RESPONSE OF SOME ONION CULTIVARS TO MICRONUTRIENTS APPLICATION UNDER MIDDLE DELTA CONDITIONS.
II- Bulbs yield, quality and storagability.

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استجابة بعض أصناف البصل للمعاملة بالعناصر الصغرى تحت ظروف وسط الدلتا
٢- محصول الأبصال وصفات الجودة والتخزين

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ملخص البحث

أجريت الدراسة بهدف بيان استجابة محصول الأبصال وصفات الجودة والتخزين بها فى ثلاثة أصناف من البصل هى : شندول رقم (١) ، جيزة (٦) محسن ، وجيزة (٢٠) للمعاملة بالعناصر الصغرى (النحاس والمنجنيز والزنك) كل بتركيز صفر ، ٥٠٠ ، ١٠٠٠ ، ١٥٠٠ ملليجرام / لتر وذلك فى عامى ١٩٨٣/١٩٨٤ ، ١٩٨٤/١٩٨٥م.

وأوضحت النتائج الآتى :-

- تفوق الصنف جيزة ٢٠ على الصنفين الآخرين بصورة معنوية فى المحصول الكلى والتسويقى - كما أعطى أقل نسبة من الأبصال المزدوجة ، وجدير بالذكر أن هذا الصنف حقق أيضا أعلى وزن غض ونسبة مادة جافة ومواد صلبة ذائبة كلية فى الأبصال الناضجة ، ولكن كان ذات أقل قيمة فى مؤشر شكل البصلة ، وبالاضافة الى هذا فان الصنف جيزة ٢٠ كان ذات أقل فقد فى وزن الأبصال أثناء التخزين وتلاه فى ذلك الصنف شندويل رقم ١ والصنف جيزة ٦ محسن على الترتيب .
- بوجه عام لم يكن هناك فرق معنوى بين العناصر الصغرى المستخدمة فيما يتعلق بتأثيرها على محصول الأبصال أو صفات الجودة أو التخزين بها .

- أدى استخدام التركيزات المنخفضة نسبيا من العناصر الصغرى الى زيـــادة معنوية فى محصول الأبصال الكلى والتسويقى ، كما أدت أيضا الى تحســن فى الوزن الغض ونسبة المادة الجافة وقطر الأبصال ولكن كان لهذه التركيزات تأثير سلبى على المواد الصلبة الذائبة الكلية - وأدى استخدام التركيـــزات العالية من العناصر الى زيادة محصول الأبصال المزدوجة ٠
- أعطت نباتات المقارنة وكذلك تلك التى عوملت بالتركيزات المنخفضة مـــن العناصر الصغرى (٥٠٠ ملليجم / لتر) أبصالا ذات أقل نسبة فقد فى الوزن خلال التخزين ٠
- تم دراسة العديد من حالات التفاعل بين العوامل تحت الدراسة ٠

ABSTRACT

The study was initiated to investigate bulbs yield, quality and storagability in three onion cultivars, i.e., Shandaweel No. 1, Giza 6M and Giza 20 as responded to Cu, Mn and Zn micronutrients application, each at 0, 500, 1000 and 1500 mg/L concentrations.

Opposing to the other tested cultivars, Giza 20 cv., significantly had the highest total and marketable bulbs yield, but appeared with the least doubles percentage. It also had superior fresh weight, dry matter (%) and T.S.S. in mature bulbs, but showed the least shape index value. Giza 20, however, achieved the least total loss percentage in bulbs weight during storage, so it was followed in this connection by Shandaweel No. 1 and Giza 6M, respectively. In general, no significant differences between the tested micronutrients in regards to their effects on bulbs yield, quality or storagability.

The relatively low micronutrient concentrations significantly increased total and marketable bulbs yield. It also improved bulbs fresh weight, dry matter percentage and diameter, but negatively affected T.S.S. contents. Meanwhile, the higher concentration (1500/mg/L) increased double bulbs yield.

Control plants or those received micronutrients at the lowest concentration, i.e., 500 mg/L, produced bulbs with the least total loss percentage in weight during storage. The interactions between tested variations were discussed.

INTRODUCTION

The effect of Cu, Mn and Zn micronutrients on onion yield, quality and storagability is well documented in the literature. The application of copper and manganese sulphate to onion plants markedly increased bulbs yield (El-Moursi, 1980) and gave low double bulbs number (Ibrahim et al., 1980). Foliar spraying of manganese and zinc on onion was also reported by El-Sayed et al. (1985) to increase dry matter percentage, diameter and length in produced bulbs.

Micronutrients were reported, however, to improve bulbs storagability. Moderate rates of applied $MnSO_4.4H_2O$ to onion was observed by Basilious (1983) to reduce weight loss percentage in storaged bulbs. Besides the total loss percentage in bulbs weight during storage was found by the auther to be high in bulbs produced from onion plants sprayed with high $ZnSO_4.7H_2O$. On the other side, no significant variation in storagability of onion bulbs was noticed due to copper application (Badre, 1980 and El-Kafoury, 1986).

This work was designed to study yield performance of three onion cultivars as responded to the most important micronutrients application under Middle Delta conditions.

MATERIALS AND METHODS

Informations regarding studied variations, experimental design, dates of planting were included in the first paper of the series (Khalil et al., 1988). Bulbs yield of the four inner ridges was harvested on May 27th and June 1st in 1984 and 1985 seasons, respectively, i.e., when 50% of the tops were down. After harvest, plants were left in the field to cure for two weeks, then tops and roots were removed, so the total length, fresh weight, dry matter percentage and T.S.S. in bulbs were assessed.

A sample of 50 cured uniform bulbs was undertaken from the yield of each replication and kept in common burlap bags under common storage conditions (Temp. 25 ± 5) a period of four months. During storage period, bulbs were monthly inspected, since rotted and sprouted bulbs were discarded and the remaining was weighed. The percentage of weight loss, due to discarding rotted and sprouted bulbs, were then recorded.

Obtained data were exposed to proper statistical analysis of variance (Snedecor and Cochran, 1967) and the Duncan's multiple range test at 5% level was used for the comparison among means (Duncan, 1955). The data expressed as percentages were transformed to arcsine before the analysis of variance.

RESULTS AND DISCUSSION

1- Yield and its components:

1-1- Effect of cultivar:

As can be seen in Table (1), Giza 20 cv. significantly had the highest total (ton/fed.) and marketable (ton/fed.) bulbs yield as compared to the other tested cultivars. This result is true in both seasons of study. Giza 20 cv. had also high double bulbs (kg/fed.), so it ranks the first in 1983/1984 season. In spite of that, Giza 20 cv. showed the least double bulbs yield percentage in either 1983/1984 and 1984/1985 seasons, whereas the highest record in this respect was observed in Shandaweel No. 1 cv.. The total and marketable bulbs yield (ton/fed.) of Giza 6M significantly exceeded those of Shandaweel No. 1 cv. in 1983/1984 season, but vice versa occured in 1984/1985. Giza 20 cv. was also reported by El-Gammal et al. (1980) and El-Kafoury (1986) to be of highest total and marketable bulbs yield.

Table (1): Effect of cultivars and applied micronutrients; along with their tested cocentrations on bulbs yield and its components in onion .

Yield and its components Studied variations	1983/1984 Total yield (Ton/ Fed.)	Marketable yield (Ton/ Fed.)	Marketable yield (%)	Double bulbs yield (Kg/ Fed.)	Double bulbs yield (%)	1984/1985 Total yield (Ton/ Fed.)	Marketable yield (Ton/ Fed.)	Marketable yield (%)	Double bulbs yield (Kg/ Fed.)	Double bulbs yield (%)
Cultivars										
Giza 20	9.040 a	8.900 a	98.45 a	140.39 a	1.54 b	12.285 a	12.122 a	98.69 a	163.52 b	1.32 b
Giza 6M	3.515 b	3.413 b	97.10 b	104.43 b	2.93 a	3.169 c	3.069 c	96.77 b	100.53 c	3.27 a
Shandaweel No.1	2.766 c	2.672 c	96.59 b	95.81 b	3.45 a	5.785 b	5.570 b	96.04 b	216.60 a	4.00 a
Micronutrients										
$CuSO_4.5H_2O$	5.043 a	4.938 a	97.51 a	106.37 a	2.50 a	7.028 a	6.888ab	97.65 a	140.58 a	2.41 b
$MnSO_4.4H_2O$	5.047 a	4.931 a	97.25 a	116.87 a	2.78 a	6.781 a	6.614 b	96.71 a	168.18 a	3.30 a
$ZnSO_4.7H_2O$	5.232 a	5.115 a	97.37 a	117.37 a	2.64 a	7.430 a	7.520 a	97.12 a	171.90 a	2.90 ab
Micronutrients Concent.(mg/l)										
0	4.854 b	4.757 b	97.60 a	98.79 b	2.43 b	6.629 b	6.480 b	97.17 ab	151.40 b	2.88 ab
500	5.477 a	5.377 a	97.88 a	101.90 b	2.16 b	7.567 a	7.430 a	97.80 a	136.70 b	2.19 b
1000	5.202 ab	5.077 ab	97.15 b	125.40 a	2.86 a	7.247 ab	7.059ab	96.75 b	188.99 a	3.25 a
1500	4.896 b	4.769 b	96.93 c	128.10 a	3.11 a	6.876 b	6.713 b	96.93 ab	164.11 ab	3.14 a

* Means separation in columns by Duncan's multiple range test 5 % level .

* Values in the same column followed by the same letter don't differ sinificantly .

The superiority of Giza 20 cv. owe much to its well adaptation to environmental conditions under Middle Delta region, particularly what dealing with photoperiod and temperature. From the field observation, Giza 20 cv. showed less disease incidence as compared to the other tested cultivars, factors that created well opportunity to increase bulbs yield. The contradictories in yield responses among seasons of study could be explained due to the variation in such environmental conditions particularly what dealing with climate.

1-2- Effect of micronutrients:

With a slight descrepancies, no significant differences can be seen among the tested micronutrients in regard to their effects on the studied yield components in both seasons (Table 1). In spite of that a trend of increasing total (ton/fed.), marketable (ton/fed.) and double (kg/fed.) bulbs was observed to follow $ZnSO_4.7H_2O$ foliar application. Besides, plants received $CuSO_4.5H_2O$ sprays gave the least double bulbs yield (Kg/fed. and %) in both seasons. It gave also the highest marketable yield percentage, followed in this respect by those received $ZnSO_4.7H_2O$ and $MnSO_4.4H_2O$ in descending order.

Obtained results are in agreement with those of El-Moursi (1980) and El-Sayed et al. (1985) using such micronutrients on onion.

1-3- Effect of micronutrient concentrations:

Results of yield and its components, as responded to tested micronutrient concentrations, are reported in Table (1) from which it can be concluded that plants received relatively low concentrations, i.e., 500 and 1000 mg/L are of high total (ton/fed.) and marketable (ton/fed. and %) bulbs yield. This result was insistently observed in both seasons of study. As compared to control, the percentages of total bulbs yield increase due to micronutrients application at the concentrations of 500 and 1000 mg/L are 12.83% and

17%, respectively. These values are true in 1984, whereas the increase percentage in 1985 are 14.15 and 9.32%, respectively.

Obtained results go along with those of Yanawa and Fujii (1972), El-Moursi (1980) and El-Sayed et al. (1985). They reported that the relatively low micronutrients concentration are more effective to favour bulbs yield in onion.

Micronutrients application at relatively high concentrations, i.e. 1000 and 1500 mg/L increased double bulbs yield (Kg/fed. and %), so the highest marketable yield being obtained in control plants or in those received micronutrients application at lower concentration i.e., 500 mg/L.

Results could be explained as the higher micronutrient concentrations disruptes the apical bud of onion plants, thereby may be encouraged another buds to grow, producing multiple bulbs. This drawn conclusion was previously suggested by Midan and Malash (1982) on onion. Obtained results are in harmony with those of El-Moursi (1980).

1-4- The interactions effect:

No significant variation in bulbs yield or its components could be noticed due to the interaction between the tested factors, so its related data were omitted.

2- Bulbs quality:

2-1- Effect of cultivar:

It is easily noticable that grown cultivars differ in mature bulbs quality (Table 2). Giza 20 cv. significantly had the highest fresh weight, dry matter and total soluble solids in mature bulbs. It also achieved superior bulb diameter but approved to have the least shape index value.

Table (2.):Effect of cultivars and applied micronutrients, along with their concentrations on mature bulb characteristics in onion .

Bulb characteristics Studied variations	1983/1984 Bulb fresh weight (gm)	Dry matter in bulb (%)	Bulb diameter (cm)	Shape index (D/L)	T.S.S. (%)	1984/1985 Bulb fresh weight (gm)	Dry matter in bulb (%)	Bulb diametr (cm)	Shape index (D/L)	T.S.S. (%)
Cultivars										
Giza 20	87.20 a	14.19 a	6.49 a	1.20 b	13.77 a	92.24 a	13.77 a	7.04 a	1.18 b	14.52 a
Giza 6M	56.13 b	12.31 b	5.16 b	1.28 a	12.33 b	59.27 c	12.69 b	5.40 b	1.28 a	13.48 b
Shandaweel No.1	45.65 c	12.58 b	4.74 c	1.25 a	12.75 b	64.28 b	12.65 b	5.43 b	1.30 a	13.82 b
Micromutrients										
$CuSO_4.5H_2O$	62.03 a	13.20 a	5.38 a	1.24 a	12.80 a	71.86 a	13.01 a	5.92 a	1.25 a	14.04 a
$MnSO_4.4H_2O$	62.91 a	12.70 b	5.47 a	1.25 a	13.10 a	72.05 a	12.80 a	5.93 a	1.24 a	13.84 a
$ZnSO_4.7H_2O$	64.03 a	13.17 a	5.53 a	1.24 a	12.94 a	72.17 a	12.78 a	5.97 a	1.27 a	13.94
Micromutrients concentrations (mg / l)										
0	60.12 b	12.57 c	5.21 c	1.24 b	13.07 ab	69.54 b	11.91 c	5.69 b	1.25 b	13.52 a
500	65.53 a	13.75 a	5.67 a	1.27 a	12.70 b	74.88 a	13.94 a	6.25 a	1.27 a	14.03 a
1000	64.14 a	13.05 b	5.57 a	1.23 b	12.80 ab	72.68 ab	13.00 b	6.05 a	1.25 ab	14.09 a
1500	62.19 ab	12.72 bc	5.40 b	1.24 b	13.22 a	71.02 b	12.61 b	5.84 b	1.25 ab	14.14 a

* Means separation in columns by Duncan's multiple range test 5 % level .

* Values in the same column followed by the same letter don't differ significantly .

Likewise, Shandaweel No. 1 cv. significantly showed the least fresh weight and diameter in bulbs as assessed in 1983/1984 season, whereas in 1984/1985, Giza 6M cv. being of least records in this respect. Shandaweel No. 1 and Giza 6M did not differ significantly in dry matter percentage and T.S.S. in bulbs or in shape index value. The superiority of Giza 20 cv. in bulbs fresh weight along with their dry matter and T.S.S. contents may be interpreted on the basis of its genetic superiority in the potentialy of dry matter accumulation in bulbs. This drawn conclusion goes along with the results of Kleinkopf et al. (1981) who reported varietal variation in the potentialy of dry matter accumulation in potato tubers.

Giza 6M and Shandaweel No. 1 cvs. were hereditically known to be of more flattened bulbs and have large diameter, thereby the increase in shape index values is quite expected. Such obtained results are in agreement with those of El-Shafie et al. (1971), El-Gammal et al. (1980) and El-Kafoury (1986).

2-2- Effect of micronutrients:

With a slight descrepancies, no significant differences could be noticed among studied micronutrients regarding their effects on bulb quality (Table 2). In spite of that, somewhat superority in bulb fresh weight and diameter could be noticed due to $ZnSO_4.7H_2O$ foliage sprayings.

The superiority of $ZnSO_4.7H_2O$ was previously discussed to be due to the key role of Zn in growth hormons synthesis. Besides, the foliage application of $CuSO_4.5H_2O$ seemed to cause the highest dry matter percentage in bulbs, although significances were noticed in the first season only. It also achieved the highest T.S.S. in bulbs in the second season. Results may be interpreted as Cu improved photosynthesis process and consequently may enhance carbohydrate synthesis, product that constitute the largest part of dry weight.

2-3- Effect of micronutrient concentrations:

The relatively low concentrations, i.e. 500 and 1000 mg/L, of applied micronutrients gave the highest fresh weight and dry matter percentage in bulbs (Table 2). It also improved bulbs diameter and increased shape index value. Increasing the above mentioned growth parameters of bulbs was associated with a decrease in their T.S.S. contents. The lower micronutrient concentrations were previously discussed to encourage vegetative growth, thereby may increase metabolities synthesis and storage in bulbs, factors that reflected an increase in their growth parameters.

The associated reduction in T.S.S. was quite expected due to increase bulbs growth, i.e., the dillution effect. The superiority of low micronutrient concentrations in increasing onion bulbs growth was also noticed by Badawi and Khalaf (1981) and El-Sayed et al. (1985).

2-4- The interactions effect:

The interaction between the tested factors exerted, in general, no significant effect on mature bulb quality, so its related data were omitted.

3- Storagability:

3-1- Effect of cultivar:

Bulbs storagability was first expressed by Woodman and Barnell (1937) in England as total loss percentage in bulbs weight during respected period.

Data regarding storagability of onion bulbs as affected by grown cultivars are presented in Table (3). It can be concluded that, Giza 20 cv. is of superior storagability characteristics, since it significantly had the least total loss percentage in bulbs

Table (3): Effec of cultivars and applied micronutrients, along with their tested concentrations on the weight loss (%) in bulbs during storage period in onion .

Studied variations	1983/1984 Storage period in months				1984/1985 Storage period in months			
	1	2	3	4	1	2	3	4
Cultivars								
Giza 20	12.39 b	3.36 c	8.55 c	9.79 c	14.55 b	3.52 c	9.28 c	3.77 c
Giza 6M	15.20 a	5.78 a	13.74 a	21.45 a	17.51 a	5.78 a	14.10 a	22.57 a
Shandaweel No.1	13.13 b	4.32 b	11.41 b	16.72 b	15.23 b	4.65 b	13.83 a	20.03 b
Micronutrients								
$CuSO_4.5H_2O$	13.16 a	4.49 a	11.06 a	15.68 a	15.49 a	4.71 a	12.39 a	15.24 ab
$MnSO_4.4H_2O$	13.65 a	4.28 a	11.23 a	15.74 a	15.44 a	4.37 a	12.28 a	14.38 b
$ZnSO_4.7H_2O$	13.91 a	4.69 a	11.41 a	16.53 a	16.37 a	4.86 a	12.54 a	16.75 a
Midronutrients concentrations (mg / l)								
0	12.95 b	4.18 b	10.37 b	14.99 a	14.24 b	3.82 b	11.77 a	15.05 a
500	14.59 a	4.48ab	11.64 a	15.92 a	16.08 a	4.69 a	12.58 a	14.91 a
1000	13.73ab	4.67 a	11.46 a	16.05 a	16.43 a	5.16a	13.01 a	14.94 a
1500	13.02 b	4.62 a	11.46 a	16.98 a	16.31 a	4.92 a	12.26 a	16.93 a

* Means separation in columns by Duncan's multiple range test 5 % level .

* Values in the same column followed by the same letter don't differ significantly .

weight during storage. This result is true in both seasons of study and was inistently observed in all inspections that conducted during storage period. In this connection, Giza 20 was followed by Shandaweel No. 1 cv., since Giza 6M significantly came the later.

Obtained results are in agreement with those of El-Gammal et al. (1980) who reported that bulbs of Giza 20 cv. are solid and have a rest period almost reaches 10 months. They also reported that Giza 20 cv. had higher T.S.S. and dry matter percentage, so it can be considered a good storage cultivar. Further confirmation was done by Ahmed et al. (1977) who reported that the percentage of total soluble solids might be an indication to onion storagability and dry matter content as well. They added that, Bulk 344 (released as Shandaweel No. 1) had higher T.S.S. and dry matter percentage as compared, in this respect, to Giza 6M cv.

3-2- Effect of micronutrients:

Results in Table (3) show that applied micronutrients insignificantly affected, with a slight exceptions, the weight loss in onion bulbs at different inspections conducted during storage period. The absence of significances may be explained on the basis that the effect of applied micronutrients was annulied by plant aging, so it completely disappeared in harvested bulbs.

Another explanation could be done as each of applied micronutrients plays a distinct role in improving factors well be known to be related to bulbs storagability, the variation between them is then unexpected. The insignificances among micronutrients in regards to their effects on bulbs storagability were also reported by Badre (1980) and El-Kafoury (1986) on onion.

3-3- Effect of micronutrient concentrations:

Data given in Table (3) show that, with a slight discrepancies, control plants and those received lower micronutrients concentration, i.e., 500 mg/L, are of least total loss percentage in bulbs weight. The noticed reduction in weight loss of bulbs during storage may accounted much to the reduction in moisture contents in these bulbs. It is of interest to note herein that, total loss percentage in bulbs weight is high in the first month of storage, hence it decreased to the least values in the second one and seems to increase again up to the fourth month.

The high moisture contents in the new harvested bulbs could explain the increase in bulbs weight loss during the first period of storage. This drawn conclusion goes along with the results of Basilious (1983). However, the noticed increase in weight loss percentage of bulbs that noticed in the later periods of storage, i.e., 3rd and 4th months, may be due to terminate dormancy period, and consequently increasing sprouting in bulbs.

3-4- The interactions effect:

Data in Table (4) show that, regardless applied micronutrients, bulbs of Giza 20 cv. seemed to be of least weight loss percentage. This result is true at all assessments conducted during storage period. Giza 20 cv. was followed in this connection by Shandaweel No. 1, since Giza 6M came the later. Superior storagability characteristic in Giza 20 cv. bulbs was previously reported by El-Gammal et al. (1980).

It could also observed that manganese sulphate foliar sprayings was more effective in decreasing the weight loss percentage in Giza 20 cv. bulbs. This result is true at the first three months of storage, so $ZnSO_4$ was more effective in the fourth month. Results

Table (4): The interactive effect of cultivars and applied micronutrients on the weight loss (%) in bulbs during storage period in onion .

Studied interactions		1983/1984 Storage period in months 1	2	3	4	1984/1985 Storage period in months 1	2	3	4
Cultivars X micronutrients									
Giza 20	X $CuSO_4$	12.52 a	3.18 d	8.83 a	11.92 a	15.75abc	3.15 d	9.78 a	2.86 a
	X $MnSO_4$	11.83 a	2.96 d	8.28 a	13.71 a	14.25 bc	3.34 d	9.43 a	4.43 a
	X $ZnSO_4$	12.83 a	3.94 c	8.56 a	10.13 a	13.65 c	4.06bcd	8.62 a	4.01 a
Giza 6M	X $CuSO_4$	14.42 a	6.40 a	13.40 a	21.21 a	15.61abc	7.00 d	14.24 a	22.94 a
	X $MnSO_4$	15.62 a	4.99 d	14.05 a	21.19 a	18.45 a	4.90 bc	19.11 a	21.64 a
	X $ZnSO_4$	15.55 a	5.95 a	13.76 a	21.94 a	18.47 a	5.75 b	13.74 a	23.13 a
Shandaweel No.1	X $CuSO_4$	12.90 a	3.88 c	10.95 a	16.90 a	15.10 bc	3.99 cd	13.16 a	19.92 a
	X $MnSO_4$	13.15 a	4.89 b	11.26 a	15.75 a	13.61 c	4.86 bc	13.07 a	17.07 a
	X $ZnSO_4$	13.35 a	4.18 c	11.92 a	17.53 a	16.99 ab	5.08 bc	15.24 a	23.10 a

x Means separation in columns by Duncan's multiple range test 5 % level .

x Values in the same column followed by the same letter don't differ significantly .

were insistently observed in the first season only, where it could also be seem that copper sulphate treatments are generally more effective to reduces weight loss in bulbs of Giza 6M and Shandaweel No. 1 cvs. In the second season, no definitive trend was noticed in this respect.

As regards to the interactions effect of cultivar and micronutrients concentration, it seems that regardless the tested micronutrient concentrations, Giza 20 cv. approved to be of least weight loss percentage in bulbs as assessed at all inspection times (Table 5). Shandaweel No. 1 and Giza 6M cvs., respectively, followed Giza 20 cv. in this respect. Similar results were obtained by El-Gammal et al. (1980). Data also showed that the relatively higher micronutrient concentrations (1000 and 1500 mg/L) reduced weight loss percentage in Giza 20 cv. bulbs as assessed at the first month of storage.

At the other inspections that conducted during storage period, control plants were generally of least total loss percentage in bulbs weight. The weight loss reduction that noticed in Giza 20 cv. bulbs to follow high concentrations of applied micronutrients may be interpreted due to reduces the naturally well known high moisture in bulbs particularly at harvest time.

The interaction between micronutrients and their tested concentrations seems to affect the weight loss (Table 6) in storaged bulbs depending on the time spent in storage, $CuSO_4.5H_2O$ at 1000 mg/L concentration caused the least weight loss in bulbs as assessed at the first month of storage. In confirmity with such obtained results, Basilious (1983) reported that total loss weight was great after 60 days from storage in bulbs produced from plants sprayed with high $ZnSO_4.7H_2O$ concentration.

Table (5): The interactive effect of cultivars and applied micronutrients concentrations on the weight loss (%) in bulbs during storage period in onion .

Studied interactions		1983/1984 Storage period in months 1	2	3	4	1984/1985 Storage period in months 1	2	3	4
Cutivars X micronut.concen.(mg/l)									
Giza 20	X 0	13.13cde	3.00 a	8.01 a	10.10 a	15.99bcd	3.12 a	8.29 a	4.07 d
	X 500	13.62 cd	3.54 a	8.62 a	9.80 a	15.48cde	3.47 a	9.39 a	4.20 d
	X 1000	11.08 e	3.23 a	8.82 a	9.75 a	13.10 e	3.60 a	9.71 a	3.19 d
	X 1500	11.74 de	3.67 a	8.77 a	9.49 a	13.63 e	3.87 a	9.80 a	3.61 d
Giza 6M	X 0	13.65 cd	5.57 a	13.19 a	20.27 a	14.25 de	4.95 a	12.58 a	19.98 c
	X 500	16.53 a	5.37 a	13.89 a	20.32 a	19.72 a	5.77 a	14.58 a	20.66 bc
	X 1000	16.28 ab	6.07 a	13.75 a	21.24 a	19.00 ab	5.96 a	15.28 a	23.59 ab
	X 1500	14.32 bc	6.11 a	14.13 a	23.96 a	17.06a-d	6.44 a	13.98 a	26.05 a
Shandaweel No.1	X 0	12.08cde	3.85 a	9.92 a	14.62 a	12.48 e	3.38 a	14.51 a	12.11 b
	X 500	13.61 cd	4.65 a	12.41 a	17.63 a	13.04 e	4.83 a	13.76 a	19.86 c
	X 1000	13.85 cd	4.73 a	11.83 a	17.15 a	17.19a-d	5.91 a	14.04 a	18.03 c
	X 1500	12.99cde	4.06 a	11.49 a	17.50 a	18.22abc	4.46 a	12.99 a	21.12 bc

* Means separation in columns by Duncan's multiple range test 5 %level .

* Values in the same column followed by the same letter don't differ significantly .

Table (6): The interactive effect of applied micronutrients, along with their concentrations on the weight loss (%) in bulbs during storage period in onion .

Studied interactions		1983/1984 Storage period in months 1	2	3	4	1984/1985 Storage period in months 1	2	3	4
Micromut. X micromut.concen.(mg/l)									
$CuSO_4$	X 0	13.05 a	4.24 a	10.45 cd	13.62 a	14.67a-d	4.09 a	11.74 c	15.38 a
	X 500	15.07 a	4.05 a	10.54 cd	14.52 a	17.87 a	4.29 a	12.05 bc	14.28 a
	X 1000	12.07 a	4.91 a	10.86bcd	15.33 a	14.42bcd	5.64 a	11.65 c	13.55 a
	X 1500	12.45 a	4.75 a	12.39abc	18.12 a	14.99a-d	4.83 a	14.13 ab	17.95 a
$MnSO_4$	X 0	13.18 a	4.05 a	10.39 cd	15.22 a	13.34 d	3.64 a	12.11 bc	15.31 a
	X 500	14.16 a	4.52 a	11.06bcd	14.89 a	13.70 cd	4.45 a	11.00 c	12.86 a
	X 1000	14.46 a	4.37 a	12.59 ab	16.13 a	17.18 ab	4.82 a	15.77 a	13.75 a
	X 1500	12.75 a	4.18 a	10.89bcd	16.72 a	17.53 ab	4.56 a	10.23 c	15.64 a
$ZnSO_4$	X 0	12.62 a	4.14 a	10.28 d	15.00 a	14.72a-d	3.72 a	11.46 c	14.47 a
	X 500	14.53 a	4.98 a	13.32 a	18.34 a	16.67abc	5.33 a	14.68 a	17.62 a
	X 1000	14.67 a	4.73 a	10.94bcd	16.68 a	17.68 ab	5.01 a	11.60 a	17.70 a
	X 1500	13.83 a	4.92 a	11.11bcd	16.11 a	16.40a-d	5.38 a	12.42 a	17.19 a

* Means separation in columns by Duncan's multiple range test 5 % level .

* Values in the same column followed by the same letter don't differ significantly .

In the second month of storage period, control plants or those received $CuSO_4.5H_2O$ at 500 mg/L concentration are of less loss percentage in bulbs weight. Besides, when $MnSO_4.4H_2O$ and $ZnSO_4.7H_2O$ were applied, the check plants achieved the least weight loss in the bulbs. These results are true in both seasons of study.

In confirmity with such obtained results, the moderate concentration of $MnSO_4.4H_2O$ foliage applications was found by Basilious (1983) to cause the lowest weight loss in storaged onion bulbs. The three factors interactive effect exerted insignificant variation in bulbs storagability and its related data are too large, so it were excluded.

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