /l recorded the tallest plants and gave the highest number of both leaves and branches/ plant, fresh and dry weight of branches , leaves and shoots /plant, chlorophyll a, b, total (a+b) and carotenoides in leaf tissues, average number of fruits/plant, average fruit weight, yield / plant , total yield /fad. and fruit length and diameter.

KEYWORDS: Eggplant , *Solanum melongena*, cultivars, vermicompost tea, yeast extract, growth, yield.

1. INTRODUCTION

Eggplant is one of major vegetables grown and consumed in Egypt. It is rich in thiamine (vit. B₁), niacin (vit. B₃), and folacin (folic acid) as well as Ca, Fe, K, Zn, Cu and Mn (Kowalski *et al.*, 2003). It belongs to the family solanaceae. *Solanum melongena* is characterized by great morphological diversity. Divided eggplant cultivars into 3 botanical varieties on the basis of the shape of the fruit : 1-*S. melongena* var. *esculentum* Dunal (Nees) – round, oval or egg-shaped fruits, 2- *S. melongena* var. *serpentinum* L. – long slender fruits, and 3-*S. melongena* var. *depressum* L. – small, miniature fruits, dwarf, and early types (Martin and Rhodes,1979). Significant differences were observed among eggplant cultivars with respect to plant growth, yield and fruit quality (Hussein *et al.*, 2010; Msogoya *et al.*, 2014; Nandwani *et al.*, 2015; Bsoul *et al.*, 2016; Abd El-Hady *et al.*, 2017; Al-Zubaidi, 2018; Hassan *et al.*, 2018; Iwuagwu *et al.*, 2019; Abou Al – Azm *et al.* , 2021)

Dry yeast is a normal bio-substance proposed to have protective, stimulating, and nutritional functions. The protein, cell division, nucleic acid synthesis, enlargement, and chlorophyll formation stimulatory effects of yeast extract were highlighted (Barnett *et al.*, 1990). Vitamins, cytokinins , minerals, enzymes, and amino acids have also been increased (Khedr and Farid, 2002).

Foliar spray with yeast extracts increased growth parameters, yield and fruit quality of eggplant (El-Tohamy *et al.* ; 2008 El-Nemr *et al.*, 2015 ; El-Sayed *et al.*, 2015 ; Fouda and Abd-Elhamied, 2017; Ahmed *et al.* , 2021).

Vermicompost is natural organic substances resulting from the degradation of plant and livestock waste by earthworms. This organic matter is enriched with beneficial microorganisms and recoverable nutrients for plants (Arancon *et al.*, 2012; Canellas *et al.*, 2015; Olivares *et al.*, 2015). Vermicompost water extract (called VCT) may contain higher levels of nutrient that would be assimilated by foliar tissues and therefore may induce an effect on plant growth and production. Plants which are sprayed with 20% of vermitea had the tallest plants, most resistant to diseases and pests, earliest to produce 50% flowers, produced the most number of flowers, highest fruit set (%), longest and largest fruit and gave the highest total fruit yield of eggplant (Randy and Pabellan , 2016).

Therefore the aim of this research was to study the effect of vermicompost tea and yeast extract on vegetative growth, fruit yield and fruit quality of two eggplant cultivars (long black and long white as long slender fruits) grown in sand loam soil during summer season plantations.

2. MATERIALS AND METHODS

This experiment was conducted during the two successive summer seasons of 2019 and 2020 in the Private Vegetable Farm, Abou-Hamad District, Shahrkia Governorate, Egypt. to study the effect of foliar spray with vermicompost tea (VCT) as a natural fertilizer at 2.5 and 5 ml /l and yeast extract (YE) as bio- stimulant at 15 and 30 g / l , beside sprayed with water on vegetative growth and fruit yield components of two eggplant cultivars (long black and long white as long slender fruits) during summer plantations .

The soil was sandy loam in texture , it consisted of 30.91 and 32.00 % clay, 10.29 and 11.81% silt and 58.6 and 57.03% sand in the first and second seasons , respectively . Chemical properties of the experimental soil were E.C. (mmhos/cm) 2.89 and 3.01, pH 7.98 and 8.02 , organic matter (%)1.49 and 1.52, available N (ppm) 9.18 and 9.37 , available P₂O₅ (%) 0.037 and 0.036 and available K₂O (%) 0.57 and 0.58 in 2019 and 2020 seasons , respectively .

The experiment contained 10 treatments which were the combinations between two eggplants cultivars (long black and long white) and five treatments(vermicompost tea at 2.5 and 5 ml /l and yeast extract at 15 and 30 g / l as well as control) . The experimental layout was split plot design with three replicates. Cultivars were randomly arranged in the main plots and foliar spray treatments were randomly distributed in the sub plots. All foliar applications were added four times at 45, 60, 75 and 90 days after transplanting.

Seeds of eggplant cultivars were sown in nursery on May 10th and 12th in 2019 and 2020 seasons, respectively. Eggplant transplants were transplanted at 40 cm apart on one side of the ridge on July 10th and 14th in both seasons, respectively. The experimental unit area was 18 m² and it contained three ridges with 6 m length and 1.0 m in width. One ridge was used for measuring growth parameters and the other two ridges were used for yield determination.

Extract of yeast was prepared from active dry yeast (*Saccharomyces cerevisiae*) according to the methods described by Morsi *et al.* (2008). Its contents P, K, Mg, Ca, Fe, Ba, Mn and Zn and higher proteins, free amino acid and vitamins.

The vermicompost was obtained from Central Laboratory for Agricultural Climate (CLAM), Giza, Egypt. Chemical analysis of the vermicompost (average two seasons), it had, weight of m³ (760 kg) , moisture content (51%), pH (6.99), EC (1.37 dS/m), total N (2.33%), organic matter (52.31 %), C/N ratio (1:12.89), total P (1.39 %) and total K (0.99%). Vermicompost tea was prepared by

soaking vermicompost in tap water at ratio 1:10 (w/v).

The cultural practices; i.e., irrigation, fertilization and the pest and weed control were applied as recommended for eggplant.

2.1. Data Recorded

Plant growth : Five plants were randomly taken from each experimental unit at 110 days after transplanting in both seasons to determine the following parameters per plant: Plant height , number of both leaves and branches, fresh and dry weights of leaves (g), fresh and dry weights of branches (g) and fresh and dry weights of shoots (leaves + branches) .

Leaf Pigments content: A disc sample from the fourth outer leaf of eggplant plant was randomly taken from every experimental unit at 110 days after transplanting in both growing seasons to determine chlorophyll a, b and chlorophyll (a+b) as well as total carotenoides (Wettstein ,1957).

Yield traits : At harvest stage, the mature fruits of eggplant for each plot were collected (twice every week). Total picked fruits /plot during the whole harvesting season were weighed, counted and yield / plant , total yield / fad. and average fruit weight were calculated (Faddan = 4200 m² = 0.42 ha).

Fruit quality : Twenty fruits from each plot were taken for measuring fruit length and diameter. Dry matter (%): 100 grams of the grated mixture were dried at 105⁰C till the constant weight and DM (%) was recorded. Total carbohydrate (%): It was determined colorimetrically in dry matter of fruits as (g glucose/ 100g) as outlined by Doubs *et al.* (1956).

2.2. Statistical analysis

Recorded data were subjected to statistical analysis of variance according to Snedecor and Cochran (1980) and means separation were done according to Duncan(1958).

3. RESULTS AND DISCUSSION

3.1. PLANT GROWTH

3.1.1. Effect of cultivars

Data in Tables 1, 2 and 3 indicate that long black cultivar was higher plant height, number of branches/ plant , number of leaves , fresh weight (FW) and dry weight (DW) of branches/ plant , fresh and dry weight of leaves / plant and fresh and dry weight of shoots/ plant than long white cultivar at 110 days after planting in both seasons of study. The increases in branching/ plant were about 6.1 and 6.8 branches for long black cultivar over long white cultivar in the 1st and 2nd seasons, respectively. Also the increases in DW of shoots/ plant were about 10.42 and 11.47 g for long black cultivar over

Table 1. Effect of cultivars and some safety materials on morphological characters of eggplant at 110 days after transplanting during 2019 and 2020 summer seasons.

Treatments	Plant height (cm)		Number of branches / plant		Number of leaves/ plant	
	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
Effect of cultivars						
Long black	123.00 a	127.00 a	30.60 a	32.80 a	130.66 a	138.80 a
Long white	117.50 b	120.48 b	24.50 b	26.72 b	123.40 b	131.70 b
Effect of safety materials						
Control (water)	103.75 d	104.35 d	22.50 d	22.90 d	106.65 d	113.20 d
VCT at 2.5 ml/l	123.50 b	130.45 b	28.50 b	33.55 a	128.35 b	136.10 b
VCT at 5 ml/l	130.00 a	135.15 a	32.75 a	32.65 ab	146.65 a	161.80 a
YE at 15 g /l	118.25 c	121.50 c	25.25 c	28.25 c	123.35 c	130.20 c
YE at 30 g/l	125.75 b	127.25 b	28.75 b	31.45 b	130.15 b	134.95 b

VCT=Vermicompost tea , YE=Yeast extract

Table 2. Effect of cultivars and some safety materials on fresh weight of different eggplant parts at 110 days after transplanting during 2019 and 2020 summer seasons

Treatments	Fresh weight of branches/plant (g)		Fresh weight of leaves /plant (g)		Fresh weight of shoots (branches +leaves) (g)	
	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
Effect of cultivars						
Long black	231.88 a	237.09 a	137.70 a	143.76 a	369.58 a	380.85 a
Long white	194.82 b	199.90 b	114.82 b	118.06 b	313.24 b	323.53 b
Effect of some safety materials						
Control (water)	177.69 d	188.13 d	93.00 d	96.48 d	270.69 d	285.09 d
VCT at 2.5 ml/l	216.41 c	211.38 c	135.83 b	136.30 b	352.25 bc	351.16 c
VCT at 5 ml/l	234.62 a	247.98 a	143.73 a	154.08 a	378.35 a	403.54 a
YE at 15 g /l	211.76 c	208.18 c	125.65 c	129.41 c	341.39 c	340.07 c
YE at 30 g/l	226.27 b	236.80 b	133.09 b	138.28 b	364.36 ab	381.09 b

VCT=Vermicompost tea , YE=Yeast extract

Table 3. Effect of cultivars and some safety materials on dry weight of eggplant parts at 110 days after transplanting during 2019 and 2020 summer seasons

Treatments	Dry weight of branches/plant (g)		Dry weight of leaves /plant (g)		Dry weight of shoots (branches +leaves) (g)	
	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
Effect of cultivars						
Long black	39.11 a	42.55 a	25.69 a	26.88 a	64.80 a	69.43 a
Long white	32.65 b	35.22 b	21.73 b	22.74 b	54.38 b	57.96 b
Effect of some safety materials						
Control (water)	27.46 e	30.03 e	15.70 e	16.79 e	43.17 e	46.82 e
VCT at 2.5 ml/l	37.51 c	38.66 c	25.63 c	26.49 c	63.14 c	65.16 c
VCT at 5 ml/l	43.18 a	49.11 a	28.55 a	30.42 a	71.73 a	79.53 a
YE at 15 g /l	31.55 d	34.56 d	22.17 d	22.85 d	53.72 d	57.42 d
YE at 30 g/l	39.70 b	42.07 b	26.49 b	27.50 b	66.19 b	69.57 b

VCT=Vermicompost tea , YE=Yeast extract

long white cultivar in the 1st and 2nd seasons, respectively. Average number of branches / plant (branching) as average two seasons were about 31.7 for long black cultivar and 25.61 for long white cultivar (average two seasons). These results are in the same line with those reported by Abd El-Hady *et al.* (2017) on eggplant. They found that long black cultivar gave significant increases in vegetative growth parameters (plant height, leaf number, shoot fresh and dry weight). These results could be due to the genetic differences between the two cultivars used which led to the presence of many variations in vegetative growth.

There were significant differences among eggplant cultivars respecting plant growth (Hussein *et al.*, 2010; Msogoya *et al.*, 2014; Nandwani *et al.*, 2015; Bsoul *et al.*, 2016; Abd El-Hady *et al.*, 2017; Al-Zubaidi, 2018; Hassan *et al.*, 2018; Iwuagwu *et al.*, 2019; Abou Al – Azm *et al.*, 2021).

3.1.2. Effect of spraying with some safety materials

Foliar spray of eggplant grown in sandy loam soil during summer plantations with vermicompost (VCT) at 2.5 and 5 ml/l, yeast extract (YE) at 15 and 30 g/l significantly increased plant growth parameters compared with control (spraying with water) at 110 days after transplanting in both seasons of study (Tables 1, 2 and 3), and VCT at 5ml /l gave the highest values of plant height, number of branches/ plant , number of leaves , fresh and dry weight of branches/ plant fresh and dry

weight of leaves / plant and fresh and dry weight of shoots/ plant, followed by YE at 30 g/l. The increases in number of branches/ plant were about 10.25 and 9.75 branches for VCT at 5ml /l over the control in the 1st and 2nd seasons, respectively. Also, the increases in dry weight of shoots/ plant were about 28.56 and 32.71 g over the control in the 1st and 2nd seasons, respectively. Foliar spray with yeast extracts increased growth parameters of eggplant (El-Tohamy *et al.* ,2008 ;El-Nemr *et al.*, 2015 ; El-Sayed *et al.*, 2015 ;Fouda and Abd-Elhamied, 2017; Ahmed *et al.* 2021).

3.1.3. The interaction effect

The interaction between two eggplant cultivars(long black and long white) and spraying with VCT and YE at different concentrations had a significant effect on plant growth parameters at 110 days after transplanting in both seasons (Tables 4, 5 and 6). The interaction between two cultivars and foliar spray with VCT at 2.5 and 5 ml /l and YE at 15 and 30 g /l increased plant growth parameters compared to the interaction between two cultivars and foliar spray with water (control) in both seasons. The interaction between long black cultivar and spraying with VCT at 5ml /l gave the highest values of plant height, number of branches/ plant , number of leaves , fresh and dry weight of branches/ plant fresh and dry weight of leaves / plant and fresh and dry weight of shoots/ plant, followed by the interaction between long black cultivar and spraying with YE at 30 g/l.

Table 4. Effect of the interaction between cultivars and some safety materials on morphological characters of eggplant at 110 days after transplanting during 2019 and 2020 summer seasons

Cvs	Treatments Safety materials	Plant height (cm)		Number of branches / plant		Number of leaves/ plant	
		2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
Long black	Control (water)	105.0 f	107.0 f	25.0 e	24.0 fg	108.3 g	115.0 f
	VCT at 2.5 ml/l	126.0 bc	135.0 ab	32.0 b	36.0 ab	131.7 cd	140.0 c
	VCT at 5 ml/l	135.0 a	139.0 a	37.0 a	38.0 a	153.3 a	171.00 a
	YE at 15 g /l	120.0 de	123.0 de	28.0 c	32.0 cd	126.7 e	132.0 de
	YE at 30 g/l	129.0 b	131.0 bc	31.0 b	34.0 bc	133.3 c	136.0 cd
Long white	Control (water)	102.5 f	101.7 f	20.0 g	21.8 g	105.0 g	111.4 f
	VCT at 2.5 ml/l	121.0 d	125.9 cd	25.0 e	31.1 d	125.0 e	132.2 de
	VCT at 5 ml/l	125.0 c	131.3 b	28.5 c	27.3 e	140.0 b	152.6 b
	YE at 15 g /l	116.5 e	120.0 e	22.5 f	24.5 f	120.0 f	128.4 e
	YE at 30 g/l	122.5 cd	123.5 de	26.5 d	28.9 e	127.0 de	133.9cde

VCT=Vermicompost tea , YE=Yeast extract

Table 5. Effect of the interaction between cultivars and some safety materials on fresh weight of different eggplant parts at 110 days after transplanting during 2019 and 2020 summer seasons

Treatments		Fresh weight of branches/plant (g)		Fresh weight of leaves /plant (g)		Fresh weight of shoots (branches +leaves) (g)	
Cvs	Safety materials	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
Long black	Control (water)	196.97 fg	206.06 de	100.00 f	104.25 e	296.97 f	310.31 e
	VCT at 2.5 ml/l	232.73 c	227.27 bc	146.06 b	150.30 b	378.79 b	377.57 c
	VCT at 5 ml/l	253.34 a	266.66 a	154.55 a	167.27 a	407.89 a	433.93 a
	YE at 15 g/l	230.91 c	225.45 bc	139.39 c	141.82 c	370.30 bc	367.27cd
	YE at 30 g/l	245.45 b	260.00 a	148.48 ab	155.15 b	393.93 ab	415.15 b
Long white	Control (water)	158.40 h	170.20 f	86.00 g	88.70 f	244.40 g	259.86 f
	VCT at 2.5 ml/l	200.10 ef	195.50 e	125.60 d	122.30 d	325.71def	324.76 e
	VCT at 5 ml/l	215.90 d	229.30 b	132.90 c	140.90 c	348.81 cd	373.15 c
	YE at 15 g/l	192.60 g	190.90 e	111.90 e	117.00 d	312.48 ef	312.87 e
	YE at 30 g/l	207.10 e	213.60 cd	117.70 e	121.40 d	334.79 de	347.03 d

VCT=Vermicompost tea , YE=Yeast extract

Table 6. Effect of the interaction between cultivars and some safety materials on dry weight of different eggplant parts at 110 days after transplanting during 2019 and 2020 seasons

Treatments		Dry weight of branches/plant (g)		Dry weight of leaves /plant (g)		Dry weight of shoots (branches +leaves) (g)	
Cvs	Safety materials	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
Long black	Control (water)	31.11 f	34.44 e	16.89 h	18.06 g	48.00 f	52.50 f
	VCT at 2.5 ml/l	40.33 c	42.11 c	27.56 c	28.97 bc	67.89 c	71.08 c
	VCT at 5 ml/l	46.44 a	52.78 a	30.67 a	32.73 a	77.11 a	85.51 a
	YE at 15 g/l	35.00 de	38.23 d	24.89 e	25.11 de	59.89 de	63.34 d
	YE at 30 g/l	42.67 b	45.23 b	28.44 b	29.53 b	71.11 b	74.76 b
Long white	Control (water)	23.82 h	25.62 g	14.52 i	15.53 h	38.34 g	41.15 g
	VCT at 2.5 ml/l	34.70 e	35.22 e	23.70 f	24.02 e	58.40 e	59.24 e
	VCT at 5 ml/l	39.92 c	45.45 b	26.44 d	28.11 c	66.36 c	73.56 b
	YE at 15 g/l	28.11 g	30.90 f	19.45 g	20.60 f	47.56 f	51.50 f
	YE at 30 g/l	36.73 d	38.91 d	24.54 e	25.47 d	61.27 d	64.38 d

VCT=Vermicompost tea , YE=Yeast extract

3.2. LEAF PIGMENTS CONTENT

3.2.1. Effect of cultivars

Data in Table 7 indicate that long black cultivar recorded higher concentrations of chlorophyll a, b in leaf tissues than long white cultivar at 110 days after transplanting in both seasons and carotenoides in 1st season only . Whereas there was no significant differences between them in total chlorophyll in both seasons and carotenoids in 2nd season only. These results are in harmony with those obtained with Bsoul *et al.* (2016). They showed that there were significant differences among eggplants cultivars regarding total chlorophyll.

3.2.2. Effect of spraying with some safety materials

The obtained results in Table 7 indicate that spraying with VCT at 5 ml /l significantly increased chlorophyll a, b total (a+b) and carotenoides in leaf tissues of eggplant followed by spraying with YE at 30 g /l at 110 days after transplanting in both seasons of study . Slomy *et al.* (2019) showed that spraying eggplant plants with yeast extract at 20 g /l significantly increased total chlorophyll in leaves than unsprayed plants also, Ahmed *et al* (2021) indicated that yeast extract at 6 g / l significantly affected leaf chlorophyll content (SPAD) of eggplant.

Table 7. Effect of cultivars and some safety materials on leaf pigments (mg/gDW) of eggplant at 110 days after transplanting during 2019 and 2020 summer seasons

Treatments	Chlorophyll (a)		Chlorophyll (b)		Total Chlorophyll (a+b)		Carotenoides	
	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
Effect of cultivars								
Long black	3.36 a	3.63 a	1.57 a	1.32 a	4.93 a	4.95 a	1.52 a	1.37 a
Long white	3.09 b	3.34 b	1.45 b	1.21 b	4.54 a	4.56 a	1.40 b	1.26 a
Effect of some safety materials								
Control (water)	2.70 e	3.03 e	1.19 c	1.14 c	3.90 c	4.17 c	1.35 c	1.13 c
VCT at 2.5 ml/l	3.17 c	3.38 c	1.55 b	1.28 b	4.72 b	4.66 bc	1.46 b	1.34 b
VCT at 5 ml/l	3.82 a	3.91 a	1.75 a	1.47 a	5.58 a	5.38 a	1.57 a	1.52 a
YE at 15 g /l	3.01 d	3.30 d	1.50 b	1.18 c	4.52 b	4.48 c	1.38 c	1.19 c
YE at 30 g/l	3.42 b	3.80 b	1.56 b	1.27 b	4.98 b	5.08 ab	1.53 a	1.42 b

VCT=Vermicompost tea , YE=Yeast extract

3.2.3. Effect of the interaction

The interaction treatment between long black cultivar and spraying with VCT at 5 ml /l significantly increased the concentration of chlorophyll a, b total (a+b) and carotenoides in leaf

tissues followed by the interaction treatment between long black cultivar and spraying with YE at 30 g /l at 110 days after transplanting in both seasons (Table 8).

Table 8. Effect of the interaction between cultivars and some safety materials on leaf pigments (mg/g DW) of eggplant at 110 days after transplanting during 2019 and 2020 summer seasons

Cvs	Safety materials	Chlorophyll (a)		Chlorophyll (b)		Total Chlorophyll (a+b)		Carotenoides	
		2019 season	2020 season	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
Long black	Control(water)	2.82 f	3.16 f	1.24 e	1.19 cd	4.06 ef	4.35cde	1.41 de	1.18 ef
	VCT at 2.5 ml/l	3.30 c	3.52 e	1.62 bc	1.34 b	4.92bcd	4.86bcd	1.52 b	1.40 bc
	VCT at 5 ml/l	3.98 a	4.08 a	1.83 a	1.53 a	5.81 a	5.61 a	1.64 a	1.59 a
	YE at 15 g /l	3.14 cd	3.44 e	1.57bcd	1.23 c	4.71b-e	4.67b-e	1.44cde	1.24def
	YE at 30 g/l	3.56 b	3.96 b	1.63 bc	1.33 b	5.19abc	5.29 ab	1.60 a	1.48 ab
Long white	Control(water)	2.59 g	2.91 g	1.14 e	1.09 e	3.74 f	4.00 e	1.30 f	1.09 f
	VCT at 2.5 ml/l	3.04 de	3.24 f	1.49 cd	1.23 c	4.53cde	4.47b-e	1.40 e	1.29cde
	VCT at 5 ml/l	3.66 b	3.75 c	1.68 ab	1.41 b	5.35 ab	5.16abc	1.51 bc	1.46 ab
	YE at 15 g /l	2.89 ef	3.16 f	1.44 d	1.13 de	4.33def	4.30 de	1.32 f	1.14 f
	YE at 30 g/l	3.28 c	3.64 d	1.50 cd	1.22 c	4.77b-e	4.87a-d	1.47bcd	1.36bcd

VCT=Vermicompost tea , YE=Yeast extract

3.3. YIELD COMPONENTS

3.3.1. Effect of cultivars

There were significant differences in number of fruits/ plant , average fruit weight, yield / plant and total fruit yield /fad. in both seasons between two cultivars. Long black cultivar gave a higher number of fruits/ plant, average fruit weight, yield / plant and total yield /fad. than long white cultivar (Table 9). The increases in number of fruits/ plant , average fruit weight, yield / plant and total yield /fad. were about 2.41 and 3.51, 3.63 and 4.87 (g), 0.181 and 0.314 (kg) and 2.334 and 3.275 (ton) for long black

cultivar over long white cultivar in the 1st and 2nd seasons, respectively. Average fruit weight (as the average of two seasons) were about 54.37 and g for long black cultivar and 50.12 g for long white cultivar. The increases in total yield for long black cultivar may be due to that long black cultivar recorded higher branching (Table 1), dry weight of shoots (Table 3), chlorophyll a and b (Table 7), number of fruits / plant, average fruit weight and yield / plant (Table 9).Long black cultivar significantly increased the number of fruits/ plant , average fruit weight , yield / plant and total yield /fad. (Abd El-Hady, *et al.* 2017).

Table 9. Effect of cultivars and some safety materials on yield components of eggplant during 2019 and 2020 summer seasons

Treatments	Number of fruits / plant		Average fruit weight (g)		Yield / plant (kg)		Total yield (ton/fad.)	
	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
	Effect of cultivars							
Long black	27.17 a	28.48 a	54.37 a	54.38 a	1.485 a	1.554 a	15.417 a	16.139 a
Long white	24.76 b	24.97 b	50.74 b	49.51 b	1.265 b	1.240 b	13.083 b	12.864 b
Effect of some safety materials								
Control (water)	22.18 e	23.54 d	47.17 d	48.33 e	1.049 d	1.140 d	10.965 e	11.905 d
VCT at 2.5 ml/l	26.81 c	27.52 b	53.43 b	51.70 c	1.435 b	1.426 b	14.868 c	14.773 b
VCT at 5 ml/l	29.18 a	29.12 a	56.99 a	56.74 a	1.665 a	1.659 a	17.238 a	17.170 a
YE at 15 g/l	23.61 d	25.98 c	51.39 c	50.08 d	1.215 c	1.306 c	12.558 d	13.563 c
YE at 30 g/l	28.06 b	27.45 b	53.78 b	52.91 b	1.511 b	1.457 b	15.621 b	15.099 b

VCT=Vermicompost tea , YE=Yeast extract

These results could be due to the genetic differences between the two cultivars used which led to the presence of many variations in fruit yield and its components.

Significant differences for fruit yield and its components among eggplant cultivars were observed (Hussein *et al.*, 2010; Msogoya *et al.*, 2014; Nandwani *et al.*, 2015; Bsoul *et al.*, 2016; Al-Zubaidi, 2018; Hassan *et al.*, 2018; Iwuagwu *et al.*, 2019; Abou Al – Azm *et al.*, 2021).

3.3.2. Effect of spraying with some safety materials

The obtained results in Table 9 show that spraying eggplant grown in sandy loam soil during summer plantations with VCT at 2.5 and 5 ml /l, YE at 15 and 30 g/l increased yield and its components compared to spraying with water in both seasons . Foliar spray with VCT at 5 ml /l significantly increased the number of fruits/ plant , average fruit weight , yield / plant and total yield /fad., followed by spraying with YE at 30 g /l in both seasons. The increases in number of fruits/ plant, average fruit weight, yield / plant and total yield /fad. were about 7.0 and 5.58, 9.82 and 8.41 (g), 0.616 and 0.519 (kg) and 6.253 and 5.265 (ton) for spraying with VCT at 5 ml /l over the control (spraying with water) in the 1st and 2nd seasons, respectively. The stimulative effect of VCT at 5 ml /l on total yield may be due to that VCT at 5 ml /l increased plant growth (Tables 1, 2 and 3), leaf pigments content (

Table 7), average number of fruits/ plant and average fruit weight (Table 9).These results are in agreement with the findings of El-Tohamy *et al.* (2008) who found that foliar application of eggplant with YE at different concentrations resulted in significant increment in the number of fruits/ plant and total yield/faddan. Foliar spray with yeast extracts increased yield and its components of eggplant (El-Sayed *et al.*, 2015 ;Fouda and Abd-Elhamied, 2017).

3.3.3. The interaction effect

Data in Table 10 show that the interaction between two cultivars and spraying with VCT and YE at different concentrations increased number of fruits/ plant , average fruit weight , yield / plant and total yield /fad. in both seasons of growth compared to the interaction between two cultivars and spraying with water (control) in both seasons. The interaction between long black cultivar and spraying with VCT at 5 ml /l increased the number of fruits/ plant , average fruit weight , yield / plant and total yield. followed by the interaction treatment between long black cultivar and spraying with YE at 30 g /l. There was positive correlation between number of branches/plant and yield/plant, average fruit weight and fruit diameter. There was positive correlation between yield/plant and average fruit weight, fruit length and fruit diameter and also, between average fruit weight , length and diameter (Mahmoud and El-Mansy, 2018).

Table 10. The interaction effect between cultivars and some safety materials on yield traits of eggplant during 2019 and 2020 summer seasons

Treatments		Number of fruits / plant		Average fruit weight (g)		Yield / plant (kg)		Total yield (ton/fad.)	
Cvs	Safety materials	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
Long black	Control (water)	23.21 f	24.59 ef	49.94 d	50.48 f	1.159 ef	1.241 de	12.170 f	13.000 e
	VCT at 2.5 ml/l	28.15 c	28.82 bc	55.08 b	53.93 c	1.551 bc	1.554 bc	16.086 c	16.117 c
	VCT at 5 ml/l	30.22 a	30.76 a	59.09 a	60.69 a	1.786 a	1.867 a	18.453 a	19.304 a
	YE at 15 g/l	25.06 e	28.82 bc	52.33 c	51.70 e	1.311 def	1.490 c	13.566 e	15.445 d
	YE at 30 g/l	29.24 b	29.41 ab	55.41 b	55.14 b	1.620 ab	1.622 b	16.810 b	16.831 b
Long white	Control (water)	21.15 h	22.49 g	44.41 e	46.18 i	0.939 g	1.039 f	9.760 g	10.810 g
	VCT at 2.5 ml/l	25.47 e	26.23 de	51.79 c	49.47 g	1.319 de	1.298 d	13.650 e	13.429 e
	VCT at 5 ml/l	28.14 c	27.49 cd	54.89 b	52.79 d	1.545 bc	1.451 c	16.023 c	15.036 d
	YE at 15 g/l	22.17 g	23.15 fg	50.46 d	48.46 h	1.119 f	1.122 ef	11.550 f	11.681 f
	YE at 30 g/l	26.89 d	25.49 e	52.16 c	50.69 f	1.403 cd	1.292 d	14.432 d	13.366 e

VCT=Vermicompost tea , YE=Yeast extract

3.4. FRUIT QUALITY

3.4.1. Effect of cultivars

Long black cultivar gave higher fruit length and diameter, whereas long white cultivar gave higher DM (%) in fruits in both seasons of study (Table 11), whereas there was no significant differences between two cultivars with respect to total carbohydrates in fruits. Fruit length (as average of two seasons) was about 13.12 cm for long black

cultivar and 10.51 cm for long white, also fruit diameter ranged from 4.25 cm for long black and 3.83 cm for long white . Significant differences among eggplant cultivars regarding fruit quality (Hussein *et al.*, 2010; Msogoya *et al.*, 2014; Nandwani *et al.*, 2015; Bsoul *et al.*, 2016; Abd El-Hady *et al.*, 2017; Hassan *et al.*, 2018; Al-Zubaidi, 2018; Iwuagwu *et al.*, 2019; Abou Al – Azm *et al.* , 2021).

Table 11. Effect of cultivars and some safety materials on fruit quality of eggplant during 2019 and 2020 summer seasons

Treatments	Fruit length (cm)		Fruit diameter (cm)		Dry matter (%)		Total carbohydrates (%)	
	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
Effect of cultivars								
Long black	12.13 a	14.11 a	4.18 a	4.31 a	5.91 b	6.15 b	19.76 a	19.88 a
Long white	10.25 b	10.78 b	3.53 b	4.13 b	6.08 a	6.33 a	19.57 a	20.12 a
Effect of some safety materials								
Control (water)	9.27 e	11.07 e	3.57 c	3.60 d	5.32 c	5.19 e	18.79 cd	18.63 c
VCT at 2.5 ml/l	11.35 c	12.62 c	3.90 b	4.15 c	6.36 b	6.93 b	20.78 b	21.69 a
VCT at 5 ml/l	12.37 a	13.47 a	4.05 a	4.67 a	7.75 a	7.91 a	21.17 a	21.33 a
YE at 15 g/l	11.20 d	12.12 d	3.85 b	4.11 c	5.35 c	5.74 c	18.95 c	19.38 b
YE at 30 g/l	11.76 b	12.95 b	3.90 b	4.55 b	5.20 d	5.43 d	18.65 d	18.97 bc

VCT=Vermicompost tea , YE=Yeast extract

3.4.2. Effect of spraying with some safety materials

Spraying eggplant with VCT at 2.5 and 5ml /l and YE at 15 and 30 g /l increased fruit length, diameter, DM (%) and total carbohydrates in fruits (Table 11) and VCT at 5ml /l gave the highest values of these characters, followed by YE at 30 g /l in both seasons. Foliar spray with yeast extracts increased fruit quality of eggplant (El-Nemr *et al.*, 2015 ; El-

Sayed *et al.*, 2015 ;Fouda and Abd-Elhamied, 2017).

3.4.3. Effect of the interaction

Spraying long black cultivar with VCT at 5ml /l increased fruit length and diameter, whereas spraying long white cultivar with VCT at 5ml /l increased DM (%) and total carbohydrates in fruits in both seasons (Table 12).

Table 12. Effect of the interaction between cultivars and foliar spray with some safety materials on fruit quality of eggplant during 2019 and 2020 summer seasons

Treatments		Fruit length (cm)		Fruit diameter (cm)		Dry matter (%)		Total carbohydrates (%)	
Cvs	Safety materials	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season	2019 season	2020 season
Long black	Control (water)	10.35 g	12.90 d	3.90 c	3.60 g	5.21 gh	4.76 f	18.34 fg	18.48 d
	VCT at 2.5 ml/l	12.30 c	14.45 b	4.20 b	4.20 e	6.25 d	6.88 b	20.59 c	21.50ab
	VCT at 5 ml/l	13.25 a	14.70 a	4.40 a	4.90 a	7.61 b	7.94 a	21.36 a	20.75 b
	YE at 15 g/l	12.00 d	13.80 c	4.20 b	4.05 f	5.21 gh	5.82 c	19.44 d	19.55 c
	YE at 30 g/l	12.78 b	14.70 a	4.20 b	4.80 b	5.29 fg	5.35 e	19.09 e	19.16cd
Long white	Control (water)	8.20 h	9.25 i	3.25 f	3.60 g	5.44 ef	5.62 cd	19.24 de	18.79cd
	VCT at 2.5 ml/l	10.40 g	10.79 g	3.60 de	4.11 f	6.48 c	6.99 b	20.97 b	21.88 a
	VCT at 5 ml/l	11.50 e	12.25 e	3.70 d	4.45 c	7.89 a	7.88 a	20.99 b	21.92 a
	YE at 15 g/l	10.40 g	10.45 h	3.50 e	4.18 e	5.49 e	5.66 cd	18.47 f	19.22cd
	YE at 30 g/l	10.75 f	11.20 f	3.60 de	4.31 d	5.12 h	5.52 de	18.22 g	18.79cd

VCT=Vermicompost tea , YE=Yeast extract

4. CONCLUSION

From the foregoing results, it could be concluded that , foliar spray of two cultivars (long black and long white as long slender fruits) grown in sandy loam soil during summer plantations with vermicompost tea at 2.5 or 5ml /l and yeast extract at 15 and 30 g /l increased vegetative growth and fruit yield compared to foliar spray the same cultivars with water (control) .Spraying of long black cultivar plants with vermicompost tea at 5ml /l increased plant height, number of leaves/ plant, number of branches/ plant, fresh and dry weight of branches/ plant, fresh and dry weight of leaves /plant, fresh and dry weight of shoots /plant, chlorophyll a, b, total (a+b) and carotenoides in leaf tissues, fruit number /plant, average fruit weight, yield / plant and total yield /fad., fruit length and diameter.

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الملخص العربي

تأثير الرش الورقي ببعض المواد الامنه على النمو والمحصول لصنفين من الباذنجان خلال الزراعات الصيفية

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اجريت هذه التجربة خلال الموسم الصيفى لعامى ٢٠١٩ و ٢٠٢٠ فى مزرعة خضر خاصة بمنطقة ابو حماد، محافظة الشرقية، مصر لدراسة تأثير الرش الورقى بشاى الفيرمي كمبوست كسماد طبيعى بتركيز ٢,٥ و ٥ مل لكل لتر وبمستخلص الخميرة كمنشط حيوى بتركيز ١٥ و ٣٠ جرام لكل لتر على النمو والمحصول ومكوناته لصنفين من الباذنجان (اسود طويل وابيض طويل) خلال الزراعات الصيفية . ادى رش نباتات الباذنجان المنزرع فى أرض رملية طمية خلال الزراعات الصيفية الورقى بشاى الفيرمي كمبوست بتركيز ٢,٥ و ٥ مل لكل لتر وبمستخلص الخميرة بتركيز ١٥ و ٣٠ جرام لكل لتر الى زيادة النمو والمحصول مقارنة بالرش بالماء (معاملة المقارنة). ادى رش نباتات الباذنجان صنف اسود طويل بشاى الفيرمي كمبوست بتركيز ٥ مل لكل لترالى زيادة كل من ارتفاع النبات عدد الاوراق وعدد الافرع للنبات،الوزن الغض والجاف للافرع والمجموع الخضرى للنبات ، محتوى انسجة الورقة من الكلوروفيل ا ، ب ، والكلى (٣+ب) والكاروتينويدات ، متوسط وزن الثمرة ، محصول النبات ، المحصول الكلى للفدان ، وطول وقطر الثمرة .