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IMPROVEMENT OF WHEAT PRODUCTION BY USING SOME AGRICULTURAL PRACTICES FOR REDUCING ENVIRONMENTAL POLLUTION.

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ABSTRACT: Two field experiments were conducted at extension farm in Mansoura Center, Dakahlia district, Egypt during 1996/97 and 1997/98 to study the effect of different fertilization treatments, times of foliar spraying of Super Grow of some wheat cultivars on the chemical composition of grains and straw for reducing pollution. The trails were arranged in a strip plot design with four replications. The main findings could be summarized as follows:

The recommended NPK fertilization recorded highest concentrations of cadmium, lead, zinc, iron, nitrate in grains and concentrations of nitrate and nitrite in straw compared with other fertilization treatments in both seasons. However, the lowest concentrations produced from biofertilization with Syrialin + Phosphorin + Organic fertilizers compared with other treatments over both seasons.

Foliar application of Super Grow at tillering + elongation stages and at tillering + heading stages significantly increased the concentrations of nitrate and nitrite in straw compared with other times of applications over both seasons. However, the lowest concentrations of cadmium, lead, iron, zinc, nitrate in grains as well as concentrations of nitrate and nitrite in straw produced from spraying at tillering stage (40 days from sowing) over both seasons.

The three wheat cultivars did not differ in cadmium, lead, nitrate, nitrite concentrations in grains as well as nitrate and nitrite in straw

over both seasons. However, the maximum cadmium and lead concentrations in grains were produced from Gemmiza 3 cultivar (0.120 and 0.114 ppm) followed by Sakha 69 cultivar (0.116 and 0.106 ppm) and Sids 8 cultivar (0.117 and 0.109 ppm) over two seasons. Highest zinc and lead concentrations in grains was obtained from Sakha 69 cultivar followed by Gemmiza 3 and Sids 8 cultivars.

Maximum concentrations of cadmium in grains were obtained from adding the recommended NPK fertilization with spraying Super Grow at tillering + heading stages (40 + 80 days from sowing) over both seasons. The highest concentrations in grain from adding the recommended NPK fertilization with spraying at tillering + elongation stages (40 + 60 days from sowing) and/or at tillering + heading stages (40 + 80 days from sowing) over both seasons. The minimum concentrations of zinc and iron in grains was produced from spraying Super Grow at tillering + elongation stages (40 and 60 days from sowing) and sown Sakha 69 and/or Gemmiza 3 cultivars over both seasons.

It could be seen that, to reduce the pollution in wheat straw and grains under environmental conditions of Dakahlia governorate, Egypt, the use of biofertilization of syrialin + phosphorin and organic fertilizers proved to be more effective procedures in this regard.

INTRODUCTION

Wheat (*Triticum aestivum*, L.) is considered as one of the main cereal crops in the world as well as in Egypt and Libya. The importance of wheat as a major food source for man in many countries has increased consistently in last decade. Increasing wheat productivity is a national target in Egypt and Libya to fill the gap between wheat consumption and production.

The total cultivated area with wheat in Egypt about million hectares (2.5 million feddans) producing was about 6.3 million tons (42 million ardabs) in 1999 season with an average of 6.76 ton/hectares 18.94 ardab/feddan, Gomaa (1999). Meanwhile, the total cultivated area with wheat in Libya was about 30 thousand hectares (12.6 thousand feddans) in 1999 season with a national average of about 5.41 ton/hectares (15.15 ardab/feddan).

Environmental pollution, especially by increasing chemical fertilization is one of the most effective factors in the destruction of the biosphere components. Among all chemical contaminates nitrate, nitrite and heavy metals particularly in soil and subsequently plants which are considered as potential hazardous contaminants in the introduces harmful substances into soil. When absorbed by wheat plants, these contaminants enter the food chain of both animal and human.

The nitrate being in water and food have serious effects, as they cause diseases for children and ruminant animals called "Methemoglobinemia" that caused a high ratio of mortality for children and animals, while the adult can endure nitrates being in water. These diseases are caused when the child or animal drink water full of high ratio of nitrates or take food full of a high ratio more than 10 parts per million and in this case the nitrates are to be reduced in the bowels nitrates that are to be absorbed in the blood current, then combined with hemoglobin transforming it to methemoglobin and blood comes to be capable of carrying oxygen during respiration. The bad effects that are possible for nitrification process is composing of nitrosamines compounds and these consist by combining of nitrate (wheather consisted by ammonia oxidation or nitrates reduction) with some products of insecticides decay. It has become evident that these compounds cause cancer and cells mutation (W.H.O., 1984). According to Bergstrom and Brink (1986), it is reasonable to except that the loss of nitrate by leaching occurs more readily than ammonium especially in coarse-texture soil. Ammonium may be retained in soils as an exchangeable ion on clay surface or it may from relatively stable complexes with some organic substances. Ibrahim (1990) found that the concentration of NH_4-N and NO_3-N in the drainage water from silty clay soils is much higher than from clay soil. Tahoun *et al.* (1993) did quantitative estimates of nitrogen losses from Egyptian soils. Fields with tile drain facilities were monitored for nitrogen inputs and outputs. They found that leaching losses of nitrogen from soils with corn ranged between 7 and 49 kg/fed. Also, Sveda *et al.* (1992) found that ammonium fertilizers and urea may undergo loss by volatization soon after application but, dentrification and leaching loss may occur later when the NH_4-N has been oxidized to NO_3-N.

Plant absorbs nitrogen from soil in the nitrate form or ammonium or both of them depending on the availability of each. As early as El-Baisary *et al.* (1982) studied the effect on N-applied as calcium ammonium nitrate or urea to wheat plant. They stated that the amount of nitrogen accumulated in grains was less with calcium ammonium nitrate than with urea. In addition, the amount of nitrogen in straw greatly affected by nitrogen application but without significant differences among nitrogen forms. In another study, Mahler *et al.* (1994) found that grain yield of wheat and nitrogen use efficiency were insignificantly affected when NH_4NO_3 or urea were used.

Toxic metals derived from soil parent materials usually constitute by far the major group in soils. Hassan (1997) cited from literature that cadmium pollution of the environment has been rapidly increased in recent decades as a result of rising consumption of Cd by industry. Unlike Pb and Cu which have been utilized for centuries, Cd had only been widely used this century. Morethan, half of the Cd ever used in industry was produced in the last 25 years. Hutton (1982) also mentioned that sources of soil contamination by Cd are the mining and smelting of Pb and Zn atmospheric and soil pollution. He has also added that phosphate fertilizers are important example of Cd impurity and their continual use has led to significant increases in the Cd, Zn and Fe content of many agricultural soils.

The objectives of this investigation was to study the utilization of some agricultural practices to improve wheat productivity for the three evaluated wheat cultivars, Sakha 69, Sids 8 and Gemmiza 3 through different fertilization treatments, times of foliar nutrients application and their interactions. Minimizing the environmental pollution with the mineral fertilizers, in particular nitrogenous ones is considered among the study targets.

MATERIALS AND METHODS

Two field experiments were conducted at Mansoura Center, Dakahlia Governorate, in extension field during 96/1997 and 97/1998 seasons. This investigation was aimed to study the effect of different fertilizer treatments i.e. without, recommended NPK (70 kg N/fad, 23 kg P_2O_5/fad and 25 kg K_2O/fad), 40 m^3 farmyard (FYM) manure/fad, inoculation grains of Syrialin (400 gm/fad) + Shosphorin (400 gm/fad) + 40 m^3

FYM, inoculation grains of Syrialin (800gm/fad) + Phosphorin (800gm/fad) + 40 m^3 FYM (one faddan = 4200 m^2)

Times of foliar nutrition of Super Grow at tillering (40 days from sowing), at elongation (60 days from sowing), at heading (80 days from sowing), at tillering + elongation stages, at tillering + heading stages on growth, yield and yield components of three wheat cultivars i.e., Sakha 69, Sids 8 and Gemmiza 3.

A strip split plot design with four replicates was used. The horizontal plots were devoted as above mentioned six fertilization treatments. The vertical plots were allocated with the five times of foliar application of Super Grow nutrient as above mentioned. The sub plots were occupied by the choosen three wheat cultivars, namely: Sakha 69, Sids 8 and Gemmiza 3 . The sub plots area was 3.0 x3.5 m (10.5 m^2) i.e. 1/400 fad. The recommended of nitrogen fertilization in the form of urea (46.5% N) was used at a rate of 70 kg N/fad and applied in two equal portions with the first watering. Before the second watering calcium superphosphate at a rate of 150 kg /fad (15.5% $P_2 O_5$) and potassium sulphate at a rate of 50 kg/fad (50%K_2O) were added during land preparation. Bacterial inoculation of wheat grains was done immediately before sowing irrigation. Biofertilization included Azotobacter, Azospirillium and Bacillus bacteria were obtained from ARC Ministry of Agriculture. Organic fertilizer as farmyard manure which was taken from dairy farm Agric. Experiment Station, Fac. of Agric. Mansoura Univ. and its contents are shown in Table 1. Foliar application of Super Grow 20-20-20 at a rate of 50 gm/300 liter water was used in this study. Super Grow consists of 20% of total nitrogen , 20% available phosphoric acid (P_2O_5), 20% soluble potash (K_2O), 0.15% Fe, 0.05% Mn, 0.05% Cu, 0.005% Mo, 0.2% S, 0.15%Zn, 0.05% Mg, 0.05% Ca and 0.02% B . Grains of wheat cultivars were obtained from Wheat Breeding Section, ARC. The experimental soil was loamy clay texture, the mechanical and chemical analysis of experimental soil are presented in Table 2. Water samples were collected from the different drains passing through the area and used in irrigation the soils at different periods. Also, water samples were taken from normal canal (Dammitta branch) to represent Nile water, the chemical composition of Nile water from normal canal (Dammitta branch) are presented in Table 3. In both seasons, wheat was preceded by maize. Grains of wheat cultivars were sown on mid November at a rate of 70 kg/fad in both seasons.

At harvest, ten guarded plants were taken at random from each sub plot to determine the following characters:

1- Heavy metals (cadmium, lead, zinc and iron) were estimated in a digestive solution ($HClO_4$-H_2SO_4-HNO_3) by an atomic absorption spectrophotometer method according to A.O.A.C. (1980).

2- Nitrates in the plant: as described by Singh (1988), 0.1 gm of finely ground samples with 50 ml of 2% acetic acid in conical flask was rotary shaken for 20 minutes and filtered. Nitrate was determined in the filtrate according to Bremner (1965).

Data of the two seasons were subjected to the proper statistical analysis of the technique of analysis of variance of strip split plot design as mentioned by Gomez and Gomez (1984). Treatments means were compared using New Least Significant Differences (N-LSD) test at 5 % and 1% level probability.

RESULTS AND DISCUSSION

A. Fertilization treatments effects:

The results in Tables 4 and 5 show that fertilization treatments significantly affected the concentrations of cadmium, lead, zinc, iron, nitrate, nitrite in grains and nitrite in straw over both season. Adding the treatments of recommended NPK fertilization as mineral fertilization produced highest concentration of cadmium, lead, zinc, iron, nitrate, nitrite in grains and nitrite in straw compared with other treatments over both seasons, which were 0.204, 0.177, 40.50, 38.35, 4.140, 0.198 ppm in the grains and 3.168, 0.136 ppm in straw, respectively. Using biological fertilizer Syrialin + Phosphorin at 400 g/fed + 40 m^3 Organic fertilizer per feddan reduced heavy metals concentrations compared with other treatments except without fertilization. In addition, the lowest concentration was produced from without fertilization treatment followed by biofertilization treatments. These results are in agreement with those obtained by Meshref *et al.* (2000).

B. Times of foliar spraying effects:

Super Grow foliar application at different stages significantly affected concentrations of cadmium, lead, zinc, iron, nitrate, nitrite in grains and nitrite in straw as presented in Tables 4 and 5. Foliar application of Super Grow at tillering + elongation and/or at tillering + heading stages maximized significantly the concentrations of cadmium, lead, zinc, iron, nitrate, nitrite in grains and nitrite in straw compared with other times of spraying in both seasons. Meanwhile, foliar spraying of Super Grow at tillering + elongation stages significantly maximized the concentrations of Zinc and nitrate in grains compared with other times of spraying in both seasons. In addition, the lowest concentration was produced from foliar spraying at tillering stage.

C. Cultivars performance:

The results in Tables 4 and 5 show that tested cultivars significantly differed in concentrations of Zinc and Iron over both seasons. Maximum concentration of iron in grains were obtained from sowing Gemmiza 3 cultivar followed by Sakha 69, and Sids 8 cultivar came in the last rank which were 29.39, 29.08 and 28.80 ppm over both seasons. Meanwhile, the highest concentration of zinc in grains were obtained from sowing Sakha 69 cultivar followed by Gemmiza 3, and Sids 8 cultivars came in the last rank which were 28.25, 28.11 and 27.64 ppm in both seasons. Also, the concentrations of cadmium, lead, nitrate, nitrite in grain and nitrate, nitrite in straw of wheat cultivars was not significantly differed in wheat cultivars, but Gemmiza 3 cultivar tended to be the highest as shown in Tables 4 and 5.

D. Significant interaction effects:

The interaction between fertilization treatments and times of foliar nutrient application significantly affected concentrations of Cd and Pb over both seasons as shown in Table 6. Maximum concentrations of Cd was obtained from adding recommended seasons compared with other treatments. Meanwhile, the highest concentration of Pb was obtained from adding recommended NPK fertilization and foliar application at tillering by elongation and/or at tillering + heading stages which were 0.205 and 0.207 ppm with insignificant differences over both seasons. The lowest concentrations of Cd and Pb in grain were produced from the interaction (Table 7) between without fertilization treatment and foliar application at all stages with insignificant differences between over both seasons.

The interaction between times of foliar application and some wheat cultivars significantly affected concentration of Zn, Fe in both seasons as presented in Table 7. Maximum concentrations of Zn and Fe were produced from foliar application of Super Grow at tillering + elongation and/or at tillering + heading stages when both Sakha 69 or Gemmiza 3 cvs. were used, which were 29.73, 30.17 and 31.32, 31.37 ppm and/or 29.35, 29.38 and 31.35, 31.76 ppm, respectively in both seasons. All interaction had insignificant effects on concentrations of nitrate, nitrite in grains and nitrate, nitrite in straw over both seasons indicating that each both three tested factors acted separately. Ultimately, the use of biofertilization by syrialin + phosphorin (400 g/fad) + 40 m^2 organic manure as well as spraying super grow at tillering and elongation stages proved to be the most effective treatments applied to reduce grain and straw pollution with heavy metals and nitrate or nitrite, especially for Sids 8 and Gemmiza 3 wheat cvs., and this phenomenon was clearly valied under the environmental conditions of Dakahlia Governorate, Egypt.

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Table (1): Chemical analysis of the Farmyard manure over both seasons.

PH	Organic Carbon %	Total Nitrogen %	C/N Ratio %	Total Phosphorus %	Total Potassium %
7.21	19.35	1.46	13.1	0.26	1.41

Table (2): Mechanical and chemical analysis of experimental soil in both seasons.

Seasons	Mechanical analysis				Chemical analysis		
	Coarse sand %	Fine sand %	Silt %	Clay %	Organic matter %	PH	Total N%
1996/97	5.49	19.80	36.29	38.42	1.88	7.80	0.122
1997/98	6.59	18.80	40.41	34.20	1.81	7.75	0.117

Table (3): Chemical composition of Nile water for normal canal (Dammitta branch) in 1996/97 and 1997/98 seasons.

Variables	Season	
	1996/97	**1997/98**
PH	7.55	7.53
Ec (ds/m)	0.48	0.47
Soluble anions and cations (mg/l):		
CO_3 (ppm)	-	-
HCO_3 (ppm)	3.10	3.09
Cl^- (ppm)	1.42	1.39
$SO4^{--}$(ppm)	0.28	0.22
Ca^{++} (ppm)	1.79	1.77
Mg^{++} (ppm)	1.22	1.21
Na^+ (ppm)	1.55	1.50
K^+ (ppm)	0.24	0.22
Fe (ppm)	0.400	0.300
Mn (ppm)	0.080	0.070
Zn (ppm)	0.070	0.090
Cu (ppm)	0.010	0.020
Co (ppm)	0.050	0.040
Ni (ppm)	0.010	0.010
Cd (ppm)	0.001	0.002
Pb (ppm)	0.050	0.051

Table (4): Means of cadmium, lead, zinc and iron concentrations in grains (ppm) as affected by fertilization treatments, times of foliar nutrition of some wheat cultivars over both seasons.

Characters Treatments	Concentration in grains (ppm)			
	Cadmium	Lead	Zinc	Iron
A: Fertilization treatments				
Without fertilization	0.060	0.051	18.80	19.46
NPK fertilizers,Recom	0.204	0.177	40.50	38.35
Organic fertilizers	0.115	0.111	29.79	28.63
S 400+ P 400 +O 40	0.108	0.105	27.79	28.96
S 600+ P 600 +O 40	0.107	0.106	25.53	29.58
S 800+ P 800 +O 40	0.111	0.107	25.59	29.56
F-test	*	*	**	*
N-L.S.D. at 5%	0.003	0.002	0.43	0.37
N-L.S.D. at 1%	----	---	0.58	---
B: Times of foliar application				
At tillering stage	0.098	0.091	24.56	25.58
At elongation stage	0.118	0.109	28.13	27.06
At heading stage	0.121	0.112	28.55	30.07
At tillering +elong. stages	0.125	0.119	29.61	31.33
At tillering+ heading	0.126	0.119	29.16	31.40
stages	*	*	**	*
F-test	0.001	0.004	0.25	0.25
N-L.S.D. at 5%	----	---	0.34	---
N-L.S.D. at 1%				
C: Wheat cultivars				
Sakha 69	0.116	0.106	28.25	29.08
Sids 8	0.117	0.109	27.64	28.80
Gemmiza 3	0.120	0.114	28.11	29.39
F-Test	NS	NS	**	**
N-L.S.D.at 5 %	---	---	0.21	0.20
N-L.S.D.at 1 %	---	---	0.27	0.26

S = Syrian , P=Phosphorin and O =Organic fertilizer

Table (5): Means of nitrate, nitrite concentrations in grains and straw (ppm) as affected by fertilization treatments, times of foliar nutrition of some wheat cultivars over both seasons.

Characters Treatments	Concentration in grains		Concentration in straw	
	Nitrate (ppm)	Nitrite (ppm)	Nitrate (ppm)	Nitrite (ppm)
A: Fertilization treatments				
Without fertilization	2.122	0.102	1.021	0.044
NPK fertilizers,Recom	4.140	0.198	3.168	0.136
Organic fertilizers	3.242	0.129	2.424	0.109
S 400+ P 400 +O 40	3.046	0.135	2.342	0.102
S 600+ P 600 +O 40	2.837	0.128	2.329	0.098
S 800+ P 800 +O 40	2.955	0.127	2.331	0.106
F-test	*	*	**	*
N-L.S.D. at 5%	0.008	0.003	0.014	0.003
N-L.S.D. at 1%	---	---	0.019	---
B: Times of foliar application				
At tillering stage	2.551	0.125	2.087	0.083
At elongation stage	2.908	0.136	2.267	0.096
At heading stage	3.246	0.139	2.309	0.104
At tillering +elong. stages	3.306	0.141	2.342	0.106
At tillering+ heading stages	3.274	0.142	2.340	0.106
F-test	**	*	*	*
N-L.S.D. at 5%	0.008	0.002	0.007	0.003
N-L.S.D. at 1%	0.010	---	---	---
C: Wheat cultivars				
Sakha 69	3.058	0.143	2.277	0.100
Sids 8	3.043	0.134	2.255	0.099
Gemmiza 3	3.069	0.133	2.275	0.098
F-Test	NS	NS	NS	NS
N-L.S.D.at 5 %	---	---	---	---
N-L.S.D.at 1 %	---	---	---	----

S = Syrian , P=Phosphorin and O =Organic fertilizer

Table (6): Means of cadmium and lead concentrations in grains (ppm) as affected by the interaction between fertilization treatments and times of foliar nutrients over both seasons.

Characters		Concentrations in grains (ppm)	
		Cadmium	Lead
Without fertilization	At tillering stage	0.058	0.050
	At elongation stage	0.058	0.049
	At heading stage	0.060	0.051
	At tillering + elongation	0.062	0.055
	At tillering + Heading	0.062	0.051
NPK fertilizers (Recom.)	At tillering stage	0.158	0.133
	At elongation stage	0.200	0.175
	At heading stage	0.212	0.167
	At tillering + elongation	0.225	0.205
	At tillering + Heading	0.226	0.207
Organic fertilizers	At tillering stage	0.109	0.103
	At elongation stage	0.117	0.110
	At heading stage	0.118	0.117
	At tillering + elongation	0.117	0.112
	At tillering + Heading	0.114	0.115
S 400+ P 400 +O 40	At tillering stage	0.082	0.083
	At elongation stage	0.113	0.105
	At heading stage	0.111	0.107
	At tillering + elongation	0.117	0.115
	At tillering + Heading	0.116	0.115
S 600+ P 600 +O 40	At tillering stage	0.082	0.085
	At elongation stage	0.111	0.107
	At heading stage	0.111	0.112
	At tillering + elongation	0.112	0.113
	At tillering + Heading	0.119	0.113
S 800+ P 800 +O 40	At tillering stage	0.099	0.090
	At elongation stage	0.110	0.106
	At heading stage	0.112	0.115
	At tillering + elongation	0.119	0.111
	At tillering + Heading	0.117	0.111
F-test		**	**
N-L.S.D.at 5 %		0.007	0.006
N-L.S.D.at 1 %		0.009	0.008

S = Syrian , P=Phosphorin and O =Organic fertilizer

Table (7): Means of zinc and iron concentrations in grains (ppm) as affected by the interaction between times of foliar nutrients and wheat cultivars over both seasons.

Times of foliar application	Wheat cultivars	Concentrations in grains (ppm)	
		Cadmium	Lead
At tillering stage	Sakha 69	25.13	25.98
	Sids 8	24.31	25.45
	Gemmiza 3	24.23	25.32
At elongation stage	Sakha 69	28.70	26.67
	Sids 8	27.64	26.48
	Gemmiza 3	28.05	28.02
At heading stage	Sakha 69	28.36	30.07
	Sids 8	28.54	29.66
	Gemmiza 3	28.74	30.48
At tillering + elongation	Sakha 69	29.73	31.32
	Sids 8	28.94	31.29
	Gemmiza 3	30.17	31.37
At tillering + heading	Sakha 69	29.35	31.35
	Sids 8	28.76	31.10
	Gemmiza 3	29.38	31.76
F. test		**	**
N-LSD at 0.05		0.51	0.49
N-LSD at 0.01		0.67	0.65

تحسين إنتاجية القمح بإستخدام بعض العمليات الزراعية لتقليل التلوث البيئى

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أجريت تجربتان حقليتان فى حقل إرشادى بمركز المنصورة بميت بدر خميس محافظة الدقهلـــية وذلــك خـــلال الموسمين ١٩٩٦/٩٧ ، ١٩٩٧/٩٨ بهدف دراسة تأثير بعض معـــاملات التسميد المختلفة ، مواعيد إضافة التسميد الورقى بالسوبر جرو ٢٠-٢٠-٢٠ علـــى التركيب الكيماوى للقش والحبوب لبعض أصناف القمح بغية تقليل التلوث البيئى . ويمكن تلخيص أهم النتائج المتحصل عليها كما يلى :

١- ســجل التسميد المعدنى الموصى به NPK أعلى تركيزات للعناصر الثقيلة (الكادميوم - الرصـــاص - الزنك - الحديد) وكذلك النترات والنتريت بالحبوب وكذلك تركيزات النترات والنتريت بالقش مقارنة بمعاملات التسميد الآخرى.

٢- لقد سجل الرش بالسماد الورقى السوبر جرو عند مرحلتى التفريع والإستطالة أو عند التفريع وطرد السنابل أعلى تركيز من كل من الرصاص والكادميوم والزنك والحديد والنـــترات والنتريـــت بالحـــبوب وكذلك تركيز كل من النترات والنتريت بالقش حيث سجل الرش عند مرحلة التفريع فقط أقل تركيزات من هذه العناصر.

٣- لـــم تختلف أصناف القمح تحت الدراسة معنوياً فى محتوى الحبوب من تركيزات كل مـــن الكادميوم والرصاص والنترات والنتريت وكذلك تركيز كل من النترات والنتريت بالقش إلا أن أعلى تركيزات كانت فى الصنف جميزة ٣ ، سخا ٦٩ ثم سدس ٨.

٤- لقـــد ســـجل أعلى نسبة من عنصر الكادميوم بالحبوب عند إستخدام التسميد المعدنى NPK الموصى به والرش بالسوبر جرو خلال مرحلتى التفريع وطرد السنابل بينما سجلت أقل تركيزات منها بالتسميد الورقى خلال مرحلتى التفريع والإستطالة (٤٠ و ٦٠ يوم من الزراعة) وفى حالة زراعة الصنف سخا ٦٩.

توصـــى هـــذه الدراســـة بالتسميد الحيوى (السيريالين + الفوسفورين) بمعدل ٤٠٠ جـــم/فـــدان و ٤٠ م٣ سماد عضوى والتسميد الورقى بالسوبر جرو خلال مرحلتى التفريع والإستطالة وزراعة الصنف سدس ٨ أو جميزة ٣ وذلك للحصول على أعلى إنتاجية وأقل تركـــيزات مـــن العناصـــر الثقـــيلة والنترات بالحبوب والقش وذلك تحت ظروف محافظة الدقهلية.