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EFFECT OF WATER QUALITIY ON PRODUCTIVITY OF SOME ONION (*Allium cepa* L.) CULTIVARS, SOIL PROPERTIES AND THEIR CONTENTS OF HEAVY METALS

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ABSTRACT

Two Lyzimeter experiments were conducted at Sakha Agricultural Research Station, Kafr El-Sheikh Governorate Egypt, for two seasons, 2010/2011 and 2011/2012 Lyzimeters (100 x 70 x 90 cm) were filled with clayey soil and irrigated with for three water treatments twenty five years

The present study aimed to investigate the effect of irrigation water quality for long-term on productivity of three onion cultivars Behairy Red (CV_1), Giza 20 (CV_2) and Giza Red (CV_3). Three irrigation water qualities; Nile water (W_1), agriculture drainage water (W_3) and mixed water; W_2 (50% W_1 + 50% W_3) used for irrigation to study its effects on onion contents from four heavy metals Ni, Cd, Pb and Cu and some soil characteristics. A split–plot design with four replicates was used where, water treatments and cultivars were allocated to main and sub-plots, respectively.

The obtained results showed that:

- Using poor water quality for irrigation increased ECe, SAR, soluble cations and anions in soil paste extract and DTPA extractable heavy metals in soils (Cu, Ni, Cd and Pb) than that of mixed or good water quality.
- The maximum values of marketable yield and total bulbs yield/fed. As well as bulb quality (bulb diameter and average bulb weight) were obtained by irrigated with Nile water, while the lowest values were obtained by agriculture drainage water in 1st and 2nd seasons.
- Behairy Red cultivar produced the highly significant marketable yield and total yield, and significantly decreased culls yield as well as bulb quality (bulb diameter and average bulb weight). On the other hand, Giza 20 produced the highly significant total soluble solids (TSS%) in both seasons.
- The highest values concerning the previous characters were obtained with Behairy Red cultivar under Nile water irrigation, whereas the lowest values were obtained by Giza Red in soil irrigated with agriculture drainage water in both seasons.
- Content of the studied heavy metals were greater in bulb than in leaves.
- The results showed that Behairy Red cultivar (cv_1) was more tolerant cultivar to agriculture drainage and mixed water and its contents of Ni, Pb and Cu.
- No significant differences were found between Cd content at all studied onion cultivars used for.
- The heavy metals content of onion cultivars from can be arranged as follows:

  With Pb: CV_1<C V_3 < CV_2
  With Cu: CV_1 < CV_2 < CV_3
  With Ni: CV_2 < CV_1 < CV_3

Keywords: Water quality, productivity, heavy metals, onion cultivars, soil characteristics.

INTRODUCTION

Onion (*Allium cepa*, L.) is one of the most important vegetable crops grown commercially in Egypt due to its multifarious use as local consumption, processing and exportation. The cultivated area for onion production in Egypt in 2007/2008 season the area was 102,703 fed. (1 feddan = 4200 m^2) and produced 1,259,007 tons with an average of 12.6 t/fed. [†] The average of exports reached 340,000 tons[††]. Increasing productivity of onion with good quality is an important target for the growers of onions. The unit of both water and area productivity still low and it is needed to be increased according to the increased people demands throughout improved agricultural practices i.e. sowing date, high- yielding cultivars, proper both fertilization and irrigation management irrigated with tannery polluted water ….etc. Optimum irrigation management is the most important factor affecting onion productivity and quality under the Egyptian conditions.

Pollution is defined as any change in physical, chemical or biological conditions of the environment which may harmfully affect the quality of human life including effects upon animals and plants.

The untreated industrial drainage waters contain little or more amount of heavy metals, which may cause enhancement of their level in the Nile and/or agricultural drainage water when they mixed. A recent study showed a remarkable increase in levels of heavy metals in some Egyptian soils (especially soils lies in the extreme North Delta) in addition appreciable amount of these metals are found in vegetation, water bodies and aquatic organisms in western and Middle areas of the Nile delta (El-Sanafawy, 2002). Use of low quality water in irrigation could be an important consideration when the disposal is being planned in arid and semi arid regions. Using drainage water in irrigation caused high increase in EC and SAR of saturated soil paste extract (Omar *et al*., 2001). Meanwhile, using drainage water in irrigation significantly increase the total and DTPA extractable heavy metals compared with Nile water (Zein *et al*., 2002).Once the ions have been absorbed through the roots or leaves and have been transported to the xylem vessels there is the possibility of movement throughout the whole plants. The rate and extent of movement within plants depend on the metal concerned, the plant organ and the age of plant (Chancy and Giordano, 1977). Mn, Zn, Cd, B, Mo and Cu were classified as intermediate and Cr, Pb and Hg were translocated to least extent.

The objectives of the present work are to assess the effect of irrigation water quality for long-term on productivity, heavy metals contents (Cd, NI, CU and Pb) of onion cultivars and some soil characteristics irrigated with tannery polluted.

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MATERIALS AND METHODS

Two lyzimeter experiments were carried out at Sakha Agricultural Research Station, Kafr El-Sheikh, Egypt, for two seasons 2010/2011 and 2011/2012 to study the effect of irrigation water quality for long –term on the productivity of three onion cultivars and the content of their, bulb and leaves of heavy metals; Pb, Cd, Ni and Cu. Eight weeks old onion seedlings of good quality were transplanting in 15th and 20th December in the first and second seasons, respectively. The experimental lay out was split plot in randomized complete block design with four replications. The studied treatments were as follows:

A- Main plots (irrigation water treatment):

W_1-Nile water.

W_2- Mixed water 50%w_1+50%w_3.

W_3- Agriculture drainage water.

B- Sub plot (cultivars):

CV_1- Behairy Red (local).

CV_2- Giza 20.

CV_3- Giza Red.

The study was conducted in concrete Lyzimeters (100 x 70 x 90 cm) Filled with clayey soil since 1987. The sub plot area was 0.7 m^2 consisted of 4 rows each of 1 m in length and 15 cm width. Seedling within each row were spaced at 7cm apart (containing approximately 60 seedling). All sub –experimental plots were fertilized with equal amount of calcium super phosphate (15.5%P_2O_5) at rate of 300 kg/fed. and potassium sulphate 48% K_2O) at rate of 50 kg/fed. were added during the tillage of the experiment. Amount of nitrogen, the rate of 100 kgN/fed. as ammonium nitrate, 33.5%N was applied in the two equal dose. The first dose was applied after thirty days from transplanting and the second one was added at thirty days later after transplanting.

All other cultural practices of planting onion were carried out as commonly used in this district. After 120 days from transplanting, random samples of three plants of each plot were taken for recording cotent of their ,bulb and leaves of heavy metals ,pb,cd ni and cu, dry aching technique was used for samples digestion as described by Chapman and Pratt (1961). Soil samples were taken from each lyzimeter before planting and after harvesting, for chemical analysis; total soluble salts, soluble cations & anions in soil paste extract were determined according to Richards (1969). Soil samples were DTPA extracted and Pb, Cd, Ni and Cu were determined using an Atomic Absorption Spectrophotometer Perkin Elmer 3300. Havesting took place around mid May when about 30%of tops were fallen down. After havesting, roots and tops were trimmed and bulbs were classified for recording marketable bulbs yield (t/fed.), culls bulbs yield (ton/fed.),Total bulbs yield ton/fed), bulb diameter (cm) and average bulb weight (g) by dividing total yield of marketable bulbs by its number as well as total soluble solids (TSS %)**,** which determined immediately after harvest by a hand refractometer in the same representative sample of bulbs according to A.O.A.C. (1975).

Statistical analysis were tested by analysis of variance (little and hills, 1972). Duncan's multiple range test was used for comparison among the treatment means Duncan's 1965. Some characteristics of the used irrigation water are presented in Table (1). Soil chemical analysis before transplanting and after harvesting (according to Lindsay, W.K. and W.A. Norvall (1978) are presented in Table (2)

Table (1): Chemical characteristics of Nile and agriculture drainage water used for irrigation during the two seasons.

Irrigation water	ECdS/m at 25°c	pH	Cation meq/L				Anion meq/L				SAR	Water class
			Ca^{++}	Mg^{+2}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$So_4^{=}$		
Nile water	0.52	8.00	1.82	1.49	1.54	0.35	-	2.46	1.62	1.12	1.20	C2-s1
Agriculture drainage water	1.82	8.20	4.10	2.08	11.41	0.61	-	3.90	10.8	3.50	6.49	C3-s2

Irrigation water	Heavy metal content mg/L			
	Cu	Ni	Cd	Pb
Nile water	0.02	0.007	0.008	0.082
Agriculture drainage water	0.280	0.300	0.04	0.800
Critical limits according FAO (1989)	0.200	0.200	0.010	5.000

RESULTS AND DISCUSSION

Nile and agriculture drainage water evaluation:

Chemical characteristics of Nile and agriculture drainage water used for irrigation of onion cultivars are shown in Table (1) According to Richard's classification, Nile water C_2-S_1; medium salinity low sodicity (Richards, 1969). While, data of agriculture drainage water revealed that the water was in the class of (C_3S_2), high salinity and medium sodicity which can not be used for soils with restricted agriculture drainage and crop with good salt tolerance should be selected. It can be concluded that Nile water is of good quality and agriculture drainage water of poor quality for irrigation. The mixed water will be intermediate between them in relation to its chemical composition. Also data in Table (1) Showed that the studied heavy metals Cd, Pb, Ni and Cu content of agriculture drainage water were greater than of Nile water and higher than the critical limits, according to FAO (1989), i.e., 0.01, 5.00, 0.2 and 0.2 for Cd, Pb, Ni and Cu mg/L, respectively. The high heavy metal contents in agriculture drainage water could be attributed to the pollution sources of industrial and municipal wastes discharged to the agriculture drainage system these results are in agreement with these obtained by El-Mowelhi *et al.*, (1995)and zein *et al*. (1998)

Effect of the studied irrigation water qualities on some chemical properties of clay soils:

A- Soil salinity, SAR and soluble ions:

Change in electrical conductivity of soil paste extract (dS/m) soluble cations ; Ca^{+2} , Mg^{+2}, Na^{+} and K^{+} (meq/L) and soluble anions; HCo_3^{-}, Cl^{-} and

SO_4^{--} ; (meq/L) are listed in Table (2). Comparing the mean ECe values of the studied soils, before planting (frist season) and after harvesting (second season). . The data show that ECe values increased from 4.69, 5.10and 5.60 ECe dS/m to 4.92, 6.00 and 7.68 ds/m as affected by W_1, W_2 and W_3 water quality treatments, respectively. SAR mean values increased from 5.34 and 6.17 to 5.94 ,5.20 and 6.50 as affected byW1, W_2 and W_3 water treatment. The obtained data showed also, that utilization of agriculture drainage water for irrigation purposes tend to increase soluble cations Na^+ and Mg^{++} than before planting. The data also showed that all soluble anions, Cl^- and So_4^{--} mean values, were higher in soil irrigated with poor quality in harmony with those obtained by Zein *et al*. (1996).

Table (2): Soil chemical analysis before planting (first season) and after harvesting(second season)under three irrigation water quality (means of two seasons)

Water quality	Cation meq/L				Anion meq/L				ECe ds/m	PH 1:2.5	SAR	SP%
	Ca^{++}	Mg^{++}	Na^+	K^+	Co_3^-	HCo_3-	Cl^-	So_4-				
Before Planting(frist season)												
W_1	17.30	12.00	17.20	0.40	-	2.60	17.10	27.20	4.69	8.20	4.49	75.90
W_2	19.63	12.50	18.30	0.57	-	2.70	16.00	32.30	5.10	8.25	4.57	76.80
W_3	21.40	11.50	12.40	0.54	-	3.50	20.20	32.65	5.60	8.30	5.53	78.10
After harvesting(second season)												
W_1	18.25	12.10	18.30	0.39	-	2.70	16.59	29.40	4.92	8.15	4.70	76.40
W_2	20.80	12.45	19.10	0.42	-	2.90	18.23	32.70	5.20	8.20	4.68	77.00
W_3	23.40	13.56	23.85	0.47	-	3.60	21.89	38.60	6.50	8.25	5.55	77.30

B- DTPA- extracted heavy metals from studied soils:

Data in Table (3) show that all values of DTPA extractable heavy metals of soils can be discendingly arranged according to the effect of water treatments as follow : $W_3 > W_2 > W_1$ before onion transplanting and after harvesting.

Table (3): DTPA extractable heavy metal concentrations from 2010 to 2012 (mg/kg) before planting (first season) and after harvesting onion cultivars (means of two seasons) as affected by water quality.

Irrigation water quality	Heavy metal content mg/kg soil			
	Cd	Ni	Pb	Cu
	Before planting (mg/kg soil)			
W_1	0.098	1.80	4.00	6.00
W_2	0.156	2.01	8.90	6.70
W_3	0.172	2.70	11.0	7.52
	After harvesting (mg/kg soil)			
W_1	0.099	1.82	3.70	5.90
W_2	0.157	2.10	8.80	6.70
W_3	0.181	2.40	11.02	7.30

It seems that soil content of DTPA-extractable studied heavy metals has the following sequence Cu > Pb > Ni > Cd. This trend was different from that found under using agriculture drainage water and mixed water Pb > Cu > Ni > Cd. This may be due to that some of available Pb changed to these findings. The obtained results are in agreement with those of Abou El-Roos *et al*. (1991) who found that the behaviour of Cu and pb differ from that of Cd, CO and Ni in soils irrigated with sewage effluent, they added that in Cd, Cu and Ni metals, the percentages held in primary minerals fraction were increased with time on the expense of the percentage of other fractions, especially that organically complexed. Although the studied soils were still beyond the critical levels, it could be reached this point upon the continuous using of agriculture drainage water.

Effect of water quality on yield and bulb quality:

Data presented in Table 4 showed that the tested irrigation water quality exhibited significant differences in mean values of yield and yield component characters (marketable yield, culls yield, and total yield) and bulb quality (bulb diameter, average bulb weight and TSS%) in both seasons. Results indicated that, irrigated with Nile water, attained the highest mean values of marketable yield/fed. (11.46 And 10.48 t/fed.), total yield/fed. (13.69 and 12.92 t/fed.), average bulb diameter(6.76 and 6.77 cm) and average bulb weight (100.00 and 98.11 g) in the first and second seasons, respectively. On the other hand, the highest value of culls yield (2.57 and 2.46 t/fed.) and TSS% (14.10 and 14.04) was obtained by irrigation with agriculture drainage water, in the first and second seasons, respectively. From these results, it can be concluded that an increases in yield and its components as well as bulb quality due to Nile water treatment.

Significant cultivars variation was observed in all the characters (Table 4). Behairy Red (CV_1) showed maximum marketable yield, total yield, bulb diameter and average bulb weight, whereas maximum culls yield was recorded from Giza Red (CV_3). Data also showed that Giza 20 (CV_2) attained the highest means of percentage of total soluble solids (TSS %). These differences in total bulb yield/fed. may be due to genetic variation between these cultivars which affected on the efficiency of the utilization for different environmental resources. These results were in agreement with those found by Mohamed and Gamie (1999), Mohamed and Gamie (2000) and El-Damarany and Obiadalla (2005).

Regarding The interaction effect of irrigation water quality and cultivars on yield and bulb quality were significant. Moreover, Data in Table (4) and Figs.(1, 2 and 3) indicate that the maximum marketable yield and total yield was obtained from the combination of Behairy Red cultivar and irrigation with Nile water. In contrast the higher mean of culls yield (2.81 and 3.03 t/fed.) was obtained with Giza Red cultivar for agriculture drainage water in the two seasons, respectively.

4

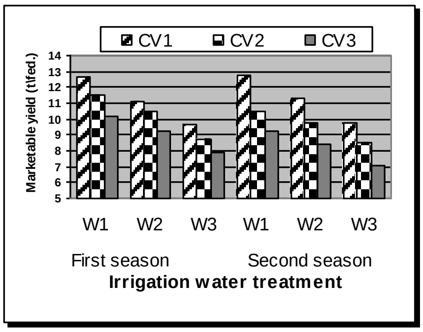

Fig.1: Marketable bulbs yield (t/fed.) as affected by the interaction between irrigation water treatment and three onion cultivars in 2010/2011 and2011\2012 seasons.

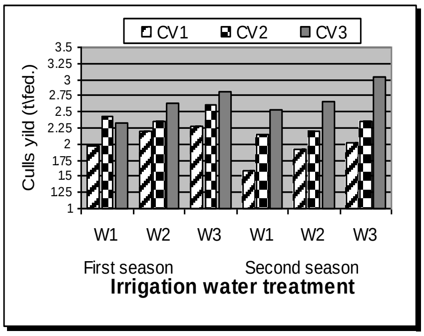

Fig.2: Effect of the interaction between irrigation water treatment and three onion cultivars on culls yield (t/fed.) in the two seasons.

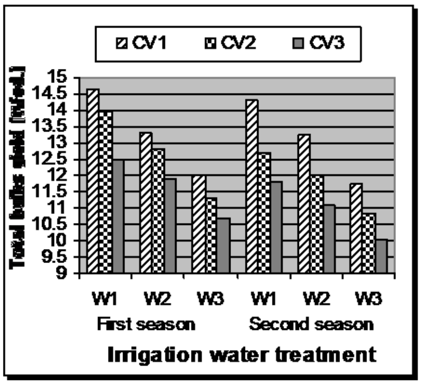

Fig.3: Effect of the interaction between irrigation water treatment and three onion cultivars on total bulbs yield (t/fed.) in the two seasons.

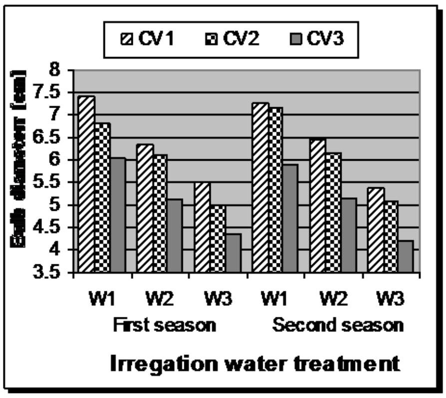

Fig. 4: Bulb diameter (cm) as affected by the interaction between irrigation water treatment and three onion cultivars in both Seasons

Data arranged in Table (4) and Figs. (4, 5 and 6) claimed that the maximum average of bulb diameter (cm) and weight (gm) were obtained when using Nile water in irrigation with Behairy Red (W_1 CV $_1$) in both seasons. The inverse was true in TSS %, While Giza 20 with agriculture drainage water gave the highest means of TSS% in the second season only (W_3 CV $_2$).

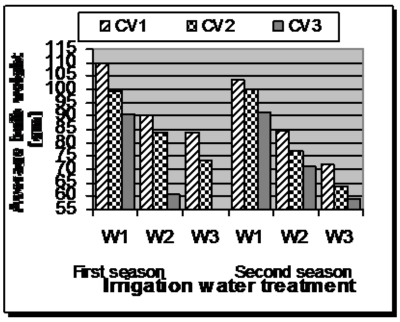

Fig. 5: Effect of the interaction between irrigation water treatment and three onion cultivars on average bulb weight (gm) in 2010\2011 and 2011\2012 seasons.

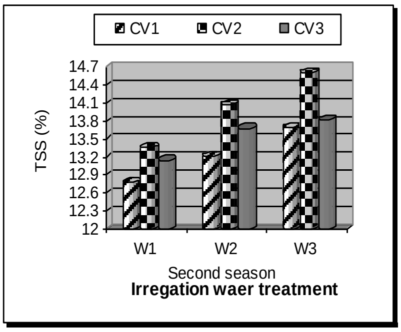

Fig. 6: TSS (%) as affected by the interaction between irrigation water treatment and three onion cultivars in the second season.

Heavy metals contents:

Data in Table (5) show that the studied heavy metals Cd, Pb, Ni and Cu content of onion plant under agriculture drainage water were greatest than that of Nile water and mixed water. This could be attributed to the pollution sources of industrial (oil and soap factory) and municipal wastes discharged to the agriculture drainage system. These results are in agreement with those obtained by Zein *et al*. (2002) and El-Mowelhi *et al*. (1995).

Table, 5 and Figs from, 1 to 4 illustrate the influence of water quality on the studies heavy metals means concentration in roots, coat seed, pod cover, leaves and seeds. On onion cultivars especially with irrigated by agriculture drainage water (W_3) were as the following order:

Bulls: Pb > Ni > Cu > Cd

Leaves: Pb >NI > CU > Cd

Table (5) reveals the highly significant effects of water quality (W_1, W_2 and W_3) especially with Ni, Pb.

The distribution of Cu within plants is highly variable within roots Cu is associated mainly with cell wall and its largely mobile.

Dunman *et al*. (1991) found that the concentration of Ni in plants, generally, reflects the concentration of the element in the soil, although the relationship is clearly more directly related to the concentration of soluble ions of Ni and rate replenishment of this mobile pool. As Ni is easily mobile in plant, berries and seeds are reported to contain elevated Ni concentration (Alina and Pendias *et al.,* 2000).

Cadmium values (Table, 5) of seeds indicated that Cd has the lowest values in all studied heavy metals. This conclusion are in agreement with Alloway (1995) who found that the uptake of Cd decreased when pH was increased, faba bean showed a similar response.

Page *et al.* (1981) found that relative excess of Cu, Ni and Mn can reduce uptake of Cd by plants. The Cd in plants is relatively very mobilize, although the translocation of Cd through the plant tissues may be restricted because Cd is easily held mainly in exchange sites of active compounds located in the cell walls (Cunningham *et al.*, 1975).

Data in Table (5) indicates that the onion cultivars generally had the lowest content of studied heavy metals under all water treatments. No significant in Cd for all treatments of water quality and onion cultivars. V_2 variety had the lowest content of Pb, Ni and Cu under all water treatments. The order of onion cultivars to concentration of heavy metals decreased as follow:

Table (5): Effect of irrigation water treatments on heavy metals content (mg/kg)of onion cultivars (Mean of two seasons).

vars	Heavy metals content(mg/kg .D.W)											
	Cd			Pb			Cu			Ni		
	W_1	W_2	W_3	W_1	W_2	W_3	W_1	W_2	W_3	W_1	W_2	W_3
Bulb												
CV_1	0.1811	0.2669	0.275	3.6176	5.612	6.200	1.018	1.288	1.300	1.3699	1.500	1.622
CV_2	0.2629	0.300	0.321	2.803	4.200	5.112	1.020	1.300	1.340	1.0981	1.120	1.230
CV_3	0.2974	0.3600	0.371	2.729	2.929	2.998	3.106	3.260	3.400	1.417	1.511	1.520
Leaves												
CV_1	0.162	0.1800	0.200	2.810	3.420	4.200	0.966	1.01	1.03	1.261	1.36	1.400
CV_2	0.217	0.2620	0.280	1.950	2.920	3.200	0.760	1.02	1.02	1.01	1.02	1.058
CV_3	1.2620	0.278	0.280	1.860	2.010	2.060	2.010	2.50	2.60	1.02	1.10	1.200
Translocation coeffient												
CV_1	86.18	67.44	72.73	77.68	60.94	67.74	94.89	78.44	79.23	92.05	90.67	86.31
CV_2	82.54	87.33	87.23	69.52	69.52	62.60	74.51	78.46	76.12	91.99	91.07	86.02
CV_3	88.10	77.22	75.47	68.16	68.62	68.71	64.71	76.69	76.47	71.99	72.80	78.95
Kabata-pendias and pendias, 1992		0.01						0.2			0.2	

With w_1: cv_1 cu>NI>cd>pb
With w_1: cv_2 NI>cdI>cu>pb
With w_1: cv_3 cd>NiI>cuI>pb
With w_2:cv_1 NI>cu>cd>pb
With $w_2$$cv_2$: NI>cd>cu>pb
With w_2 cv3cd>cu>NI>pb
With w_3 cv_1: NI>cu>cd>pb
With w_3 cv_2:cd>NI>cu>pb
With w_3 cv_3: NI>cu>cd>pb

Incomparison to stanered limits of Kabata-pendias and pendias, 1992 showed that Cd, Pb and Ni (mg|Kg) were higher than that the lower limits and lower the upper limits while cu content was lower than the upper and lower limits.

These results very important for classified the common onion cultivars to various heavy metals polluted soils. From these sequences we can favor one variety in every soil polluted with one element.

These results are in partial agreement with those obtained by Zein *et al*. (1996) in their study on soybean cultivars. These results may be due to the differences in genetic constitution of the studied genotypes and / or the dilution effect phenomenon. This conclusion is in partial agreement with that of Shalaby *et al*. (1996) who concluded that increasing heavy metals concentration in plants may attributed either to the higher amounts of these heavy metals added into the used soil through the applied wastesin the suffering areas. The safest policy would appear to minimize inputs of heavy metals to soil wherever to save our life and economy and restrict heavy metals bioavailability translocation coefficient from bulb to leaves :

Once the ions have been absorbed through the roots and have been transferred to the xylem vessels, there is possibility of movement throughout the whole plant, the rate and extent of movement within plants depend on the metal concerned, the plant organ and the age of plant **Alloway, (1995**). The data of heavy metal concentration in bulbs and leaves of studied onion cultivars and coefficient of their translocation (TC) from bulbs to leaves are presented in Table 5 and bulb to leaves TC was calculated as follows:

$$\textbf{Bulb to Leaves TC} = \frac{\textbf{Content of heavy metal in leaves (mg/kg)}}{\textbf{Content of the same heavy metal in bulbs (mg/kg)}} \quad \textbf{100}$$

Data in Table (5) illustrate that the studied heavy metals translocation from bulbs to leaves can be arranged according to mean values of translocation coefficient in the following decreasing order :

Cd > NI > CU > Pb

It shows that pb was the least in translocation from bulb to leaves in all types of water treatments (W_1, W_2 and W_3). The results are in good agreement with those of Zein *et al.* (2009,2002) and Chaney and Giordano (1977) who classified pb as one of the least translocated elements with plant. They added that, under conditions of optimal growth, pb precipitates on root cell wall in the insoluble amorphous form. Zhen – Guo Shen *et al*. (2009). found that application of EDTA (as an organic conditioner) to the soil significantly increased the concentrations of Pb and enhancing pb accumulation in the plants while the Cu and Cd and Ni concentration and translocation coefficient indicate that Ni values increased due to agriculture drainage water treatment than other treatment due to its higher content of agriculture drainage water from oil and soap factory (used Ni catalyst in one processes of manufacturing).They also added that the result results of the sequencetial chemical extraction of soil samples showed the pb concentration in the carbonate specilically adsorbed and Fe-Mn oxide phase were significantly decrease after EDTA treatment and solubilized mainly from these two phases in the soil.Date of Table (5) illusterated that onion cultivars be haved as on accumaltor for cd ,cu, ni,and could be useful indicator of the metal avaiablity for plants The obtained results are in good agreement with (Zein *et al*., 2002) and Chancy and Giordano (1977) for heavy metal translocation

Conclusion

Considering the previous discussions and conclusions, it seems that there is an obvious need for more research work to be carried out on the risk assessment of heavy metals contaminated soils. As mentioned by Essa and

El-Kassas (1999) the danger of distribution wastes by such factories containing high concentration of heavy metals affects the survival in the suffering areas. The safest policy would appear to minimize inputs of heavy metals to soil wherever to save our life and economy and restrict heavy metals bioavailability in the soil – plant animal pathway

Dunman *et al*. (1991) found that the concentration of Ni in plants, generally, reflects the concentration of the element in the soil, although the relationship is clearly more directly related to the concentration of soluble ions of Ni and rate replenishment of this mobile pool. As Ni is easily mobile in plant, berries and seeds are reported to contain elevated Ni concentration (Alina and Pendias *et al.,* 2000).

Abo El-Naga *et al*. (1999) and Zien *et al*.(2009) recommended that attention must be earnestly given to protect the environment and commitments and the latest law issued 1994 in Egypt, must be obligatory under taken for these factories to prevent them from polluting agricultural soil by wastes.

Apart from the roles played by pollution control and soil chemistry, plant breading can make a vital contribution through the selection and utilization of crop genotypes which accumulate the least heavy metals

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تأثير جودة مياه الرى على إنتاجية وجودة أصناف البصل وخواص الأرض ومحتواهما من العناصر الثقيلة

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****قسم بحوث البصل - معهد بحوث المحاصيل الحقلية - مركز البحوث الزراعية - الجيز ة– مصر**

أقيمت تجربتين بمحطة البحوث الزراعية بسخا – كفر الشيخ – مصر لموسمى2010 و 2011و2011 / 2012 تهدف إلى دراسة تأثير نوعية مياه الرى للمدى البعيد منذ عام 1987 على إنتاجية ثلاثة أصناف من البصل هى بحيري احمر وجيزة 20 وجيزة احمر وخواص الأرض الكيمائية وكذلك على محتوى البصلة والاوراق من العناصر الثقيلة وهى الرصاص والكادميوم، النيكل والنحاس.

وقد أجريت الدراسة فى أحواض أسمنتية (100 × 70 × 90 سم) وضعت بها تربة طينية وتروى الأحواض بثلاثة نوعيات من المياه منذ عام 1987 وهذه النوعيات هى مياه النيل (مياه ذات نوعية جيده ًW_1) مياه صرف (ذات نوعية رديئة W_3) ومياه مخلوطة (50 % W_1 + 50% W_2) ووزعت المعاملات فى قطع منشقة فى أربع مكررات حيث وضع الرى فى القطع الرئيسية والأصناف فى القطع المشقية.

وأوضحت النتائج مايلى :

- زاد إستخدام مياه الصرف فى الرى من قيم التوصيل الكهربى ECe ، SAR والكاتيونات والأنيونات الذاتية فى مستخلص عجينة الأرض المشبعة وكذلك محتوى مستخلص التربة ب DTPA من العناصر الثقيلة المخلوطة أو مياه الصرف فى الرى .
- وجد أن هناك تأثير عالى المعنوية لنوعية المياه المستخدمة فى الرى على المحصول ومكونات المحصول وكذلك محتوى أصناف البصل من العناصر الثقيلة المدروسة.
- ، ومياه الصرف وكان الاقل في محتواه من الرصاص ، النيكل، النحاس ولايوجد هناك فروق معنوية مع عنصر الكادميوم لكل الأصناف تحت الدراسة .

- أوضحت النتائج أن الرى بمياه النيل أعطت أعلى إنتاجية فى أصناف البصل ومكونات المحصول وجودة الأبصال فى كلا الموسمين.
- أوضحت النتائج تفوق الصنف البحيري الأحمر فى صفات محصول الأبصال القابل للتسويق للفدان والمحصول الكلى للفدان وكذلك جودة الأبصال, بينما سجل الصنف جيزة 20 أعلى القيم من المواد الصلبة الذائبة فى كل من الموسمين.
- ادى ري الصنف البحيري الأحمر بمياه النيل للحصول على اعلى القيم من محصول الأبصال القابل للتسويق للفدان والمحصول الكلى للفدان , بينما تم الحصول على اقل القيم بري الصنف جيزة احمر بمياه الصرف فى كلا الموسمين.
- كان محتوى أجزاء النبات من العناصر الثقيلة تبع المتسلسلة الابصال > الأوراق .
- أوضحت النتائج أن البحيري احمر كان أكثر الأصناف تحملا لإستخدام المياه المخلوطة
- أظهرت النتائج أن محتوى الأصناف المدروسة من العناصر الثقيلة أخذ الترتيب التالى :

بحيري احمر,اكبر من جيزة 20 اكبرمن جيزة احمرلكل من الرصاص والنحاس والنيكل والكادميوم.

قام بتحكيم البحث

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Table (4): Total bulbs yield and Bulb quality of three onion cultivars as affected by different irrigation water treatments and their interaction in 2010/2011 and 2011/2012 seasons.

Treatment	Season											
	2010\20112011						2011\2012					
	Total bulbs yield			Bulb quality			Total bulbs yield			Bulb quality		
	Marketa-ble yield (t/fed.)	Culls yield (t/fed.)	Total yield (t/fed.)	Bulb diameter (cm)	Average bulb weight (gm)	TSS %	Marketable yield (t/fed.)	Culls yield (t/fed.)	Total yield (t/fed.)	Bulb diameter (cm)	Average bulb weight (gm)	TSS %
Irrigation water(I):												
W_1-Nile water.	11.46 a	2.23 a	13.69 a	6.76 a	100.00 a	12.80 c	10.48 a	2.08 c	12.92 a	6.77 a	98.11a	13.10 c
W_2-Mixedwater50%w_1+50%w_3	10.27 b	2.40 b	12.67 b	5.86 b	78.33 b	13.28 b	9.85 b	2.27b	12.11b	5.92b	77.49 b	13.66 b
W_3-Agriculture drainage water.	8.76 c	2.57 a	11.33 c	4.95 c	69.31 c	14.10 a	8.43 c	2.46 a	10.89 c	4.88 c	64.91 c	14.04 a
F-test	**	**	**	**	**	**	**	**	**	**	**	**
Onion cultivars(CV):												
CV_1 - Behairy Red	11.15 a	2.15 c	13.31 a	6.43 a	94.59 a	13.14 b	11.26 a	1.83 c	13.10 a	6.38 a	86.46 a	13.24 c
CV_2- Giza 20	10.23 b	2.46 b	12.69 b	5.98 b	85.55 b	13.70 a	9.62 b	2.24 b	11.85 b	6.12 b	80.26 b	14.02 a
CV_3 - Giza Red	9.11 c	2.59 a	11.70 c	5.16 c	67.50 c	13.35 b	8.23 c	2.74 a	10.97 c	5.07 c	73.79 c	13.55 b
F-test	**	**	**	**	**	**	**	**	**	**	**	**
Interaction (I x CV):												
W_1 CV_1	12.66 a	1.97 f	14.63 a	7.43 a	109.90 a	12.45	12.72 a	1.59 g	14.31 a	7.26 a	103.30 a	12.78 e
W_1 CV_2	11.52 b	2.42 c	13.93 b	6.82 b	99.60 b	13.24	10.53 c	2.14 e	12.68 c	7.15 b	99.90 b	13.36 d
W_1 CV_3	10.20 e	2.32 d	12.52 e	6.03 d	90.53 c	12.72	9.26 e	2.52 c	11.78 e	5.88 e	91.10 c	13.15 d
W_2 CV_1	11.11 c	2.21 e	13.32 c	6.35 c	90.29 c	13.04	11.33 b	1.91 f	13.24 b	6.48 c	84.33 d	13.22 d
W_2 CV_2	10.45 d	2.35 d	12.80 d	6.12 d	83.80 d	13.57	9.80 d	2.21 e	12.02 d	6.14 d	76.96 e	14.08 b
W_3 CV_3	9.25 g	2.63 b	11.88 f	5.11 f	60.89 f	13.23	8.40 f	2.67 b	11.08 f	5.14 g	71.18 f	13.68 c
W_3 CV_1	9.69 f	2.28 d	11.98 f	5.51 e	83.60 d	13.93	9.73 d	2.01 f	11.74 e	5.40 f	71.72 f	13.70 c
W_3 CV_2	8.72 h	2.60 b	11.32 g	5.00 g	73.26 e	14.29	8.52 f	2.35 d	10.87 g	5.06 g	63.92 g	14.61 a
W_3 CV_3	7.87 i	2.81 a	10.68 h	4.35 h	51.08 g	14.09	7.03 g	3.03 a	10.06 h	4.19 h	59.09 h	13.82 bc
F-test	**	**	**	**	**	NS	**	**	**	**	**	*

***, ** and NS indicate P<0.05, P<0.01 and not significant, respectively. Means in the same column for each factor designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test.**