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Effect of Magnetic Water and Fertilization Requirements on Garlic Yield and Storability

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ABSTRACT

Two field experiments were carried out at the Experimental Station Farm, Faculty of Agriculture, Mansoura University, Egypt, during the two successive seasons of 2016/2017 and 2017/2018, to study the impact of magnetized irrigation water, compost addition, different levels of nitrogen and potassium fertilizer moreover their interactions on yield and its components, chemical composition and storability of garlic (*Allium sativum* L.) cv. Sids-40. Data showed that irrigation with magnetized water gave the highest significant values of yield and its components, quality characteristics except nitrate (NO_3) and nitrite (NO_2) contents in head of garlic after harvest and storage traits in the two growing seasons compared to ordinary water treatments. Also, data show that compost addition increased significantly all studied characters. Moreover, fertilized garlic plants with 100% NK followed by 75% from recommended doses produced the highest values of all parameters. It could be recommended that irrigation garlic plants with magnetized water, 75% NK from the recommended dose and compost addition at 10 m^3/fed for maximizing productivity, quality parameters, storage and minimizing the environmental pollution comparing to plants irrigated with ordinary water + 100% NK.

Keywords: Garlic, magnetic water, compost, NK, yield, quality, storability.

INTRODUCTION

Garlic (*Allium sativum* L.) is one of the oldest, and very important vegetable crops in Egypt, due to its wide local consumption as a spice, exportation and medicinal properties. Garlic consider the second important crop of family Alliaceae. It is known since the ancient Egyptians. It is rich crop of carbohydrates, niacin, phosphorus element, protein, Ca, Fe, thiamine and ascorbic acid. Garlic is used small quantities therefore we can't depend on it as a source for nutrition elements. It has some medical benefits thus it contains at allicin which is antibacterial, it used as a flavor material.

Magnetized water causes changing in the electronic, atomic and molecular structure causing differences in viscosity, boiling and solidifying point, and other properties (Pang and Deng 2008). It reduces surface tension, provide adequate nutrients for plant growth and increase minerals dissolvability (Babu, 2010). While, Magnetic water technology has been used to reduce the effect concentration of salts, increase the yield and its quality and reduce the irrigation water amounts. It improves conductivity, solubility of salts and pH (Grewal and Maheshwari, 2011). Also, irrigation with magnetically treated water are more robust than those irrigated with ordinary water, a feature which presumably makes them better able to resist insects, diseases and compete with weeds which are expensive and damaging to human health and environmental condition (Aliverdi *et al*., 2015). Also, Mahdi *et al*. (2017) indicated that magnetic water had bactericidal effect against Pseudomonas aeruginosa having multidrug resistance.

Magnetized water gave the highest significant values of vegetative growth characteristics, chlorophylls, as well as chemical constituents of leaves, yield/fed, dry matter percentage, chemical composition and quality parameters, TSS, total sugars, crude protein and carbohydrates percentage, except nitrite (NO_2) and nitrate (NO_3) contents compared to normal water treatments Dawa *et al*. (2017) on tomato, Doklega (2017) on potato and Imryed (2017) on lettuce.

Compost plays vital roles on vegetative growth and development of plants as a source of some mineral nutrients in available forms and enhancing soil characteristic.

Moreover, it increases water hydraulic conductivity, holding capacity and decrease pH of soil moreover, decreases the frequency of plant diseases while, show that plants fertilized with compost increased significantly vegetative growth parameters, chlorophylls contents, N, P and K percentages in the leaves and fruits, total fats, Vitamin C, TSS, total carbohydrates, crude protein, dry matter percentage, early and total yield ton/fed were increased significantly with compost addition compared to untreated plants (Geries *et al.,* 2012) on onion, El-Zehery (2015) on pepper, Hassan (2015) on garlic, Hewidy *et al*. (2015) on broccoli, Tsado (2015) on tomato, Doklega and Abd El-Hady (2017) on broccoli and Doklega (2018) on Summer Squash.

The different growth parameters of garlic improved with increasing application rate of N. Also, bulb fresh weight increased significantly and yield and quality with application in the two growing seasons respectively (Gulser, 2005; Sardi and Timer, 2005 and ElHifny, 2010).

Registered significant increase in number of leaves/plant, plant height, dry matter yield, fresh weight, protein content and total yield with application of potassium at a high rate Singh and Lal (2012) on potato, Verma and Singh (2012) on onion and Barman *et al.* (2013) on onion.

Geries *et al*. (2012) reported the minimum weight loss percentage of onion bulbs was obtained from applying 30 kg N (Enc.)/fed or 6 tons (compost)/fed. While, excessive N application contributes to increase storage losses. While, Singh and Lal (2012) reported that application of K at a high rate on potato reduced the percent rottage to 7.8 percent from 10.62 percent with control. Potassium enhanced storage quality of potato and also extend their shelf life. The effect of K on shelf life was favorable both slowing of senescence and through decrease of numerous physiological diseases.

As well as, on lettuce Imryed (2017) indicated that storage traits (weight loss, crude protein, total soluble solids, crude fiber percentages and total sugars, total carbohydrates, Vitamin C, nitrite "NO_2" and nitrate "NO_3" contents) in both seasons, except nitrate content in the second season only recording lowest total weight losses in the two storage seasons under the effect of magnetized water influences on plant growth and development.

The main objective of this investigation was to study the impact of magnetized irrigation water, compost addition and different levels of nitrogen and potassium fertilizer as well as their interactions on yield and its components, chemical composition and storability of garlic.

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Station Farm, Faculty of Agriculture, Mansoura University, Egypt, during the two successive seasons of 2016/2017 and 2017/2018, to study the impact of magnetized irrigation water, compost addition and different levels of nitrogen and potassium addition moreover their interactions on yield and its components, chemical composition and storability of garlic (*Allium sativum* L.) cv. Sids - 40.

Analysis of soil:

Mechanical and chemical:

Soil samples were taken randomly from the experimental field area at a depth of 0 - 30 cm from soil surface before soil preparation to determine the mechanical and chemical soil properties according to Chapman and Pratt (1971) as shown in Table 1.

Microbiological status:

It was estimated in both soil irrigated with magnetic and normal water by standard spread-plate dilution method described by Seeley and Van Demark (1981). It was estimated by seed and pathology lab. at Faculty of Agriculture, Mansoura University as shown in Table 2 and Fig 1.

Table 1. Mechanical and chemical soil characteristics* at the experimental soil during the two growing seasons of 2016/2017 and 2017/2018.

Soil characters		1st	2nd
Particle size distribution (%)	Coarse sand	3.56	2.98
	Fine sand	29.35	30.07
	Silt	38.15	37.32
	Clay	28.94	29.63
	Texture class	S Cl L	S Cl L
EC dS m^{-1}(1:5)		0.82	0.87
pH (1:2.5)		8.05	7.98
Saturation percentage		60.5	62.3
Organic matter g kg^{-1}		1.66	1.72
Total $CaCO_3$ g kg^{-1}		4.05	3.88
Available nutrients (mg kg^{-1})	N	51.3	52.6
	P	5.14	5.73
	K	80.9	82.3

Table 2. Types and numbers of bacteria and Fungi present in soil at the end of the experiment.

Pathogen	Colony forming units (cfu)/ g soil	
	untreated water	magnetized water
Pseudomonas sp.	9×10^7	3×10^7
Rhizoctonia sp.	4×10^4	-----
Fusarium solani	1×10^4	-----

Pseudomonas sp.

***Rhizoctonia sp.* (Tap water)**

***Rhizoctonia sp.* (Magnetic water)**

***Fusarium solani* (Tap water)**

***Fusarium solani* (Magnetic water)**

Fig. 1. Types and numbers of bacteria and Fungi present in soil at the end of the experiment.

The experimental design and treatments:

This experiment was carried out in a strip-split plot design with three replicates. Each experiment included 12 treatments .The vertical-plots were allocated to two water irrigation treatments as follow :

1- Normal water.

2- Magnetized water.

The horizontal plots were devoted into two treatments (organic fertilization) as follows:

1- Without compost .

2- Compost of rice straw addition 10 m^3/fed was incorporated in the soil before planting.

Chemical analysis of used vegetarian compost in both seasons are presented in Table 3.

Table 3. Average chemical analysis of different sources of vegetarian compost during the two seasons of study.

Parameters	1st	2nd
Organic matter%	39.9	38.7
Organic carbon%	23.2	22.5
Total N%	1.47	1.39
C/N	15.8	16.2
Total P%	0.53	0.49
Total K%	0.79	0.74
SP%	95.4	96.1
EC dS m^{-1}(1:10)	3.93	3.84
pH (1:5)	6.09	6.14

The sub-plots were located to three mineral fertilization levels: (100 %, 75 % and 50 %) of NK from recommended doses .

Nitrogen fertilizer (100 %from recommended dose) is 120 kg N/fed, it was added in a form of ammonium sulphate (20.6 % N), while potassium fertilizer dose (100 %from recommended dose) is 48 kg K_2O/fed it was added in the form of potassium sulphate (48.0 % K_2O).

Mineral fertilizers were added in three equal doses after 30, 60 and 90 days from planting. Calcium super phosphate (15.5 % P_2O_5) was applied during soil preparation at the rate of 60 kg P_2O_5/fed .

Each experimental plot included three ridges, each of 0.6m width and 6 m length resulted an area of 10.8 m^2.

Agricultural practices:

The experimental field well prepared for each experiment through two division and then divided into the experimental units with dimensions as previously mentioned. Nearly uniform garlic cloves were soaked in running water for 12h, and then hand – planted at 10 cm apart on two sides of each row on 14th and 6th of October in the first and the second seasons, respectively.

All the other cultural practices for garlic production were used according to the recommendation of the Ministry of Agriculture, Egypt.

Storage (shelf-life) of garlic :

After curing, random samples (2kg) were taken from every plot per treatment, stored in room conditions along four months from April of the storage period. The averages of air temperature and relative humidity in store room were recorded in Table 4.

Table 4. Average of monthly air temperature and relative humidity in store during the storage period in 2017 and 2018 seasons .

Months	2017		2018	
	Temperature (C)	Relative humidity (%)	Temperature (C)	Relative humidity (%)
Frist month	22.8	55.4	20.9	53.3
Second month	25.6	49.9	24.9	48.8
Third month	30.2	52.3	28.2	49.7
Fourth month	32.5	56.2	29.4	54.1

STUDIED CHARACTERS:

1- yield and its components:

- **Total yield (t/fed):** It was estimated as yield of each plot then calculated as (t/fed).

*** Bulb traits :**

- Bulb weight (g).
- Bulb dry weight percentage.
- Number of cloves/bulb .

2. Bulbs quality:

- **Total soluble solids percentage (TSS %):** It was determined in the juice of garlic bulbs by using Gali 110 Refractometer according to AOAC (1990).
- **Total carbohydrates percentage:** It was determined according to Somogy (1952).
- **Total allicin mg/g DW**: It was estimated by the method described by Patricia *et al.*. (2014).
- **Nitrate (NO_3) and nitrite (NO_2) contents:** in bulbs were measured as described by Singh (1988).

3. Storage (shelf-life) of garlic:

Five bulbs were taken after four months from the beginning storage period to assess the following characters:

- Total soluble solids percentage .
- Total allicin mg/g DW .
- Total carbohydrates percentage.

Statistical analysis

Data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the strip-split plot design as published by Gomez and Gomez (1984) using "MSTAT-C" computer software package. Least significant of difference (LSD) method was used to test the differences among treatment means at 5 % level of probability as reported by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Effect of irrigation water treatments:

Data present in Tables 5, 7, 9 show that water irrigation treatments have significant effects on yield and its constituents, quality parameters and storage traits in both seasons. The highest means of previous measurements of garlic were recorded by irrigation garlic plants with magnetized water, excluding nitrate (NO_3) and nitrite (NO_2) contents in heads garlic at harvesting comparing to plants irrigated with normal water in both seasons. The increases in total yield traits of garlic may be due to ascribed to that magnetic water reduce the number of pathogens in the soil (as shown in Table 2 and Fig 1), perhaps due to the roles played by magnetized water as previously mentioned by (Babu, 2010) and (Grewal and Maheshwari, 2011). These results are in the similar point of view with those reported by Dawa *et al*. (2017) on tomato, Doklega (2017) on potato and Imryed (2017) on lettuce .

Effect of organic fertilization:

Concerning the effect of organic fertilizers, the obtained results which present in Tables 5, 7 and 9 indicate that compost addition 10 m3/fed to the garlic plants was incorporated in the soil before planting significantly affected on yield and its components, quality parameters and storage traits, in both seasons. Fertilized garlic plants with compost exceeded significantly over control treatments plants the aforementioned parameters in both seasons. These increases in yield and its constituents, quality parameters and storage traits of garlic by compost may be due to the positive effect of compost fertilizer components as shown in Table 3, where it get better soil drainage, aeration and improved the soil water retain. Compost uses as a soil amendment, which increase soils water holding capacity and increases the availability of some essential micronutrients for plant roots, which important for formation of nucleic acid, cytokinins, cell wall , it facilitates sugar translocation in plants, influences development of cell and elongation which in turn enhances chlorophyll and NPK contents, yield and product quality.

These results are on the same line with those obtained by Geries *et al.* (2012) on onion, El-Zehery (2015) on pepper, Hassan (2015) on garlic, Tsado (2015) on tomato, Doklega and Abd El-Hady (2017) on broccoli and Doklega (2018) on summer squash.

Effect of soil mineral fertilizers:

As for the impact of soil mineral NK fertilizers, data presented in the same Tables reveal that the parameters mentioned previously were increase significantly with 100% NK from recommended dose (120 kg N/fed), (48 kg K_2O /fed) compare to plants which treated with 50% NK and the differences are significant in both seasons. These results may attributed to known roles of N in plants. Nitrogen is a major component of proteins, nucleic acids and coenzymes, While, K activates some enzymes and play an vital roles in regulating the opening and closing of stomata. The important roles of nitrogen and potassium in plant growth which reflected negatively on yield and its components, quality parameters and storage traits. These results are agreement in with those recorded by Doklega (2017) on potato .

Effect of interactions:

The interactions among magnetized irrigation water, compost and levels of nitrogen and potassium fertilizer Tables 6,8 and 10 have significant effects on nitrate (NO_3) and nitrite (NO_2) contents in heads garlic, total soluble solids and total carbohydrates contents in heads garlic after the storage period (in the second season), head fresh weight, head dry weight, number of cloves/head, total yield of garlic plants after harvest, total allicin and total carbohydrates after harvest (in the two seasons). The highest values of these characters resulted in irrigation garlic plants with magnetized water and compost and addition mineral fertilizer at 100 % of the recommended doses (120 kg N/fed), (48 kg K_2O /fed), excluding nitrate (NO_3) and nitrite (NO_2) contents in garlic heads at harvest, as shown in Tables 6, 8,10 . The highest values of nitrate (NO_3) and nitrite (NO_2) contents in heads garlic at harvest are produce from irrigation garlic plants with untreated water, compost addition and mineral fertilizing with 100 % of the recommended doses (120 kg N/fed), (48 kg K_2O/fed) in both seasons. While, irrigation garlic plants with untreated water without compost and mineral fertilization with 50 % of the recommended doses resulted in the lowest values of these characters in both seasons.

Table 5. Head fresh and dry weights, number of cloves/head and total yield/fed of garlic at harvest as affected by water treatments, organic fertilization and mineral NK-levels as well as their interactions during 2016/2017 and 2017/2018 seasons.

Characters	Head fresh weight (g)		Head dry weight (%)		Number of cloves/head		Total yield (t/fed)	
Treatments	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
A- Water treatments:								
Normal	52.65	49.73	29.24	26.17	16.94	14.55	7.054	6.703
Magnetic	54.22	50.92	29.95	26.57	17.90	15.75	8.453	7.755
F. test	*	*	*	*	*	*	*	*
B- Organic fertilization:								
Without	50.79	49.20	28.37	25.79	16.41	14.16	6.899	6.466
Compost	56.07	51.46	30.82	26.95	18.42	16.13	8.607	7.992
F. test	*	*	*	*	*	*	*	*
C- Mineral NK-levels:								
100 %	56.65	54.66	31.05	28.35	18.70	17.58	8.812	8.502
75 %	53.81	50.41	29.70	26.22	17.75	14.91	7.848	7.147
50 %	49.83	45.90	28.03	24.55	15.80	12.95	6.600	6.039
LSD at 5%	0.37	0.41	0.14	0.13	0.22	0.16	0.196	0.171
D- Interactions:								
A × B	*	*	*	*	NS	NS	*	*
A × C	*	*	*	*	NS	*	*	*
B × C	*	*	*	*	NS	*	*	*
A × B × C	*	*	*	*	*	*	*	*

Table 6. Head fresh and dry weight, number of cloves/head and total yield/fed of garlic at harvest as affected by the interactions among water treatments, organic fertilization and mineral NK-levels during 2016/2017 and 2017/2018 seasons.

Characters			Head fresh weight (g)		Head dry weight (%)		Number of cloves/head		Total yield (t/fed)	
Water	Organic	NK-levels	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Normal	Without	100 %	53.73	52.93	29.94	27.24	17.16	16.16	7.500	7.380
		75 %	49.40	48.73	27.70	25.61	16.33	13.33	6.793	5.600
		50 %	47.80	44.20	26.72	23.96	14.33	11.16	5.400	4.600
	Compost	100 %	57.76	55.10	31.36	29.02	19.33	17.83	8.630	8.493
		75 %	56.20	50.96	30.87	26.45	18.33	15.50	7.560	7.503
		50 %	51.00	46.50	28.86	24.75	16.16	13.33	6.440	6.643
Magnetic	Without	100 %	54.86	54.10	30.37	27.67	18.16	17.00	8.213	8.307
		75 %	50.80	49.90	28.24	25.96	17.16	14.16	7.220	7.117
		50 %	48.16	45.33	27.25	24.32	15.33	13.16	6.270	5.793
	Compost	100 %	60.26	56.53	32.54	29.46	20.16	19.33	10.903	9.827
		75 %	58.86	52.06	31.97	26.87	19.16	16.66	9.820	8.367
		50 %	52.36	47.60	29.31	25.17	17.40	14.16	8.290	7.120
LSD at 5%			0.74	0.92	0.29	0.31	0.45	0.33	0.382	0.343

Table 7. Total soluble solids, total carbohydrates percentages, allicin, nitrate (NO_3-N) and nitrite (NO_2-N) contents in garlic heads at harvest as affected by water treatments, organic fertilization and mineral NK-levels as well as their interactions during 2016/2017 and 2017/2018 seasons.

Characters	TSS(%)		Total carbohydrates(%)		Allicin(µM)		NO_3-N(ppm)		NO_2-N(ppm)	
Treatments	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
A- Water treatments:										
Normal	5.13	5.46	34.37	33.53	20.27	21.29	99.36	80.78	1.470	1.374
Magnetic	5.40	5.62	34.83	34.12	20.95	21.65	78.14	79.11	1.138	1.348
F. test	*	*	*	*	*	*	*	*	*	*
B- Organic fertilization:										
Without	4.79	5.40	33.83	33.57	19.48	21.08	85.51	75.68	1.251	1.257
Compost	5.73	5.68	35.36	34.09	21.74	21.86	91.98	84.21	1.357	1.466
F. test	*	*	*	*	*	*	*	*	*	*
C- Mineral NK-levels:										
100 %	5.82	6.16	35.51	35.22	21.60	22.95	100.83	96.75	1.594	1.763
75 %	5.30	5.53	34.68	34.08	20.75	21.47	87.82	79.77	1.401	1.364
50 %	4.66	4.92	33.60	32.18	19.49	19.98	77.60	63.32	0.917	0.957
LSD at 5%	0.07	0.04	0.09	0.11	0.16	0.12	1.68	1.42	0.038	0.034
D- Interactions:										
A × B	*	NS	NS	NS	NS	NS	NS	*	NS	*
A × C	NS	NS	NS	*	*	NS	*	NS	*	*
B × C	*	*	*	NS	*	*	NS	NS	NS	NS
A × B × C	NS	NS	NS	*	*	*	NS	*	NS	*

Table 8.Total soluble solids, total carbohydrates percentages, allicin, nitrate (NO_3-N) and nitrite (NO_2-N) contents in garlic heads at harvest as affected by the interactions among water treatments, organic fertilization and mineral NK-levels during 2016/2017 and 2017/2018 seasons.

Characters			TSS (%)		Total carbohydrates(%)		Allicin (µM)		NO_3-N (ppm)		NO_2-N (ppm)	
Water	Organic	NK-levels	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Normal	Without	100 %	5.37	5.92	34.76	34.73	20.27	22.34	110.76	90.33	1.733	1.603
		75 %	4.55	5.31	33.45	33.15	19.13	20.95	96.70	73.60	1.553	1.207
		50 %	4.17	4.72	32.74	31.61	18.41	19.43	80.70	61.10	0.977	0.890
	Compost	100 %	5.97	6.23	35.76	35.36	22.09	23.16	117.66	103.76	1.860	1.910
		75 %	5.76	5.58	35.41	33.97	21.54	21.68	103.86	86.26	1.633	1.520
		50 %	4.94	4.99	34.09	32.37	20.19	20.18	86.46	69.66	1.063	1.113
Magnetic	Without	100 %	5.57	6.09	35.11	35.08	20.85	22.71	84.16	94.53	1.323	1.717
		75 %	4.74	5.52	33.80	34.89	19.64	21.30	72.00	77.43	1.157	1.313
		50 %	4.36	4.85	33.13	31.97	18.61	19.76	68.76	57.10	0.760	0.810
	Compost	100 %	6.39	6.42	36.42	35.73	23.18	23.61	90.73	98.36	1.460	1.820
		75 %	6.15	5.73	36.07	34.32	22.71	21.97	78.73	81.80	1.260	1.417
		50 %	5.17	5.14	34.44	32.77	20.74	20.56	74.46	65.43	0.867	1.013
LSD at 5%			NS	NS	NS	0.36	0.29	0.24	NS	2.85	NS	0.067

Table 9. Total soluble solids and total carbohydrates percentages and allicin content in garlic heads after storage as affected by water treatments, organic fertilization and mineral NK-levels as well as their interactions during 2017 and 2018 seasons.

Characters	TSS (%)		Total carbohydrates (%)		Allicin (µM)	
Treatments	2017	2018	2017	2018	2017	2018
			A- Water treatments:			
Normal	5.71	5.43	31.62	30.35	23.13	21.79
Magnetic	6.00	5.60	32.02	30.68	23.80	22.23
F.test	*	*	*	*	*	*
			B- Organic fertilization:			
Without	5.42	5.24	31.10	29.93	22.46	21.16
Compost	6.28	5.80	32.54	31.10	24.47	22.86
F.test	*	*	*	*	*	*
			C- Mineral NK-levels:			
100 %	6.42	5.85	32.65	31.21	24.62	23.02
75 %	5.87	5.54	31.89	30.58	23.57	22.06
50 %	5.25	5.15	30.92	29.75	22.20	20.96
LSD at 5%	0.10	0.06	0.11	0.06	0.22	0.23
			D- Interactions:			
A × B	NS	NS	*	NS	NS	NS
A × C	NS	NS	NS	NS	NS	NS
B × C	*	*	*	*	*	*
A × B × C	NS	*	NS	*	NS	NS

Table 10. Total soluble solids and total carbohydrates percentages and allicin content in garlic heads after storage as affected by the interactions among water treatments, organic fertilization and mineral NK- levels during 2017 and 2018 seasons.

Characters			TSS (%)		Total carbohydrates (%)		Allicin (µM)	
Water	Organic	NK-levels	2017	2018	2017	2018	2017	2018
Normal	Without	100 %	5.94	5.57	31.96	30.66	23.66	22.14
		75 %	5.13	5.10	30.74	29.63	21.89	20.65
		50 %	4.78	4.86	30.16	29.13	21.14	20.30
	Compost	100 %	6.52	5.93	32.91	31.40	24.74	23.35
		75 %	6.34	5.80	32.59	31.16	24.50	22.89
		50 %	5.54	5.32	31.39	30.15	22.86	21.44
Magnetic	Without	100 %	6.38	5.69	32.27	30.91	24.15	22.52
		75 %	5.32	5.21	31.06	29.88	22.41	21.02
		50 %	4.97	4.98	30.43	29.36	21.54	20.35
	Compost	100 %	6.87	6.21	33.47	31.88	25.95	24.06
		75 %	6.71	6.06	33.18	31.65	25.48	23.69
		50 %	5.73	5.46	31.72	30.38	23.28	21.75
LSD at 5%			NS	0.11	NS	0.12	NS	NS

CONCLUSION

In view of obtained and discussed results, it was found that irrigation garlic plants cv. Sids- 40 with magnetized water, compost addition 10 m^3/fed. was incorporated in the soil before planting, and mineral nitrogen and potassium fertilizing at 100% of the recommended dose (120 kg N/fed), (48 kg K_2O/fed), gave the highest values of yield and quality parameters and increased the storability (shelf-life), but application of 75% of the recommended mineral nitrogen and potassium fertilizer, compost addition and irrigation with magnetized water is recommended due to its beneficial effects of minimizing the environmental pollution and production costs with reducing nitrate and nitrite content in heads garlic which in turn have a positive effect on consumer health.

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تأثير الري بالماء الممغنط والاحتياجات السمادية على المحصول والقدرة التخزينية للثوم

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أجريت تجربتان حقليتان في مزرعة - كلية الزراعة - "جامعة المنصورة" - مصر ، خلال موسمي ٢٠١٧/٢٠١٦ و ٢٠١٨/٢٠١٧ لدراسة تأثير الري بالماء الممغنط واضافة السماد العضوي (الكمبوست) ومستويات من النيتروجين والبوتاسيوم وكذلك تفاعلاتها على المحصول ومكوناته وصفات الجودة والتخزين للثوم الصيني (سدس ٤٠) تحت الظروف البيئية لمنطقة المنصورة، محافظة الدقهلية، مصر . وقد اظهرت النتائج زيادة معنوية لصفات المحصول ومكوناته، معاملات الجودة ماعدا محتوي النترات والنيتريت في رؤوس الثوم بعد الحصاد، وصفات التخزين بالري بالماء الممغنط مقارنة بالماء العادي كما ادت إضافة الكمبوست لزيادة جميع الصفات المدروسة ، علاوة على ذلك ، أعطت نباتات الثوم المسمدة بنسبة ١٠٠٪ نيتروجين وبوتاسيوم من الكمية الموصي بها اعلى القيم لجميع الصفات المدروسة تليها ٧٥% . لذلك يمكن التوصية بري نباتات الثوم بالماء الممغنط مع اضافة الكمبوست بمعدل ١٠م^{3} و٧٥% نيتروجين وبوتاسيوم من الكمية الموصي بها من أجل زيادة الإنتاجية وتحسين صفات الجودة والقدرة التخزينية والحد من التلوث البيئي مقارنة مع النباتات التي تم ريها بالماء العادي مع اضافة ١٠٠ ٪ من التسميد بالنيتروجين والبوتاسيوم .