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THE IMPACT OF ORGANIC AND MINERAL FERTILIZATIONS, PLANT SPACING AND FOLIAR APLICATON OF YEAST AND GARLIC EXTRACT ON SEED PRODUCTION OF SQUASH.
1-VEGETATIVE GROWTH AND LEAF CHEMICAL CONSTITUENTS

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ABSTRACT

This study was carried out during the two summer seasons of 2011 and 2012 at Sakha Agricultural Research Station Farm, Kafr El-Sheikh Governorate, Egypt on summer squash (*Cucurbita pepo* L.) El-Askandarani cultivar to study the impact of plant spacing(30,40 and 60cm between plants), nitrogen fertilizer sources (organic and inorganic) and foliar spray with biostmulants(garlic or yeast extracts) and their interactions on vegetative parameters and leaf chemical constituents.Resultes indicated that, the highest values of vegetative growth characters i.e., plant length, number of leaves, fresh and dry weight, leaf area and chlorophyll contents in leaves as well as chemical constituents of leaves(N, P, K, Fe, Zn and Mn)were recorded when plants growing at 60 cm between plants. Squash plants sprayed with 2.5cm\l garlic extracts recorded better growth performance and higher values of chemical constituents of leaves than unsprayed plants. Also fertilized plants with 50%organic+50%inorganic recorded the highest significant values of most aforementioned parameters compared with control. The best results of both vegetative growth parameters and chemical constituents of leaves were recorded when plants growing at 60cm between them and fertilized by 50%organic as compost +50%inorganic as ammonium nitrate (100 kg/fed.) and sprayed with garlic or yeast extracts at 2.5cm/l in both seasons. Therefore, this treatment could be recommended for improving squash plants performance under similar condition of this study.

Keywords: Summer squash, plant spacing**,** nitrogen fertilizer sources**,** organic farming, foliar application**,** garlic extract**,** yeast extract**,** vegetative growth**,** chemical constituents.

INTRODUCTION

Summer squash (*Cucurbita pepo* L.), is one of the most important crop of the family Cucurbitaceae, and of highly polymorphic vegetable grown during summer in tropical and subtropical condition. Plant density is one of the important aspect for production system of different crops. Optimum plant spacing ensures proper growth and development of plant resulting maximum yield of crop and economic use of land. Recent studies showed that increasing plant spacing within plants led to improvement growth of plants compared with the closer spacing (Fayed, 2010, Islam *et al*., 2011, Babayee *et al*., 2012).The excessive use of nitrogen fertilizer represents the major factor of plant production cost, increase soil salinity, lead to serious health

hazards and creates some pollution of agro-ecosystem (Fisher and Richter, 1984).The optimum fertilizer requirements for summer squash production can be realized not only with the recommended quantity, but also through using proper sources that are considered one of the most important factors affecting the vegetative growth. Organic matter such as animal manure, green manure, plant residue and composted organic matter is accepted as a good soil management practice in sustainable crop production because it enhances soil fertility through the modification of soil physical, chemical and biological properties. (Asuegbu and Uzo, 1984 and El-Gizy, 1994).Moreover, organic manures play an important role in nutrients solubility and activate physiological and biochemical processes in plant leading to the increase in plant growth and nutrients uptake (Dahdouh *et al*., 1999 Sarhan *et al.,* 2011, Adesina *et al*., 2011,).Recently, great attention has been focused on the possibility of using natural and salty substitute, i.e. dry yeast and garlic extracts as a substitute for artificial chemical fertilizers which have pollutant effects in the soil and plants and in turn, cause damage of the human health, foliar sprays of yeast or garlic extracts are used in vegetable crops production for stimulating and hastening plant growth, flowering and fruit set and consequently increasing early and total yield (Shafshak,2004, El-Sawy,2007; Shehata *et al.,* 2012, Mahmoud *et al*., 2013). Hence, the objective of this work was to study the impact of organic, mineral fertilizers, plant spacing and foliar application of garlic and yeast extracts on growth and leaf nutrient composition of summer squash.

MATERIALS AND METHODS

This study was carried out during the two summer seasons of 2011 and 2012 at Sakha Agricultural Research Station Farm, Kafr El-Sheikh Governorate, Egypt on summer squash (*Cucurbita pepo* L.) El-Askandarani cultivar to study the impact of plant spacing, nitrogen fertilizer sources (organic and inorganic) and foliar spray with biostmulants and their interactions on vegetative parameters and leaf chemical constituents of summer squash.

The physical and chemical properties of the experimental soil are given in Table (1).

Table(1):Physical and chemical and properties of experimental soil in 2011 and 2012 seasons.

Seasons	O.M (%)	Clay (%)	Silt (%)	Sand (%)	Texture class	E.C (dS\m)	PH	Available(Mg\Kg soil)		
								N	P	K
1st	1.96	42.45	23.92	33.63	Clay	4.96	7.7	26	9.5	650
2nd	2.12	43.22	24.20	32.58	Clay	4.60	7.5	37	11	683

The experimental layout was split-split plots system in a randomized complete block design with three replicates. Plant spacing (30, 45 and 60 cm between plants) were randomly distributed in the main plots which were subdivided to three sub-plots, each one contained foliar application, i.e., control(water spray), yeast extract at rate 2.5cm\l and garlic extract at rate 2.5cm\l sprayed at three times (after two, four and six weeks from seed sowing date). while the nitrogen fertilizer sources (mineral and organic) were assigned to the sub-sub plots(Table 2). Mineral fertilizer as ammonium nitrate (33.5% N) was added in three equal portions after 2, 4 and 6 weeks from seed sowing date. Organic fertilizer (compost) was determined according to nitrogen percentage input (chemical analysis for total nitrogen) to provide 60 kg N/fed.The chemical analysis of compost is presented in Table (3)

This experiment included 45 different treatment combinations, each plot was comprised of three ridges 5 m length, 1 m width, the sub-sub plot area was 15 m^2. Seeds were sown on 7^{th} and 10^{th} March in the first and second seasons, respectively

The normal cultural practices for the commercial summer squash production were followed according to the instructions advised by the Ministry of Agricultural

Table(2):Quantity of organic and mineral fertilizers for the different nitrogen source treatments in 2012 and 2013 seasons.

Fertilizer treatments	**Quantity of fertilizer**		
	Compost ton/fed		**Mineral fertilizer kg/fed. ammonium nitrate**
	2011	**2012**	
100% organic (compost)	5	4.60	-
100% mineral	-	-	200
75% organic + 25% mineral	3.75 1.25	3.45 1.15	50 150
75% mineral + 25% organ 50% organic + 50% mineral	2.5	2.3	100

Table(3): chemical analysis of compost during 2011 and 2012 seasons.

Seasons	**Macro-elements (%)**			**O.M(%)**
	N	P	K	
1^{st}	1.2	0.48	0.75	37.5
2^{nd}	1.3	0.49	0.76	38.2

Data recorded:

Growth parameters:

A random sample of five plants were taken from each plot at 50 days after sowing (DAS) in both seasons of the study for measuring the growth parameters of summer squash plants, i.e., Plant fresh and dry weight (g), No. of leaves/plant, Leaf area/plant (cm^2) was calculated according to Koller (1972) and total chlorophyll was measured by A Minolta SPAD chlorophyll meter (Yadava, 1986).

Chemical constituents of leaves:

The samples of leaves was randomly taken for estimating minerals content. In addition, nitrogen was determined by using the Micro-Kjeldahl method (Piper, 1950). Phosphorus was determined by using the spectrophotometers (King, 1951). Potassium was determined according to (Jackson, 1967).Iron, manganese and zinc were determined according to Chapman and Pratt (1978).

Statistical analysis:

Data were tested by analysis of variance according to Little and Hills (1975). Duncan's Multiple Range test was used for comparison among treatments means (Duncan, 1955).

RESULTS AND DISCUSSION

Growth parameters

Effect of plant spacing:

Data presented in Table (4) show that growth parameters was significantly affected by plant spacing in the two growing seasons. The results indicated that increasing plant spacing from 30 to 60 cm increased values of plant growth parameters. The decreasing in plant growth due to decrease plant spacing might be attributed to the high competition for nutrients and water among plants with the adjoining plants in the row (Kultur *et al*., 2001). In the same tendency, Dimitrov and Kanzirska (1995); Saad (2002); Ban *et al*. (2006); Fayed (2010); Islam *et al.* (2011) and Babayee *et al*. (2012), reported that growth parameters of squash plants were increased with increasing plant spacing.

Effect of foliar application:

Comparing the effect of foliar application treatments (yeast and garlic extracts), it was found that all growth parameters were increased in response to spraying all foliar in the two growing seasons as compared to the check treatment (control). Data in Table (4) clearly show that the highest significant values of the aforementioned parameters were recorded by spraying plant with garlic extracts following by spraying yeast extract, while the check treatment (control) recorded the lowest values of vegetative parameters in both seasons. Regarding the growth enhancing potential of garlic or yeast extract might be attributed to being contain natural sources of many growth promoting substances (macro and micronutrients, IAA,) (El-Desouky *et al*., 1998 and Nagodawithana, 1991). These results are in harmony with the findings of Helmy (1992) on summer squash; El-Ghamriny *et al*. (1999) on

tomato; El-Sawy (2007) on cucumber; Shehata *et al*. (2012) on cucumber and Swelam (2012) on pepper plants.

Table (4): Effect of plant spacing, foliar application and nitrogen fertilizer sources on vegetative growth characters of summer squash during 2011 and 2012 summer season.

Treatments	Plant fresh weight (g)		Plant dry weight (g)		No. of leave /plant		Plant leaf area (cm^2)		Total chlorophyll (SPAd)	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Plant spacing (cm)										
30	334.39 b	324.36 c	39.34 b	38.21 c	21.71 b	21.06 b	2843.26 b	2735.71 b	35.13 c	33.51 c
45	356.28 a	345.57 b	41.93 a	40.72 b	23.03 a	22.42 a	3027.21 a	2914.28 a	40.33 b	39.42 b
60	361.59 a	350.85 a	42.63 a	41.54 a	23.12 a	22.35 a	3075.04 a	2985.09 a	45.42 a	44.08 a
F. test	**	**	**	**	**	**	**	**	**	**
Foliar application										
Control	315.85 c	308.55 c	37.13 c	36.03 c	21.66 b	21.05 c	2684.76 c	2606.46 c	38.53 c	36.88 c
Yeast extract	358.46 b	347.86 b	42.28 b	41.14 b	22.82 a	22.16 b	3046.23 b	2954.23 b	40.65 b	39.46 b
Garlic extract	377.97 a	364.38 a	44.49 a	43.41 a	23.29 a	22.61 a	3214.52 a	3073.88 a	41.68 a	40.67 a
F. test	**	**	**	**	**	**	**	**	**	**
N fertilizer sources										
100% inorganic	350.14 c	339.63 bc	41.21 c	40.32 b	22.60 bc	21.99 bc	2983.41 c	2860.61 bc	40.11 bc	39.12 c
75% inorganic + 25% organic	358.74 b	347.97 ab	42.22 b	40.98 b	23.01 b	22.36 b	3050.02 b	2958.65 ab	40.73 b	39.41 b
75% organic + 25% inorganic	343.11 d	332.95 c	40.45 d	39.31 c	22.18 c	21.50 c	2914.69 d	2790.27 c	39.82 c	38.47 d
50% organic + 50% inorganic	365.82 a	351.11 a	43.06 a	41.75 a	23.97 a	23.28 a	3107.78 a	3014.58 a	41.78 a	40.16 a
100% organic	336.01 e	329.64 c	39.58 e	38.41 d	21.18 d	20.57 d	2853.30 e	2767.74 c	39.01 d	37.88 e
F. test	**	**	**	**	**	**	**	**	**	**

Effect of fertilizer treatments:

Data presented in Table 4 reveal that the highest values of plant growth parameters (plant fresh and dry weight, No. of leaves, plant leaf area and total chlorophyll) were produced by plants fertilized with 50% organic + 50% inorganic fertilizer treatment followed by 75% inorganic + 25% organic, while the lowest values were obtained by 100% organic fertilizer treatment. Improving vegetative growth parameters due to treatment of compost plus chemical N fertilizer compared with using each alone can be attributed to that applying mineral N stimulated the rate of decomposition of compost and produced higher humus substances which in turn improve the physical and chemical properties of the soil as well as increase both the exchangeable water soluble of nutrients and their uptake (Cooke, 1972). Consequently, vegetative growth parameters would be increased. In this concern, Mafadi and Gohar (1975) attribute this action due to adsorption $NH4^+$ ion on the surface of compost and became available to plant uptake. Similarly, Jha *et al.* (1996) stated that applying chemical fertilizer with organic manures increased both N mineralization and nitrification which in turn enhance the access to NH_4-N and result in greater number of viable cells of nitrifying bacteria, especially with chemical fertilization. The superiority of 50% inorganic N + 50% compost treatment in enhancing vegetative growth of summer squash plants may be due to that such organic manure is capable as a source of many essential

macro and micronutrients to plants (Remington and Frances, 1955) to serve as a good natural soil texture conditioner being rich in organic matter and increase availability and uptake of NPK which positively reflected on plant cell elongation and division as well as stimulate photosynthesis and metabolic processes. The obtained results are in accordance with those of Abd El-Kawy (2003); Saad (2002); Ghoname and Shafeek (2005); Hanna *et al.* (2005); Farrag (2009) and Swelam (2012); Baghdadi *et al.* (2012); Shehata *et al*. (2012); Mahmoud *et al.* (2013)

Effects of interactions between each two of plant spacing, foliar application and fertilizer treatments.

Data presented in Table (5) noticed that the highest values of growth parameters were recorded by the plants planted at spacing 60 cm and sprayed with garlic extract followed by yeast extract treatment. On the other hand, the lowest values recorded by plants at spacing 30 cm and sprayed with water. Meanwhile, the plants grown at spacing 60 cm and fertilized with 50% inorganic + 50% organic tended to increase the growth parameters in both seasons compared to the lowest values in this respect obtained by plants growing at 30 cm and fertilized with 100% organic treatment. Regarding interactions between foliar application and fertilizer treatments, data in the same table showed that, fertilized plants with 50% organic + 50-% inorganic and sprayed with garlic extract had better vegetative growth parameters .

Effect of interaction among plant spacing, foliar application and fertilizer treatments:

Data in Table (6) show that, there were significant differences in plant fresh, dry weight and plant leaf area due to the combination interaction among plant spacing, foliar and N fertilizer sources treatments in both seasons. On the other hand, the differences were not significant as for no. of leaves/plant in both seasons and in the first seasons as for total chlorophyll. The highest plant fresh and dry weight and largest leaf area was achieved by planting summer squash plants at spacing 60 cm and fertilized with 50% inorganic + 50% organic and sprayed with garlic extracts compared with the lowest values in this respect produced by plants at 30 cm spacing and fertilized with 100% organic without spraying.

Chemical constituents of leaves

Effect of plant spacing:

Chemical constituents (N, P, K, Fe, Zn and Mn) concentrations of squash leaves were reflected successive and significant increments with increasing plant spacing in both seasons. Table 7 showsthat summer squash planted at 60 cm spacing gave the highest elements percentage in leaves followed by 45 cm spacing compared to the lowest percentage resulted by 30 cm spacing treatment. Increasing plant density decreased N, P, K, and Fe, Zn and Mn content. This may be due to the increased competition between and within plants. In this concern, Hanaa and Adams (1992), Sanders *et al*. (1993), Saad (2002) found that increasing plant spacing improvement the elements content in leaves of pumpkin plants.

T5

T6

Effect of foliar application:

Data in Table (7) show that garlic extract foliar application treatment increased leaves mineral contents followed by yeast extract foliar application compared to the lowest one obtained by control treatment. Improving mineral leaves contents of summer squash plants by garlic or yeast extract treatment, may be due to presence of macro and micro-nutrients in the extracts of garlic or yeast. Similarly, El-Ghamriny *et al.* (1999) on tomato; Shafshak *et al*. (2004) on squash plants; El-Sawy (2007) and Shehata *et al*. (2012) on cucumber plants, found that the spraying of garlic or yeast extract improved leaves and seed mineral contents.

Effect of fertilizer treatments:

As for the effect of N fertilizer sources on chemical constituents of leaves, data in Table (7) show that, squash plant fertilized with 50% organic + 50% inorganic treatment gave the highest N, P, K, Fe, Zn and Mn leaf contents compared with the lowest mineral contents 100% organic treatment in both seasons.In the same tendency, Alphons and Saad (2000) on cucumber; Adam *et al.* (2002); Farrag (2009), on cantaloupe, Taha *et al.* (2011) on squash found that fertilizing plants with organic plants increased macro- and microelements contents in leaves and seed.

Effects of interactions between each two of plant spacing, foliar application and fertilizer treatments.

Data in Table (8) clear that, the combined interaction between plant spacing at 60 cm plus foliar garlic extracts gave the highest percentage of macro and microelements in leaves compared to the lowest values obtained by squash plants growing at 30 cm without spraying (control).As for, the combined interaction between plant spacing and fertilizer treatments, data presented in Table (8) show that the highest values of N, P, K, Fe, Zn and Mn contents in leaves were achieved by plant spacing 60 cm plus applying 50% organic. + 50% inorganic fertilizers in both seasons except as for P in the first season. Regarding effect of the interaction between foliar application and fertilizer treatments on chemical constituents of leaves, data in Table (8) show that there were non-significant differences about N%, P% in the first season and K% in the second season. Meanwhile, the differences were not affected as for Fe and Mn in both seasons. The plants fertilized with 50% organic + 50% inorganic plus sprayed with garlic extract gave the highest values in this respect.

Effect of interaction among plant spacing, foliar application and fertilizer treatments.

As for the effect of the interaction among plant spacing, foliar application and N fertilizer on chemical constituents of summer squash leaves during 2011 and 2012 seasons, data in Table (9) declared that, the squash plants growing at 60 cm and fertilized with 50% inorganic + 50% organic and sprayed with garlic extract tended to increase the leaves mineral contents (N, P, K, Fe, Zn and Mn).

T7

1700

T8

T9

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تـأثير التسـميد العضـوي والمعدني ومسـافة الزراعـة والـرش الـورقي بمستخلصـات الخميرة والثوم على إنتاج تقاوي قرع الكوسه

١- النمو الخضري والمحتوى الكيماوي للأوراق .

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أجريت هذه الدراسة فى مزرعة محطة بحوث البساتين بسخا ـ محافظة كفرالشيخ خلال الموسمين الصيفيين ٢٠١١م ، ٢٠١٢م على الكوسة الصيفى صنف اسكندرانى بهدف دراسة تأثير مسافات الزراعة (٣٠،٤٠ و٦٠ سم بين النباتات) والتسميد النيتروجينى (عضوى ومعدنى) بالإضافة إلى الرش بالمنشطات الطبيعية (مستخلص الثوم والخميرة)على النمو الخضرى والمحتوى الكيماوي لأوراق نباتات الكوسة الصيفى

ويمكن تلخيص اهم النتائج المتحصل عليها كالتالى:-

أعطت معاملة زراعة النباتات على مسافة ٦٠سم بين النباتات أعلى القيم لصفات النمو الخضرى والممثلة فى طول النبات وعدد الأوراق للنبات والوزن الرطب والجاف للنبات ، وكذا المساحة الورقية والمحتوى الكلى من الكلوروفيل وكذلك المحتوى الكيماوي للأوراق مثل النيتروجين والفوسفور والبوتاسيوم والحديد والزنك والمنجنيز.كذلك أدى رش النباتات بمستخلص الثوم الى زيادة معنوية فى كل قياسات النمو الخضرى وكذا والمحتوى الكيماوي للأوراق مقارنة بالنباتات الغير معاملة فى حين سجلت النباتات التى تم تسميدها ٥٠%سماد عضوى (كمبوست)+٥٠%سماد معدنى (نترات نشادر) أعلى زيادة معنوية فى معظم الصفات المدروسة مقارنة بالكنترول .

من هذا نستخلص ان افضل النتائج بالنسبة لصفات النمو الخضري والمحتوى الكيماوي للأوراق ناتجة من زراعة نباتات الكوسة على مسافة ٦٠سم والتى تم تسميدها ب٥٠%سماد عضوى (كمبوست)+٥٠%سماد معدنى (نترات نشادر) وتم رشها بمستخلص الثوم ٢,٥مل\لتر .

قام بتحكيم البحث

أ.د / سمير طة العفيفى	**كلية الزراعة – جامعة المنصورة**
أ.د / محمد أمام رجب	**كلية الزراعة – جامعة عين شمس**

Table(5): Effects of interactions between each two of plant spacing, foliar application and nitrogen fertilizer sources on vegetative growth characters of summer squash during 2011 and 2012 seasons.

Treatment		Plant fresh weight (g)		Plant dry weight (g)		No. of leaves /plant		Plant leaf area (cm^2)		Total chlorophyll (SPAD)	
Plant spacing (cm)	Foliar application and N fertilizer source	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
30	Control	304.87 d	295.73 f	35.81 d	34.76 e	19.70 f	19.14 e	2589.18 e	2511.52 d	32.51 h	29.84 h
	Yeast	328.00 c	318.22d	38.58 c	37.43 d	22.88 bcd	22.71 bc	2788.80 d	2704.30 c	35.73 g	34.67 g
	Garlic	370.30 ab	358.14 bc	43.61 ab	42.42 bc	22.56 cde	21.80 cd	3152.35 bc	2991.31 b	37.14 f	36.04 f
45	Control	320.38 c	310.69 e	37.69 c	36.58 d	23.23 abc	22.60 ab	2727.10 d	2645.26 c	39.12 e	37.94 e
	Yeast	367.26 b	356.24 c	43.21 b	42.01 c	22.38 b-e	21.72 cd	3121.80 c	3028.09 ab	40.22 d	39.06 d
	Garlic	381.24 a	369.80 a	44.92 a	43.59 ab	23.48 ab	22.93 a	3232.72 ab	3069.48 ab	41.77 c	41.21 c
60	Control	322.30 c	319.24 b	37.90 c	36.74 d	22.04 e	21.40 d	2738.00 d	2662.60 c	44.12 b	42.85 b
	Yeast	380.13 ab	369.11 a	45.05 a	43.65 ab	23.20 abc	22.56 ab	3228.64 ab	3131.81 a	46.03 a	44.65 a
	Garlic	382.35 a	364.20 ab	44.95 a	44.22 a	23.84 a	23.10 a	3258.49 a	3160.86 a	46.12 a	44.75 a
F. test.		**	**	**	**	**	**	**	*	**	**
Plant spacing x N fertilizer sources											
30	100% inorg.	338.81 e	328.63	39.78 d	38.66 c	21.70	21.05	2878.20 c	2680.64	35.09	33.44 L
	75% inorg+25% org.	340.52 e	330.28	40.07 cd	38.90 c	21.92	21.28	2892.02 c	2805.27	35.67	34.11 k
	75% org.+25% inorg.	324.83 f	315.05	38.22 e	37.22 d	21.57	20.95	2769.01 d	2685.31	34.74	33.16 L
	50% org.+50% inorg.	344.95 de	334.54	40.60 cd	39.34 c	22.93	22.14	2932.02 c	2844.28	36.71	34.46 j
	100% org.	323.10 f	313.31	38.02 e	36.91 d	20.43	19.85	2745.38 d	2663.05	33.42	32.43 m
45	100% inorg.	358.41 b	347.64	42.20 b	40.94 b	22.73	22.30	3054.01 b	2962.44	39.63	39.57 g
	75% inorg+25% org.	359.10 b	348.26	42.22 b	41.08 b	23.66	22.98	3052.10 b	2960.38	41.04	39.98 f
	75% org.+25% inorg.	346.72 cd	336.15	40.79 c	39.56 c	22.62	21.87	2942.04 c	2743.04	39.82	38.65 h
	50% org.+50% inorg.	373.12 a	361.95	44.01 a	42.71 a	24.77	24.16	3167.27 a	3072.14	42.14	40.91 e
	100% org.	344.21 de	333.86	40.49 cd	39.34 c	21.36	20.75	2921.01 c	2833.37	39.02	37.93 i
60	100% inorg.	353.30 bc	342.61	41.63 b	41.39 b	23.38	22.63	3018.13b	2937.72	45.61	44.31 b
	75% inorg+25% org.	376.73 a	365.35	44.34 a	42.99 a	23.42	22.82	3206.15 a	3110.15	45.46	44.13 b
	75% org.+25% inorg.	357.84 b	347.72	42.37 b	41.12 b	22.35	21.67	3033.41 b	2942.46	44.90	43.62 c
	50% org.+50% inorg.	379.32 a	356.83	44.58 a	43.20 a	24.21	23.53	3224.03 a	3127.32	46.46	45.11 a
	100% org.	340.91 de	341.75	40.27 cd	39.00 c	21.76	21.12	2894.01 c	2806.80	44.62	43.32 d
F. test		**	NS	**	**	NS	NS	**	NS	NS	**
Foliar application x N fertilizer sources											
Control	100% inorg.	318.61 g	309.07	37.42 g	36.33 g	21.77	21.10	2715.01 g	2644.18 g	38.78	37.06 i
	75% inorg+25% org.	319.12g	309.44	37.53 g	36.42 g	22.04	21.43	2710.40 g	2628.75 g	38.95	37.46 h
	75% org.+25% inorg.	309.41h	299.96	36.39 h	35.32 h	21.00	20.35	2629.06 h	2550.05 g	37.87	36.22 j
	50% org.+50% inorg.	323.90 g	314.12	38.04 g	36.91 g	23.24	22.68	2753.22 g	2670.73 fg	40.14	37.74 h
	100% org.	308.42 h	310.17	36.30 h	35.17 h	20.23	19.68	2617.12 h	2538.58 g	36.97	35.92 k
Yeast	100% inorg.	358.50 d	347.75	42.20 de	40.88 de	22.68	22.02	3048.10 d	2956.33 cd	40.68	39.51 e
	75% inorg+25% org.	372.61 c	361.40	43.83 c	42.63 c	23.71	23.12	3167.20 c	3071.85 bc	40.96	39.75 e
	75% org.+25% inorg.	349.54 e	339.68	41.50 e	40.26 e	22.00	21.31	2967.14 e	2877.68 de	40.27	39.09 f
	50% org.+50% inorg.	372.23 c	361.07	43.83 c	42.51 c	23.95	23.30	3164.30 c	3068.80 bc	41.68	40.43 c
	100% org.	339.51 f	329.36	40.06 f	38.88 f	21.75	21.08	2886.05 f	2799.00 ef	39.27	38.53 g
Garlic	100% inorg.	373.32 c	362.05	43.99 c	43.78 b	23.35	22.86	3188.60 c	2981.28 cd	40.86	40.74 b
	75% inorg+25% org.	384.61 b	373.06	45.27 b	43.92 b	23.25	22.54	3273.25 b	3175.20 ab	42.25	41.12 b
	75% org.+25% inorg.	370.44 c	359.27	43.49 c	42.32 c	23.55	22.84	3148.21 c	2943.07 cd	41.33	40.11 d
	50% org.+50% inorg.	401.35 a	378.13	47.31 a	45.83 a	24.72	23.85	3406.28 a	3304.22 a	43.57	42.31 a
	100% org.	360.21 d	349.38	42.42 d	41.21 d	21.57	20.95	3057.24 d	2965.64 cd	40.37	39.22 f
F. test		**	NS	**	**	NS	NS	**	*	NS	**

Table(6): Effects of interactions among plant spacing, foliar application and nitrogen fertilizer sources on vegetative characters of summer squash during 2011 and 2012 seasons.

Treatment			Plant fresh weight (g)		Plant dry weight (g)		No. of leaves/plant		Plant leaf area (cm^2)		Total chlorophyll SPAD	
Plant spacing, cm	Foliar applic.	N fertilizers sources	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
30	Control	100% inorg.	313.82 n	304.60 no	36.67 p	35.57 m	19.76	19.20	2665.10 p	2584.40 mno	32.42	29.59 s
		75% inorg+25% org.	314.94 n	305.31 no	37.03 p	36.00 m	19.60	19.06	2669.21 p	2588.90 mno	32.97	30.51 r
		75% org.+25% inorg.	288.81 o	280.12 o	33.93 q	32.97 n	19.56	19.00	2454.30 q	2380.63 o	32.04	29.43 s
		50% org.+50% inorg.	315.62 n	306.15 no	37.13 op	35.93 m	21.56	20.93	2682.12 p	2601.73 L-o	34.65	30.15 r
		100% org.	291.30 o	282.50 o	34.30 q	33.33 n	18.00	17.53	2476.34 q	2401.93 no	30.42	29.54 s
	Yeast	100% inorg.	327.62Lmn	317.82 k-n	38.57 mno	37.43 j-m	22.50	21.83	2785.03 m-p	2701.00 klm	35.52	34.46 p
		75% inorg+25% org.	335.51 jkL	325.44 j-n	39.43 klm	38.27 h-k	23.63	22.96	2851.40 k-n	2765.86 j-m	36.39	35.31 o
		75% org.+25% inorg.	320.83 mn	311.21 mn	37.73 nop	36.63 klm	22.66	22.06	2728.11 op	2644.46 k-o	35.56	34.52 p
		50% org.+50% inorg.	341.41 jk	331.11 h-n	40.17 kl	38.90 hij	23.50	22.86	2901.15 jkl	2814.43 g-m	36.74	35.69 o
		100% org.	314.82 n	305.50 no	37.03 op	35.93 m	22.10	21.43	2676.27 p	2595.74 L-o	34.45	33.41 q
	Garlic	100% inorg.	374.71 efg	363.51 c-g	44.10 e-h	42.97 cde	22.83	22.13	3185.51 fgh	2756.53 i-m	37.32	36.27 n
		75% inorg+25% org.	371.32 efg	360.14 c-g	43.73 e-h	42.43 de	22.53	21.83	3156.13 fgh	3061.03 d-h	37.65	36.54 n
		75% org.+25% inorg.	364.85 fgh	353.18 c-i	43.00 ghi	42.07 def	22.50	21.80	3124.41 gh	3030.83 d-h	36.64	35.55 o
		50% org.+50% inorg.	377.92 def	366.42 b-f	44.50 d-g	43.20 b-f	23.73	22.63	3213.20 efg	3116.70 c-f	38.72	37.56 m
		100% org.	362.81 gh	351.93 d-g	42.73 hi	41.47 ef	21.20	20.60	3084.12 hi	291.46 d-j	35.37	34.33 p
45	Control	100% inorg.	321.70 mn	312.11 mn	37.90 m-p	36.77 klm	22.83	22.10	2757.62 mop	2674.60 klm	39.54	38.37 L
		75% inorg+25% org.	317.15 n	307.51 no	37.27 op	36.17 lm	24.10	23.46	2695.24 p	2614.36 L-o	39.49	38.75 kL
		75% org.+25% inorg.	317.13 n	307.22 no	37.30 op	36.20 lm	22.36	21.63	2692.10 p	2611.63 L-o	38.31	37.17 m
		50% org.+50% inorg.	331.22 klm	321.55 k-n	38.97 Lmn	37.87 i-L	24.63	24.23	2816.31 L-o	2731.42 j-n	40.44	39.24 k
		100% org.	314.94 n	305.40 no	37.03 op	35.93 m	22.23	21.60	2675.17 p	2594.30 L-o	37.24	36.22 n
	Yeast	100% inorg.	372.61 efg	361.50 c-g	43.87 e-h	42.53 de	21.86	21.30	3176.25 fgh	3072.46 c-g	40.33	39.23 k
		75% inorg+25% org.	369.72 efg	358.70 c-h	43.50 e-h	42.63 de	23.96	23.23	3143.14 fgh	3048.63 d-h	40.42	39.21 k
		75% org.+25% inorg.	347.65 ij	337.13 g-h	40.87 jk	39.60 gh	20.80	20.03	2954.10 jk	2865.56 f-L	39.55	38.44 L
		50% org.+50% inorg.	382.81 cde	371.30 b-f	45.10 cde	43.77 bcd	24.53	23.86	3254.12 def	3155.70 b-f	41.33	40.11 j
		100% org.	363.64 jh	352.71 c-j	42.73 hi	41.50 ef	20.76	20.13	3091.18 hi	2998.10 d-i	39.51	38.35 L
	Garlic	100% inorg.	380.82 cde	369.42 b-c	44.83 c-f	43.53 bcd	23.50	23.50	3237.72 d-g	3140.26 cde	39.05	41.12 i
		75% inorg+25% org.	390.30 cd	378.61 a-d	45.90 cd	44.47 bc	22.93	22.26	3317.05 de	3218.18 a-d	43.23	41.95 h
		75% org.+25% inorg.	375.50 efg	364.24 c-g	44.20 e-h	42.87 cde	24.70	23.96	3179.16 fgh	2751.93 i-m	41.62	40.35 j
		50% org.+50% inorg.	405.51 b	393.43 ab	47.97 b	46.50 a	25.16	24.40	3432.70 bc	3329.30 abc	44.65	43.37 fg
		100% org.	354.06 hi	343.43 e-k	41.70 ij	40.60 fg	21.10	20.53	2998.45 ij	2907.73 e-k	40.33	39.23 k
60	Control	100% inorg.	320.16 mn	310.62 mn	37.70 nop	36.67 klm	22.73	22.00	2722.10 op	2673.56 klm	44.37	43.23 g
		75% inorg+25% org.	325.36Lmn	315.54Lmn	38.30 m-p	37.10 klm	22.43	21.76	2766.80 nop	2683.00 klm	44.41	43.12 g
		75% org.+25% inorg.	322.25 mn	312.61 mn	37.93 m-p	36.80 klm	21.06	20.43	2740.18 nop	2657.90 k-n	43.27	42.07 h
		50% org.+50% inorg.	324.80Lmn	315.12 mn	38.03 m-p	36.93 klm	23.53	22.90	2762.15 nop	2679.03 klm	45.21	43.85 def
		100% org.	318.84 mn	342.61 f-L	37.57 nop	36.23 Lm	20.46	19.93	2701.50 op	2619.50 L-o	43.25	42.02 h
	Yeast	100% inorg.	375.31 efg	364.01 c-g	44.17 e-h	42.67 de	23.70	22.93	3191.07 fgh	3095.53 c-f	46.23	44.86 b
		75% inorg+25% org.	412.54 ab	400.16 a	48.57 ab	47.00 a	23.53	23.16	3506.22 ab	3401.06 ab	46.09	44.75 b
		75% org.+25% inorg.	380.31 cde	370.82 b-f	45.90 cd	44.53 bc	22.53	21.83	3220.25 efg	3123.03 c-f	45.71	44.33 b-e
		50% org.+50% inorg.	392.63 c	380.85 abc	46.23 c	44.87 b	23.83	23.16	3336.35 cd	3236.26 a-d	46.91	45.51 a
		100% org.	340.05 jk	329.94 i-n	40.40 jkl	39.20 ghi	22.40	21.70	2890.15 j-m	2803.16 h-n	45.16	43.82 ef
	Garlic	100% inorg.	364.33 gh	353.30 c-i	43.03 ghi	44.83 b	23.73	22.96	3141.27 fgh	3047.17 d-h	46.21	44.83 b
		75% inorg+25% org.	392.32 c	380.51 a-d	46.17 c	44.87 b	24.30	23.53	3347.12 cd	3246.40 a-d	45.92	44.52 bc
		75% org.+25% inorg.	371.01 efg	359.84 c-g	43.27 f-i	42.03 def	23.46	22.76	3141.16 fgh	3046.45 d-h	45.74	44.42 bcd
		50% org.+50% inorg.	420.51 a	374.86 a-d	49.47 a	47.80 a	25.26	24.53	3574.62 a	3466.67 a	47.36	45.96 a
		100% org.	363.72 gh	352.82 c-j	42.83 hi	41.57 ef	22.43	21.74	3090.07 hi	2997.73 d-i	45.40	44.06 cde
F. test			**	**	**	**	NS	NS	**	*	NS	**

Table (7):Effect of plant spacing, foliar application and nitrogen fertilizer sources on chemical constituents of summer squash leaves during 2011 and 2012 summer season.

Treatments	N(%)		P(%)		K(%)		Fe (ppm)		Mn (ppm)		Zn (ppm)	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Plant spacing (cm)												
30	2.147 c	2.124 c	0.354 c	0.345 c	3.319 c	3.318 c	350.51 c	340.26 c	152.22 c	147.22 c	51.22 c	49.51 c
45	2.223 b	2.205 b	0.375 b	0.365 b	3.375 b	3.276 b	378.04 b	366.47 b	169.55 b	164.46 b	58.86 b	57.62 b
60	2.243 a	2.225 a	0.421 a	0.409 a	3.422 a	3.319 a	417.24 a	405.17 a	177.68 a	172.55 a	72.22 a	70.88 a
F. test	**	**	**	**	**	**	**	**	**	**	**	**
Foliar application												
Control	2.184 c	2.161 c	0.379 c	0.369 c	3.308 a	3.210 c	373.08 c	362.11 c	159.42 c	154.57 c	57.13 c	55.22 c
Yeast extract	2.201 b	2.181 b	0.384 b	0.374 b	3.358 b	3.256 b	382.20 b	371.02 b	166.43 b	161.37 b	60.53 b	58.73 b
Garlic extract	2.228 a	2.212 a	0.387 a	0.376 a	3.448 a	3.347 a	390.51 a	378.77 a	173.62 a	168.28 a	64.65 a	63.46 a
F. test	*	**	**	**	**	**	**	**	**	**	**	**
N fertilizer sources												
100% inorganic	2.202 c	2.187 b	0.383 c	0.373 c	3.374 c	3.270 c	381.85 c	370.11 c	166.52 c	161.37 c	60.62 b	58.26 c
75%inorganic+ 25% organic	2.223 b	2.198 b	0.385 b	0.375 b	3.388 b	3.292 b	384.44 b	372.48 b	168.07 b	163.07 b	62.44 a	60.48 b
75%organic+ 25% inorganic	2.186 d	2.165 c	0.381 d	0.371 d	3.353 d	3.250 d	379.74 d	368.59 d	165.01 d	159.74 d	59.43 bc	57.92 c
50%organic+ 50% inorganic	2.241 a	2.218 a	0.388 a	0.377 a	3.404 a	3.307 a	385.55 a	375.07 a	170.11 a	164.81 a	62.77 a	62.18 a
100% organic	2.170 e	2.154 c	0.379 e	0.369 e	3.339 e	3.236 e	378.07 e	366.92 e	162.85 e	158.17 e	58.55 c	56.85 d
F. test	**	**	**	**	**	**	**	**	**	**	**	**

Table(8): Effects of interactions between each two of plant spacing, foliar application and nitrogen fertilizer sources on chemical constituents of summer squash leaves during 2011 and 2012 seasons.

Treatment		N (%)		P (%)		K (%)		Fe (ppm)		Mn (ppm)		Zn (ppm)	
Plant spacing x Foliar application		2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
30	Control	2.124 f	2.093 g	0.351 i	0.341 g	3.218 i	3.122 g	342.73 i	332.86 i	145.06 h	140.61 h	48.11 h	46.66 i
	Yeast	2.146 e	2.128 f	0.356 h	0.346 f	3.317 h	3.219 f	349.93 h	339.93 h	152.26 g	146.86 g	51.42 g	49.53 h
	Garlic	2.173 d	2.152 e	0.357 g	0.347 f	3.421 c	3.312 c	358.86 d	348.11 g	159.33 f	154.21 f	54.26 f	52.33 g
45	Control	2.206 c	2.188 d	0.368 f	0.358 e	3.332 g	3.236 ef	369.13 f	358.06 f	159.94 f	154.93 e	56.64 e	54.73 f
	Yeast	2.224 b	2.204 c	0.371 e	0.366 d	3.358 f	3.252 e	378.26 e	366.81 e	170.06 e	165.26 e	60.11 d	57.72 e
	Garlic	2.237 b	2.221 b	0.382 d	0.371 c	3.435 b	3.340 b	386.73 d	374.53 d	178.67 b	173.22 b	59.93 d	60.41 d
60	Control	2.224 b	2.202 cd	0.418 c	0.407 b	3.376 e	3.272 d	407.41 c	395.41 c	173.26d	168.21 d	66.74 c	64.26 c
	Yeast	2.232 b	2.212 bc	0.421 b	0.409 ab	3.401 d	3.296 c	418.43 b	406.33 b	176.94 c	172.11 c	70.21 b	68.93 b
	Garlic	2.274 a	2.263 a	0.424 a	0.411 a	3.492 a	3.390 a	425.92 a	413.82 a	182.86 a	177.46 a	79.73 a	77.65 a
F. test.		*	*	**	**	**	**	*	*	**	**	**	**
Plant spacing x N fertilizer sources													
30	100% inorg.	2.134 g	2.119 h	0.354	0.344 m	3.312 h	3.213	351.01 g	339.71 L	152.88	147.88 j	50.56 h	48.88
	75% inorg+25% org.	2.161 f	2.117 h	0.356	0.347 L	3.339 g	3.237	352.44 i	341.82 k	153.34	148.67 j	53.01 g	51.11
	75% org.+25% inorg.	2.134 g	2.117 h	0.353	0.343 mn	3.308 h	3.204	348.32 k	338.74 L	151.11	145.86 k	49.11 h	47.42
	50% org.+50% inorg.	2.178 e	2.151 g	0.359	0.349 k	3.351 f	3.248	353.54 i	344.11 j	155.56	150.44 i	54.22 g	52.33
	100% org.	2.131 g	2.121 h	0.351	0.342 n	3.286 i	3.186	347.22 k	337.21 m	148.22	143.21 L	49.23 h	47.77
45	100% inorg.	2.222 d	2.207 d	0.375	0.366 h	3.379 e	3.275	378.11 f	366.72 g	169.44	164.22 f	59.33 e	57.12
	75% inorg+25% org.	2.243 c	2.228 c	0.378	0.367 g	3.388 de	3.296	382.13 e	369.21 f	171.12	165.66 e	60.56 e	58.55
	75% org.+25% inorg.	2.209 d	2.191 e	0.372	0.363 i	3.357 f	3.257	375.22 g	364.11 h	168.13	162.85 g	58.89 ef	56.67
	50% org.+50% inorg.	2.251 bc	2.229 c	0.379	0.369 f	3.403 c	3.310	381.67 e	370.92 e	173.22	168.11 d	58.56 ef	60.66
	100% org.	2.189 e	2.169 f	0.371	0.361 j	3.349 f	3.243	373.22 h	361.61 i	165.86	161.42 h	57.02 f	55.11
60	100% inorg.	2.252 bc	2.236 c	0.421	0.409 c	3.431 b	3.322	416.55 c	404.13 c	177.22	172.11 b	72.05 bc	68.76
	75% inorg+25% org.	2.263 b	2.252 b	0.423	0.411 b	3.439 b	3.342	418.78 b	406.42 b	179.76	174.88 a	73.78 ab	71.77
	75% org.+25% inorg.	2.216 d	2.189 e	0.419	0.408 d	3.397 cd	3.291	415.67 c	403.15 cd	175.77	170.45 c	70.33 cd	69.68
	50% org.+50% inorg.	2.296 a	2.277 a	0.426	0.414 a	3.461 a	3.362	421.44 a	410.32 a	181.21	175.86 a	75.56 a	73.55
	100% org.	2.191 e	2.174 f	0.416	0.404 e	3.384 e	3.280	413.79 d	402.16 d	174.44	169.55 c	69.44 d	67.66
F. test		**	**	NS	**	*	NS	**	**	NS	*	**	NS
Foliar application x N fertilizer sources													
Control	100% inorg.	2.184	2.157 g	0.379	0.368 g	3.313 i	3.211	373.55	362.12	159.22	154.33	56.22 fg	53.56 j
	75% inorg+25% org.	2.202	2.170 f	0.381	0.371 f	3.309 i	3.230	375.01	363.33	161.24	156.87	58.13 ef	56.11 i
	75% org.+25% inorg.	2.171	2.146 g	0.377	0.366 h	3.292 j	3.186	371.22	360.22	157.78	152.77	56.11 g	54.23 j
	50% org.+50% inorg.	2.213	2.189 e	0.382	0.373 e	3.341 h	3.241	376.56	366.21	163.11	158.12	60.15 de	58.33 g
	100% org.	2.154	2.144 g	0.375	0.366 h	3.289 jj	3.183	369.11	358.77	155.76	150.78	55.44 g	53.89 j
Yeast	100% inorg.	2.206	2.200 de	0.384	0.373 e	3.361 g	3.257	382.02	369.88	166.44	161.33	60.11 d	57.88 gh
	75% inorg+25% org.	2.215	2.194 de	0.387	0.376 c	3.383 f	3.276	384.88	372.76	167.65	162.55	62.21 c	60.22 ef
	75% org.+25% inorg.	2.174	2.151 g	0.383	0.373 e	3.337 h	3.234	379.67	368.84	165.33	159.88	58.44 de	57.46 gh
	50% org.+50% inorg.	2.243	2.219 c	0.391	0.378 b	3.396 e	3.295	386.21	376.11	170.34	165.21	63.67 bc	61.44 de
	100% org.	2.164	2.144 g	0.382	0.368 g	3.318 i	3.216	378.22	367.43	162.33	157.89	58.21 de	56.67 hi
Garlic	100% inorg.	2.217	2.204 d	0.387	0.377 c	3.448 b	3.342	390.05	378.44	173.88	168.45	65.56 ab	63.33 c
	75% inorg+25% org.	2.251	2.232 b	0389	0.378 b	3.473 a	3.370	393.44	381.33	175.34	169.78	67.11 a	65.12 b
	75% org.+25% inorg.	2.213	2.200 de	0.385	0.375 d	3.432 c	3.331	388.33	376.65	171.84	166.55	63.89 bc	62.14cd
	50% org.+50% inorg.	2.267	2.249 a	0.392	0.381 a	3.478 a	3.384	393.88	382.88	176.55	171.11	64.67 b	66.78 a
	100% org.	2.193	2.176 f	0.383	0.372 f	3.412 d	3.310	386.86	374.55	170.46	165.58	62.16 c	60.01 f
F. test		NS	**	NS	**	**	NS	NS	NS	NS	NS	**	*

Table 9: Effect of interactions among plant spacing, foliar application and nitrogen fertilizer sources on chemical constituents of summer squash leaves during 2011 and 2012 seasons.

Treatment			N (%)		P (%)		K (%)		Fe (ppm)		Mn (ppm)		Zn (ppm)	
Plant spacing	Foliar application	N fertilizers sources	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
30	Control	100% inorg.	3.453 rs	3.353 pq	0.435	0.421 v	1.303 z	1.265 z	341.66 x	332.01 tu	145.67	141.01	46.67 z	45.67 yz
		75% inorg+25% org.	3.463 qrs	3.363 p	0.439	0.426 stu	1.303 z	1.265 z	343.67 wx	333.72 t	146.33	143.05	49.68 xyz	48.11 wxy
		75%org.+25% inorg.	3.436 st	3.326 qr	0.432	0.418 w	1.295 z	1.257 z	341.33 x	331.32 u	143.34	139.11	45.33 z	44.01 z
		50%org.+50% inorg.	3.516 op	3.420 no	0.443	0.431 po	1.306 z	1.265 z	345.64 vw	336.11 s	149.12	144.16	51.12 w-z	49.33 u-x
		100% org.	3.416 j	3.317 r	0.431	0.418 w	1.292 q	1.255 z	341.32 x	331.32 u	141.15	136.12	47.33 z	46.34 y
	Yeast	100% inorg.	3.513 p	3.407 o	0.438	0.425 u	1.308 z	1.268 y	352.13 u	339.31 qr	152.68	147.33	51.15 w-z	49.12 vwx
		75% inorg+25% org.	3.516 op	3.417 no	0.445	0.431 pq	1.312 z	1.273 x	351.65 u	341.12 q	152.66	147.32	53.33 s-x	51.33 s-v
		75%org.+25% inorg.	3.486 pq	3.388 op	0.437	0.424 u	1.306 z	1.268 x	347.01 v	338.72 r	152.34	146.15	49.13 yz	47.35 xy
		50%org.+50% inorg.	3.553 mn	3.443 mn	0.446	0.433 nop	1.313 z	1.272 x	353.64 tu	344.73 p	156.11	151.17	55.11 r-v	53.11 qrs
		100% org.	3.476 qr	3.367 p	0.435	0.422 v	1.306 z	1.267 v-z	345.33 vw	336.02 s	147.68	142.68	48.67 yz	47.01 xy
	Garlic	100% inorg.	3.563 lmn	3.463 klm	0.344	0.431 pq	1.320y	1.280 v	359.33 r	347.75 o	160.33	155.33	54.16 r-w	52.13 rst
		75% inorg+25% org.	3.633 d-g	3.531 b-g	0.446	0.432 opq	1.324 x	1.224 u	362.11 q	350.74 n	161.01	155.68	56.13 q-u	54.17 pqr
		75%org.+25% inorg.	3.546 no	3.447 Lmn	0.441	0.427 st	1.318 z	1.280 v	356.68 s	346.11 op	157.67	152.66	53.23 t-x	51.75 s-v
		50%org.+50% inorg.	3.573 j-n	3.467 klm	0.447	0.433 nop	1.328 w	1.287 t	361.33 q	351.32 n	161.67	156.34	56.67 qt	54.67 opq
		100% org.	3.553 mn	3.453 Lmn	0.441	0.427 s	1.315 z	1.274 w	355.12 st	344.31 p	156.14	151.14	51.65 vy	50.14 t-w
45	Control	100% inorg.	3.570 k-n	3.467 klm	0.442	0.426 s-t	1.336 t	1.296 q	371.67 o	360.15 L	159.67	154.67	56.11 q-u	54.16 pqr
		75% inorg+25% org.	3.603 g-k	3.508 d-j	0.446	0.432 pq	1.336 t	1.296 q	372.64 o	360.31 L	161.68	156.64	57.02 p-s	55.21 opq
		75%org.+25% inorg.	3.550 mn	3.451 Lmn	0.442	0.427 rs	1.334 u	1.294 r	365.12 b	354.72 m	158.33	153.12	56.21 q-u	54.31 pqr
		50%org.+50% inorg.	3.626 d-g	3.513 d-i	0.447	0.431q	1.340 s	1.299 p	371.64 o	361.13 L	164.32	159.64	60.67 L-p	59.11 Lm
		100% org.	3.570 k-n	3.463 klm	0.439	0.425 tu	1.331 v	1.291 s	364.65 b	354.32 m	155.68	150.62	53.68 s-w	51.67 r-u
	Yeast	100% inorg.	3.620 e-h	3.522 d-h	0.446	0.432 pq	1.347 qr	1.308 n	376.33 n	365.71 k	170.11	165.14	59.12 n-q	56.33 nop
		75% inorg+25% org.	3.613 f-i	3.497 f-k	0.447	0.433 nop	1.350 p	1.310 m	381.64 Lm	368.35 j	171.35	166.17	61.15 L-o	59.11 Lm
		75%org.+25% inorg.	3.583 i-m	3.507 d-j	0.443	0.429 r	1.347 qr	1.306 mo	376.32 n	364.34 k	169.13	164.05	59.67 m-q	57.10 mno
		50%org.+50% inorg.	3.616 f-i	3.513 d-i	0.451	0.437 ijk	1.352 op	1.312 m	383.67 kL	373.72 i	173.62	168.66	62.68 k-n	60.33 kl
		100% org.	3.570 k-n	3.473 j-m	0.442	0.429 r	1.346 r	1.303 o	373.33 o	362.15 L	166.33	162.68	57.64 o-r	56.22 nop
	Garlic	100% inorg.	3.623 d-h	3.497 f-k	0.452	0.436 klm	1.352 o	1.311 m	386.15 j	374.31 i	178.66	173.67	63.11 j-m	61.01 kl
		75% inorg+25% org.	3.646 b-f	3.531 b-g	0.451	0.438 i	1.355 n	1.314 L	392.13 h	379.14 h	180.34	174.33	63.63 i-L	61.67 jk
		75%org.+25% inorg.	3.616 f-i	3.483 h-L	0.448	0.435 klm	1.352 op	1.310 m	384.33 jk	373.17 i	177.02	171.68	61.14 L-o	59.03 Lm
		50%org.+50% inorg.	3.626 d-g	3.523 d-h	0.455	0.442 gh	1.357 m	1.317 k	389.65 i	378.11 h	181.67	176.11	52.33 u-y	62.67 ijk
		100% org.	3.590 h-L	3.481 i-m	0.447	0.434 mno	1.348 q	1.307 n	381.66 Lm	368.25 j	175.68	171.21	59.67 m-q	57.68 mn
60	Control	100% inorg.	3.590 h-L	3.471 j-m	0.452	0.436 jkl	1.376 j	1.340 gh	407.34 f	394.15 f	172.33	176.33	66.06 h-k	61.12 kl
		75% inorg+25% org.	3.606 g-j	3.493 g-k	0.451	0.438 ij	1.379 i	1.342 g	408.65 f	396.22 f	175.67	171.16	67.33 ghi	65.33 jh
		75%org.+25% inorg.	3.570 k-n	3.463 klm	0.448	0.434 Lmn	1.374 k	1.335 i	407.33 f	394.71 f	171.64	166.23	66.67 hij	64.66 jhi
		50%org.+50% inorg.	3.623 d-h	3.512 d-i	0.455	0.441 gh	1.382 h	1.344 f	412.32 e	401.75 e	176.11	170.68	68.34 jh	66.67 fg
		100% org.	3.600 g-k	3.493 g-k	0.447	0.434 mno	1.371 L	1.332 j	401.35 g	390.72 g	170.68	165.64	65.31 h-k	63.64 hij
	Yeast	100% inorg.	3.646 b-f	3.541 bcd	0.455	0.442 fgh	1.384 g	1.344 f	417.68 d	404.75 d	176.65	171.65	70.33 fg	68.33 ef
		75% inorg+25% org.	3.656 bcd	3.533 b-f	0.457	0.443 fgh	1.386 f	1.350 e	421.33 c	409.13 c	179.14	174.33	72.35 ef	70.32 de
		75%org.+25% inorg.	3.676 bc	3.567 b	0.454	0.441 h	1.382 h	1.339 h	415.65 d	403.71 de	174.66	169.65	66.67 hij	68.15f
		50%org.+50% inorg.	3.623 a	3.621 a	0.459	0.445 de	1.392 e	1.353 d	421.36 c	410.12 c	181.34	176.15	73.33 ef	71.04 d
		100% org.	3.636 d-g	3.527 c-g	0.451	0.437 ij	1.382 h	1.340 gh	416.15 d	404.31 d	173.15	168.33	68.34 gh	67.11 fg
	Garlic	100% inorg.	3.653 b-e	3.543 bcd	0.451	0.446 d	1.400 c	1.362 b	424.64 b	413.32 b	182.68	177.11	79.68 bc	77.16 c
		75% inorg+25% org.	3.680 b	3.563 bc	0.462	0.447 c	1.403 b	1.360 c	426.33 b	414.34 b	184.65	179.33	81.67 b	79.67 b
		75%org.+25% inorg.	3.643 c-e	3.537 b-e	0.457	0.443 efg	1.396 d	1.355 d	424.12 b	411.21 c	181.17	175.35	77.68 cd	76.34 c
		50%org.+50% inorg.	3.743 a	3.633 a	0.463	0.451 a	1.407 a	1.367 a	430.67 a	419.35 a	186.34	181.15	85.12 a	83.17 a
		100% org.	3.616 f-i	3.501 e-k	0.492	0.444 def	1.392 e	1.351 e	424.17 b	411.12 c	179.65	174.68	74.64 de	72.33 d
F. test			**	**	NS	**	**	*	**	**	NS	NS	**	**