EFFECT OF POTASEIN AND SOME BIO-FERTILIZERS ON EARLINESS AND HEAD QUALITY OF GLOBE ARTICHOKE "Cynara Scolymus L."

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ABSTRACT

Two field experiments were carried out at Barrage Horticultural Research station during 1998/1999 and 1999/2000 growing seasons to investigate the effect of the following treatments:-

1. Recommended rates, i.e 61.5 kg N, 38.25 kg P_2O_5 and 36 kg K_2O per feddan (control).
2. Using 8 kg nitrobein / fed. + 50% from the recommended N.
3. Using 5 kg phosphorein/ fed + 50% from the recommended P.
4. Foliar spray by 2500 ppm potasein + 50% from the recommended K.

The obtained data indicated that foliar spray with potasein + 50% from the recommended K produced the heighest early yield with the heighest value of receptacle weight (the edible part).

Concerning the total yield there were no significant differences among the tested treatments.

INTRODUCTION

Balanced nutrition is very important for obtaining vigrous vegetative growth, high production and good quality.

Nile valley soils faced numerous deteriorating problems during the last decades, among which is the shifting of the PH value to the alkaline side, entering plant nutrients in unavailable forms.

Most farmers applying intensive and non- rational rates of mineral fertilizers. Most of these fertilizer elements are either fixed in the soil or leached and become unaccessible by plants. Several investigators indicated that soil inoculation with P- solubilizing bacteria improved soil fertility and plant productivity by releasing P- element (Forster and Freter, 1988 and Hauka et al., 1990). Also, El- Awag et al, 1993, Abo- El- Nour et al, 1996 and El - Sheekh, 1997 mentioned that, under Egyptian soil conditions, using bio-fertilizer phosphorein with or instead of mineral - P apparently increased the available - P concentrations in both soil and plants. Furthermore, the excessive use of mineral fertilization represents the major cost of crop production and creates pollution of agro- ecosystem (Fisher and Richter, 1984).

It was also, recorded that treating seed potato tubers with nitrobein different N- fertilizer levels significantly increased plant height (Ashour, et al., 1997).

Barroccio, 1969; Magnifico and Lattanzio, 1976; Moulinier, 1980; Pomares et al., 1993; Elia et al., 1994 and Abd El-Fattah, 1998 found a possitive relationship between globe artichoke productivity and the available - P level in soil.

It was also found that increasing potassium application rate from 0 to 24 and furtherly to 48 kg K_2O/ fed, increased the percentage of the harvested heads, during the period from November till February month and the reverse was true during the period from March till may month (El-Shal et al, 1993).

Thus, this investigation was planned to study the effects of potasein and some bio- fertilizers on early yield, late yield, heads characters and N,P,K percentage in the receptacle.

MATERIALS AND METHODS

The present investigation was carried out at Barrage Horticultural Research station farm, during the two successive winter seasons of 1998/1999 and 1999/2000, to study the effect of some bio- fertilizers on artichoke plant vegetative growth, early yield, late yield, head traits and chemical constituents in head's receptacle.

The experiments were conducted using a randomized complete blocks design, with three replications. Eeach experimental plot was $25m^2$ (5 ridges, with 5 m long and 1 width). Planting date was during the first week of August, in both seasons of study. Soil preparation was carried out according to the recommendations of the Ministry of Agriculture and the old crown pieces of the local cultivar, were planted after treating pre-planting with Topsen, M70 solution (2gm/ litte water for 30 minutes) to pretect it from soil rots. The old crown pieces were hand planted in the presence of water on the third top of slope ridge at 1 m apart.

The following treatments were used:-

1. Recommended rates, i.e 61.5 kg N, 38.25 kg P_2O_5 and 36 kg K_2O per feddan (control).
2. Using 8 kg nitrobein/fed + 50% from the recommended N + recommended P and K.
3. Using 5 kg phosphorien/fed + 50% from the recommend P + recommended N and K.
4. Foliar spray by potasein at the rate of 2500 ppm + 50% from the recommended K + recommended N and P.

The chemical fertilizers were applied in three equal doses starting after 60 days from planting with 30 days interval, while the tested bio- fertilizers were applied after one week from each chemical fertilizer dose application.

Recorded data : The following data were recorded :

I. Vegetative growth characters i.e. plant height, leaves number per plant, leaf length and off-shoots number per plant, were determined after 150 days from planting on 10 plants chosed randomly in each plot.

II. Early yield and head itraits; All flower heads which produced during the period from the begining of harvest season till the end of february were calculated to estimate the early yield. A randome sameple of 10 flower heads were taken from the early yield of each plot to measure flower head weight, head length and receptacle weight.

III. Late yield and head characters; all flower heads which harvested during the period from the end of February till the end of harvest season, were calculated to determine the late yield.

A randome sample of 10 flower heads were taken from the late yield of each plot to measure flower head weight, length and diameter as well as receptacle weight.

IV. **Chemical constituents :**

Percentages of nitrogen, phosphorus and potassium in the receptacle were estimated according to Koch et al. (1924(, Troug et al., (1939) and Brown et al. (1946).

The obtained data were statistically analyzed and treatment means were compared using least significant differences (L.S.D) as it was mentioned by Gommez and Gommez (1984).

Physical and chemical properties of experimental soil were analysed according to the methods described by Jackson (1967) and the recorded data are shown in Table (1).

RESULTS AND DISUCSSION

I. Vegetative growth :

a. Effect of nitrobein

It is clear from data in Table (2), that nitrobein (Treat No. 2) had a possitive effect on leaves number per plant, leaf length and plant height during the two successive seasons compared with the control (Treat No. 1).

Table 1. The physical and Chemical properties of the experimental soil .

(A) : Pysical properties %			
Clay	Silt	Sand	Texture grade
57	32.1	10.9	Clay

B- Chemical properties	Soil Depth (cm)	
	0- 30	30 - 60
$CaCo_3$	02.30	02.29
E.C. mmohos/ cm	00.58	00.71
C.E.C. mg/100g soil	30.19	26.80
O.M. %	01.72	01.54
PH (1 : 2.5)	07.6	0.7.5
Soluble ions mg 1100 g. soil		
Cations		
Na^+	2.00	1.69
K^+	1.200	1.14
Ca^{++}	1.02	0.97
Mg^{++}	1.30	1.40
Anions		
Cl^-	4.50	4.30
HCO^-3	1.15	1.20
SO^-4	1.93	2.02
Available Cations mg/100 g Soil		
N	52.50	43.40
P	22.04	15.31
K	45.20	37.10

Table 2. Effect of potasein and some bio- fertilizers on artichoke vegetative growth during 1998/1999 and 1999/2000 seasons.

Char. Treat.	Leaves number per plant		Leaf length (cm)		Plant height (cm)		Off shoots number per plant	
	98/99	99/2000	98/99	99/2000	98/99	99/2000	98/99	99/2000
1	15.027	26.793	49.057	79.633	17.583	40.633	1.973	1.983
2	18.280	27.447	61.750	77.780	18.223	38.110	1.073	1.310
3	12.723	27.553	49.223	71.307	15.417	36.387	0.430	1.550
4	19.057	29.583	61.917	82.917	19.557	47.500	1.640	2.183
L.S.D 0.05	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

The benefical effects of the bio- fertilizer on vegetative growth may be related to the enhancing effects on non- symbiotic N_2 - fixing bacteria on morphology and/or physiology of the root system, which propably promoted the vegetative growth to go forward.

Jagnow et al. (1991) and Noel et al (1996), indicated that non-symbiotic N_2-Fixing bacteia; Azotobacter and Azospirillum strains produced adequate amounts of IAA and cytokinins, which increased the surface area per unit root length and enhance root hair branching with an eventual increase in the up take of nutrients from the soil. Carletti et al. (1996), demonstrated that plants inoculated with Azospirilum displayed an increase in total root length by 150% compared with the un- inoculated (control).

The results reported by Formmel et al. (1993), El- Gamal, (1996) and Ashour et al., (1997) Confirmed our findings concerning the stimulating effects of bio- fertilizers on vegetative growth characters.

b- Effect of phosphorein :

Data in Table (2), revealed that phosphorein (treat. No. 3) had no-significant effect on vegetative growth of artichoke plants under Barrage soil conditions, this might be due to that Barrage farm soil have sufficient soluable mineral phosphate and sequently it was not in need to phosphorein which contains active baceria which is capable to convent tri- calcium phosphate to available - P (Mono- P) which, in turn, increases plant growth (Abo El-Nour et al. (1996) and Abd El- Fattah, (1998).

The obtained results was agreed with that obtained by Pomares et al. (1993), who recorded that plant growth of globe artichoke was higher, when the available phosphate level was raised up to 26-33 ppm in the soil.

c- Effect of potasein :

Data in Table (2) revealed that potasein (treat No. 4) caused an obvious increasing on vegetative growth values, although the differences between the effects of the tested treatments were not significant (El- Shal, et al 1993).

II. Early yield and head traits :

a. Effect of nitrobein

It is clear from data indicated in Table (2) that nitrobein (treat No. 3), increased early yield, head weight, head diameter and receptacle weight, when compared with the control. Nitrobein possitive effect on both early yield and head traits, may be due to increasing available nitrogen.

These results are confirmed with that obtained by Kumaraswany et al. (1990), Ashour et at (1997) and Gomez et al (1998).

b. Effect of phosphorein

Data in Table (3) shows that phosphorein (treat 3), under Barrage farm soil conditions decreased early yield and head traits. On the other hand,

El-Sheekh, 1997, Abd El-Fattah, 1998 and Abd El-Rahman et al., 2001 reported that phosphorein may be improved soil fertility via releasing the fixed-P with other elements and contributing growth hormones, such as cytokinins or auxins. Magnifico and Lattanzio (1976) reported that P-nutrition resulted in increasing head yield.

c- Effect of Potasein

It is clear from data in Table (3) that potasein (treat No. 4), produced the higher values of early yield, head weight, head diameter and receptacle weight than those obtained by the control (treat No. 1). These results are similar to that obtained by El-Shal et al, 1993.

Table 3. Effect of potasein and some bio- Fertilizers on early yield and head traits during 1998/1999 and 1999/2000 Se-esons.

head char	Early yield heads No. fed		head weight (gm)		Head length cm		Head diam (cm)		Recept weight (gm)	
Treat	98/99	99/2000	98/99	99/2000	98/99	99/2000	98/99	99/2000	98/99	99/2000
1	4720.000	22666.667	234.747	164.250	9.693	9.133	8.210	7.333	58.220	52.730
2	5160.000	24000.000	261.274	207.500	8.301	9.883	8.335	7.683	47.729	11.757
3	4120.000	16000.000	241.713	136.833	9.000	8.067	7.948	7.067	50.908	23.200
4	6040.000	28000.000	235.155	191.083	8.672	9.010	7.770	8.420	64.168	63.393
L.S.D 0.05	1047	N.S	N.S	43.25	N.S	N.S	N.S	0.4512	N.S	N.S

III. Late yield and head Characters

a. Effect of nitrebein :

Data in Table (4) shows that nitrobein (treat No. 2), in general, increased late yield, head weight, head length, head diameter and receptacle weight. The detective positive effects of bio-fertilizer on artichoke late yield and heads characters might be related to it's beneficial effects on vegetative growth characters, which propably supplied more photosynthates and hence, might help in increasing yield potential.

Table 4. Effect of potasein and some bio- fertilizers one late yield and head characters during 1998/1999 and 1999/2000 seasons.

char.	Late yield heads No. plant		Head weight gm		head length (cm)		head diameter (cm)		Teceptacle werght (gm)	
Treat	98/99	99/2000	98/99	99/2000	98/99	99/2000	98/99	99/2000	98/99	99/2000
1	15960.00	10653.333	182.433	160.417	8.533	8.950	7.420	7.600	70.799	70.333
2	14586.00	14320.00	163.277	214.500	7.874	9.500	6.881	9.267	39.456	94.493
3	12227.00	22346.667	191.152	150.667	9.007	8.467	7.473	7.467	99.683	64.240
4	15080.00	7240	147.667	192.00	8.210	4.633	7.057	7.133	32.842	96.393
L.S.D 0.05	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	27.15	N.S

These results appeared to be in close agreement with the results which obtained by Formmel et al (1993), Abd El- Ati et al (1996) and Ashour et al (1997). They found that inoculation seed potato tubers with nitrobein biofertilizer significantly increased both yield and tuber weigh.

b. Effect of phosphorein :

Data recorded in Table (4) shows that phosphorein (treat No. 3), markedly increased late yield and receptacle weight.

The obtained results coincide with those of Magnifico and lattanzio (1976), who revealed that head yield of globe artichoke plants was clearly increased by increasing P_2O_5.

This increasing due to the P-solubilizing bacteria, which may have played a great role in correcting the P-solubility problem in the soil, in addition to improving soil fertility via releasing the Fixed-P with other elements and contributing growth hormons, such as cytokinins or auxins (El-Sheekh, 1997 and Abd El-Fattah, 1998).

c. Effect of potasein :

Data in table (4) indicate that potasein decreased the late yield when compared with control (treat No. 1), this effect might be due to that potasein increased the earliness production of artichoke. Those results agreed with that obtained by El-Shal. et al, 1993.

V. Chemical constituents :

a. Effect of nitrobein

Data in table (5) shows that nitrobein bio-fertilizer markedly increased percentage of potassium element in the receptacle when Compared with the control.

The obtained results agreed with that obtained by Abd El-Fattah, 1998 and El-Zeiny et al, 2001.

b. Effect of phosphorein

Data in Table (5) revealed that phosphorein application increased percentage of nitrogen and potassium in the receptacle, in comparison with that produced in the control (non- inoculated soil). The obtained results agreed with those of Abd El- ati et al 1996, Abd El-Fattah, 1998 and El-Zeiny et al, 2001.

c. Effect of potasein :

It is clear from data in Table (5) that potasein foliar spray increased the percentage of both nitrogen and potassium in the receptacle, when compared with the control (treat No. 1)

Table 5. Effect of potasien and some bio- fertilizers on N,P,K percentage of head receptacle during 1998/1999 and 1999/2000 seasons

Char	Pecentage of N,P,K					
Treat	N%		P%		K%	
	1999/2000	2000/2001	1999/2000	2000/2001	1999/2000	2000/2001
Treat (1)	3.495	3.390	0.963	0.890	4.075	3.990
Treat (2)	2.699	2.509	0.409	0.399	4.475	4.310
Treat (3)	4.593	4.300	0.655	0.499	4.875	4.700
Treat (4)	5.074	4.920	0.766	0.600	4.725	4.60
L.S.D	1.200	1.210	0.13	0.021	0.031	0.042

CONCLUSION

The aforementioned results of the present study, generally, indicated that foliar spray with potasein at the rate of 2500 ppm + 50% from the recommended potassium is the recommended treatment for raisng globe artichoke early yield and improving head traits.

Also, using bio- fertilizers may be considered as a substitute and/ or to decrease the mineral fertilizers application and consequently reduce the environment pollution.

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الملخص العربى

تأثير البوتاسين وبعض المخصبات الحيوية على التبكير وصفات الجودة فى الخرشوف

صفاء على احمد منصور، عفاف توفيق مجمود قاسم و عبد المنعم محمد عبد الحميد

قسم بحوث البطاطس والخضر خضرية التكاثر – معهد بحوث البساتين – مركز البحوث الزراعية

اجريت دراسة حقلية بمزرعة محطة بحوث البساتين بالقناطر خلال موسمى ١٩٩٨/ ١٩٩٩، ١٩٩٩/٢٠٠٠ لدراسة تأثير النيتروبين والفوسفورين والرش بالبوتاسين على التكبير وصفات الجودة فى الخرشوف، حيث تم استخدام اربع معاملات هى:-

١- الكونترول وهى عبارة عن التسميد بمعدل ٦١,٥ كجم نيتروجين + ٣٨,٢٥ كجم فوسفور ٥ + ٣٦ كجم بوتاسيوم.

٢- استخدام ٢/١ معدل السماد الازوتى + ٨ كجم نيتروبين للفدان + السماد الفوسفاتى الكامل + السماد البوتاسى الكامل.

٣- اضافة السماد الازوتى الكامل + ٢/١ معدل السماد الفوسفاتى + ٥ كجم فوسفورين للفدان + السماد البوتاسى الكامل.

٤- الرش بالبوتاسين بمعدل ٢٥٠٠ جزء فى المليون + ٢/١ معدل السماد البوتاسى + السماد الازوتى الكامل + السماد الفوسفاتى الكامل.

قسم السماد الكيماوى على ثلاث دفعات متساوية تبدأ بعد ٦٠ يوم من الزراعة وبفاصل ٣٠ يوم بين الدفعة والاخرى، وقد روعى اضافة المخصبات الحيوية بعد اسبوع من التسميد الكيماوى حتى لا يتأثر نشاط المخصب الحيوى وقد وزعت المعاملات فى قطاعات كاملة العشوائية فى ثلاث مكررات.

اهم النتائج :

١- الرش بالبوتاس بتركيز ٢٥٠٠ جزء فى المليون مع استخدام نصف معدل السماد البوتاسى ادى إلى زيادة المحصول الميكر وتحسين صفات الجودة.

٢- استخدام المخصب الحيوى نيتروبين بمعدل ٨ كجم + ٢/١ معدل السماد النيتروجينى ادى إلى زيادة المحصول الميكر.

٣- استخدام البوتاسين او ا لمخصب الحيوى نيتروبين ادى إلى خفض كمية المساد المعدنى البوتاسى او النيتروجينى بمعدل ٥٠% وبالتالى يؤدى ذلك إلى خفض تكاليف الانتاج والمحافظة على البيئة من التلوث.