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EFFECT OF POTASSIUM FERTILIZATION AND FOLIAR APPLICATION OF CERTAIN MICRO-NUTRIENTS COMBINATIONS ON GROWTH, YIELD AND CHEMICAL COMPOSITION OF GARLIC PLANTS

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ABSTRACT

Two field experiments were conducted at the Experimental Farm of the Faculty of Agriculture, Moshtohor, Zagazig University during the winter seasons of 1989/1990 and 1990/1991 to study the response of garlic plants cv. Japanese to potassium fertilization (50, 100 and 150 kg K_2O/fad) and foliar spray of copper, zinc and iron combinations (control, 50 ppm Cu + 50 ppm Zn + 50 ppm Fe, 100 ppm Cu + 100 ppm Zn + 100 ppm Fe and 150 ppm Cu + 150 ppm Zn + 150 ppm Fe).

Obtained results show that growth parameters (plant height, number of leaves, fresh and dry weight per plant) and total yield and its components (bulb length, diameter and weight) as well as all determined chemical constituents (photosynthetic pigments, N, K, Cu, Zn and Fe) were statistically increased with increasing potassium fertilizer level up to 100 kg K_2O or micro-nutrients mixture concentration. In this respect 100 kg K_2O combined with the highest micro-nutrient concentration (150 ppm Cu + 150 ppm Zn + 150 ppm Fe) was the most favourable treatment under the experimental conditions.

INTRODUCTION

Garlic (Allium sativum, L.) is one of the most important bulb crops grown in Egypt. The highest productivity of garlic could be achieved through improving the agricultural treatments especially the application of optimal levels of potassium fertilizer and/or the use of micro-nutrients especially nowadays after that Egyptian soils become deficient in one or more of micro-nutrients needed by garlic due to the building of the High Dam.

Many investigators reported the improving effect of potassium application on plant growth, yield and its components (Ismail et al., 1979 & 1980; Maksoud et al., 1983 and El-Mansi et al., 1985). In addition, El-Mansi et al. (1985), indicated that there was a progressive and consistent increase in photosynthetic pigments in the tissues of garlic leaves with increasing potassium fertilizer up to the highest used level (100 kg K_2O/fad).

With regard to micro-nutrients, Yanazawa & Fujii, (1972); Mel'nik, (1973); Komarova, (1975) and Abed et al. (1988), indicated that soaking cloves or spraying garlic plants with micro-nutrients (Cu and/or Zn) enhanced growth, stimulated dry matter accumualtion and increased total yield and its components. Furthermore, Abed et al. (1988), reported that micro-nutrients application increased total nitrogen, phosphorus, potassium, zinc and copper content of different plant parts.

This study was conducted to elucidate the effect of potassium fertilization and micro-nutrients spray on growth, yield and chemical composition of garlic plants.

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Farm of the Faculty of Agriculture, Moshtohor, Zagazig University, during the winter seasons of 1989/1990 and 1990/1991 to investigate the effect of potassium fertilization and micro-nutreints spray (i.e. combinations of copper, zinc and iron) on growth, yield and chemical composition of garlic plants cv. Japanese.

Each experiment included 12 treatments which were the combination of three levels of potassium fertilizer (50, 100 and 150 kg K_2O/fadan) and 4 concentrations of the following micro-nutrients mixtures.

1- Distilled water to act as control treatment.
2- 50 ppm Cu + 50 ppm Zn + 50 ppm Fe.
3- 100 ppm Cu + 100 ppm Zn + 100 ppm Fe.
4- 150 ppm Cu + 150 ppm Zn + 150 ppm Fe.

Salts of copper, zinc and ferrious sulphate were used as sources of Cu, Zn and Fe respectively. Potassium sulphate fertilizer (48-52% K_2O) was used as a source of potassium.

The soil of the experimental Farm was clay loam in texture with pH 7.5, available K 0.5 meq/L., Cu 3.3 ppm, Zn 0.25 ppm and Fe 0.20 ppm.

Cloves were planted on October 3rd and 6th in 1989 and 1990 respectively at 7 cm apart on both sides of ridges 60 cm wide and 3.5 m long. A split-plot design with four replicates was adopted where K-fertilization treatments were situated at the main plots and micro-nutrient treatments in sub-plots. Each experimental sub-plot included 5 ridges with an area about 10.5 m^2 (1/400 of fad.).

Garlic plants were sprayed with mixture of micro-nutrients three times during the growing season starting three weeks after planting and three weeks intervals. Both nitrogen and phosphorus fertilizers were added at 60 and 48 kg/fad. as N and P_2O_5 respectively. The amounts of N, P and K fertilizers were sub-divided into three equal doses starting four weeks after planting and four weeks intervals. Other agricultural practices were carried out as commonly followed in the district. Three weeks later from the last fertilizers dosage, representative samples each of 10 plants were taken from each experimental sub-plot for measuring vegetative growth characteristics and chemical analysis determination. The vegetative growth measurments were recorded as plant height, number of leaves and fresh and dry weight per plant as well as length, diameter and average weight of bulb. For chemical determination, representative samples were taken from plant foliage and cloves during the second season only (1990/1991) for determining photosynthetic pigments (chlrophyll a, b and carotenoides) in plant foliage colorimetrically as described in A.O.A.C. (1970). Also nitrogen, potassium, copper, zinc and iron were assayed in dry matter of plant foliage and cloves according to the methods described by Pregl (1945) for total nitrogen, Brown and Lilleland (1946), for potassium and Chapman and Pratt (1961) for micro-nutrients.

At time of harvest, all plants for each experimental plot were harvested and the total yield per faddan was calculated after curing plants for three days.

All obtained data were subjected to statistical analysis according to Snedecor and Cochran (1968).

RESULTS AND DISCUSSION

1- **Vegetative growth:**

Data illustrated in Table (1) show the effect of potassium fertilization and micro-nutrients mixture sprays as well as their interaction on vegetative growth aspects of garlic plants.

Regarding the effect of potassium, it is clear from such data in Table (1) that all studied growth parameters i.e., plant height, number of leaves, fresh and dry weight per plant were statistically increased with increasing levels of potassium fertilization during both the growing seasons. In this respect the medium used level (100 kg K_2O/fad.) reflected the hgiehst increments of such growth parameters. Obtained results may be due to the role of potassium in carbohydrates formation and assimilation resulted from high photosynthetic pigments content (Table, 3) and total nitrogen (Table 4) which represent the major constituents of plant materials. These results are in agreement with those reported by Ismail *et al.*, (1979 & 1980) and El-Mansi *et al.*, (1985) on garlic.

Concerning the effect of micro-nutrients, the same data in Table (1) reveal that application of micro-nutirents at their different concentrations exerted a marked effect on all studied growth measurements compared with the check treatment. In this connection the medium and highest concentrations of both mixtures of each of Cu, Zn and Fe (100 and 150 ppm) resulted in the highest values of plant growth aspects. These results may be attributed to the main role of such micro-elements in controlling varius enzyme activities and photosynthetic pigments formation, consequently affecting plant growth. Obtained results are in harmony with those reported by Mel'nik, (1973); Komarova, (1975) and Abed *et al.*, (1988) on garlic.

As for the interactional effect, it is obvious from the same data that, irrespective of number of leaves which was not significantly affected, all the studied morphological parameters were enhanced with increasing either potassium level or the micro-nutrients mixture concentration. In this regard, the maximum increments were obtained in case of using 100 kg K_2O/fad. and spraying the plants with mixture solution of Cu, Zn and Fe containing 100 ppm for each.

2- **Yield and its components:**

Data presented in Table (2) show the effect of potassium fertilization and micro-nutrients spray as well as their interaction on total yield and its components. Such data

Table (1): Effect of different levels of potassium fertilizer and micro-nutrients spray on vegetative growth characteristics of garlic plants.

Season		1989/1990				1990/1991			
K_2O-fertilizer level (kg/Fad)	Micro-nutrient concentration (ppm)	Plant height (cm)	No. of leaves per plant	Fresh weight per plant (g)	Dry weight per plant (g)	Plant height (cm)	No. of leaves per plant	Fresh weight per plant (g)	Dry weight per plant (g)
50	Control	55.1	5.7	57.0	9.0	56.9	5.8	58.5	9.0
	50 Cu+ 50 Zn+ 50 Fe	56.5	6.5	62.2	9.6	55.3	6.1	62.4	10.6
	100 Cu+100 Zn+100 Fe	58.2	6.6	64.6	11.8	56.2	6.2	64.4	12.2
	150 Cu+150 Zn+150 Fe	58.8	6.7	64.7	12.6	57.1	6.4	61.3	12.8
100	Control	59.3	6.5	67.4	12.4	57.9	6.8	61.3	10.4
	50 Cu+ 50 Zn+ 50 Fe	64.9	6.7	72.0	13.8	57.4	7.0	78.3	14.8
	100 Cu+100 Zn+100 Fe	73.8	7.9	79.8	19.2	82.7	7.3	80.6	20.0
	150 Cu+150 Zn+150 Fe	70.3	7.6	75.9	20.4	77.6	7.9	82.3	22.2
150	Control	60.7	6.3	65.1	10.8	83.8	6.5	63.5	10.8
	50 Cu+ 50 Zn+ 50 Fe	61.7	6.6	66.5	12.2	86.4	6.5	73.3	14.0
	100 Cu+100 Zn+100 Fe	63.3	6.7	71.5	15.0	94.8	6.5	73.6	15.4
	150 Cu+150 Zn+150 Fe	64.6	6.9	70.8	16.2	92.2	6.8	75.4	17.4
L.S.D. at 5%		5.4	N.S	N.S	2.1	0.7	N.S	4.6	2.0
K_2O 50		57.1	6.4	62.1	10.7	56.4	6.2	61.7	11.1
100		67.1	7.2	73.8	16.5	68.6	7.2	75.6	16.9
150		62.6	6.6	68.5	13.6	89.3	6.5	71.5	14.4
L.S.D. at 5%		2.4	0.4	1.8	0.9	0.3	0.5	2.3	0.9
	Control	58.4	6.2	63.2	10.7	66.2	6.3	61.1	10.0
	50 Cu+ 50 Zn+ 50 Fe	61.0	6.6	66.9	11.9	66.4	6.5	71.3	13.1
	100 Cu+100 Zn+100 Fe	65.1	7.1	71.9	15.4	77.9	6.7	72.9	15.9
	150 Cu+150 Zn+150 Fe	64.5	7.1	70.5	16.4	75.6	7.0	73.1	17.5
L.S.D. at 5%		2.8	0.4	2.1	1.0	0.5	N.S	2.7	1.0

revealed that average bulb weight, bulb height and diameter as well as the total yield were statistically increased with increasing the level of potassium ferilizer from 50 up to either 100 or 150 kg K_2O per faddan. In this regard, the maximum increments in all formentioned yield performance were connected with the medium level of potassium fertilizer (100 kg K_2O/faddan). Obtained results may be due to the role of potassium in carbohydrates assimilation and translocation from plant foliage to plant bulb. Similar results were reported by Ismail et al. (1979 & 1980); Maksoud et al., (1983) and El-Mansi et al., (1985) on garlic.

As for the effect of micro-nutrients, data in Table (2) indicate, in general, that there were a significant increase in bulb weight, height and diameter and the total yield due to spraying the plants with the mixture of studied micro-nutrients. Such increments are positively connected with increasing the concentration of micro-nutrients compared with the control treatment. Obtained results are in agreement with those obtained by Mel'nik (1973); Komarova, (1975) and Abed et al., (1988) on garlic.

Concerning the interactional effect, it is clear from data at Table (2) that irrespective of weight, diameter and yield in the first season and bulb height and diameter in the second one which were not statistically affected during the second season, the total yield and its parameters were enhanced and showed a progressive and constant increase with increasing both potassium level and micro-nutrient concentration. In this respect, the highest total yield with maximum bulb parameters were obtained as a result of using 100 kg K_2O per faddan and spraying plants with the highest micro-nutrients concentration (150 ppm Cu + 150 ppm Zn + 150 ppm Fe).

3- Chemical constituents:

a- Photosynthetic pigments:

Data in Table (3) show the effect of potassium fertilization and micro-nutrient spray as well as their interaction on chlorophyll a, chlorophyll b and total carotenoides content in plant foliage. From such data, it is clear that, increasing level of potassium fertilizer from 50 up to 150 kg K_2O per faddan led to a continous and significant increase in all determined photosynthetic pigments. In this respect, the highest level of potassium fertilization reflected the highest increments in the content of photosynthetic pigments for plant foliage. These results agree with those reported by Jasa et al., (1975) and El-Mansi et al., (1985) on garlic.

Table (2): Effect of different levels of potassium fertilization and micro-nutrients spray on total yield and its components of garlic plants .

Season		1989/1990				1990/1991			
K_2O fertilizer level (Kg/Fad.)	Micro-nutrients concentration (ppm)	Bulb weight (g.)	Bulb height (cm)	Bulb diameter (cm)	Total yield (Ton/Fad.)	Bulb weight (g.)	Bulb height (cm)	Bulb diameter (cm)	Total yield (Ton/Fad)
50	Control	41.7	3.9	3.6	6.304	42.8	3.6	3.8	6.960
	50 Cu+ 50 Zn+ 50 Fe	44.0	4.0	4.5	6.966	45.3	3.6	4.5	6.988
	100 Cu+100 Zn+100 Fe	47.3	4.0	4.7	7.239	52.3	4.1	4.5	7.216
	150 Cu+150 Zn+150 Fe	52.7	4.0	4.7	7.246	46.7	4.0	4.7	6.864
100	Control	42.8	3.9	4.4	7.549	44.5	3.6	4.1	6.864*
	50 Cu+ 50 Zn+ 50 Fe	48.3	3.9	4.8	8.068	50.5	4.1	4.6	8.768
	100 Cu+100 Zn+100 Fe	58.2	4.5	5.0	8.934	57.8	5.0	4.9	9.024
	150 Cu+150 Zn+150 Fe	55.9	5.5	5.8	8.501	67.0	4.8	4.8	9.218
150	Control	42.9	3.9	3.7	7.295	43.8	3.9	4.1	7.112
	50 Cu+ 50 Zn+ 50 Fe	45.6	4.2	4.7	7.444	53.8	4.1	4.2	8.218
	100 Cu+100 Zn+100 Fe	51.9	4.2	4.9	8.012	54.7	4.0	4.5	8.248
	150 Cu+150 Zn+150 Fe	50.1	4.1	4.9	7.927	56.2	3.8	4.4	8.608
L.S.D. at 5%		N.S	0.6	N.S	N.S	3.6	N.S	N.S	0.800
K_2O 50		46.4	4.0	4.4	6.939	46.8	3.8	4.4	7.007
100		51.3	4.5	5.0	8.263	55.0	4.4	4.6	8.469
150		47.6	4.1	4.6	7.670	52.1	4.0	4.3	8.047
L.S.D. at 5%		1.8	0.3	0.2	0.792	1.6	N.S	N.S	0.256
	Control	42.5	3.9	3.9	7.049	43.7	3.7	4.0	6.979
	50 Cu+ 50 Zn+ 50 Fe	45.9	4.0	4.7	7.493	49.9	3.9	4.4	7.991
	100 Cu+100 Zn+100 Fe	52.5	4.2	4.9	8.062	54.9	4.4	4.6	8.163
	150 Cu+150 Zn+150 Fe	52.9	4.5	5.1	7.891	56.6	4.2	4.6	8.230
L.S.D. at 5%		1.9	0.3	0.3	0.184	1.9	N.S	N.S	0.296

Table (3): Effect of different levels of potassium fertilizer and micro-nutrients spray on photosynthetic pigment concentration (mg/100 gm dry weight).

K_2O-fertilizer level, Kg/Fad.	Micro-nutrient conc., ppm	Chlorophyll (a)	Chlorophyll (b)	Carotenoides
50	Control	92.4	58.0	62.0
	50 Cu+ 50 Zn+ 50 Fe	98.2	60.0	63.4
	100 Cu+100 Zn+100 Fe	107.3	64.0	64.5
	150 Cu+150 Zn+150 Fe	119.9	65.0	65.4
100	Control	95.7	60.0	70.8
	50 Cu+ 50 Zn+ 50 Fe	109.3	62.0	72.6
	100 Cu+100 Zn+100 Fe	123.7	66.0	78.8
	150 Cu+150 Zn+150 Fe	139.7	67.0	79.4
150	Control	100.0	61.0	75.2
	50 Cu+ 50 Zn+ 50 Fe	120.3	68.0	74.7
	100 Cu+100 Zn+100 Fe	123.0	75.0	78.8
	150 Cu+150 Zn+150 Fe	123.7	76.0	79.3
L.S.D. at 5%		7.0	N.S.	3.55
K_2O 50		104.5	62.8	63.8
100		117.1	64.0	75.4
150		116.8	70.0	77.8
L.S.D. at 5%		3.1	3.7	1.7
	Control	96.0	59.9	69.3
	50 Cu+ 50 Zn+ 50 Fe	109.3	63.7	71.4
	100 Cu+100 Zn+100 Fe	117.9	68.6	74.0
	150 Cu+150 Zn+150 Fe	127.7	69.4	74.7
L.S.D. at 5%		3.6	4.2	3.6

Regarding the effect of micro-nutrients, data in Table (3) revealed that there was a progressive and consistent increase in chlorophyll a, chlorophyll b and carotenoides contents in the tissues of garlic leaves with increasing the concentration of micro-nutrient mixture. Obtained results may be due to the role of such micro-nutrients in formation of such pigments. In this regard Shafshak and Farag (1987) on spinach reported that analysis of leaves showed high values of chlorophyll a, b and carotene content to application of Cu, Zn and Fe.

As for the interaction effects, it is evident from data at Table (3) that using 100 or 150 kg K_2O and spraying the plants with mixture containing 150 ppm of each of Cu, Zn and Fe reflected the highest concentration of chlorophyl a, b and carotenoides.

b- Mineral elements:

It is obvious from data in Table (4) that, total nitrogen ,potassium, copper, zinc and iron concentration either in plant foliage or cloves were significantly increased with increasing the level of potassium fertilization up to the highest used one (150 kg K_2O/fad.). In this respect, cloves proved to be the storage portion for mineral elements in plant compared with plant foliage. Obtained results may be attributed to the main role of potassium fertilizer in translocation and accumulation of such macro- and micro-nutrients from up to under ground portion of plant (storage parts).

With regard to the effect of micro-nutrients, it is clear from the same data at Table (4) that all determined macro- and micro-elements either in plant foliage or cloves were significantly increased with increasing the concentration of micro-nutrients mixture. Obtained results are in harmony with those reported by Abed et al., (1988).

Concerning the interaction of potassium fertilizer and micro-nutrients, the same data in Table (4) show that there were continuous and significant increments in all measured elements in different plant parts with increasing either potassium fertilizer level or micro-nutrients content ratio mixture.

Table (4): Effect of different levels of potassium fertilizer and micro-nutrients spray on mineral concentration of garlic plant foliage and cloves.

K_2O-fertilizer level Kg/Fad.	Micro-nutrient conc., ppm	K, mg/100 g DW		N, mg/100 g DW		Fe, ppm		Cu, ppm		Zn, ppm	
		Foliage	Cloves	Foliage	Cloves	Foliage	Cloves	Foliage	Cloves	Foliage	Cloves
50	Control	1948	1656	2060	2490	145	150	22	26	171	182
	50 Cu+ 50 Zn+ 50 Fe	2628	1980	2140	2560	235	250	31	35	285	291
	100 Cu+100 Zn+100 Fe	2893	2304	2140	2600	260	350	35	38	299	305
	150 Cu+150 Zn+150 Fe	2928	2332	2220	2670	270	375	40	55	325	345
100	Control	1980	1818	2140	2520	180	160	23	26	191	192
	50 Cu+ 50 Zn+ 50 Fe	2656	2142	2220	2670	260	260	31	37	293	299
	100 Cu+100 Zn+100 Fe	2978	2804	2370	2750	295	344	37	39	356	361
	150 Cu+150 Zn+150 Fe	3470	3930	2370	2830	305	385	41	40	333	371
150	Control	2318	1980	2370	2640	185	170	23	28	199	205
	50 Cu+ 50 Zn+ 50 Fe	2881	2330	2520	2830	275	300	32	33	290	233
	100 Cu+100 Zn+100 Fe	3466	2932	2520	2870	310	370	29	34	366	275
	150 Cu+150 Zn+150 Fe	3494	3100	2830	2940	325	395	43	40	372	392
L.S.D. at 5%		11	12	N.S.	N.S.	N.S.	N.S.	N.S.	5	43	6
50		2599	2068	2140	2578	228	290	32	39	270	281
100		2771	2424	2275	2693	260	287	33	36	293	306
150		3040	2586	2560	2818	274	309	34	34	282	301
L.S.D at 5%		5	6	78	33	19	N.S.	2	2.63	N.S.	3
	Control	2082	1818	2190	2548	170	171	23	27	187	193
	50 Cu+ 50 Zn+ 50 Fe	2722	2151	2290	2686	257	270	31	35	289	274
	100 Cu+100 Zn+100 Fe	3112	2680	2340	2738	288	355	37.	37	307	347
	150 Cu+150 Zn+150 Fe	3297	2787	2470	2813	300	385	41	45	343	369
L.S.D. at 5%		6	7	96	38	20	15	2	3	21	4

DW : Dry weight.

REFERENCES

Abed, T.A.; Abo-Sedera, F.A. and El-Orabi, T.O.A. (1988): Effect of soaking cloves in some micro-nutrients solutions and nitrogen fertilizer soil addition on growth, yield and chemical composition of garlic plants. Annals Agric. Sci. Moshtohor, 26(4): 2675-2693.

A.O.A.C. (1970): Official methods of analysis, the Association of Official Agric. Chemists Washington.

Brown, J.D. and Lilleland, O. (1946): Rapid determination of potassium and sodium in plant material and soil extract by flame photometery. Proc. Amer. Soc. Hort. Sci. 48: 341-346.

Chapman, H.D. and Pratt, P.F. (1961): Methods of analysis for soil, plants and water. Univ. of Calif. Div. Agric. Sci. Calif. U.S.A.

El-Mansi, A.A.; Kalil, M.A.I.; Gad, A.A.; El-Sawah, M.H. and Zaki, M. (1985): Effect of potassium fertilizer on the productivity and storagability of garlic. Zagazig J. Agric. Res. 12: 39-51.

Ismail, Z.; Habeeb, H.; Saad, M. and Abdel-Kader, A. (1980): Response of garlic to N rate and sources P and K application on the sandy loam soil of sawthern Nil-Delta. Agric. Res. Rev. 3: 65-75.

Ismail, Z.; Habeeb, H. and Soliman, S.C. (1979): N, P and K requirements of Egyptian garlic crop in Middle Egypt. Agric. Res. Rev. 3: 37-45.

Jasa, B.; Koutink, V. and Sedak, B. (1975): Nutrition of vegetables with urea-metaphosphate fertilizers. Acta. Univ. Agric. 75: 1355-63. (C.F. Hort. Abstr. 47, 6625).

Komarova, E.N. (1975): The effect of boron, zinc and copper on the growth and development of winter garlic planted in spring (C.F. Hort. Abstr. 76, 4465, 1976).

Maksoud, M.A.; Foda, S.; El-Gizawi, A. and Taha, L.M. (1983): Response of garlic plants to fertilization treatments. Egypt. J. Hort. 10: 159-165.

Mel'nik, T.K. (1973): The effect of micro-elements on chlorophyll content in garlic leaves (C.F. Hort. Abstr. 45: 2325, 1975).

Pregl, E. (1945): Quantitative organic micro-analysis 4th Ed. J. Chundril, London.

Shafshak, Nadia S. and Farag, S.A. (1987): Effect of foliar spray with some micro-nutrients on vegetative and seed yield of spinach. Ann Agric. Sci. Moshtohor, 25: 1660-1673.

Snedecor, G.W. and Cochran, W.G. (1968): Statistical Methods The Iowa State Univ. Press. Ames. Iowa, U.S.A. 6th Ed. 593 pp.

Yanazawa, T. and Fujii, S. (1972): Studies on leaf chlorosis in Baker's garlic grown on sandy soil. I.V. foliar sprays for correcting zinc deficiencies in garlic plants. J. Japanese Soci. Hort. Sci. 41: 61-65. (C.F. Hort. Abstr. 43: 6022, 1973).

تاثير التسميد البوتاسى والرش بمخلوط بعض العناصر المغذية الصغرى على النمو والمحصول والتركيب الكيماوى لنباتات الثوم

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أجريت تجربتان فى مزرعة التجارب بكلية الزراعة بمشتهر خلال الموسم الشتوى لعامى ١٩٨٩/ ١٩٩٠، ١٩٩٠/ ١٩٩١ لدراسة استجابة نباتات الثوم صنف اليابانى للتسميد البوتاسى والرش بمخاليط من النحاس والزنك والحديد على النمو والمحصول والتركيب الكيماوى لنبات الثوم.

أوضحت النتائج على قياسات النمو (معبرا عنها بارتفاع النبات وعدد الاوراق والوزن الطازج والجاف للنبات) وكمية المحصول ومكوناتة (طول وقطر ووزن البصلة) وكذا التركيب الكيماوى (الكلوروفيل والكاروتين والنتروجين والبوتاسيوم والنحاس والزنك والحديد) تزداد بزيادة مستوى التسميد البوتاسى وكذلك بزيادة تركيز العناصر الصغرى بالمخلوط بوجه عام وكانت أفضل المعاملات هى التسميد البوتاسى بمعدل ١٠٠ كجم بو٢ ٦ للفدان مع الرش بأعلى تركيز من العناصر الصغرى المستخدمة فى المخلوط (١٠٠ جزء فى المليون لكل من النحاس والزنك والحديد).