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EFFECT OF UREA AND BAKING YEAST AS FOLIAR APPLICATION ON GROWTH, YIELD AND QUALITY OF POTATO.

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ABSTRACT: *Tow field experiments were carried out at Gemmeiza Research Station during the two summer seasons of 2000 and 2001 to investigate the effect of foliar application of urea or baking yeast each alone or its different combinations on growth, yield and tubers quality of potato, Diamant CV.*

The obtained results indicated that, foliar application of urea had no significant effect on all growth characters in the first season , but in the second one, spraying potato plants with 1% urea significantly increased number of main stems, number of branches and number of leaves/ plants.

Foliar application of baking yeast specially 5, l0 or 15 g/ L produced the highest values of each growth characters, number of tubers/ plant, yield/ plant, contents of N, P and K in both leaves and tubers, starch and specific gravity of potato plants in the two growing seasons.

The combination of 1% urea and 20 g/ L of baking yeast in the first season and 10, 15 g/ L in the second one gave the highest values of the above mentioned characters.

Key words: *Baking yeast - Urea – Potato – (Solanum tuberosum , L.).*

INTRODUCTION

Potato (*Solanum tuberosum , L.*) is one of the most important and popular vegetable crop grown in Egypt for local consumption and export. Mineral or bio-fertilizers are important factors for higher yield of potato tubers. Nitrogen play an important role in plant growth and its productivity. In this respect, several workers revealed that , application of nitrogen led to significant increases in plant growth and development (Klein, et al., 1990, Parke, 1991 and Whips and Lynch, 1986).

Baker's yeast as a natural bio-stimulant appeared to introduce an astonished effect on growth of many plants, since it has three basic functions, i .e carbon dioxide production, formation of alcohol as well as organic acid and esters (Magoffin and Hoseney 1974, Martinez – Anoya et al., 1990, Nadi, 1995 and Khalid, 1998). Foliar spray of common bean plants with baking yeast at 5 g/L improved plant growth, number and weight of pods / plant (Fathy and Farid, 1996). Moreover, foliar spray of 2 g/Lbread yeast increased plant growth, total yield and quality of eggplant (Hewedy et al., 1996) and (El – Ghamriny et al., 1999) on Tomato plants.

The objective of the present investigation to study the effect of baking yeast and urea foliar nutrition on vegetative growth, yield, quality and chemical constituents of leaves and tubers.

MATERIALS AND METHODS

The present study was carried out at EL. Gemmeiza Agriculture Research Station, Gharbiya Governorate during the summer seasons of 2000 and 2001. physical and chemical characteristics of the experimental soil are shown in Table (1).

Imported cut seed tubers of potato, Diamant CV. were planted in rows five meter in length and 0.75 m in width.

The distance within the row is 0.25m. the experimental unit area was 15 m^2 consisted of 4 rows, the middle rows were let for measure the yield, while the rest rows were assigned for taken vegetative samples to measure growth characters.

Potato seed tubers were planted on January 20th and 24th in the first and the second seasons, respectively. All experimental units received identical levels of NPK fertilizers where ammonium nitrate (33.5% N) was applied at 120 Kg N/ fed. two times after 40 and 60 days from planting, mono calcium super phosphate (15%. P_2O_5) at 75 kg P_2O_5/ fed during soil preparation and potassium sulphate (48% K_2O) at 96 Kg K_2O/ fed. two times, the first during seed planting and the other 40 days after planting.

Baker's yeast was prepared by mixed it with sugar at ratio of 1: 1 before dissolving in water, then left for 12 hours before spraying. Baker's yeast concentrations were 5, 10, 15 and 20 g/L. Chemical constituents of baker's yeast were shown in Table (2).

Table (1): Physical and chemical characteristics of the experimental soil

Ecx 10^3		2.14	2.19
Soluble ions (m.eq / 100 gm soil)	SO_4	0.20	0.19
	Cl	0.38	0.38
	HCO_3	0.32	0.30
	Mg	0.28	0.27
	Ca	0.25	0.26
	K	0. 01	0.01
	Na	0.36	0.33
pH (1: 2.5)		8.1	8.0
Available (PPm)	K	550	536
	P	4.7	5.1
	N	22.5	24.3
Total (%)	K	0.33	0.36
	P	0.12	0.12
	N	0.12	0.13
O.M		1.60	1.66
Texture class		Clay	Clay
Year		2000	2001

Table (2) Composition of Baker's Yeast.

Protein	47%
Carbohydrate	33 %
Minerals	8 %
Nucleic acids	8%
Lipids	4 %

Approximate composition of minerals :

Na	0.12 mg /g	Cu	8.00 µ /g
Ca	0.75	se	0.10
Fe	0.02	Mn	0.02
Mg	1.65	Cr	2.20
K	21.00	Ni	3.00
P	13.50	Va	0.40
S	3.90	Mo	0.40
Zn	0.17	Sn	3.00
Si	0.03	Li	0.17

Approximate composition of vitamins :

Thiamine	60 – 100 µ /g
Riboflavin	35 – 50
Niacin	300 – 500
Pyridoxine Hcl	28
Pantorhenate	70
Biotin	1.3
Cholin	4000
Folic acid	5 – 13
Vit – B12	0.001

Urea (46% N) was used at rate of 1% to increased activity and efficiency of baker's yeast 3 times, 40, 50 and 60 days after planting. Foliar application of each yeast or urea was applied in the early morning using a wetting agent.

The experimental design was split plot with four replications where urea foliar application was arranged in the main plot and the beaker yeast foliar application was assigned in the sub plot. The normal agricultural practices commonly used in growing potatoes were done.

Data were tested by analysis of variance (Little and Hills, 1972) Duncan multiple range test (D M R T) was used for comparisons among treatments means (Duncan, 1965).

Seven days before harvesting, five plants from each sub plot were randomly selected to determine the following growth characters: stem length, number of main stems, number of branches/ plant, number of leaves / plant and leaves dry matter percent.

The hills of the same plants were digged and the total yield/ plant was recorded. Tubers yield were graded to different sizes i.e, > 60 mm, 35 – 66 mm and < 35 mm in diameter.

Percentage of dry matter and specific gravity were measured according to (Nissen, 1955) and starch as (Simmonds, 1977). two weeks after harvesting.

Leaf and tuber peel tissues were oven dried at 70 c for 48 hours in air forced ventilated oven. The dried samples were ground and used for determine N% (Kock and Mc Meeking, 1924), P% (Trough and Mayers, 1939) and K% (Jackson, 1967).

RESULTS AND DISCUSSION

A – Vegetative growth.

1- Effect of foliar application of urea :

Foliar application of urea had no significant effect on all vegetative growth characteristics in 2000 season. On the other hand, the spray of 1% urea increased number of leaves per plant in the 2001 study, (Tables 3 and 4).

2- Effect of baking yeast :

Spraying potato plants with baking yeast at a rate of 5 and 10 g/L produced the heighest stem length, number of main stems, branches and leaves per plant in both seasons. Similar simulative effects of baking yeast were reported on vegetative growth of tomato (Midan,1986; Hewedy et al, 1996 and El-Ghamriny et al,1999) and eggplant (Fathy and Farid, 1996).

Table (3): Effect of urea and bakers yeast on vegetative growth of potato at summer season of (2000).

Chrc. / Treatments	Stem length (cm)	No. of main stem / plant	No. of branches /plant	No. of leaves / plant	Leaves dry weight (%)
2000 season					
0 % urea	77 –57	1.971	9.647	70-356	10.464
1 % urea	73-29	2.571	11.307	62.956	9.898
F. test	N.S	N.S	N.S	N.S	N.S
5 g yeast / L	80.39 a	2.108	12.072a	76.415 a	10.082
10 g yeast /L	73.04 b	2.292	9.530 ab	58.875 bc	9.702
15 g yeast /L	74. 46 ab	2.125	8.930 b	55.183 c	10.520
20 g yeast /L	73.83 b	2.558	11.375ab	76.150 ab	10.420
F . test	*	N.S	*	*	N.S
0 % urea x 5 g yeast	78.53ab	2.133 b	12.143 ab	91. 580 a	11.033 a
0 % urea x 10 g yeast	79.92 ab	2. 083 b	10.567 bc	74.750 ab	9.830 a - c
0 % urea x 15 g yeast	76 . 17 ab	1. 833 b	7.993 c	54.760 bc	10.253 a - c
0 % urea x 20 g yeast	75.67 ab	1.833 b	7.883 c	60.333 bc	10.740 ab
1 % urea x 5 g yeast	82.25 a	2.083 b	12.000 ab	61.250 bc	9.130 c
1% urea x 10 g yeast	66.17 c	2. 500 b	8.493 bc	43.000 c	9.573 bc
1% urea x 15 g yeast	72.75 bc	2.417 b	9.867 bc	55.607 bc	10.787 ab
1 % urea x 20 g yeast	72.00 bc	3. 283 a	14.867 a	91.967 a	10 . 100 a - c
F. test	*	*	*	*	*

* and N.S indicate significant differences at P < 0.05 and not significant , respectively according to F. test.

- Means designed by the same letter are not significantly different at the 5 % level according to Duncan's test.

Table (4): Effect of urea and bakers yeast on vegetative growth of potato at summer season of (2001).

Chrc. / Treatments	Stem length (cm)	No. of main stem / plant	No. of branches /plant	No. of leaves / plant	Leaves dry weight (%)
Season 2001					
0 % urea	64.925	2.225 b	9.292 a	81.750 b	6 . 375
1 % urea	62 .092	2.580 a	8.917 b	87.808 a	6. 133
F. test	N.S	*	*	*	N.S
5 g yeast / L	64 . 250 a	2. 400 ab	9.917 a	83.300 b	6.000
10 g yeast / L	63. 767 a	2.400 a b	10.317 a	92. 867 a	6.083
15 g yeast / L	66.950 a	2.277 b	8.883 b	94. 367 a	6.367
20 g yeast / L	59.067 b	2.533a	7.300 c	68. 583 c	6.567
F. test	*	*	*	*	N.S
0 % urea x 5 g yeast	64.400 ab	1.967 d	9.900 a	69.233 bc	5.667b
0 % urea x 10 g yeast	65.800 ab	2.233 b -d	10.133 a	89.600 a	6.200 b
0 % urea x 15 g yeast	65.433 ab	2.133 cd	7.767 b	94.300 a	6.167 b
0 % urea x20 g yeast	64.067 ab	2.567 ab	9.367 a	73. 867 b	7.467 a
1 % urea x 5 g yeast	86.100 ab	2.833 a	9.933 a	97.367 a	6.333 b
1 % urea x10 g yeast	61 . 733 b	2.567 ab	10.500 a	96. 133 a	5. 967 b
1 % urea x15 g yeast	68. 467 a	2.420 bc	10.000 a	94 . 433 a	6 . 567 b
1 % urea x20 g yeast	54. 067 c	2 . 500 b	5.233 c	63. 300 c	5. 667 b
F. test	*	*	*	*	*

* and N.S indicate significant differences at P < 0.05 and not significant , respectively according to F. test.
- Means designed by the same letter are not significantly different at the 5 % level according to Duncan's test.

The enhancing effect of baking yeast on vegetative growth might be due to its high content of cytokinins (Skoog and Miller, 1957). That are reported to delay the degradation of chlorophyll via the inhibition of chlorophyllase enzyme. Moreover, cytokinins enhance the synthesis of protein and RNA that are closely related with delaying the aging of leaves (Natio et al, 1981).

Yeast was identified as a source of B vitamins and certain micronutrients, so it is expected to improve plant growth. In accordance with this drawn conclusion, Abd–El– Fattah and Arisha (2000) and Arisha (2000) noted that vitamin B at the concentration of 2.5 ppm significantly increased stem length of common bean. However, the fermentation process that occurred in the presence of yeast produces CO_2 in high quantity, a factor that may increase photosynthesis and consequently plant growth.

Another explanation could be thought of as yeasts are capable of producing certain growth promoting substances such as hormones and amino acids (Armanious, 1987), that may enhance plant growth.

3- Combined effect of urea and Baking yeast :

The interaction effect between concentration of yeast and presence of urea on stem length was inconsistent indicating that 5g/ L yeast showed that highest value in 2000 study as compared with 15 g/ L yeast in 2001. yeast via its cytokinins content (Skoog and Miller, 1957) and the high content of vit- Bs and minerals (Table, 2) might be play a considerable role in orientation and

translocation of metabolites from leaves into the Productive organs. (Arisha. 1982; Faris and Mahasen. 1991; Megali et al, 1994; El–Ghamriny et al,1999 and Mohamed et al, 1999).

B – Yield and its components :

1- Effect of foliar application of urea :

Data in Tables (5 and 6) indicated that urea had significant effect on tubers number less than 35 mm in diameter and tubers yield. The plants treated with 1% urea solution produced the highest number and weight of the tubers less than 35 mm in diameter in 2000 and tubers number per plant, tubers number and weight over than 60 mm and 35 – 60 mm in diameter in 2001 study.

2- Effect of baking yeast :

Baking yeast a rate of 5, 10 and 15 g/L produced plants having the highest tubers number and weight / plant in the first season, as well as the rate of 20 g/L in the second one.

3- Combined effect of urea and Baking yeast :

Data in Tables (5 and 6) showed that there was a significant effect by the interaction between urea and baking yeast foliar application on tubers number and weight with their grading in both seasons. Treated plants with 1% urea + 5 or 10 g/L baking yeast produced the highest tubers number and weight with their grading in both seasons. In this concern, yeast via its cytokinins content (Skoge and Miller, 1957) and the high content of vit. Bs and minerals (Table, 2) might be play a considerable role in orientation and translocation of metabolites form the leaves into the production organs.

Table (5): Effect of urea and baker yeast on potato yield at summer season of (2000) year.

Chrc. / Treatments	Tubers number				Tubers weight			
	Plant	> 60 (mm) diameter	35 – 60 (mm) diameter	< 35 (mm) diameter	Plant (g)	> 60 mm diameter	35 – 60 (mm) diameter	< 35 (mm) diameter
	2000 season							
0 % urea	9.897	2.567	4.750	2.467 b	1158.468 b	679.483	467 . 858	91.117 b
1 % urea	12 . 232	2.850	5.067	4.283 a	1288.983 a	666.742	505 .183	117.058 a
F.test	N.S	N.S	N.S	*	*	N.S	N.S	*
5 g yeast / L	11.987 a	3.000 a	5.633 a	3.167 ab	1385.817 a	723.683a	562. 460	100.683
10 g yeast / L	12.673 a	2.867 a	5.433 ab	4.333 a	1272 . 650 a	629.800 a	524.033	118.817
15 g yeast / L	10. 325 b	2.733 a	4.167 c	3.400 ab	1149.317 b	524. 783ab	448. 583	76. 950
20 g yeast / L	9.273 b	2.233 b	4.400 bc	2.800 b	1087. 100 b	514. 183 b	460. 017	112. 900
F.test	*	*	*	*	*	*	N.S	N.S
0 % urea x 5g yeast	10.343 bc	2.800 bc	5.467 ab	1.933 c	1272.933 bc	631.900 bc	529.267	111.767
0 % urea x 10 g yeast	11.240 b	2.600 bc	5.133ab	3.467 b	1136.467 cd	534.567 c	514.533	87.367
0 % urea x 15 g yeast	9.753 bc	2.800 a-c	3.033 b	3.900 b	1170.000 cd	652.187 bc	449.800	69.133
0% urea x 20 g yeast	8.250c	2.267 c	4.467 ab	1.467c	1053.633 d	499.300c	458.033	96.200
1 % urea x 5 g yeast	13. 630 a	3.400 a	5.800 a	4.400 a	1498 .700 a	815.467 a	575.633	107.600
1 % urea x 10 g yeast	14.107a	3.133 ab	5.733 a	5.200 a	1408 . 833 ab	728.033 ab	533.633	150.267
1 % urea x 15g yeast	10.897 b	2.667 bc	4.400 ab	3.000 ab	1127.733cd	597. 400bc	449.667	80.767
1 % urea x 20 g yeast	10.297 bc	2.200 c	4.333ab	3.733 ab	1120.667 cd	529.067 c	462.000	129.600
F.test	*	*	*	*	*	*	N.S	N.S

* and N.S indicate significant differences at P < 0.05 and not significant , respectively according to F. test.

- Means designed by the same letter are not significantly different at the 5 % level according to Duncan's test.

Table (6): Effect of urea and baker yeast on potato yield at summer season of (2001) year.

Chrc. / Treatments	Tubers number				Tubers weight			
	Plant	> 60 (mm) diameter	35 – 60 (mm) diameter	< 35 (mm) diameter	Plant (g)	> 60 mm diameter	35 – 60 (mm) diameter	< 35 (mm) diameter
Season 2001								
0 % urea	9. 102 b	1.410 b	2. 692 b	4.292	717.325	234.358 b	291.667	193.800
1% urea	10.067 a	1.975 a	3.217 a	4.392	740.842	283.442 a	299.342	178.692
F. test	*	*	*	N.S	N.S	*	N.S	N.S
5g yeast / L	9.633 b	1.850 a	3.100 b	4.017 c	717.883	276.517 a	313.950 a	147.217 b
10 yeast / L	8.983b	1.833 a	2.217 c	4.450 ab	702.183	261.650 a	261. 033 b	196. 167a
15 yeast / L	9.363 b	1.337 b	3.550 a	4.233 bc	732.617	204.267 b	296.933 a	201. 317 a
20 yeast / L	10.367 a	1.750 a	2.950 b	4.667 a	763.550	293.167 a	310.100 a	200.283 a
F.test	*	*	*	*	N.S	*	*	*
0 % urea x 5 g yeast	9.700 a	1.333 c	3.333 b	4.267 b	730.300	191.867 c	348.400 a	163.367b
0% urea x10 g yeast	7.600 c	1.766 b	1.633 d	3.600 c	681.800	277.833 b	241.300 d	176.000 b
0 % urea x 15 g yeast	8.573 b	0.773 d	3.167 bc	4.167 b	702.500	172.133 d	253.567 cd	223.457 a
0 %urea x20 g yeast	10.533 a	1.767 b	2.633 c	5.133 a	774.700	296.600 b	323.400 ab	212.367 a
1 % urea x 5 g yeast	9.567 a	2.367 a	2.867 bc	3.767 c	706.067	361.167 a	312.833 ab	131.067 c
1% urea x 10 g yeast	10.367 a	1.900 b	2.800 bc	5.300 a	742.567	245.467 b	280.767 b-d	216.333 a
1 %urea x15 g yeast	10.123 a	1.900 b	3.933 a	4.300 b	762.533	238.400 b	346.300 a	179.187 b
1 %urea x 20 g yeast	10.200 a	1.733 b	3.267 b	4.200b	752.400	290.733 b	296.800 a-c	188.200 b
F.test	*	*	*	*	N.S	*	*	*

* and N.S indicate significant differences at P < 0.05 and not significant , respectively according to F. test.

- Means designed by the same letter are not significantly different at the 5 % level according to Duncan's test.

C: Chemical constituents of the leaves, tubers and their quality :

1-fect of foliar application of urea :

Data in Tables (7 and 8) indicated that N and P_2O_5 of the leaves and N of tubers increased by urea foliar application in both seasons.

2- Effect of baking yeast :

Data in Tables (7 and 8) showed that there were a significant effects by foliar application with baking yeast. Sprayed baking yeast at the rates of 10 and 15 g/ L produced plants having a higher N, P and K concentration in their leaves and tubers compared to other treatments in both seasons.

These results agree with those obtained by khalid (1999) and Mohamed et al. (1999).

3– Combined effect of urea and baking yeast :

Effect of the interaction between urea and baking yeast at different concentration on leaves and tubers N, P and K content are shown in Tables (7 and 8).

It is evident from these results that all urea and baking yeast treatments interaction had a significant effects on N, P and K content of the leaves and tubers in both seasons. Sprayed potato plants with urea and 10 or 15 g/L baking yeast produced the highest N, P and K constituents in both season.

Table (7): Effect of urea and baking yeast on chemical constituents of leaves and tubers and their quality during 2000 summer season.

Chrc. / Treatments	Leaves			Tubers			Tubers dry weight %	Strach content %	S.G
	N %	P_2O_5%	K_2O %	N %	P_2O_5%	K_2O %			
Season 2000									
0 % urea	3.242 b	0.771 b	3.421	1.846 b	0.396	2.003	16.810	12.183	1.069
1 % urea	3.418 a	0.804 a	3.454	1.988 a	0.376	1.997	16.276	12.020	1.068
F.test	*	*	N.S	*	N.S	N.S	N.S	N.S	N.S
5 g yeast / L	3.163 b	0.717 c	3.300 c	1.783c	0.383	1.990 ab	16.276 ab	10. 272 b	1.069 b
10 g yeast / L	3.383 a	0.817 b	3.617 b	2.003a	0.417	2.537 a	16.975 a	10.566 b	1.061 b
15 g yeast / L	3.425 a	0.867 a	3. 683 a	1.970 ab	0. 367	2.012 ab	16.844 ab	12.134 b	1.069 b
20 g yeast /L	3.342 a	0.750 c	3.350 c	1.912 b	0.375	1.962 b	16.078 b	16.433 a	1.086 a
F.test	*	*	*	*	*	*	*	*	*
0 % urea x 5 g yeast	3.133 d	0.717 d	3.383 d	1.66 7 d	0.417	1.973 ab	16.186 ab	10.043b	1.068 b
0 % urea x 10 g yeast	3.317bc	0.808 bc	3.500 bc	1.983 ab	0.417	2.007 ab	17.043 a	10.566 b	1.061 b
0 % urea x 15 g yeast	3.317bc	0.833 b	3.567 ab	1.933 ab	0.367	2.050 a	16. 738 ab	12.883 ab	1.072ab
0 % urea x 20 g yeast	3.200cd	0.733 d	3.233 e	1.800 c	0.383	1.983 ab	14.292 b	16.270 a	1.085 a
1 % urea x 5 g yeast	3.193cd	0.717 d	3.217 e	1.900 bc	0.350	2.007 ab	16.390 ab	10.501 b	1.060 b
1 % urea x 10 g yeast	3.450ab	0.833 b	3.533 a - c	2.023 a	0.417	2.007 a	16.906 a	10.566 b	1.061 b
1 % urea x 15 g yeast	3.533 a	0.900 a	3.800 a	2.007 ab	0.367	1.973 ab	16.948 ab	11.416 b	1.066 b
1 % urea x 20 g yeast	3.483 a	0.767 cd	3.467 c	2.023 a	0.367	1.940 b	16.864 ab	15.597 a	1.088 a
F. test	*	*	*	*	N.S	*	*	*	*

* and N.S indicate significant differences at $P < 0.05$ and not significant , respectively according to F. test.

- Means designed by the same letter are not significantly different at the 5 % level according to Duncan's test.

Table (8): Effect of urea and baking yeast on chemical constituents of leaves and tubers and their quality during 2001 summer season.

Chrc. / Treatments	Leaves			Tubers			Tubers dry weight %	Strach content %	S.G
	N %	P_2O_5%	K_2O %	N %	P_2O_5%	K_2O %			
Season 2001									
0 % urea	3.438 b	0.963 b	4.325	1.930	0.521	2.346	21.167 b	11.94	1.071
1 % urea	3.713 a	1.087 a	4.425	1.962	0.533	2.250	22.017 a	12.757	1.072
F.test	*	*	N.S	N.S	N.S	N.S	*	N.S	N.S
5 g yeast / L	3.392 b	0.920 c	4.208 b	1.870 b	0.525	2.296ab	21.360b	12.858 a	1.079 a
10 g yeast / L	3.617 a	1.028b	4.480 a	2.016 a	0.592	2.475a	22.750a	13.343 a	1.076 a
15 g yeast / L	3.675 a	1.175 a	4.542 a	1.943 a	0.517	2.300ab	21.167b	13.506 a	1.073 a
20 g yeast / L	3.617 a	0.978 bc	4.300 b	1.912 b	0.475	2.125b	21.100b	9.687 b	1.067 b
F. test	*	*	*	*	N.S	*	*	*	*
0 % urea x 5 g yeast	3. 183 c	0.833 d	4.167 c	1.870 c	0.467	2.363	21.233 bc	10.987 c	1.075 c
0 % urea x 10 g yeast	3.500 b	0.933 cd	4.400 b	2.016 a	0.667	2.467	22.600a	11.737 c	1.067 c
0 % urea x 15 g yeast	3.567 b	1.150 a	4.533 ab	1.863 ab	0.560	2.383	20.367c	13.380 b	1.072 b
0 % urea x 20 g yeast	3.500 b	0.933 cd	4.300 c	1.912 bc	0.500	2.167	20.267c	11.557 c	1.067 c
1 % urea x 5 g yeast	3.600 b	1.007 bc	4.250 c	2.026 a	0.583	2.217	21.467 a.c	14.730 a	1.083 a
1 % urea x 10 g yeast	3.733 a	1.117 ab	4.500 ab	2.013 a	0.516	2.483	22.700 ab	14.980 a	1.066 a
1 % urea x 15 g yeast	3.783 a	1.200 a	4.550 a	1.963 ab	0.483	2.217	21.967 ab	13.630 b	1.078 b
1 % urea x 20 g yeast	3.733 a	1.033 bc	4.400 b	1.990 ab	0.450	2.083	21.933 ab	7.717 d	1.046 d
F. test	*	*	*	*	N.S	N.S	*	*	*

* and N.S indicate significant differences at $P < 0.05$ and not significant , respectively according to F. test.

- Means designed by the same letter are not significantly different at the 5 % level according to Duncan's test.

In addition, dry weight of tubers was significantly affected by the interaction between urea and baking yeast, the plants treated with 5 g/L without urea spray produced the highest dry weight in both seasons.

Concerning, starch percentage and specific gravity of potato tubers, data in Tables (7 and 8) indicated that both starch and specific gravity percentage significantly affected by urea and baking yeast as foliar application

interaction in both seasons. Potato plants sprayed with 1% urea plus 20 g/L and 1% urea plus 5 or 10 g/L baking yeast produced tubers having the highest starch and specific gravity percentage in the first and the second season, respectively.

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تأثير الرش باليوريا والخميرة على النمو والمحصول والجودة لمحصول البطاطس

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الملخص العربي

تـم إجراء هذا البحث بمزرعة محطة البحوث الزراعية بالجميزة محافظة الغربية خلال الموسم الصـيفي لعام ٢٠٠٠ ، ٢٠٠١ لدراسة تأثير الرش باليوريا ١ % والخميرة بمعدل ٥ ، ١٠ ، ١٥ ، ٢٠ جم / لتر على إنتاجية وجودة محصول البطاطس صنف دايمونت.

وقد كانت أهم النتائج المتحصل عليها ما يلي :

١- اسـتجابة نبات البطاطس للرش باليوريا بتركيز ١% حيث أدى ذلك إلى زيادة لكل مكونات النمو وكذا عدد الدرنات وزيادة تركيز العناصر في كلاً من الأوراق والدرنات في كلا الموسمين.

٢- أدى الـرش بالخمـيرة بتركيز ٥، ١٠ جم / لتر و١٠، ١٥جم / لتر إلى حدوث زيادة في النمو الخضري وعدد ووزن الدرنات/ نبات وكذلك تركيز العناصر في كلٍ من الدرنات والأوراق ومحتوى النشا والكثافة النوعية في الموسم الأول والثاني على الترتيب.

٣- أدى التفاعل بين الرش باليوريا (١ %) والخميرة (٢٠ جم خميرة / لتر) إلى حدوث زيادة معنوية في النمو الخضري للبطاطس في الموسم الأول والرش باليوريا (١ %) والخميرة (١٠ جـم أو ١٥ جـم خميرة/ لتر) في الموسم الثاني إلى حدوث زيادة معنوية في النمو الخضري وكذلـك عدد ووزن الدرنات وتركيز العناصر في كلٍ من الأوراق والدرنات وكذلك محتوى النشا والكثافة النوعية للدرنات.

وبـناء على النتائج السابقة يمكن التوصية برش نباتات البطاطس بمحلول اليوريا بتركيز ١% بالإضـافة إلى ١٥ جم/ لتر خميرة وذلك للحصول على محصول عالي وجودة عالية مع إمكانية تقلـيل استخدام الأسمدة الآزوتية مما يعمل على تقليل التلوث الناتج عن الإسراف في استخدام الأسمدة الآزوتية.