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EFFECT OF COMPOST, FOLIAR SPRAYING WITH POTASSIUM AND BORON ON GROWTH, YIELD AND FRUIT QUALITY OF STRAWBERRY

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ABSTRACT

This work was carried out in the two successive summer season plantations of 2006/ 2007 and 2007/2008 on strawberry cv. Sweet Charlie at south Tahrir district, newly reclaimed sand soils at Experimental Station Farm, Horticultural Research Station, Behiera Governorate, to study the influence of compost manure at a rate of 20 t/fed. compared with mineral nitrogen fertilizer at a rate of 200 kg N/feddan (100 % of the recommended rate as a check) and complied with foliar spraying of potassium (46% K_2O) as potassium citrate at a doses of 1% and/or boron 50 ppm on plant growth, yield and its components, fruit quality as well as chemical contents.

A randomized complete block design with three replications was used in both growing seasons. The results indicated that plant growth characters (plant length, number of crowns, number of runners, number of leaves and foliage fresh and dry weight, likewise, early yield, total yield and marketable yield gave the highest values with the treatment which received mineral nitrogen fertilizer combination with foliar spraying of potassium and boron and total titratable acidity were the highest with the plants supplied mineral nitrogen fertilizer alone. Moreover, potassium percent in the leaves and the fruits were recorded with mineral nitrogen fertilizer combination with foliar application potassium and boron and/or potaasium alone in the first and seconed season. On the same trend, the highest values of average fruit weight, total soluble solids and vitamin C as well as fruit juice % with plants supplied by compost manure with foliar spraying by potassium and boron in both growing seasons. On the other hand, the lowest value of fruit moisture % in the fruits and unmarketable yield were obtained when plants applied by compost manure with foliar addition of potassium and boron.

Keywords: Compost manure, Nitrogen fertilizer, Potassium, Boron, Strawberry.

INTRODUCTION

Strawberry (*Fragaria X ananassa Duch*) is one of the most popular vegetable crops. In Egypt, it occupies an important position among the untraditional vegetable crops due to its multifarious use as local fresh consumption, food processing and exportation (Mohamed and Gaber, 2002). Strawberry is very responsible to nitrogen fertilizers due to its shallow root system and high productivity, in relation to plant size. The use of nitrogen fertilizer in strawberry production was found to have simulative effects on the vegetative growth parameters (Moussa *et al.,* 1993). El- Araby *et al*. (2003) reported that nitrogen fertilizer led to significant increases in all vegetative growth characters.

Organic agriculture should be a synonym of sustainability a sense of although, it is broadest sense of the world. Organic systems are not always more stainable the conventional ones (Aguirre, 2005). Compost manure used as amendments for strawberries two consecutive years produced fruit of equal quality but treatments did not provide sufficient N to plants and yield was lower than expected.Wang and Lin (2002) indicated that compost

applications can also improve strawberry growth and quality. Mohamed *et al*. (1991) found that early and total yield were increased by using either nitrogen or potassium fertilization. The highest yield was detected by application of 900 kg of ammonium sulphate or 300 kg potassium sulphate. Total soluble solids of fruits were decreased by increasing either nitrogen or potassium levels. No significant effect was observed on vitamin C content and acidity of fruits. Arancon *et al.* (2004) found that vermicompst application at 10 t/ha significantly increased leaf area, plant shoot biomass, number of flowers, number of runners and marketable fruit weights. Rajbir *et al*. (2008) found that vermicompost application increased total fruit yield, firmness, total soluble solids, ascorbic acid content and decreased acidity, the best results were archived at 7.5t/ha of vermicompost.

Municipal solid waste compost had a high water holding capacity because of its organic matter content, which in turn improved the water holding capacity of the soil (Hernando *et al.,* 1989; Soumare *et al.,* 2003). Furthermore, compost increased the aggregate stability of the soil through the formation of cationic bridges, thereby, improve the soil structure, diversity and activity of the soil organisms. It also, feed and supplies the soil nutrients (Rechcigl, 1995; Annabi *et al.,* 2007).

The aim of this investigation was to study the effect of compost manure as compared with mineral nitrogen fertilizer combined with foliar sprays of potassium and boron on growth, yield and fruit quality as well as chemical contens of strawberry plants.

MATERIALS AND METHODS

A field experiment was carried out during the two summer seasons of 2006/2007 and 2007/2008 at south Tahrir district, newly reclaimed sand soils, under a drip irrigation system at Experimental Station Farm, Horticultural Research Station, Behiera Governorate, Egypt.

Frigo transplants of Strawberry Sweet Charlie cultivar were obtained from local nurseries under the supervision of Strawberry Improvement Center of Ain Shams University. Transplants were dipped for 30 minutes at doses of 1m/l Bricour N +1g/l Ridomil glod cupper. The transplants took place in row 0.75 m apart in the two sides of the row at 0.25 m interrow spacing. Individual plot consisted of 3 ridges 8 m in length and 0.75 m with and each plot was 18 m^2 in area. Planting dates were carried out on September 10 and 16 in the two seasons of 2006/2007 and 200/ 2008 respectively.

Some physical and chemical properties of the experimental soil at depth of 0-30 cm are shown in Table 1.

Table 1: Some physical and chemical properties of the experimental soil during 2006 and 2007.

Properties	Sand %	Silt %	Clay %	Texture	O.M. %	$CaCO_3$	pH	Available nutrients (ppm)					
								N	P	K	Fe	Zn	Mn
2006	93.5	3.9	2.6	sandy	0.03	1.11	7.9	0.03	3.14	9.76	3.0	1.5	1.4
2007	93.6	3.7	2.7	sandy	0.05	1.17	8.1	0.04	3.87	10.12	3.6	1.6	1.7

Table 2: Chemical analysis of the compost manure during 2006 and 2007 seasons.

Compot manure	Weight of m^3 (kg)	pH	EC dS/m	Organic matter %	C : N ratio %	Humus value	Total N %	Total P %	Total K%	Fe ppm	Zn ppm	Mn
2006	615	7.1	4.8	31.5	18:1	23.10	1.0	0.55	1.12	750	40	162
2007	635	7.3	5.1	30.0	18.5:1	22.0	1.0	0.60	1.23	780	50	175

The experimental design was randomized complete blocks (RCB) with three replicates. The experiment included 8 treatments, consisted of mineral nitrogen fertilizer ammonium nitrate (33.5% N), compost manure, foliar application of potassium as potassium citrate (46% k_2O) and boron (boric acid 17% B) as follows:

1. Nitrogen fertilirzer at the recommended rate, *i.e.,* of N 200 kg N/feddan as a control.
2. Compost manure at a rate of 20 t/feddan.
3. Nitrogen fertilizer at 200 N kg/feddan with a potassium foliar spray at dose of 1%.
4. Compost manure at 20 t/feddan with a potassium foliar spray at dose 1%.
5. Nitrogen fertilizer at 200 N kg/feddan with a boron foliar spray at dose 50 ppm.
6. Compost manure at 20 t/feddan with 1% potassium foliar spray.
7. Nitrogen fertilizer at 200 N kg/feddan with 1% potassium foliar spray and 50 ppm boron.
8. Compost manure at 20 t/feddan with foliar sprays a of 1% potassium doses and 50 ppm boron.

The ammonium nitrate was added through the drip irrigation system during the growing season. Calcium super phosphate (15.5% P_2O_5) at the rate of 46.5 kg P_2O_5/feddan and potassium sulphate (48% K_2O) at the rate of 72 kg K_2O/feddan, were applied once during soil preparation. While, during the entire growing season, phosphorus and potassium fertilizers were also added through the drip irrigation system four times per week, at the rates of 75 % P_2O_5 feddan in the from of phosphoric acid (80 % P_2O_5) and 120 kg K_2O as soluble potassium sulphate (48 % K_2O).

Respect foliar spraying by potassium citrate and boric acid were added at four week intervals, starting from one month after transplanting. During the first month of the vegetative growing stage, the developed flowers and runners were removed.

Crop N requirement needed for the desired yield and the amount of N needed from compost manure was determined according N input (chemical analysis for total N in compost manure) compost was spread and thoroughly mixed with the surface of the soil layer (0 - 30) before planting during the soil preparation.

The other agricultural practices were applied according to the Ministry of Agricultural Recommendations.

Compost manure was prepared by mixing plant materials of rice straw with fresh cattle manure and obtained from El-Kalil Company in Tahrir City. Potassium citrate (46 % K_2O) and boric acid (17% B) were obtained from EL-Gomhouria Company for Chemical.

Data recorded

Vegetative growth characters

Six plants were taken randomly from each plot at blooming stage and measurements of plant height (cm), number of crowns, and number of runners, number of leaves, leaf area (cm^2), foliage fresh weight (g) and foliage dry weight per plant (g).

Flowering traits

Ten randomly chosen plants, from each plot, were labeled to record the earliness of flowering as the number of days from transplanting till flowering of 25% of the plants, and the number of flower cluster per plant counted till the end of the experiment.

Yield and its components

Early yield (ton/fed.) was calculated as fresh weight of harvested fruits from the first four pickings, harvest started on the 22 of March and extended to the 29 May in the first season; while, in the second season, it started on the 27 March and extended to of June.

Total yield (ton/fed.) was calculated as the fresh weight of all harvested fruits all over growing the season. It included marketable and non marketable fruit yield Marketable yield (included spitted, malformed, green shouldered, water damaged and rotted fruits).

Average fruit weight g (at the first, mid and end harvest time),Fruit length (cm) and fruit diameter (cm) were determined.

Fruits quality characters

Random samples of ten fresh fruits were taken from each plot at the peak of harvesting period to determine total soluble solids (TSS %) by refractomerter, vitamin C (ascorbic acid) content using 2.6 dichlorophenol indophenol as indicator for titration as outlined in A.O.A.C. (1990), fruit juice and fruit moisture percentage.

Chemical content

Percent K content in the leaves was determine in the 6 th leaf from the plant top before first harvesting time and K in the fruits at mid harvesting time. Total potassium was determined according to the method described by Jackson (1970). Total titratable acidity percentage (TAA %) as g of citric acid/100g fruits extract was determined according to A.O.A.C. (1990).

Statistical analysis

Data were statistically analyzed according to Costat Software (1985) and the Revised L.S.D test was used to compare the differences among the treatments as outlined by smith(1978).

RESULTS AND DISCUSSION

Vegetative growth characters

Data presented in Tables (3&4) indicated that the vegetative growth characters of strawberry*, i.e.,* plant length, number of crowns, number of runners, number of leaves, leaf area, foliage fresh and dry weight, were significantly affected by the tested treatments in both seasons. Clear also, that applying nitrogen fertilizer with foliar spraying by potassium plus boron

followed by nitrogen fertilizer with foliar application of potassium or boron gave the best plant growth parameters in the both seasons, while the difference did not reach the significant level among those treatments. These results might be due to availability and rapid uptake of nitrogen since it is a primary component of all nucleic acids, protein and chlorophyll.

On the other hand, potassium plays an important role in functions of enzymes need for the vital processes and growth. Potassium is considered as one of the most essential elements for growth and development of plant. Many studies proved that K plays a major role in many physiological and biochemical processes. As well as boron plays an important role in activation of cell division and cell elongation Therefore, nitrogen, potassium and boron enhances the amount of metabolites necessary for building plant organs, consequently the vegetative growth of plants. (Marschner, 1995).The obtained results are in general agreement with those reported by Moussa *et al.* (1993), Yermiyahu *et al.* (2001), El-Araby *et al.* (2003) and Abou El-Yazeid (2007).

Table 3: Plant length, number of crowns, number of runners and number of leaves of strawberry fruits as affected by compost manure with foliar spraying of potassium and boron during 2006/2007 and 2007/2008 seasons.

Characters	Plant length (cm)		Number of crowns/plant		Number of runners/plant		Number of leaves/plant	
Treatments	2006/7	2007/8	2006/7	2006/8	2006/7	2007/8	2006/7	2007/8
Mineral nitrogen fertilizer (check)	14.14c	14.13bcd	4.36a	4.45a	7.99a	7.98a	30.85ab	31.58ab
Compost manure	11.86f	12.28f	2.72b	3.30b	4.91d	4.92d	28.90c	29.88c
Mineral nitrogen with potassium	14.59b	14.57abc	4.33a	4.68a	7.91a	8.25a	30.56abc	31.53ab
Compost with potassium	12.35e	12.63f	3.06b	3.24b	5.28cd	5.37cd	29.54bc	30.32abc
Mineral nitrogen with boron	15.55a	15.23a	4.59a	4.51a	8.17a	8.26a	30.20abc	31.12abc
Compost with boron	13.30d	13.61cde	3.06b	3.24b	5.87bc	5.80bc	29.54bc	30.89abc
Mineral nitrogen with potassium and boron	15.46a	14.87ab	4.91a	4.94a	8.59a	8.76a	32.22abc	32.06a
Compost with potassium and boron	13.39d	13.40de	3.20b	3.50b	6.43bc	6.30b	30.19abc	30.94abc

Flowering traits

The effect of compost manure accompanied with foliar sprays of potassium combined with boron on flowering time (earliness) and number of flower trusses per plant were significant in both studied experiments (Table 4). The addition of compost manure with foliar application of potassium and boron reflected more earliness and number of clusters than other treatments.On the other hand, supplying the plants with mineral nitrogen

fertilizer was significantly associated with the most delay of flowering, in both seasons. The obtained results seemed to be in general agreements with those reported by and Mahamed and Gaber (2002), El- Araby *et al.* (2003) and Rajbir *et al.* (2008). The observed increment on number of cluster and earliness with supplied compost manure combined with potassium and boron as foliar spraying might be related to the improvement of physical conditions of the soil and supplying plant with nutrients for a longer period thorought the season, as reported by Arancon *et al*. (2004), Wang and Lins (2002). In addition, the role of potassium is necessary for the activation of some enzyme systems, the translocation of carbohydrates and osmosis regulation. Furthermore, boron plays a role in cell differentiation and carbohydrate metabolism (Singh and Verma, 1991).

Table 4: Leaf area, foliage fresh weight, foliage dry weight, earliness of flowering and number of cluster of strawberry fruits as affected by compost manure with foliar spraying of potassium and boron during 2006/2007 and 2007/2008 seasons.

Characters	Leaf area/plant (cm)		Foliage fresh weight /plant(g)		Foliage dry weight/ plant (g)		Earliness of flowering (days)		Number of cluster/plant	
Treatments	2006/7	2007/8	2006/7	2006/8	2006/7	2007/8	2006/7	2007/8	2006/7	2007/8
Mineral nitrogen fertilizer (check)	430.77a	432.21a	50.772a	51.702a	17.36a	17.23a	135.43a	136.58a	7.62g	6.27g
Compost manure	405.38c	407.76b	36.375d	36.307d	11.03c	11.15b	130.18b	129.34b	6.86h	6.12g
Mineral nitrogen with potassium	427.98a	430.11a	51230a	51.067a	16.11b	16.55a	130.17b	128.49c	9.95c	8.88c
Compost with potassium	410.14bc	411.42b	36.997cd	37.402c	10.87c	11.65b	128.26c	127.37d	8.88f	7.93f
Mineral nitrogen with boron	429.73a	431.36a	51.457a	51.680a	16.50b	16.93a	128.23c	126.50e	9.51d	8.62d
Compost with boron	412.15b	413.32b	38.480b	38.832b	11.53b	11.48b	127.21d	125.29f	9.22e	8.27e
Mineral nitrogen with potassium and boron	428.57a	430.16a	51.560a	52.067a	11.03c	16.49a	125.21c	124.41g	10.70b	9.94b
Compost with potassium and boron	409.73c	411.57b	38.010bc	37.530c	11.19c	11.71b	122.19f	121.38h	11.79a	10.71a

Yield and its components

The data in Table (5) show that early yield, yield/plant, total and marketable yields were significantly affected by different treatments, whereas, the maximum values of total yield were produced when strawberry plants received mineral nitrogen fertilizer combined with foliar application by potassium and boron followed, in decreasing order, by mineral nitrogen fertilizer with foliar spraying by potassium alone. The increases over the inorganic nitrogen fertilizer only were 8.37% and 5.45% in the first season

and 5.49% and 6.49% in the second season for both superior treatments, respectively. On the contrary, the lowest values were found by compost manure alone in the two growing seasons. These results might be due to the increase in vegetative growth characters and dry weight contents (Table 3). It may also be stated that the sufficient application and the efficient absorption of N and foliar potassium and boron addition were coupled together to promote the production of more photosynthesis required for good fruit strawberry yield and its components. These results are in agreement with those reported by El-Shall *et al*. (2003), Moussa *et al*. (1993), Rauf *et al*. (1998), Wojcik and Lewondowski (2003).

Table 5: Total yield and its components of strawberry fruits as affected by compost manure with foliar spraying of potassium and boron during 2006/2007 and 2007/2008 seasons.

Characters	Early yield (t/fed)		Total yield (t/fed)		Total yield (g plant)		Marketable yield (t/fed)		Culls yield (t/fed)	
Treatments	2006/7	2007/8	2006/7	2006/8	2006/7	2007/8	2006/7	2007/8	2006/7	2007/8
Mineral nitrogen fertilizer (check)	1.872b	1.912b	18.755c	19.600b	468.95c	490.31b	18.305c	19.172b	0.450a	0.427a
Compost manure	1.450d	10527d	14.550f	15.545d	363.87f	388.695d	14.550f	15.320d	0.200d	0.225de
Mineral nitrogen with potassium	1.947ab	2.037a	19.782b	20.837a	494.657b	520.00a	19.412ab	20.450a	0.370c	0.375c
Compost with potassium	1.502d	1.512d	15.767e	15.387d	394.172e	384.792d	15.562e	15.155d	0.200d	0.232d
Mineral nitrogen with boron	1.945ab	1.940b	19.522b	19.855b	490.682b	496.440b	19.237b	15.450b	0.380c	0.405ab
Compost with boron	1.720c	1.740b	17.295d	17.645c	432033d	441.620c	17.060d	17.440c	0.180e	0.200e
Mineral nitrogen with potassium and boron	2.020a	2.027a	19.352a	20.677a	508.875a	517.050a	19.997a	20.300a	0.400b	0.377bc
Compost with potassium and boron	1.745c	1.762c	19.542d	17.870c	438.752d	446.620c	17.372d	17.672c	0.170e	0.197e

Data in Table (6) results indicated that plants received compost manure with foliar spraying by potassium and boron gave the highest values of average fruit weight, length and diameter compared with other treatments in both seasons. These results could be attributed to be the role of organic nitrogen fertilizer as compost in enhancing vegetative growth characters (3), which increases the photosynthetic rates leading to an increase the net assimilation rates, consequently this will be reflected on yield components. In addition to the positive function of potassium foliar addition in plants which include energy metabolism and enzyme activation on exchange rate and nitrogen activity as well as enhanced carbohydrate movement from the

shoots to storage organs (fruits). Similar results were obtained by Mengel and Kirkby (1987). As to role boron, it including functions sugar transport, carbohydrate metabolism and RNA metabolism (Blevins *et al.,* 1994).

Table 6: Average fruit weight, length and diameter of strawberry as affected by compost manure with foliar spraying of potassium and boron during 2006/2007 and 2007/2008 seasons.

Characters	Average fruit weight/ plant (g)			Average fruit weigh/plant (g)			Fruit length(cm)		Fruit diameter(cm)	
	2006/ 2007			2007/ 2008						
Treatments	First	Mid	End	First	Mid	End	2006/7	2007/8	2006/7	2007/8
Mineral nitrogen fertilizer (check)	20.23c	14.51e	9.20h	12.24f	15.63h	8.76e	2.88e	2.15f	1.23e	0.38f
Compost manure	20.15c	14.67e	9.52g	21.23h	15.91g	8.45f	2042d	2038e	1.33de	1.42e
Mineral nitrogen with potassium	20.27c	15.43d	10.14f	22.40e	16.49f	8.75e	2.90c	2.88c	1.37d	1.48d
Compost with potassium	20.71c	15.65d	10.59e	21.93g	16.76e	8.56f	2.37d	2.35e	1.40d	1.52c
Mineral nitrogen with boron	20.18c	17.45c	11.04d	23.44d	18.68d	9.38d	2.94c	2.80d	1.63c	1.92c
Compost with boron	21.26c	17.50e	11.71c	23.71c	20.65b	9.74c	2.92c	2.82d	1.78b	1.92b
Mineral nitrogen with potassium and boron	23.50b	20.18b	13.43b	25.15b	25.25b	10.50b	3.27b	3.11b	1.95a	1.93b
Compost with potassium and boron	25.12a	20.85a	13.77a	27.39a	21.89a	11.15a	3.64a	3.84a	2.04a	2.02a

Fruits quality

Results presented in Table (7 & 8) indicated that total soluble solids, vitamin C, total sugar and fruit moisture percent of fruits strawberry were significantly affected by the various nutrients sources in both growing seasons. The highest values of average fruit weight, total soluble solids and vitamin C, and the lowest values 90.09% and 90.00% of fruit moisture in fruit were with plants supplied by compost manure with foliar spraying by potassium and boron in both seasons. On the other hand, the highest values 93.70% and 94.53% of fruit moisture were detected in fruits strawberry produced with mineral nitrogen fertilizer alone in the two seasons. These results could be attributed to the effect of compost manure on the on the increase of nutrient absorption and photosynthesis process that lead to more accumulation of metabolites in reproductive organs which in turn improve fruits quality of strawberry (Hagreaves and *et al.*, 2009; Wang and Lins, 2002) Adding potassium and boron as foliar spraying plays a key role in improve size of fruits and stimulates fruits color. It is necessary for the translocation sugar and formation of carbohydrates consequence increase fruits quality. These results are in agreement with reported by Verma *et al*. (1991), Velez-Ramos *et al* (1991) and (Fawazy *et al*. 2007).

Table 7: Total soluble solids (TSS), vitamin C, fruit juice, total sugar and fruit moisture of strawberry fruits as affected by compost manure with foliar spraying of potassium and boron during 2006/2007 and 2007/2008 seasons.

Characters	TSS %		Vitamin C mg/100g F.W.		Fruit juice		Total sugar %		Fruit moisture%	
Treatments	2006/7	2007/8	2006/7	2006/8	2006/7	2007/8	2006/7	2007/8	2006/7	2007/8
Mineral nitrogen fertilizer (check)	7.36h	8.56 f	29.16g	30.39c	6.12g	5.24h	18.45e	19.62f	93.70a	94.53a
Compost manure	8.56e	8.92d	30.17d	31.33bc	6.28f	5.34g	18.52e	19.75e	91.15d	92.19d
Mineral nitrogen with potassium	7.90g	8.71e	29.30f	30.46bc	7.20e	6.13f	18.40e	19.46g	92.50b	93.70b
Compost with potassium	8.65d	8.68f	30.19d	30.64b	7.54d	6.21e	19.72ed	20.60d	91.06d	92.81c
Mineral nitrogen with boron	8.42f	9.25c	30.03e	31.19bc	7.53d	7.35d	19.60d	20.67d	92.42b	92.22d
Compost with boron	8.73c	9.80b	31.19c	31.90b	7.75c	7.55c	20.46b	21.26b	91.09d	92.06e
Mineral nitrogen with potassium and boron	8.88b	9.84b	35.19b	35.47a	8.88b	8.68b	19.91c	20.93c	91.24c	90.17f
Compost with potassium and boron	9.28a	10.10a	36.50a	35.46a	9.30a	9.50a	22.88a	23.65a	90.09e	90.03g

Chemical contents

It evident from Table (8) that the effect of compost manure compiled foliar spraying potassium and boron of strawberry had positive significant effect on total titratable acidity % (T.T.A. %) on the two growing seasons. In general, the highest values of total titratable acidity were obtained with the plants supplied mineral nitrogen fertilizer alone, or with potassium foliar application.

Data in the same Table (8) illustrate that the highest values of potassium percentage in the leaves were obtained when nitrogen fertilizer was added as an inorganic and organic compost manure with foliar application of potassium and boron in the two seasons, While, the differences did no reach to the level of significance for potassium content in the leaves between compost manure and mineral nitrogen fertilizer with foliar application by potassium and boron in the first season. The highest values of potassium in the fruits were recorded in the plants received foliar spray of potassium, regardless the application of nitrogen, boron or compost manure in the two seasons. These results may be due to the quick absorption of mineral K fertilizer. These results are in harmony with those obtained by Moussa(1993), Miner *et al*. (1997), Hewedy (2000) and Hagreaves (2009).

Table 8: Total titratable acidity, K percent in the leaves and fruits of strawberry plants as affected by compost manure with foliar spraying of potassium and boron during 2006/2007 and 2007/2008 seasons.

Treatments	Total titratable acidity mg/100g F.W.		K in leaves %		K in Fruits %	
	2006/7	2007/8	2006/7	2007/8	2006/7	2007/8
Mineral nitrogen fertilizer (check)	0.448a	0.460a	1.05d	1.28f	1.32b	1.48e
Compost manure	0.422bc	0.416c	1.17c	1.36e	1.43b	1.42d
Mineral nitrogen with potassium	0.432b	0.468a	1.73b	1.58c	1.80a	1.59b
Compost with potassium	0.412c	0.396d	1.77b	1.84a	1.67ab	1.61b
Mineral nitrogen with boron	0.424bc	0.424b	1.19e	1.46d	1.38b	1.40d
Compost with boron	0.387d	0.382e	1.18c	1.17g	1.41b	1.42d
Mineral nitrogen with potassium and boron	0.393d	0.408c	1.93a	1.76b	1.71ab	1.62b
Compost with potassium and boron	0.356e	0.360f	1.90a	1.76b	1.69ab	1.81a

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تأثير سماد الكمبوست والرش الورقى بالبوتاسيوم والبورون على النمو ومحصول وجودة ثمار الفراولة

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تم إجراء تجربتين حقليتين ناجحتين فى موسميين متتاليين(٢٠٠٦/٢٠٠٧ و ٢٠٠٧/٢٠٠٨) على محصول الفراولة صنف سويت شارلى فى أرض رملية فى المزرعة البحثية بمحطة جنوب التحرير التابعة لمعهد بحوث البساتين بمحافظة البحيرة. لدراسة تأثير سماد الكمبوست عند معدل ٢٠ طن للفدان مقارنة بالسماد النتروجينى المعدنى عند معدل ٢٠٠ كجم للفدان (١٠٠% من المعدل الموصى به للفدان كنترول) مع الرش الورقى بعنصرى البوتاسيوم عند تركيز ١% فى صورة سترات البوتاسيوم والبورون عند عند تركيز ٥٠ ppm على النمو ومحصول وجودة ثمار الفراولة بالإضافة المحتوى الكيماوى.

وكان التصميم المستخدمة فى التجربة هو قطاعات كاملة العشوائية فى ثلاث مكررات فى كلا من موسمى الزراعة وقد أشارات النتائج أن صفات النمو الخضرى والتى تضمنت طول النبات,وعدد التيجان للنبات,وعدد المدادات للنبات,وعدد الأوراق للنبات,والوزن الطازج والجاف للنبات,وكذلك المحصول المبكروالمحصول الكلى و المحصول القابل للتسويق قد أعطت أعلى القيم مع المعاملة التى مدت بالسماد النتروجينى بالإشتراك مع الرش الورقى بالبوتاسيوم والبورون. بالإضافة إلى الحموضة الكلية تم الحصول عليها مع النباتات التى سمدت بالنتروجين المعدنى بمفرده علاوة على أن النسبة المئوية للبوتاسيوم فى الأوراق و الثمار قد سجلت مع السماد النتروجينى المعدنى مع الرش الورقى بالبوتاسيوم والبورون أو البوتاسيوم بمفردة فى الموسم الأول و الثانى. وفى نفس الإتجاه وجد أعلى القيم من متوسط وزن الثمرة,و النسبة المئوية للمواد الصلبة الكلية ,و فيتامينC بالإضافة إلى نسبة المئوية للعصير فى الثمار مع النباتات التى مدت بسماد الكمبوست مع الرش الورقى بالبوتاسيوم والبورون فى كلا موسمى الزراعة. من ناحية أخرى سجلت أقل قيم من النسبة المئوية لرطوبة الثمرة, و المحصول الغير قابل للتسويق مع إضافة سماد الكمبوست مع إضافة الرش الورقى بالبوتاسيوم و البورون.

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