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POTATO GROWTH AND PRODUCTIVITY AS AFFECTED BY NITROGEN SUPPLY UNDER DRIP IRRIGATION SYSTEM.

Ramadan, H. M.
Vegetable Research Dept., Horticulture Research Inst., Agricultural Research Center, Giza, Egypt.

ABSTRACT

The present investigation was performed to evaluate the response of potato plants to nitrogen fertilizer sources during summer and fall seasons of 1999 and 2000, using Spunta cultivar. Nitrogen fertilizer was applied at rates of 120, 150 and 180 kg. / fed. using two sources, the first one is chicken manure and the second is mineral fertilizer in the form of ammonium nitrate injected through the irrigation system (fertigation). The highest rate of nitrogen (180 kg. N / fed.) as 90 kg. N / fed. soil dressing followed by 90 kg. N / fed. fertigation significantly decreased plant height than those of the 180 kg. N/ fed. which were applied as fertigation by 17.29 and 30.00 % for summer 1999 and 2000 and 15.49 and 4.74 % for fall 1999 and 2000 respectively . The increase of nitrogen rates which were applied as fertigation from 120 to 180 kg. N / fed. gave more number of leaves per plant by 57.86 , 39.20 % for summer and fall 2000 respectively . 150 kg. N / fed. in the form of ammonium nitrate as fertigation gave higher number of stems than the other treatments .The fresh and dry weight of leaves, dry matter percentage, and protein content of tubers gradually increased as nitrogen fertigation was increased from 120 to 180 kg. N / fed. Low rate of N application had a negative effect on the number and weight of tubers . The increase of N application rate from 120 (60 kg. N / fed. as chicken manure followed by 60 kg. N / fed. as ammonium nitrate) to 180 kg. / fed. (0 + 180 kg. N / fed. as ammonium nitrate) enhanced tuber starch content by 7.94 and 4.62 % of summer 1999 and 2000 and 7.90 and 12.66 % of fall 1999 and 2000 , respectively .

The rate of 150 kg. N / fed. applied as fertigation produced 32.95 , 23.93, 48.95 and 10.68 % more tuber fresh weight as compared to those of 180 kg. N / fed. applied as (90 kg. N / fed. soil dressing followed by 90 kg .N / fed. fertigation) in both summer of 1999, 2000 and fall of 1999 and 2000 respectively. The increase of nitrogen rate which was applied as fertigation from 150 to 180 kg. N/ fed. increased nitrogen concentration in tubers by 31.03 and 11.84 % of summer 1999 and 2000 and 44.38 and 15.67 % of fall 1999 and 2000, respectively .

From these results, it could be concluded that it is recommended to apply the nitrogen fertilizer rate of 180 kg. N / fed. as ammonium nitrate injected through drip irrigation system which increased total yield by 61.05 , 36.60 and 45.38 % in fall 2000 and both summer 1999 and 2000 seasons as compared to those of 180 kg. N / fed. as 90 kg. N / fed. chicken manure followed by 90 kg. N / fed. ammonium nitrate .

keywords: Nitrogen , potato , spunta , drip irrigation , fertigation , ammonium nitrate , chicken manure .

INTRODUCTION

Potato (*Solanum tuberosum* L.) cultivation has been spread in Delta and recently in the new reclaimed areas. According to 2001 statistics, a total area of about 180764 feddans was planted with potato as follows: summer and fall seasons, 65533, and 115231 feddans respectively. Producing a total yield of 1903134 tonnes.

In Egypt, to face the potato exporting problems from old area in Delta which are infected by brown rot disease it is necessary to investigate both the horizontal extension through the new reclaimed areas and the vertical improvement of productivity through the new technology transfer such as fertigation (fertilizer injected into the irrigation water). Crops were fertilized according to current nitrogen recommendations. Generally, mineral nitrogen accumulate with potatoes and vegetables. Accumulation may have been the result of low nitrogen uptake efficiency due to a poorly developed root system, or an excess supply of nitrogen. Accumulation of soil mineral nitrogen can be reduced by improving the efficiency of nitrogen uptake e.g. by fertilizer placement or by fertigation (Neeteson 1990). Fertigation is a promising means for maintaining N concentration in the soil throughout the growing period at desirable levels, without undue losses by leaching (Papadopoulos 1988). Also, fertigation permits higher yields, a better use of water and nutrients, lower leaching losses and more controllable application of nutrients during the growing seasons than other nutrient and water supply methods (Ristimaki 1999). The plant growth was better in the fertigation than in the soil (Mohammad *et al.*,1999) and (Chawla and Narda 2000).

Therefore, the purpose of the present study was to provide information about efficiency of nitrogen application through the drip irrigation system, and the effect of nitrogen fertigation on growth rate and productivity of potato plants.

MATERIALS AND METHODS

The present investigation was conducted during summer and fall seasons of 1999 and 2000 at South Tahrir Horticultural Research Station of the Horticulture Research Institute, Agriculture Research Center, Ministry of Agriculture. The texture of the soil was sandy. The physical and chemical properties of the soil and chicken manure are given in Tables (1 & 2).

Table 1. The physical and chemical characteristics of the experimental soil at 0-30 cm. depth.

pH	E.C (dS / m)	Anions (meq . L.-1)			Cations (meq . L-1)				Mineral Nutrients (ppm)		
		HCO3-	Cl-	SO4=	Mg2+	Na+	Ca2+	K+	N	P	K
7.83	1.49	11.8	7.0	7.55	6.26	6.90	10.89	2.3	10	12	60
Physical properties		Coarse sand %			Fine sand %		Silt %		Clay %		
		42.34			26.45		20.80		10.41		

Table 2. The physical and chemical properties of the chicken manure.

pH	E.C (dS/m)	N %	P2O5 %	K2O %	T.S %	Ash %	O. m %	O.C %
8.63	6.77	1.12	0.46	0.24	66.6	35.2	64.7	37.6

A drip irrigation system with nozzles of 30 cm apart was adopted for fertigation. The experimental unit area was 112.5 m2 consisted of three rows each of 50 m length and 0.75 m apart. Whole seed tubers with average

weight ranged between 35-50 g. were planted. Spunta cultivar was planted on February 17 and 23 for summer seasons and on October 16 and 25 for fall seasons of 1999 and 2000, respectively. Cultural management, disease and pest control programs were followed according to the recommendations of the Egyptian Ministry of Agriculture.

All the experimental units received identical amount of phosphorous fertilizer which was applied at the rate of 75 kg P2O5 / fed in the form of calcium super phosphate (15.5 % P2O5) added once during soil preparation . Potassium fertilizer was applied at the rate of 98 kg K2O / fed. to all experimental units in the form of potassium sulphate (48 % K2O) added according to the plant ages , four application of potassium each (3 kg K2O / fed.) , six application (5 kg K2O / fed.) and eight application (7 kg K2O / fed.) as fertigation from 21-50 , 51-65 , and 66-80 days after planting (DAP) respectively .

Nitrogen fertilizer was applied at the rate of 120,150 and 180 kg N /fed. . using the two sources , the first one is chicken manure (1.12 % N) applied as soil dressing and the second is mineral fertilizer in the form of ammonium nitrate (33.5 % N) injected through the irrigation system (fertigation) .

The experimental treatments were used as follows:

1- 60 kg. N/ fed. chicken manure(143 kg. / experimental unit) applied as soil dressing once at soil preparation + 60 kg. N/ fed. as ammonium nitrate (33.5 :% N) applied as fertigation .
2- 75 kg. N/ fed. chicken manure (178 kg. / experimental unit) applied as soil dressing once at soil preparation + 75 kg. N / fed. as ammonium nitrate (33.5 % N) applied as fertigation .
3- 90 kg. N / fed. chicken manure (215 kg. / experimental unit) applied as soil dressing once at soil preparation + 90 kg. N / fed. as ammonium nitrate (33.5 % N) applied as fertigation .
4- 120 kg. N / fed. as ammonium nitrate (33.5 % N) applied as fertigation .
5- 150 kg. N / fed. as ammonium nitrate (33.5 % N) applied as fertigation .
6- 180 kg. N / fed. as ammonium nitrate (33.5 % N) applied as fertigation .

The total amount of ammonium nitrate (33.5 % N) applied as fertigation was divided to 36 parts for the previous treatments and injected into the irrigation system, starting 21 DAP and the whole set of fertigations were completed within 59 days, i.e. up to 80 DAP.

Three samples each five plants from different treatments were randomly taken 75 DAP for measuring the plant development viz. plant height, number of leaves and number of stems per plant, also for the fresh and dry weight of stems and leaves determining.

Harvesting was conducted on May 31 and June 7 for the summer seasons and February 1 and 10 for the fall seasons of 1999 and 2000 respectively. Thereafter yield as (number and weight of tubers per plant) were determined on five plants from each treatment. To calculate the percentage of dry matter, tubers were ovens dried at 105 0c to constant weight in air-forced ventilated oven . Tuber starch content was also determined by using the method described in A.O.A.C. (1975). For mineral composition of plant, leaves were dried at 600c for 72 hours to a constant weight then they were ground to

determine the total nitrogen by using Nesslar reagent according to Koch and Mc Meekin (1924). Protein content by using the conversion factor (N x 6.25) as described by Pregl (1945).

Randomized complete block design was used with three replicates. Data were statistically analyzed using the analysis of variance according to Snedecor and Cochran (1981). Least significant difference (LSD) test at 5 % level was used to verify differences among treatments.

RESULTS AND DISCUSSION

1- Plant height.

Regarding the effect of N fertigation on plant height, results were shown in Table (3) . It could be observed that the high rate of N fertilization (180 kg. N / fed.) as fertigation had significant effect on plant height in both fall and summer seasons .

The increase of nitrogen rates which were applied as fertigation from 120 to 180 kg. N / fed. accelerated plant height by 34.91 and 37.93 % for summer 1999 and 2000 and 15.16 and 39.20 % for fall 1999 and 2000 and respectively . On the other hand, the highest rate of nitrogen 180 kg. N / fed. as (90 kg. N soil dressing followed by 90 kg. N / fed. fertigation) significantly decreased plant height than those of the 180 kg. N / fed. which were applied as fertigation by 17.29 and 30.00 % for summer 1999 and 2000 and 15.49 and 4.74 % for fall 1999 and 2000 , respectively . Similar results were obtained by Chawla (2000) who reported that plant growth was better in the fertigation than in the soil application.

From these results it could be concluded that the negative response of plant height to the lower rates might be attributed to the poor fertilizer distribution in the root zone in the fine textured soil.

2- Number of leaves per plant.

Concerning the effect of nitrogen fertigation on number of leaves per plant results were shown in Tables (3). It is clear that the high rate of N fertigation (0 + 180 kg. N / fed.) was significantly higher in leaf number as compared with those in other treatments in both summer and fall of 2000 years .

The increase of nitrogen rates which were applied as fertigation from 120 to 180 kg. N / fed. gave more number of leaves per plant by 57.86 , 39.20 for summer and fall 2000 respectively .

Obviously, changes in leaf number followed the same pattern of the plant height . It is interesting to note that mean leaf number in fall seasons was in general lower than the respective in the summer seasons. This could be attributed to the suitable weather conditions of the summer for building more vegetative growth.

3- Number of main stems per plant.

The data presented in Tables (3) show that all treatments of N application reach the level of significance in both summer and fall seasons. No significant differences occurred between the N application (150 kg. N / fed.) and (180

kg. N / fed.) in the form of ammonium nitrate which were applied as fertigation. The best treatments (150 kg. N / fed.) in the form of ammonium nitrate as fertigation gave higher number of stems than other treatments except in fall season of 1999

Table 3. Plant height, number of leaves and number of stems per plant as affected by nitrogen application at 75 days after planting during summer of 1999 and 2000 and fall of 1 999 a nd 2 000 seasons.

Nitrogen levels (Kg. / fed.) C+ A*	Seasons	Plant height (cm.)		Number of leaves per plant		Number of stems per plant	
	Summer	1999	2000	1999	2000	1999	2000
60 +60		13.97	22.47	16.20	29.80	1.87	3.60
75 + 75		18.27	23.60	22.93	33.87	2.87	3.47
90 + 90		20.90	28.00	20.40	36.73	2.07	4.47
0 + 120		18.73	29.00	25.67	53.80	1.87	4.67
0 + 150		24.40	33.13	26.13	52.20	2.23	5.40
0 + 180		25.27	40.00	22.63	84.93	2.53	5.27
L.S.D.5 %		5.58	4.67	5.84	7.07	0.61	1.36
	Fall	1999	2000	1999	2000	1999	2000
60 + 60		19.60	22.40	17.87	19.47	2.39	3.53
75 + 75		18.53	27.20	22.53	28.60	4.14	3.67
90 + 90		20.73	29.53	26.20	30.20	3.06	3.93
0 + 120		21.30	22.27	28.93	21.07	3.73	3.73
0 + 150		24.73	26.20	31.00	26.47	4.37	4.27
0 + 180		24.53	31.00	30.93	29.33	3.34	4.13
L.S.D.5 %		1.14	5.87	8.71	4.68	0.65	0.44

*C =chicken manure A = ammonium nitrate

4- Fresh and dry weight of leaves.

Concerning the effect of nitrogen fertigation on fresh and dry weight of leaves , results presented in Table (4) show that the nitrogen applied as fertigation resulted in significantly higher fresh and dry weight of leaves comparing to nitrogen applied as soil dressing followed by fertigation . The increase of nitrogen rates applied as fertigation from 120 to 180 kg. N / fed. accelerated fresh weight of leaves by 16.80 and 72.88 % for fall 1999 and 2000 respectively and 27.30 % for summer 1999 only . On the other hand, the highest rate of nitrogen 180 kg. N / fed. as (90 kg. N soil dressing + 90 kg N / fed. fertigation) significantly lower than the 180 kg. N / fed. which applied as fertigation . The positive response of leaves fresh weight (FW) to the higher N rates might be attributed to the injected nitrogen through the irrigation system during plant ages.

In both fall and summer seasons, data show that the dry weight of leaves gradually increased from 120 to 180 kg. N / fed. applied as fertigation by 31.72 % for summer 1999 and 60.16 % for fall 2000, respectively .

Soil application of 75 kg. N / fed. followed by 75 kg. N / fed. as fertigation resulted in 36.86, 65.48, 65.35 and 10.85 % lower dry weight of leaves than that of 150 kg. N / fed. as fertigation for both summer 1999 and 2000 and fall 1999 and 2000 seasons, respectively .

5- Fresh and dry weight of stems.

It is evident that the N fertigation produced higher fresh and dry weight of stems as compared to N soil dressing followed by N fertigation in both summer and fall seasons. (Table 4).The lowest rate of N soil dressing significantly decreased fresh and dry weight of stems whereas the highest rate of N fertigation had a significant increasing effect on fresh and dry weight of stems in both fall and summer seasons .The highest rate of N fertigation (180 kg. N / fed.) significantly increased fresh weight by 41.61 and 111.73 % for summer 1999 and 2000 and 5.81 and 19.10 % for fall 1999and 2000 seasons , respectively as compared to the highest rate of N soil dressing followed by N fertigation (90 kg. N / fed. soil dressing + 90 kg. N /fed. fertigation Also , in both summer and fall seasons data show that the dry weight of stems gradually increased from 120to 180 kg. N/ fed. applied as fertigation by 42.25 , 75.27 % for summer 1999 and 2000 seasons respectively and 60.83 % for fall 2000

Table 4. Fresh and dry weight of leaves and stems of potato plants as affected by nitrogen application at 75 days after planting during summer of 1999 and 2000 and fall 1999 and 2000 .

Nitrogen level (kg. / fed.) C + A*	Seasons	Leaves				Stems			
		Fresh weight		Dry weight		Fresh weight		Dry weight	
	Summer	1999	2000	1999	2000	1999	2000	1999	2000
60 + 60		42.07	57.70	13.50	13.63	12.83	21.54	0.92	2.84
75 + 75		25.94	39.55	11.15	8.39	17.08	30.49	2.14	3.46
90 + 90		37.87	77.59	9.95	14.71	18.79	33.15	1.90	4.52
0 + 120		33.14	147.63	8.89	28.89	15.49	36.18	1.42	5.42
0 + 150		29.65	112.10	17.66	24.31	31.00	45.90	2.99	5.81
0 + 180		42.19	145.40	11.71	25.34	26.61	70.19	2.02	9.50
L.S.D. 5 %		11.29	18.84	3.78	3.64	7.61	12.85	0.39	1.77
	Fall	1999	2000	1999	2000	1999	2000	1999	2000
60 + 60		49.90	58.23	10.42	12.77	12.86	14.83	1.18	1.33
75 + 75		27.76	78.23	7.76	16.67	16.05	19.13	1.79	1.90
90 + 90		35.88	88.70	11.91	18.97	17.70	20.57	1.94	2.16
0 + 120		51.53	60.60	11.79	13.63	17.35	15.53	1.71	1.43
0 + 150		128.07	74.47	22.40	18.70	36.96	18.40	5.86	2.00
0 + 180		60.19	104.77	11.34	21.83	18.73	24.50	1.65	2.30
L.S.D. 5 %		25.34	20.48	1.83	3.40	7.55	3.89	2.36	0.27

*C= Chicken manure A= ammonium nitrate

6- Number of tubers

High rate of N fertilization (180 kg. N / fed.) as fertigation had significant effect on number of tubers per plant in both fall and summer seasons (Table 5 and Fig. 1). Also, low rate of N application had a negative effect on the number of tubers . The average number of tubers per plant in the high rate of N (180 kg. N/ fed.) as fertigation was 58.81, 11.96 and 14.50, 6.70 % higher than that shown in the N application 90 kg. N / fed. soil dressing followed by 90 kg. N / fed. fertigation in both summer of 1999 , 2000 and fall of 1999,

2000 seasons , respectively . Also, data show that the increase number of tubers per plant with increasing nitrogen fertilizer as ammonium nitrate was significant between 120 or 150 kg. N /fed. and 180 kg. N / fed. in both summer 1999 and fall 2000 , while no significant differences were recorded between 120 kg. N /fed. as 60 kg. N / fed. chicken manure followed by 60 kg. N / fed. ammonium nitrate and 180 kg. N /fed. as 90 kg. N / fed. chicken manure followed by 90 kg. N / fed. ammonium nitrate in both 1999 of summer and fall seasons .

7- Fresh weight of tubers .

Fertilization of potato plant with 150 kg. N / fed. as fertigation produced significantly higher tuber fresh weight per plant comparing with 150 kg.N / fed. as (75 kg. N / fed. soil dressing followed by 75 kg. N / fed. fertigation) in both fall 1999 and summer 2000 seasons (Table 5).

The average tuber fresh weight per plant in the high rate of N application (180 kg N / fed.) as 90 kg N / fed. soil dressing followed by 90 kg. N / fed. fertigation was 24.78 , 19.31 , 32.86 and 9.65 % less than that shown in the treatment of N (150 kg N / fed.) as fertigation in both summer and fall seasons , respectively . On the other hand , the rate of N fertilization (150 kg. N / fed.) applied as fertigation produced 32.95 , 23.93 , 48.95 and 10.68 % more tuber fresh weight as compared to those of 180 kg. N / fed. applied as (90 kg. N / fed. soil dressing followed by 90 kg.N / fed. fertigation) in both summer of 1999 , 2000 and fall of 1999 and 2000 respectively .

High rate of N fertilization (180 kg . N / fed.) applied as fertigation produced 61.05 , 36.60 and 45.38 % more tuber fresh weight as compared to those of 180 kg N / fed. divided two equal parts (90 kg. N / fed. soil dressing and 90 kg. N / fed. fertigation) in fall 2000 and both summer 1999 and 2000 seasons , respectively . This might be attributed to the poor fertilizer distribution in the root zone in the fine textured soil .These results are similar to those stated by Papadopon (1988), and Keshavaiah and Kumaraswamy (1993) who found the highest total tuber yield was obtained from drip irrigation daily and 50 % N through soil application + 50 % through drip irrigation . Mohammad *et al.* (1999) and Chawla and Narda (2000). indicated that the soil application gave lower yield than the fertigated treatments . The increase in yield was due to the increase in the size of the tubers . On other hand , Nimah *et al.* (2000) who found no significant difference was obtained in yield of potato fertilized by conventional method or via fertigation . Also , Mohammad (1999) showed that the soil application treatments had fertilizer utilization as high as the fertigation treatments and produced total tuber yield not significantly different from that obtained by the fertigation treatment with similar rate .

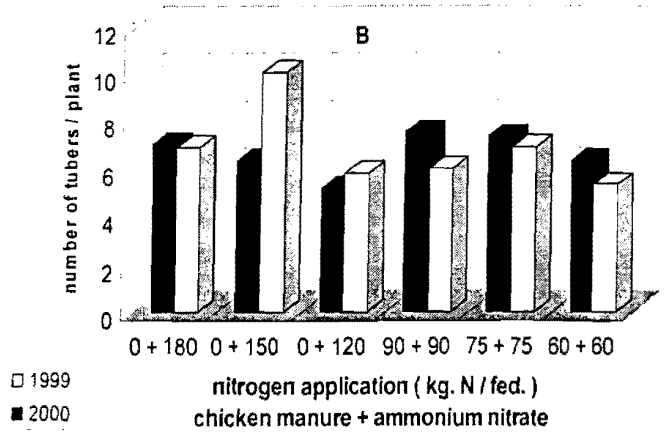

Fig 1: number of tubers per plant as affected by nitrogen application kg. / fed.(soil dressing + fertigation) during summer 1999 and 2000 (A) and fall 1999 and 2000 (B) seasons.

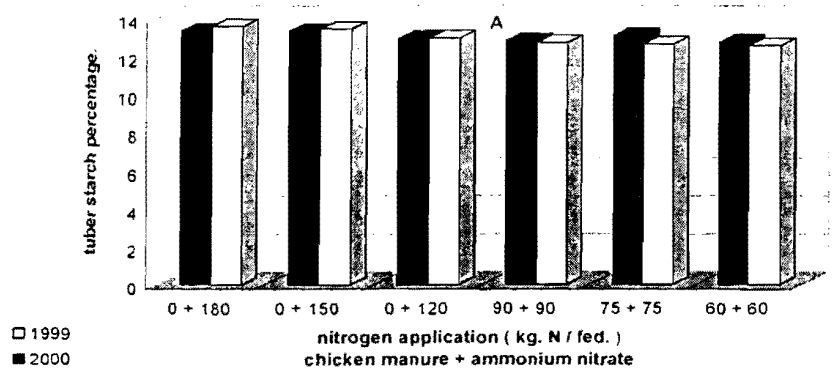

Table 6. Effect of nitrogen application (kg. N /fed.) on dry matter percentage and tuber starch percentage of potato plants at 105 DAP during summer of 1999 and 2000 and fall of 1999 and 2000 seasons .

Nitrogen level Kg. / fed. C + A*	Dry matter %				Starch percentage			
	Summer seasons		Fall seasons		Summer seasons		Fall seasons	
	1999	2000	1999	2000	1999	2000	1999	2000
60 + 60	18.64	18.76	18.08	18.57	12.59	12.76	13.41	12.87
75 + 75	18.33	18.85	18.39	19.40	12.66	13.08	13.32	13.45
90 + 90	18.21	18.82	18.99	19.37	12.73	12.83	14.38	14.14
0 + 120	18.03	19.13	17.44	18.73	12.96	12.94	13.49	13.40
0 + 150	18.67	19.43	18.95	19.20	13.45	13.33	14.82	14.55
0 + 180	19.28	19.60	19.96	19.47	13.59	13.35	14.47	14.50
L.S.D. 5 %	N.S.	0.46	N.S.	0.45	N.S.	N.S.	1.08	N.S.

* C = chicken manure A = ammonium nitrate

10- Leaf and tuber of nitrogen content .

Data presented in (Tables 7 & Fig 3) show the nitrogen concentration in potato leaves in both fall and summer seasons . 120 kg. N / fed. as fertigation decreased nitrogen concentration in leaves as compared with those of 180 kg. N / fed. (90 kg. N / fed. as soil dressing followed by 90 kg. N / fed. as fertigation) by 21.10 and 30.26 % of summer 1999 and 2000 seasons and 29.36 % of fall 2000 . On the other hand , high rates of nitrogen application 180 kg. N / fed. as fertigation significantly increased than those of 180 kg. N / fed. (90 kg. N / fed. as soil dressing followed by 90 kg. N / fed. as fertigation) by 14.57 , 8.75 % of summer 1999 and 2000 seasons and 95.65 and 51.98 of fall 1999 and 2000 respectively . Also , the increase of nitrogen rates which were applied as fertigation from 150 to 180 kg. N / fed. increased nitrogen concentration by 2.24 and 23.69 % of summer 1999 and 2000 seasons and 8.62 and 51.98 % of fall 1999 and 2000 respectively .

Similar results were obtained in tubers (Table 7 & Fig 4), the high rates of nitrogen application 180 kg. N / fed. as fertigation produced the highest concentration of nitrogen followed by 150 kg. N / fed. as fertigation by 31.03 , 11.84 , 44.38 and 15.67 % in both fall 1999 and 2000 and summer 1999 and 2000 seasons respectively . In both fall and summer seasons no significant difference between the treatment of 180 kg. N/ fed. as (90 kg. N/ fed. soil dressing + 90 kg. N/ fed. fertigation) and 120 kg. N / fed. as fertigation except in summer 2000 .

11- Leaf and tuber of protein content .

(Table7) presents the protein concentration in leaves and tubers from the various treatments in both fall and summer seasons . It is clear that the high rate of N fertigation (0 + 180 kg. N/fed.) produced the highest protein content in both leaves and tubers, while the lowest content of protein was shown in low rate of N (120 kg. N / fed.) 60 kg. N/ fed. as soil dressing follwed by 60 kg. N / fed. as fertigation . It is also evident that increasing the N rate from 120 kg. N / fed. to 180 kg. N / fed. which applied as fertigation resulted a significant high protein content in both leaves and tubers .

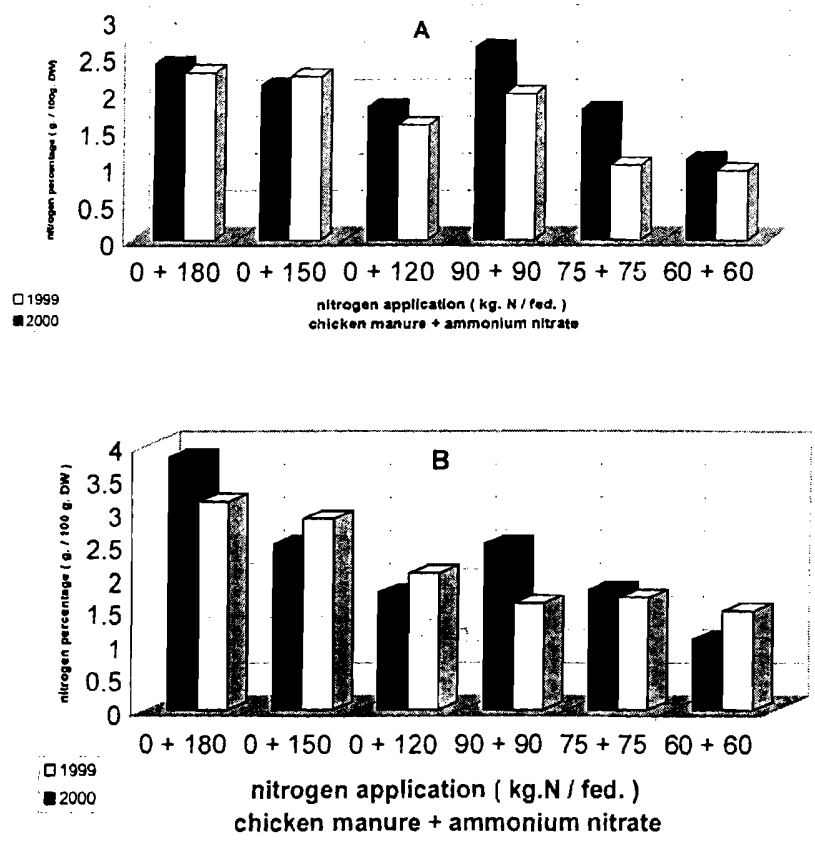

Fig: 3 Nitrogen percentage (g. / 100 g. DW) in leaves at 90 DAP as affected by nitrogen application kg. / fed. (soil dressing + fertigation) during summer 1999 and 2000 (A) and fall 1999 and 2000 (B) seasons.

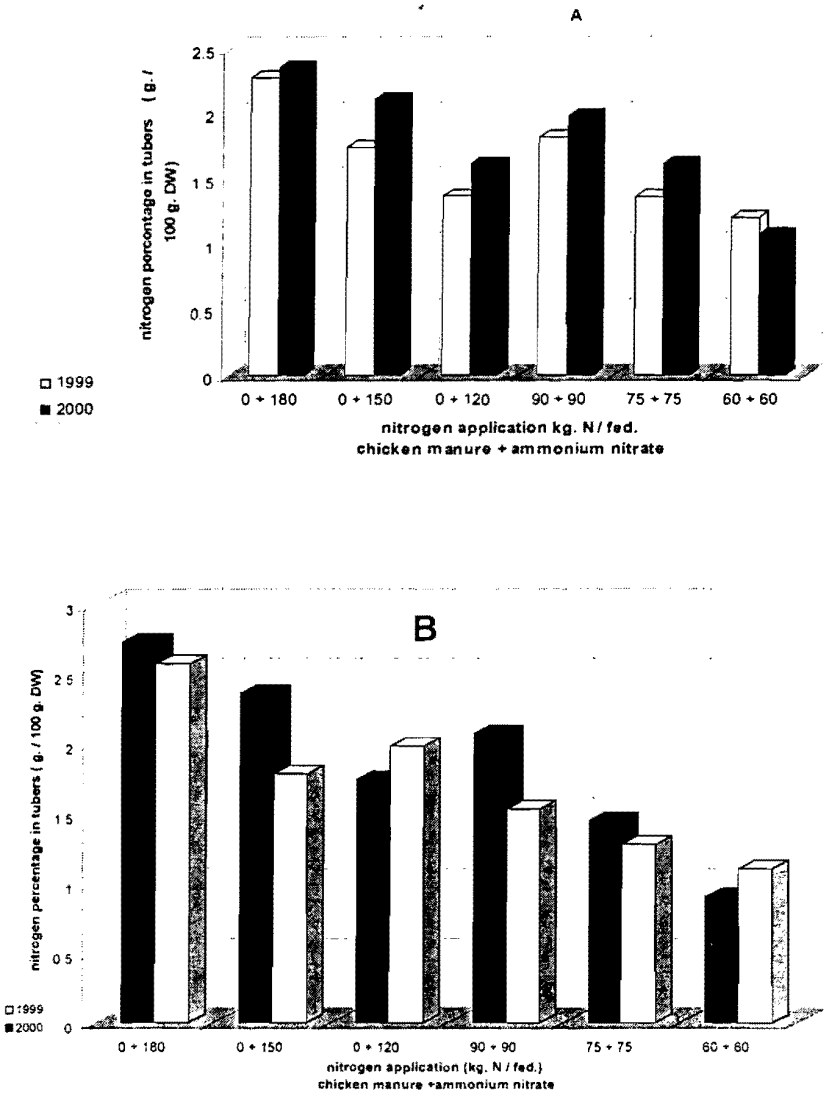

Fig. 4. Nitrogen percentage (g. / 100 g. DW) in tubers at 105 DAP as affected by nitrogen application kg. / fed.(soil dressing + fertigation) during summer 1999 and 2000 (A) and fall 1999 and 2000 (B) seasons .

Table 7. Nitrogen percentage and protein content in leaves at 90 DAP and tubers at 105 DAP during summer of 1999 and 2000 and fall of 1999 and 2000.

Nitrogen level Kg. / fed. C + A*	Seasons	Nitrogen %				Protein content			
		Leaves		Tubers		Leaves		Tubers	
	Summer	1999	2000	1999	2000	1999	2000	1999	2000
60 + 60		0.95	1.11	1.20	1.07	5.93	6.93	7.50	6.68
75 + 75		1.03	1.78	1.36	1.61	6.43	11.12	8.50	10.06
90 + 90		1.99	2.40	1.82	1.98	12.43	15.00	11.37	12.37
0 + 120		1.57	1.82	1.37	1.61	9.81	11.37	8.56	10.06
0 + 150		2.23	2.11	1.74	2.11	13.93	13.18	10.87	13.18
0 + 180		2.28	2.61	2.28	2.36	14.25	16.31	14.25	14.75
L.S.D.		0.76	0.74	0.62	0.61	4.31	4.63	3.89	3.83
	Fall	1999	2000	1999	2000	1999	2000	1999	2000
60 + 60		1.49	1.07	1.11	0.91	9.31	6.68	6.93	5.68
75 + 75		1.70	1.82	1.28	1.45	10.62	11.37	8.00	9.06
90 + 90		1.61	2.52	1.53	2.07	10.06	15.75	9.56	12.93
0 + 120		2.07	1.78	1.98	1.74	12.93	11.12	12.37	10.87
0 + 150		2.90	2.52	1.78	2.36	18.12	15.75	11.12	14.75
0 + 180		3.15	3.83	2.57	2.73	19.68	23.93	16.06	17.06
L.S.D. 5 %		0.45	0.99	N.S.	1.03	2.82	6.23	N.S.	6.46

*C = chicken manure A = ammonium nitrate

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تأثيرالتسميد النيتروجينى على النمو والأنتاجية فى البطاطس تحت نظام الرى بالتنقيط.

حسين محمد رمضان

أقسام بحوث الخضر – معهد بحوث البساتين – مركز البحوث الزراعية – جيزة .مصر .

اجرى هذا البحث لتقييم استجابة نبات البطاطس صنف اسبونتا للتسميد النتروجينى من خلال نظم الرى بالتنقيط رذلك فى موسمى الصيف ١٩٩٩ ، ٢٠٠٠ وموسمى الخريف ١٩٩٩ ، ٢٠٠٠ . استخدم التسميد النيتروجينى بمعدل ١٢٠ ، ١٥٠ ، ١٨٠ كجم / فدان ممثله فى مصدرين للازوت الأول السماد العضوى (سماد الكتكوت) كسماد أرضى والثانى السماد المعدنى (نترات الامونيوم) المحقون من خلال شبكة الرى بالتنقيط .

ادى استخدام المعدل المرتفع من النتروجين ١٨٠ كجم ن / فدان (٩٠ كجم ن / فدان سماد عضوى + ٩٠ كجم ن / فدان سماد معدنى من خلال الرى بالتنقيط) الى انخفاض معنوى فى اطوال النباتات مقارنة بالتسميد المعدنى (نترات الامونيوم) بمعدل ١٨٠ كجم ن / فدان من خلال شبكة الرى وذلك بمعدل ١٧,٢٩، ٣٠,٠ % للموسم الصيفى ١٩٩٩ ، ٢٠٠٠ ، ١٥,٤٩ ، ٤,٧٤ % للموسم الخريفى ١٩٩٩ ، ٢٠٠٠ على الترتيب . كما لوحظ زيادة فى عدد الاوراق للنبات بمعدل ٥٧,٨٦ ، ٣٩,٢٠ % للموسم الصيفى والخريفى ٢٠٠٠ على الترتيب بزيادة معدل النتروجين المستخدم من خلال شبكة الرى من ١٢٠ الى ١٨٠ كجم ن / فدان . كما ازدادت عدد السيقان للنبات بالتسميد بمعدل ١٥٠ كجم ن / فدان فى صورة نترات الامونيوم من خلال شبكة الرى .

ازداد كل من الوزن الطازج والجاف للاوراق ونسبة المادة الجافة للدرنات تدريجيا بزيادة معدل استخدام النتروجين من خلال شبكة الرى من ١٢٠ الى ١٨٠ كجم ن / فدان كما لوحظ التاثير السلبى على كل من عدد ووزن الدرنات باستخدام المعدل المنخفض من النتروجين . كما ادى زيادة استخدام معدل النيتروجين من ١٢٠كجم ن / فدان (٦٠ كجم ن / فدان سماد عضوى متبوعا ٦٠ كجم ن / فدان نترات الامونيوم) الى ١٨٠ كجم / فدان نترات الامونيوم الى زيادة محتوى النشا فى الدرنات ٧,٩٤ ، ٤,٦٢ % للموسم الصيفى ١٩٩٩ ، ٢٠٠٠ و ٧,٩٠ ، ١٢,٦٦% للموسم الخريفى ١٩٩٩ ، ٢٠٠٠ على الترتيب .

تبين ان استخدام المعدل النتروجينى ١٥٠ كجم ن / فدان من خلال شبكة الرى يؤدى الى زيادة فى الوزن الكلى للمحصول ٣٢,٩٥، ٢٣,٩٣ % للموسم الصيفى ١٩٩٩ ، ٢٠٠٠ وكذلك ٤٨,٩٥ ، ١٠,٦٨ % للموسم الخريفى ١٩٩٩ ، ٢٠٠٠ على الترتيب مقارنة بالمعدل النتروحينى ١٨٠ كجم ن / فدان ممثلة فى (٩٠ كجم ن / فدان ارضى + ٩٠ كجم ن / فدان من خلال شبكة الرى) . كما ادى زيادة استخدام معدل النيتروجين من ١٥٠ كجم / فدان الى ١٨٠ كجم / فدان من خلال شبكة الرى بالتنقيط الى زيادة تركيز النتروجين فى الدرنات ٣١,٠٣ ، ١١,٨٤ % للموسم الصيفى ١٩٩٩ ، ٢٠٠٠ و ٤٤,٣٨ ، ١٥,٦٧ % للموسم الخريفى ١٩٩٩ ، ٢٠٠٠ على الترتيب .

من نتائج التجربة يمكن التوصية باستخدام المعدل النتروجينى ١٨٠ كجم ن / فدان من خلال شبكة الرى حيث ادى الى زيادة الوزن الكلى للمحصول ٦١,٠٥ % للموسم الخريفى ٢٠٠٠ وكذلك ٣٦,٦٠ ، ٤٥,٣٨ للموسم الصيفى ١٩٩٩ ، ٢٠٠٠ على الترتيب مقارنة بالمعدل النتروجينى ١٨٠كجم ن / فدان (٩٠ كجم ن / فدان سماد عضوى متبوعا ٩٠ كجم ن / فدان نترات الامونيوم).