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EFFECT OF N-LEVEL AND ITS TIME OF APPLICATION ON YIELD AND NITROGEN UPTAKE OF SOME RICE VARIETIES

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Abstract

Two field experiments were carried out at Al-Khadmia, Kafr El-Sheikh Governorate, during the two growing seasons of 1988 and 1989 to study the effect of five nitrogen levels (0, 20, 40, 60 and 80 kg N/fed.) and three times of application (1/2 of N in dry soil + 1/2 of N at 20 days "AT", 1/2 of N at 20 days "AT" + 1/2 of N at "PI" and 1/3 of N at 20 days "AT" + 2/3 of N at "PI") on yield and nitrogen uptake of two rice varieties namely Giza 181 and Giza 175. The results could be summarized as follows:

In both seasons, Giza 181 exceeded Giza 175 in grain yield, straw yield, nitrogen uptake, nitrogen efficiency % and nitrogen recovery. Adding nitrogen as 1/2 of N in dry soil + 1/2 of N at 20 days "AT" significantly increased grain yield, straw yield,nitrogen uptake, nitrogen efficiency % and nitrogen recovery. Also, nitrogen levels increased grain yield, straw yield and total nitrogen uptake, while nitrogen efficiency % and nitrogen recovery tended to decrease with increasing N-levels.

The interaction between rice varieties and time of N-application significantly affected grain yield. Giza 181 recorded the highest grain yield when nitrogen was added as 1/2 of N in dry soil + 1/2 of N at 20 days "AT". Also, adding 60 kg N/fed. in two equal portions, 1/2 of N at 20 days "AT" + 1/2 of N at "PI" for Giza 181 obtained the highest value of total N-uptake. On the other hand, Giza 181 gave the highest grain yield by adding 60 kg N/fed. as 1/2 of N in dry soil + 1/2 of N at 20 days "AT".

INTRODUCTION

In Egyptian agriculture, rice is a crop of great economic significance as a food-crop. The use of an optimum N-level in an optimum time of application, is one of the most important factors that limit productivity of rice varieties. Dalel *et al.* (1985) showed that adding nitrogen in 4 splits increased paddy yield from 8.57 to 9.38 t/ha, also, N-applied in 3 equal split dressings at puddling or 7 days after transplanting "DAT" and at 21 and 42 DAT, gave highest yields. Bhuiyan *et al.* (1988) found that application of urea in 3 splits (1/3 initial tillering + 1/3 rapid tillering + 1/3 5-7 days before panicle initiation) gave the highest grain yield (4.6 t/ha), N-efficiency 22.6 kg grain/kg N and N-recovery 31.5 than other 2 application times (1/2 basal + 1/2 maximum tillering) and (1/3 basal + 1/3 initial tillering + 1/3 5-7 days before panicle). Hamissa *et al.* (1986) reported that nitrogen content of rice increased as nitrogen level increased up to 9 kg N/ha (40 kg N/fed.) for most rice varieties. IRRI (1987a) found that optimum nitrogen rate for most rice varieties was between 60 and 90 kg N/ha, beyond 90 kg N/ha, yield decreased. Also, Leilah and El-Kalla (1989), Nour (1989) and Singh *et al.* (1989) found that increasing nitrogen rate up 60 kg N/fed. Significantly increased rice grain yield, straw yield and N-uptake by rice plant.

The present investigation was planned to study the effect of timing and level of nitrogen on yield and nitrogen uptake of rice plants.

MATERIALS AND METHODS

Two field experiments were carried out at El-Khadmia, Kafr El-Sheik Governorate during the two summer seasons of 1988 and 1989 to study the effect of 3 timing of N-application as (1/2 of N in dry soil + 1/2 of N at 20 days after transplanting "AT", 1/2 of N at "AT" + 1/2 of N at panicle initiation "PI" and 1/3 of N at "AT" + 2/3 of N at "PI") and 5 levels from N-fertilizers namely (0, 20, 40, 60 and 50 Kg N/fed.) were added as urea (46% N) on yield and nitrogen uptake of two rice cultivars namely Giza 175 and Giza 181. The calcium monophosphate (15.0% P_2O_5)

was added before the flooding immediately at rate of 100 kg/fed. Irrigation and inter culture operations were given whenever necessary. The experiment was laid out in split-split design with 4 replicates. Some soil chemical and physical properties are given in Table 1. At harvest, the plants were collected together for yield determination:

1. Grain and straw yield (ton/fed.)
2. Harvest Index (HI)
3. Total nitrogen uptake (kg N/fed.)
4. Nitrogen efficiency % (kg rice/kg N applied)
5. Nitrogen recovery%.

Total N, available NH_4 and available NO_3 were determined according to Page (1982). Available P was determined using Olsen's method (Jackson 1967). Available K was determined using EEL flame photometer (Jackson 1967).

Table 1. Some chemical and physical properties of the experimental soils.

Properties	Seasons	
	1988	1989
Mechanical analysis		
Sand %	12.50	12.20
Silt %	31.20	31.50
Clay %	56.30	55.30
Soil texture	Heavy clay	
Chemical analysis		
E.C. mmoh/cm at 25°C	1.80	1.70
Organic matter content	1.52	1.53
Calcium carbonate %	1.32	1.34
Soil pH (1:2.5)	8.30	8.10
Total N ppm	360.00	434.00
Available NH_4 ppm	1.90	2.10
Available NO_3 ppm	18.30	17.20
Available P ppm	19.10	18.60
Available K	310.00	350.00

Data were subjected to analysis of variance according to the procedure out lined by Gomez and Gomez (1984). The treatment means were compared by the new L.S.D. of Waller and Duncan (1969).

RESULTS AND DISCUSSION

1. Grain yield (ton/fed.):

Data in Table 2 indicate that, in the two seasons, the highest grain yield was obtained with cultivar Giza 181, while the lowest one was found with Giza 175. The superiority of Giza 181 in grain yield might be attributed to its superiority in the most yield components. These results were in agreement with those obtained by Ismail (1989) who reported that a significant difference in grain yield was detected among the different rice varieties. On the other hand, adding nitrogen in equal portions (1/2 of N in dry soil + 1/2 of N at 20 days "AT") gave the highest grain yield while adding 1/3 of N at 20 days "AT" + 2/3 of N at "PI" gave the lowest one. This may be attributed to the fact that application of nitrogen in the early growth stage of rice stimulates growth and tillering and hence increased grain yield, (Leila and El-Kalla 1989).

In both seasons, there was a significant increase in grain yield with increasing nitrogen level up to 60 kg N/fed. This may be due to the increase in most of yield components by increasing nitrogen level up to 60 kg N/fed., Hamissa *et al.* (1987). On the other hand, further incremental level (80 kg N/fed.) reduced the rice grain yield compared with 60 kg N/fed.

Data in Table 3 reveal that, the interaction between time and level of nitrogen fertilization had a significant effect on rice grain yield, the highest grain yield was obtained with 60 kg N/fed. when added as 1/2 of N in dry soil + 1/2 of N at 20 days "AT". The previous results are in harmony with those obtained by Abruna (1984).

2. Straw yield (ton/fed.):

In both seasons data in Table 2 show that, there was a significant difference between the two rice varieties in straw yield, Giza 181 produced 2.86 tons/fed. while Giza 175 produced 2.71 tons/fed. On the other hand, straw yield was highly

Table 2. Effect of different rice varieties, nitrogen level and its time of application on grain yield, straw yield, harvest index, total N-uptake, N-efficiency % and N-recovery %.

Character	Grain yield t/fed.		Straw yield t/fed.		Harvest index		Total N-uptake kg N/fed.		N-efficiency %		N-recovery %	
Treatment	1988	1989	1988	1989	1988	1989	1988	1989	1988	1989	1988	1989
A. Rice varieties												
Giza 175	2.54	2.55	2.67	2.75	48.91	47.84	48.11	49.78	28.87	30.50	56.67	156.84
Giza 181	2.77	2.75	2.89	2.85	49.3	48.67	56.67	36.84	49.33	48.56	69.32	67.84
F-test	ll	ll	ll	ll	N.S.	N.S.	ll	ll	N.S.	N.S.	ll	N.S.
B. Time of N-application												
T_1	3.05	3.02	3.09	3.11	49.05	48.58	53.71	53.05	38.33	38.99	76.53	73.31
T_2	2.65	2.63	2.80	2.80	49.35	48.13	50.31	51.45	25.57	28.25	60.35	66.45
T_3	2.31	2.32	2.44	2.48	48.94	47.89	46.33	47.53	17.98	21.68	55.04	60.55
L.S.D. at 5%	0.06	0.10	0.11	0.07	N.S.	N.S.	2.17	1.52	5.06	2.75	10.591	5.93
L.S.D. at 1%	0.09	0.14	0.15	0.10	N.S.	N.S.	3.04	1.45	7.09	3.85	4.85	8.31
C. N-levels												
0 kg N	1.72	1.60	1.86	1.77	49.06	47.50	26.33	25.33	----	----	----	----
20 kg N	2.51	2.43	2.61	2.67	49.23	47.62	46.03	45.48	39.90	41.53	92.70	94.80
40 kg N	2.87	2.91	2.97	3.06	48.99	48.57	54.63	55.14	28.73	32.62	65.82	66.99
60 kg N	3.16	3.28	3.27	3.31	49.45	48.58	61.93	63.85	24.01	26.47	55.82	59.98
80 kg N	3.04	3.04	3.19	3.19	48.85	48.71	61.65	63.59	16.53	17.94	41.54	45.30
L.S.D. at 5%	0.09	0.10	0.11	0.08	0.92	0.68	2.04	1.21	3.88	1.78	6.51	4.64
L.S.D. at 1%	0.12	0.15	0.15	0.11	1.22	0.90	2.71	1.60	4.90	2.36	8.96	6.39

T_1 = 1/2 of N in dry soil before transplanting + 1/2 of N at 20 days after transplanting "AT".
T_2 = 1/2 of N at 20 days "AT" + 1/2 of N at panicle initiation "PI".
T_3 = 1/3 of N at 20 days "AT" + 2/3 of N at "PI".

significant affected by the time of nitrogen application. The highest straw yield was obtained by adding nitrogen in two equal portions (1/2 of N in dry soil + 1/2 of N at 20 days "AT") while, the lowest one was found by adding nitrogen as (1/3 of N at 20 days "AT" + 2/3 of N at "PI"). Similar findings were reported by Niae (1987). On the other hand, straw yield significantly responded to the increase in N-level up to 60 kg N/fed. The further incremental level (80 kg N/fed.) reduced rice straw yield as compared with 60 kg N/fed. The increase in straw yield by raising N-level may be due to the increase in plant height and number of tillers/m^2, Nour (1989).

Data in Table 3 show in both seasons that, straw yield was significantly affected by the interaction between time and levels of N-fertilization. The highest straw yield was recorded by 60 kg N/fed. added in two equal portions, 1/2 of N in dry soil + 1/2 of N at 20 days "AT". Similar results were reported by Hamissa *et al.* (1986).

3. Harvest index:

Data in Table 2 indicate in both seasons that insignificant differences were found between the two rice varieties and harvest index. Again, timing of N-application had insignificant effect on harvest index. On the other hand, N-levels had a significant effect on harvest index in the second season only. Similar results were found by Aly *et al.* (1986).

4. Total nitrogen uptake (kg N/fed.):

Data in Table 2 show that, total nitrogen uptake was significantly influenced by the two rice varieties, Giza 181 utilized 56.75 kg N/fed., while Giza 175 utilized 48.94 kg N/fed. over the two seasons. Data also reveal that, total nitrogen uptake was significantly affected by the time of N-application. The highest N-uptake values were found with adding nitrogen as 1/2 of N in dry soil + 1/2 of N at 20 days "AT", while the lowest ones were found with adding nitrogen as 1/3 of N at 20 days "AT" + 2/3 of N at "PI", over two seasons.

Total nitrogen uptake was significantly affected by N-level in both seasons. There was a significant increase in total N-uptake with increasing N-levels up to 60 kg N/fed. These results are in harmony with those obtained by Singh *et al.* (1989). On the other hand, the further incremental level (80 kg N/fed.) slightly reduced N-uptake (Table 2). The interaction between N-levels and time of its application had a significant effect on total nitrogen uptake in the two seasons (Table 3).

Table 3. Interaction effect between nitrogen level and time of appliation on grain yield, straw yield, total nitrogen uptake, N-efficiency and N-recovery through 1988 and 1989 seasons.

character	Season	Time of N-applica-tion	Nitrogen levels (kg N/fed.)					L.S.D.	
			00	20	40	60	80	5%	1%
Grain yield ton/fed.	1988	T_1	1.72	2.85	3.50	3.62	3.38	0.19	0.21
		T_2	1.73	2.45	2.68	3.29	3.08		
		T_3	1.69	2.24	2.41	2.56	2.65		
	1989	T_1	1.66	2.81	3.52	3.82	3.27	0.21	0.29
		T_2	1.60	2.31	2.85	3.26	3.12		
		T_3	1.55	2.18	2.36	2.75	2.73		
Straw yield ton/fed.	1988	T_1	1.81	2.94	3.54	3.67	3.50	0.20	0.27
		T_2	1.81	2.51	2.80	3.52	3.33		
		T_3	1.92	2.37	2.37	2.58	2.62		
	1989	T_1	1.82	2.99	3.61	3.77	3.44	0.15	0.20
		T_2	1.73	2.55	2.96	3.46	3.29		
		T_3	1.74	2.47	2.60	2.77	2.84		
Total nitrogen uptake kg N/fed.	1988	T_1	30.50	49.64	62.81	66.69	64.47	3.53	4.69
		T_2	31.66	45.02	51.42	65.84	62.19		
		T_3	30.59	43.46	49.66	54.24	58.28		
	1989	T_1	30.50	48.90	61.81	63.10	65.90	2.09	2.77
		T_2	30.22	43.75	55.06	66.65	66.13		
		T_3	29.16	43.79	48.56	61.78	58.76		
N-efficiency %	1988	T_1		56.30	44.50	31.70	20.70	6.38	8.48
		T_2		35.80	23.60	25.80	16.90		
		T_3		27.50	17.90	14.40	111.90		
	1989	T_1		27.60	46.30	31.70	20.10	3.08	4.10
		T_2		35.20	31.10	27.60	18.90		
		T_3		31.60	20.30	20.00	14.70		
N-recovery %	1988	T_1		98.20	86.80	62.34	45.44	11.87	15.79
		T_2		64.32	55.00	60.79	41.30		
		T_3		82.24	55.86	44.30	37.97		
	1989	T_1		98.90	75.90	63.20	44.18	8.47	11.26
		T_2		85.04	86.40	63.45	49.19		
		T_3		89.40	55.93	53.28	46.72		

T_1 = 1/2 of N in dry soil before transplanting + 1/2 of N at 20 days after transplanting "AT".

T_2 = 1/2 of N at 20 days "AT" + 1/2 of N at panicle initiation "PI".

T_3 = 1/3 of N at 20 days "AT" + 2/3 of N at "PI".

Data in Table 4 show that, N-uptake was significantly affected by the interaction between rice varieties, N-levels and time of N-application. The highest total N-uptake was obtained with treatments having a combination of Giza 181 fertilized by 60 to 80 kg N/fed. added at T1 or T2. Giza 175 gave the similar response, in both seasons.

5. Nitrogen efficiency (kg rice / kg N):

Data in Table 2 indicate that, the two rice varieties did not differ in N-efficiency in both seasons. Meanwhile, Giza 181 surpassed Giza 175 in N-efficiency in the two seasons. Data also, show that the time of N-application had a significant effect on N-efficiency. The highest value of N-efficiency was found by adding 1/2 of N in dry soil + 1/2 of N at 20 days "AT", while the lowest one was by adding 1/3 of N at 20 days at "AT" + 2/3 of N at "PI", over both seasons. Increasing N-level up to 80 kg N/fed. significantly decreased the N-efficiency in both seasons.

Data in Table 3 show that, N-efficiency was significantly affected by the interaction between N-level and time of N-application. Adding 80 kg N/fed. as 1/3 of N at 20 days "AT" + 2/3 of N at "PI" obtained the lowest N-efficiency value, but, the highest one was obtained by adding 20 kg N/fed. as 1/2 of N in dry soil + 1/2 of N at 20 days "AT".

6. Nitrogen recovery percentage:

Data in Table 2 show that, N-recovery percentage significantly differed in the two rice varieties in 1988 season only, while Giza 175 recovered 62.14%, over both seasons. Also, data indicate that N-recovery % was significantly affected by time of N-application, the highest N-recovery % was obtained by the first nitrogen treatment (1/2 of N in dry soil + 1/2 of N at 20 days "AT") while, the lowest one was obtained by the treatment (1/3 of N at 20 days "AT" + 2/3 of N at "PI") over both seasons. On the other hand, N-recovery was % significantly decreased by increasing N-level up to 80 kg N/fed.

Data in Tables 3 show that, the interaction between N-level and time of N-application had highly significant effect on N-recovery %. N-recovery gave its maximum value from the plot having 20 kg N/fed. added as 1/2 of N in dry soil + 1/2 of N at 20 days "AT", while the lowest one was obtained from the plots that included 80 kg N/fed. as 1/3 of N at 20 days "AT" + 2/3 of N at "PI".

Table 4. Interaction effect between rice varieties, nitrogen level and time of nitrogen application on total nitrogen uptake (kg N/fed.).

N-level kg N/fed.	1988						1989					
	Giza 175			Giza 181			Giza 175			Giza 181		
	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3
0	30.52	31.60	30.59	30.47	30.12	30.22	30.61	27.91	29.25	29.48	32.52	29.07
20	49.09	44.39	39.17	50.17	45.67	47.75	46.33	43.32	42.89	51.48	44.19	44.69
40	61.25	50.43	45.64	46.37	52.11	63.68	60.20	53.49	45.57	63.41	56.36	51.53
60	66.52	62.69	48.59	64.86	68.98	59.89	67.43	66.98	60.46	62.77	66.31	63.53
80	59.72	58.33	56.80	69.20	66.07	59.70	66.78	65.57	65.61	65.36	66.72	60.89
L.S.D. at 5%			5.01						2.89			
L.S.D. at 1%			6.62						3.96			

T_1 = 1/2 of N in dry soil + 1/2 of N at 20 days after transplanting "AT".
T_2 = 1/2 of N at 20 days "AT" + 1/2 of N at panicle initiation "PI".
T_3 = 1/3 of N at 20 days "AT" + 2/3 of N at "PI".

REFERENCES

1. Abruna, F. 1984. Response of rice to nitrogen fertilization in Puerto Rico. 211 (En) AGric. Exp. Sta., Coll. of Agric. Sci., Mayaguez, Puerto Rico. (c.f. Field Crop. Abst. 38 No. 8: 4174, 1985).
2. Aly, A.E., M.A. Shaalan, M.I. Shaalan, and K.A.K. Abdella. 1986. Effect of planting methods and nitrogen levels on rice crop productivity. Proc. 2nd Conf. Agron. Alex., Egypt, Vol. 1: 175-187.
3. Bhuiyan, N.I., A.L. Shan, M.A. Soleque, and S.K. Zaman. 1988. Effect of nitrogen sources and application methods on dry season irrigated rice. IRRN, 13: 3 (June) pp 28.
4. Dalel, S., R.S. Antil, V. Kumar, and M. Singh. 1985. Response of paddy to nitrogen sources, their application, time and nitrification inhibitors. Haryana Agric. Univ. J. of Res., 15(1): 87-93. (c.f. Field Crop Abst., 38 No. 10: 5360, 1985).
5. Gomez, K.A. and A.A. Gomez. 1984. Statistical procedures for agricultural roses. 2nd Ed., John Wiley & Sons.
7. Hamissa, M.R., F. Mahrous, M. Nour, and A. Ezzat. 1986. Evaluation of rate, timing and methods of nitrogen application using tracer technique. International Rice Res. Newsletter. (c.f. Field Crop. Abst., 40 No. 4: 3497, 1987).
8. Hamissa, M.R., M.S. Balal and F.N. Mahrous. 1987. Relative efficiency of nitrogen and phosphorus fertilizers for rice in Egypt. Proceeding of an International Symposium. pp. 355, 31 January - 3 February 1987, Rice Res. and Train. Centre, Sakha, Egypt.
9. Ismail, M.M. 1989. Response of some rice cultivars to fertilizers and weed control treatments. M.Sc. Thesis Fac. of Agric. Mansoura Univ. Egypt.
10. Jackson, M.L. 1967. Soil Chemical Analysis. Prentice-Hall of India Pvt. Ltd., New York.
11. Leila, A.A. and S.E. El-Kalla. 1989. Effect of rates and timing of nitrogen application on growth and yield of some rice cultivars. J. Agric. Sci. Mansoura Univ., 14(1): 52-57.
12. Niae, A.B. 1987. Response of rice to nitrogen split application on a saline soil (IRRN) International Rice Res. Newsletters, 2: 1 (Feb.) 27.
13. Nour, M.A.M. 1989. Studies on fertilization and irrigation on rice. Ph.D. Thesis. Fac. of Agric., Tanta Univ.
14. Page, A.L. 1982. Methods of Soil Analysis, Part II, Chemical and Microbiological Properties. Second Edition. Madison, Wisconsin USA.
14. Singh, R.M., K.A.N. Singh, and K.N. Singh. 1989. Effect of urea supergranule depth of placement in irrigated transplanted rice. IRRI, 14: 3 (June) 33.
15. Waller, R.A. and D.B. Duncan. 1969. A bases rule for symmetric multiple comparison problem. J. Amer. Stat. Assoc., 64: 1484-1503.

تأثير مستوى التسميد النيتروجينى ومواعيد اضافتها على المحصول والنيتروجين الممتص لبعض أصناف الأرز

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أقيمت تجربتان حقليتان فى موسمى ١٩٨٨ و ١٩٨٩ فى مزرعة الخادمية بكفر الشيخ لدراسة تأثير خمسة معدلات من التسميد النيتروجين (صفر و ٢٠ و ٤٠ و ٦٠ و ٨٠ كجم نيتروجين للفدان) مع ثلاثة مواعيد اضافة (نصف الكمية المختلطة بالارض الجافة قبل الشتل + نصف الكمية بعد ٢٠ يوم من الشتل ، نصف الكمية بعد ٢٠ يوما من الشتل + نصف الكمية عند تكوين الداليات ، ٣/١ الكمية بعد ٢٠ يوم من الشتل + ٣/٢ الكمية عند بداية تكوين الداليات) على محصول الحبوب والقش وكذلك معامل الحصاد والتيتروجين الكلى الممتص والكفاءة النيتروجينية وكمية التيتروجين المأخوذ من السماد وأوضحت النتائج الأتى:

تفوق الصنف جيزة ١٨١ فى محصول الحبوب والقش (طن / فدان) والنيتروجين الممتص والكفاءة النيتروجينية وكمية النيتروجين المأخوذة من السماد.

وكان لمواعيد اضافة السماد النيتروجينى اثر معنوى على معظم الصفات تحت الدراسة حيث أظهرت النتائج أن اضافة النيتروجين على دفعتين متساويتين نصف الكمية مختلطة بالارض الجافة قبل الشتل مباشرة + نصف الكمية بعد ٢٠ يوما من الشتل أدت الى زيادة معنوية فى محصول الحبوب والقش على مدى الموسمين وكذلك الكفاءة النيتروجينية والنيتروجين الممتص والنيتروجين المأخوذ من السماد.

زيادة معدلات التسميد حتى ٦٠ كجم نيتروجين / فدان أدت الى زيادة معنوية فى محصول الحبوب والقش ومعامل الحصاد والنيتروجين الكلى الممتص ونقص معنوى لكل من الكفاءة النيتروجينية ٪ وكمية النيتروجين المأخوذة من السماد وذلك خلال موسمى الدراسة.

لم يكن للتفاعل بين الاصناف ومواعيد الاضافة أثر معنوى على محصول الحبوب للفدان الاّ أن أعلا محصول للحبوب نتج من الصنف ١٨١ عند اضافة النيتروجين على دفعتين نصف الكمية مختلطة بالارض الجافة قبل الشتل + نصف الكمية بعد ٢٠ يوما من الشتل.

أثر التفاعل بين مواعيد الاضافة ومعدلات التسميد النيتروجيني معنوى بالنسبة لكل من النيتروجين الكلى الممتص ومحصول الحبوب والقش حيث زادت الصفات السابقة باضافة ٦٠ كجم نيتروجين / فدان بمعدل اضافة نصف الكمية مختلطة بالارض الجافة قبل الشتل + نصف الكمية بعد ٢٠ يوما من الشتل بالنسبة لمحصول الحبوب والقش أما بالنسبة لكمية النيتروجين الكلى الممتص فقد تفوقت المعاملة التى وضع فيها نصف الكمية بعد ٢٠ يوما من الشتل + النصف الباقى عند تكوين الداليات.