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EFFECT OF WATER STRESS AND FERTILIZATION WITH INORGANIC NITROGEN AND ORGANIC CHICKEN MANURE ON VEGETATIVE GROWTH CHARACHTERS OF POTATO

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ABSTRACT

Two field experiments were performed at the Experimental Station, Faculty of Agriculture, Mansoura University during the two successive summer seasons of 2007 and 2008. This investigation was aimed to study the effect of water tension treatments, mineral of nitrogen and organic fertilizers combinations and their interactions on vegetative growth characters of potato (*Solanum tuberosum* L.) cv. Spunta. Each irrigation treatments was conducted in a separate experiment. Every separate experiment laid-out in randomized complete block design with four replicates.

The main results of this investigation could be summarized as follows:

1-The results indicated that there was a significant effect on plant height, leaf area/plant, number of stems/plant, fresh and dry weights of plant foliage as well as total chlorophyll content as a result of irrigation tension in both seasons, except plant height in the first season only. However, irrigation tension did not affect number of leaves/plant in both seasons. Irrigation at 26cb (5360.17 m^3 water/ha) *i.e.* 54.1% moisture from field capacity produced the highest averages of plant height, number of leaves and stems/plant, leaf area/plant, fresh and dry weights of plant foliage in both seasons. While, irrigation at 22cb (6209.32 m^3 water/ha) *i.e.* 59.3% from field capacity recorded the highest averages of total chlorophyll content in both seasons.

2- Fertilization treatments had a significant effect on all studied characters during both seasons. Application of 60% inorganic nitrogen fertilizer (238 kg N/ha) + 40% organic chicken manure (158 kg N/ha) markedly recorded the highest values of these characters, except chlorophyll content which resulted from application of 100% mineral nitrogen fertilizer (396 kg N/ha) as compared with other fertilization treatments.

3- The interaction between studied factors had a significant effect on plant height, leaf area/plant and number of stems/plant in both seasons as well as fresh weight of plant foliage in the second season. Irrigation at 26cb (5360.17 m^3 water/ha) *i.e.* 54.1% moisture from field capacity in addition fertilization with 60% inorganic nitrogen fertilizer (238 kg N/ha) and 40% organic chicken manure (158 kg N/ha) markedly recorded the highest averages of these characters as compared with other fertilization treatments.

INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the most important field crops grown and used throughout the world. It can be grown under a wide range of climates from temperate to tropical and on many soils, but medium textured soils are preferred. In Egypt, potato as member of family Solanaceae is one of the most important food all over the world, it is considered to be one of the fourth important energy vegetable crops especially in the tropical and subtropics regions of the world. In addition the importance of potato to agriculture is not only to local consumption, but also to exportation. Their

exploitation are especially important because potato is the most economically important vegetable in the world and have a great potential to provide nutritious food in diversity of environments for increasing hungry world. In world tonnage the potato ranks after wheat, rice and maize as the fourth most important crops for human consumption, (Ewing, 1997).

Water is considered an economical scare resource in many areas of the world especially in arid and semi-arid regions as Egypt; also it is considered a limiting factor in agricultural expansion in all countries all over the world. Potato plants considered drought sensitive as compared with other crops, (Van Loon, 1981). In arid and semiarid region, potato is sensitive to water stress and irrigation has become an essential component of potato production in comparison with other crops, (Wright and Stark, 1990). In Egypt, however irrigation water is not sufficient for both irrigation and reclamation purpose, so one way to save water is increasing irrigation intervals or decreasing irrigation depth without drastic effects on the yield. Nagrajan and Bansal (1991) and Yuan *et al.* (2003) mentioned that drought water stress influenced the development and growth of potato shoots and roots. Moreover, drought stress also reduced leaf area, plant height and ground coverage as compared with unstressed conditions. Irrigation every 10 days intervals and increasing water supply significantly increased plant height and fresh weight/ plant potato C.v Spunta, but decreased dry weight (El-Banna *et al.,* 2001). Deblonde and Ledent (2001) and Lahlou *et al.* (2003) indicated that drought stress reduced plant size, fewer leaves, more senescent leaves and leaf area. Kumar and Minhas (1999) indicated that water stress caused a reduction in total chlorophyll content as well as in the rate of photosynthesis which was greater at tuber initiation 40 % than tuber development stage 30 %. Moreover, leaf area also declined more with drought stress. Ierna and Mauromical (2006) indicated that plants at moderate water deficit decreased photosynthetic rate and above-ground plant dry weight in comparison to well watered controls.

Nitrogen fertilization indispensable factor for increasing the vegetative growth of potato. The total world consumption of nitrogen fertilizer was million ton a year with a progress yearly increase of demand of about 2-3 %. The destructive effects of de-nitrification products on atmospheric ozone, besides NO_3 and NO_2 accumulation in edible parts of vegetable crops represent a serious problems for humans health because NO_3 or NO_2 absorbed into the blood may oxidize Fe^{++} and producing methemoglobin which can not transport oxygen (Swann, 1975). Moreover, the toxicity of No_3 may be due to the formation of carcinogenic N-nitrous compounds by reaction with amino compounds. The toxic ions of nitrate and nitrite forming from nitrification are well knows as an environmental polluted (Alexander, 1977). Therefore, there is a great need for further studies under Egypt conditions to establish recommendations for reducing the amount chemical nitrogen fertilizer, raising the quality and limiting the environment of pollution. Barakat *et al*. (1994) found that increasing N levels up to 432 kg N/ha caused significant progressive increase in foliage fresh weight, number of stems/plant, number of mature leaves per plant and leaf area. Whereas, did not cause any

significant effect on plant height. Singh and Raghav (2000), Kumar *et al.,* (2001), El-Banna *et al.* (2004), Al-Moshileh *et al.* (2005), El-Shahat (2005) and Kumar *et al.* (2007) indicated that number of leaves/plant, leaf area/plant, foliage fresh and dry weights, chlorophyll content and plant height constantly increased with increment nitrogen levels.

Organic manures contribute to crop growth characters through its effect on physical, chemical and biological properties of the soil (Tisdal *et al.,* 1985 and Marchesini *et al.* 1988) as well as through its effect as a source of essential elements and crop growth incidence (Hodges, 1991 and Bassyouny and Abdou-Attia, 1998). Great efforts have been directed to overcome the problems of chemical fertilizers which are generally represented in increasing costs as well as environmental pollution and its negative effects on human health. These efforts have been given to decrease the recommended of chemical fertilizer doses by application of organic fertilizer (chicken manure). In this connection, Sharma *et al.,* (1999), El-Banna and Abd-El-Salam (2000), Abou-Hadid *et al.* (2003) and Calskan *et al.* (2004) Al-Moshileh and Metawei (2007) reported that application of organic manures (chicken manure) with inorganic fertilizers significantly affected most parameters of plant growth, *i.e.*, plant height, number of leaves/plant, number of stems/plant, leaf area/plant, fresh and dry foliage.

Kloos (1986) showed that the application of chicken manures as the rate of 5 ton/ha at the combination with NPK had a marked effect on potato growth characters *i.e.* plant height, number of leaves/plant, leaf area/plant, number of stems/plant, fresh and dry weight. Ashour and Sarhan (1998) reported that application of organic manures with inorganic fertilizers significantly affected most parameters of plant growth, *i.e.*, plant height, number of leaves/plant, number of stems/plant, leaf area/plant and, fresh, dry foliage. Sharma *et al.* (1999) found that plant height, number of leaves/plant, number of stems/plant, leaf area, fresh and dry weight of foliage were increased with increasing irrigation and nitrogen levels. Abou-Hadid *et al.* (2003) found that the application mineral fertilizers with cattle or chicken manures improved the vegetative growth expressed as plant height, and leaf and stem fresh weights. Darwish *et al.* (2006) indicated that water stress conditions reduced ground cover.

Therefore, the aim of this study was determined the effect of water tension treatments (percentage of moisture from field capacity), combination between mineral nitrogen and organic fertilizers, and their interactions on growth characters of potato (*Solanum tuberosum* L.) cv. Spunta.

MATERIALS AND METHODS

Two field experiments were performed at the Experimental Station, Faculty of Agriculture, Mansoura University during the two successive summer seasons of 2007 and 2008. This investigation was aimed to study the effect of water tension treatments (percentage of moisture from field

capacity), combination between mineral nitrogen and organic fertilizers and their interactions on growth characters of potato cv. Spunta.

Treatments and experimental design:

A- Irrigation treatments:

This study included four irrigation treatments. Each irrigation treatment's was conducted in a separate experiment. Every separate experiment laid-out in randomized complete block design with four replicates which were devoted for each of the following irrigation treatments. Soil moisture content was determined using tensiometer instruments. Before the start of irrigation treatments crop received equal amount of water immediately after planting and the enough for the proper establishment of plants. Relation curve between water tension (cb) and soil moisture percentage illustrated in Fig 1. Irrigation numbers and amount of irrigation water per each one in m^3/ha, for irrigation treatments are presented in Table 1. Irrigation water treatments as follows:

1. Irrigation at 22cb. (6209.32 m^3 water/ha) *i.e.* 59.3% from field capacity.
2. Irrigation at 26cb. (5360.17 m^3 water/ha) *i.e.* 54.1% from field capacity.
3. Irrigation at 30cb. (3944.95 m^3 water/ha) *i.e.* 52.0% from field capacity.
4. Irrigation at 34cb. (3449.62 m^3 water/ha) *i.e.* 45.8% from field capacity.

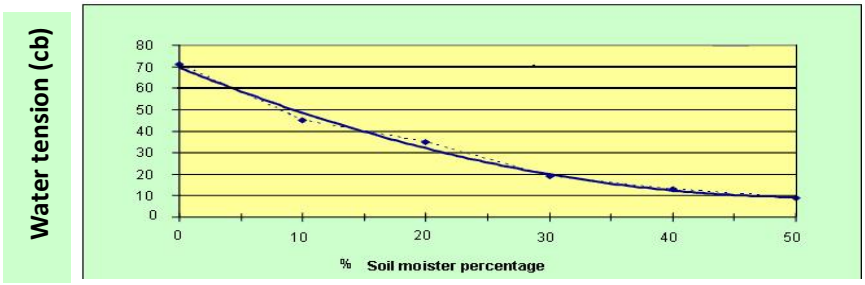

Fig. 1: Relation curve between water tension (cb) and soil moisture percentage.

Table 1: Irrigation numbers and amount of irrigation water per each one in m^3/ha, for irrigation treatments.

Treatments	Irrigation of agriculture (m^3/ha)	Amount of water for each irrigation (m^3/ha)	Irrigations number	% Moisture from F.C	Amount of irrigation water (m^3/ha)	Total irrigated water (m^3/ha)
Irrigation at 22cb	689.92	689.92	8	59.3	5519.40	6209.32
Irrigation at 26 cb	689.92	778.37	6	54.1	4670.25	5360.17
Irrigation at 30 cb	689.92	813.75	4	52.0	3255.03	3944.95
Irrigation at 34 cb	689.92	919.90	3	45.8	2759.70	3449.62

B- Fertilization treatments:

Six Fertilizer treatments were evaluated in each separate irrigation experiment. The experimental treatments of organic chicken manure and mineral nitrogen fertilizers in single or combined applications were conducted as follows:

1- 100% mineral nitrogen fertilizer (396 Kg N/ha).
2- 80% mineral nitrogen fertilizer (317 Kg N/ha) plus 20 % organic chicken manure (79 Kg N/ha).
3- 60% mineral nitrogen fertilizer (238 Kg N/ha) plus 40 % organic chicken manure (158 Kg N/ha).
4- 40% mineral nitrogen fertilizer (158 Kg N/ha) plus 60 % organic chicken manure (238 Kg N/ha).
5- 20% mineral nitrogen fertilizer (79 Kg N/ha) plus 80 % organic chicken manure (317 Kg N/ha).
6- 100 % organic chicken manure (396 Kg N/ha).

Chemical analysis of organic chicken manure was presented in Table 2.

Table 2: Chemical analysis of chicken manure* during growing seasons.

Chicken manure	2007	2008
Chemical analysis:		
Available nitrogen (%)	0.6906	0.5601
Available Phosphorous (%)	0.0621	0.0935
Available Potassium (%)	0.176	0.365
Organic matter (%)	43.70	40.11
pH	7.83	8.12
EC (ds/m^{-1})	0.81	0.75

***Soil and Water Analysis Institute, Mansoura Lab., Agricultural Research Center (ARC).**

Mechanical and chemical analysis of soil:

Randomized samples were obtained from the experimental soil at the depth of 0 - 30 cm before planting to determine the physical and chemical contents according to standard method described by **Jackson (1967)** and results are presented in Table 3.

Potato spunta seed pieces (imported from Netherlands) averaging approximately 50 g were hand cut and supersized for approximately 10 days at 15^{o} C and 90 % relative humidity prior to planting. Sprouted seed tubers were planted on 3^{th} and 1^{st} February in both seasons and were harvested after 100 days from planting dates.

The preceding crop prior to the present study was maize in both seasons. The soil was well prepared through two ploughing, leveling, compacting, ridging, division and then divided into the experimental units. The experimental site was divided into plots each plot area was 3 X 3.5 m occupying an area of 10.5 m^2 comprising five ridge, 70 cm wide and 3.o m long. Calcium superphosphate (15.5 % P_2O_5) was applied during soil preparation at the rate of 240 kg/ha. Organic chicken manure was distributed,

spreaded and thoroughly mixed with the surface soil layer (0-20 cm) after divided and before planting. The soil was irrigated, after 15 days from soil irrigation, farmers planted the ridges with sprouting seed pieces at 25 cm in ridge on depth of 10-15 cm, and each plot contained 60 cut seed pieces of tubers.

Table 3: Mechanical and chemical soil characteristics at the experimental sites during the two growing seasons (2007/2008).

Soil analysis	First season (2007)	Second season (2008)
Mechanical analysis		
Clay (%)	49.87	48.45
Silt (%)	22.06	24.22
Fine Sand (%)	20.02	19.59
Coarse sand (%)	3.02	3.11
$CaCO_3$ (%)	3.43	2.99
Texture	Clayey	Clayey
Chemical analysis		
Organic matter (%)	1.60	1.64
Total nitrogen (ppm)	865	878
Available nitrogen (ppm)	24.5	26.0
Total Potassium (ppm)	744	754
Available Potassium (ppm)	513	522
Total Phosphate (ppm)	267	279
Available Phosphate (ppm)	9.8	8.7
EC (ds/m) at 25^0C	1.5	1.9
pH	7.6	8.1

EC: Was determined in soil paste extract. PH: was determined in saturation soil paste.

Nitrogen fertilizer was added at the rate of 396 kg N/ha at three equal doses, in the form of ammonium nitrate (33.3 % N) *i.e.*, the first with planting, then the second dose were applied after complete emergence, and the third dose was applied with the second irrigation. Potassium sulphate was used as a source of potassium at the rate of 230.4 kg K_2O /ha Potassium was added at two times, one half was added with the second addition of N-fertilizer and the second half was added with the third doses of N-fertilizer.

The common agricultural practices for growing potato plants according to the recommendations of Ministry of Agriculture were followed, except the factors under study.

Vegetative growth characters

A representative samples were taken during the growth period at 90 days from planting, *i.e.* five guarded plants were chosen at random from outer ridges of each plot to determinate the following traits:

1- Plant height (cm).

2- Number of leaves/plant.

3- Leaf area/plant (cm^2): it was determined using the dry weight method according to Roads and Bloodwoath (1964).

$$\text{Leaf area} = \frac{\text{Dry weight of leaves/plant X Area of the disks (cm}^2\text{)}}{\text{Dry weight of 20 disks}}$$

4- Number of stems/plant.

5- Fresh and dry weights of plant foliage (g/plant): the leaves and stems of plant were oven dried till constant weight at 70 ^{o} C.

6- Total chlorophyll content: leaf chlorophyll content was measured by a Minolta SPAD chlorophyll meter according to Yadava (1986).

Statistical Analysis

All obtained data were statistically analyzed, as the technique of analysis of variance (ANOVA) for the randomized complete block design to each experiment (irrigation tension), then combined analysis was done between irrigation treatments as mentioned by Gomez and Gomez (1984). To compare treatment means, a New Least Significant Difference (NLSD) was used according to Waller and Duncan (1969).

RESULTS AND DISCUSSION

1-Effect of irrigation tension:

Regarding to the effect of irrigation tension, data presented in the Tables 4 and 5 revealed that there was a significant effect on leaf area/plant, number of stems/plant, fresh and dry weights of plant foliage and total chlorophyll content as a result of irrigation tension in both seasons and plant height in the second season only. On the other hand, irrigation tension did not affect plant height in the first season and number of leaves/plant in both seasons. The highest values of plant height (46.84 cm) in the second season and number of leaves/plant (41.91 and 44.09), number of stems/plant (3.06 and 3.14), leaf area/plant (1639.14 and 1698.79 cm^2/plant), fresh and dry weights of plant foliage (169.20 and 166.79 and 19.76 and 20.07 g) in both seasons were produced from irrigation at 26cb (5360.17 m3 water/ha) *i.e.* 54.1% moisture from field capacity. While, the highest values of plant height (47.56 cm) in the first season and total chlorophyll content (44.26 and 43.65) in both seasons were resulted from irrigation at 22cb (6209.32 m^3 water/ha) *i.e.* 59.3% from field capacity. On the other side, the lowest averages of all growth parameters were obtained due to irrigation at 34cb. (3449.62 m^3 water/ha) *i.e.* 45.8% from field capacity. A lack of water has deleterious effects on numerous plant processes which can impinge on photosynthetic pigments with productivity reduction, however the reserve is true for plants best supplied with water (Opik *et al.*, 2005). Moreover, water stress reduces plant growth through inhibition of various physiological and biochemical processes, such as photosynthesis, respiration, translocation, ion uptake, carbohydrates, nutrient metabolism and hormones (Karmer, 1983). These results are in harmony with those obtained by Nagrajan and Bansal (1991), Deblonde and Ledent (2001), El-Banna *et al.* (2001) and Yuan *et al.* (2003).

2-Effect of fertilization treatments:

The data presented in Tables 4 and 5 showed that fertilization treatments had a significant effect on plant height, number of leaves/plant, leaf area/plant, number of stems/plant, fresh and dry weights of plant foliage as well as total chlorophyll content in both seasons. Application of 60% inorganic nitrogen fertilizer (238 kg N/ha) + 40% organic chicken manure (158 kg N/ha) produced that maximum values of plant height (49.02 and 48.09 cm), number of leaves/plant (44.25 and 46.28), leaf area/plant (1621.72 and 1681.67 cm^2/plant), number of stems/plant (3.28 and 3.27), fresh and dry weights of plant foliage (176.99 and 176.87 and 19.88 and 20.05 g) during the two growing seasons. Whereas, the highest means of chlorophyll content (43.08 and 42.13) resulted from application of 100% mineral nitrogen fertilizer (396 kg N/ha) as compared with other fertilization treatments in both seasons. The second best fertilization treatments was application 80% mineral nitrogen fertilizer (317 Kg N/ha) plus 20 % organic chicken manure (79 Kg N/ha) with respect of dry weight of plant foliage in the second seasons and plant height, number of leaves and leaf area/plant in both seasons and application of 100% inorganic nitrogen fertilizer (396 kg N/ha) with concern of number of stems/plant and fresh weight of plant foliage in both seasons. On the contrary, the lowest values of all studied growth traits were obtained as a result of application 100 % organic chicken manure (396 Kg N/ha) during the two growing seasons.

Table 4: Averages plant length (cm), number of leaves/plant and number of stems/plant after 90 DAP as affected by irrigation tension, fertilization treatments and their interactions during 2007 and 2008 growing seasons.

Characters	Plant height (cm)		Number of leaves/plant		Leaf area/plant (cm^2)		Number of stems/plant	
Treatments	2007	2008	2007	2008	2007	2008	2007	2008
Irrigation Tension:								
Irrigation at 22cb	47.56	46.83	41.20	42.31	1578.18	1637.08	2.83	2.97
Irrigation at 26cb	47.10	46.84	41.91	44.09	1639.14	1698.79	3.06	3.14
Irrigation at 30cb	45.92	45.45	41.44	43.23	1485.74	1545.60	2.52	2.67
Irrigation at 34cb	44.17	43.18	40.68	39.40	1396.32	1456.40	2.30	2.40
F test	NS	**	NS	NS	**	**	*	**
NLSD at 5%	-	0.90	-	-	24.06	24.15	0.49	0.22
NLSD at 1%	-	1.24	-	-	31.66	31.79	-	0.32
Fertilization treatments (inorganic nitrogen fertilizer + organic chicken manure):								
100% N inorganic	45.79	45.01	40.78	41.08	1522.20	1582.15	3.00	2.92
80% N + 20% organic	48.05	46.72	42.27	42.91	1551.95	1611.76	2.67	2.80
60% N + 40% organic	49.02	48.09	44.25	46.28	1621.72	1681.67	3.28	3.27
40% N + 60% organic	45.73	45.65	41.12	42.85	1519.50	1579.36	2.63	2.83
20% N + 80% organic	45.23	44.65	40.08	41.16	1481.39	1541.18	2.35	2.56
100% organic	43.31	43.35	39.33	39.26	1452.30	1510.68	2.13	2.38
F test	**	**	**	**	**	**	**	**
NLSD at 5%	0.68	0.85	0.51	0.65	8.28	8.35	0.06	0.05
NLSD at 1%	0.90	1.12	0.68	0.85	10.90	10.99	0.08	0.07
Interaction:								
F test	**	*	NS	NS	*	*	**	**

These characters were differed due to the fertilization treatments in both seasons, the positive effect of increasing fertelization treatments may be due to favorable effects of increasing N protein in the fertilizer on nitrogen uptake and photosynthesis surfaces resultant from the increases in both number of cells pear leaf and number of leaves per plant.

Thus, protein and carbohydrate building could be increased leading to increases in dry matter production of different plant organs. El-Baze (1969). Moreover, Yagodin (1984) reported that the increase in plant growth traits may be attributed to beneficial effect of nitrogen on stimulating the mestimatic activity for producing more tissues and organs, since nitrogen play a major role in protein and nucleic acid synthesis and protoplasm formation. More, These results are in agreement with those obtained by Kloos (1986), Ashour and Sarhan (1998), Singh and Raghav (2000), El-Banna *et al.* (2004) and Kumar *et al.* (2007). On the other hand, Barakat *et al*. (1994) indicated that increasing nitrogen applied rate up to 288 kg N/ha did not cause any significant effect on plant height.

Table 5: Averages fresh, dry weight and total chlorophyll content at 90 days after planting (DAP) as affected by irrigation tension, fertilization treatments and their interactions during 2007 and 2008 growing seasons.

Characters	Fresh weight of plant foliage (g)		Dry weight of plant foliage (g)		Total chlorophyll content	
Treatments	2007	2008	2007	2008	2007	2008
Irrigation Tension:						
Irrigation at 22cb	167.12	164.70	18.11	19.65	44.26	43.65
Irrigation at 26cb	169.20	166.79	19.76	20.07	41.61	39.40
Irrigation at 30cb	161.71	161.95	18.75	17.75	38.28	37.84
Irrigation at 34cb	154.74	154.08	18.28	17.34	35.91	35.14
F test	**	**	**	**	**	**
NLSD at 5%	1.96	1.82	0.51	0.43	1.16	1.50
NLSD at 1%	2.58	2.39	0.72	0.57	1.53	1.97
Fertilization treatments (inorganic nitrogen fertilizer + organic chicken manure):						
100% N inorganic	170.00	171.25	18.94	18.92	43.08	42.13
80% N + 20% organic	161.92	160.50	18.72	18.96	42.13	41.42
60% N + 40% organic	176.99	176.87	19.88	20.05	41.19	39.87
40% N + 60% organic	162.30	158.87	19.39	18.75	39.71	38.45
20% N + 80% organic	157.15	154.62	18.12	18.15	37.88	36.96
100% organic	150.79	149.18	17.32	17.39	36.10	35.23
F test	**	**	**	**	**	**
NLSD at 5%	1.97	1.53	0.57	0.17	0.58	0.55
NLSD at 1%	2.59	2.02	0.75	0.23	0.76	0.73
Interaction:						
F test	NS	**	NS	NS	NS	NS

3-Effect of the interaction:

Regarding the interaction effect, the interaction between irrigation tension and combination between organic and inorganic fertilization had a significant effect on plant height, leaf area/plant and number of stems/plant in

both seasons as well as fresh weight of plant foliage in the second season as presented in Figs 2, 3, 4 and 5. Irrigation at 26cb (5360.17 m^3 water/ha) *i.e.* 54.1% moisture from field capacity in addition fertilization with 60% inorganic nitrogen fertilizer (238 kg N/ha) and 40% organic chicken manure (158 kg N/ha) markedly recorded the highest averages of these characters compared with other fertilization treatments, which were (50.90 and 51.37 cm); (1760.07 and 1819.74 cm2/plant); (3.85 and 3.80) in both seasons, respectively. As well as fresh weight of plant foliage (185.75 g) in the second season. These results are agreement with those reported by Ashour and Sarhan (1998), Sharma *et al.* (1999) and Abou-Hadid *et al.* (2003)

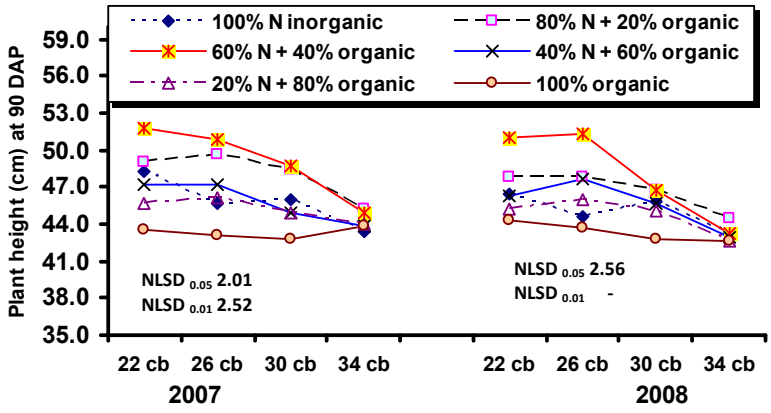

Fig. 2: Plant height (cm) at 90 day after planting as affected by the interaction between irrigation tension and fertilization treatments during 2007 and 2008 seasons.

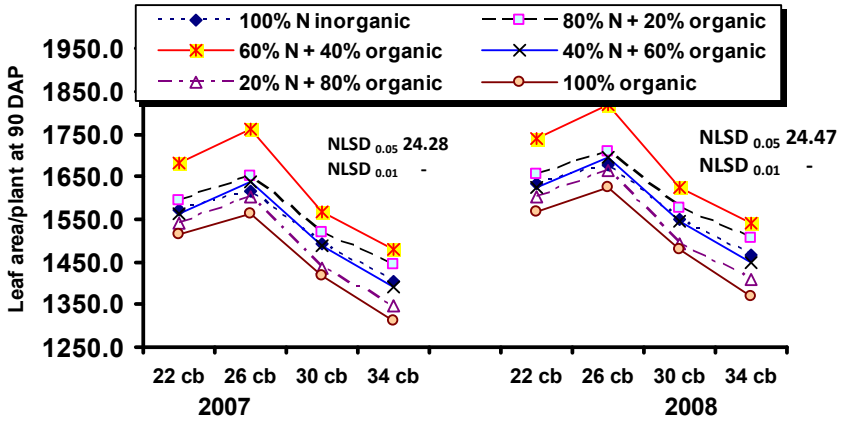

Fig. 3: Leaf area/plant at 90 days after planting as affected by the interaction between irrigation tension and fertilization treatments during 2007 and 2008 seasons.

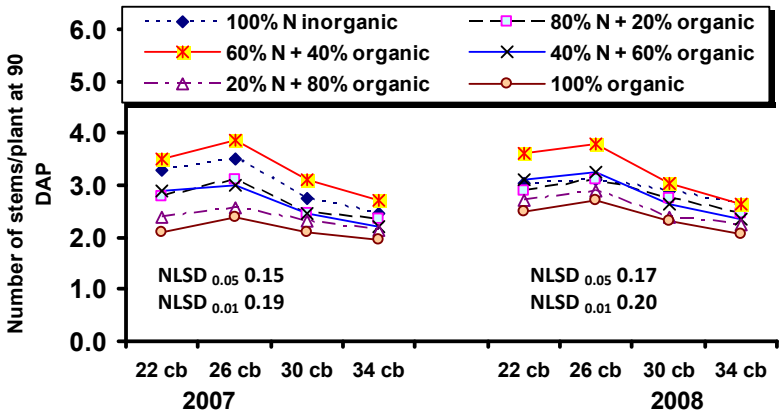

Fig. 4: Number of stems/plant at 90 days after planting as affected by the interaction between irrigation tension and fertilization treatments during 2007 and 2008 seasons.

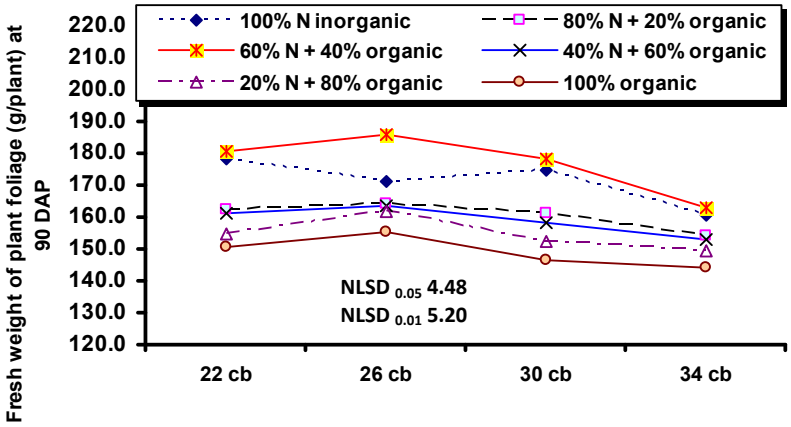

Fig. 5: Fresh weight of plant foliage (g/plant) at 90 days after planting as affected by the interaction between irrigation tension and fertilization treatments during 2008 season.

Conclusions

It could be concluded that irrigation at 26cb (5360.17 m^3 water/ha) *i.e.* 54.1% moisture from field capacity and addition 60% inorganic nitrogen fertilizer (238 kg N/ha) and 40% organic chicken manure (158 kg N/ha) to improve potato vegetative growth under the environmental condition of Mansoura district.

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تأثير الشد الرطوبى والتسميد النيتروجينى المعدنى والعضوى (سبلة الدواجن) على صفات النمو الخضرى للبطاطس

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أجريت تجربتان حقليتان بمحطة البحوث والتجارب الزراعية بكلية الزراعة جامعة المنصورة خلال موسمى الزراعة الصيفى ٢٠٠٧ و ٢٠٠٨ لدراسة تأثير معاملات الشد الرطوبى والتسميد النيتروجينى المعدنى والعضوى (سبلة الدواجن) وكذلك التفاعل بينهما على صفات النمو الخضرية لنباتات البطاطس صنف أسبونتا. تم تنفيذ كل معاملة رى فى تجربة مستقلة فى تصميم القطاعات الكاملة العشوائية فى أربع مكررات.

وكانت أهم النتائج المتحصل عليها:

١- أشارت النتائج أن صفات إرتفاع النبات ، مساحة سطح أوراق النبات ، عدد السيقان/نبات ، الوزن الغض والجاف للعرش وكذلك المحتوى الكلى للأوراق من الكلوروفيل قد تأثرت معنوياً بمعاملات الشد الرطوبى فى كل من الموسمين ، ما عدا صفة طول النبات فى الموسم الأول فقط. بينما لم يكن لمعاملات الشد الرطوبى أى تأثير معنوى على صفة عدد أوراق النبات فى كل من الموسمين. أدى الرى عند شد رطوبى ٢٦ سنتي بار أى حوالى ٥٣٦٠.١٧ م^{٣}/هكتار (أى ما يعادل ٥٤.١% من نسبة الرطوبة عند السعة الحقلية) إلى الحصول على أعلى القيم لكل من الصفات التالية (طول النبات ، عدد الأوراق/نبات ، ومساحة سطح أوراق/نبات ، والوزن الغض والجاف للعرش) ، فى حين سجل الرى عند شد رطوبى ٢٢ سنتي بار أى حوالى ٦٢٠٩.٣٢ م^{٣}/هكتار (أى ما يعادل ٥٩.٣% من نسبة الرطوبة عند السعة الحقلية) أعلى القيم لمحتوى الأوراق من الكلوروفيل فى كل من الموسمين.

٢- أظهرت النتائج أن معاملات التسميد المختلفة كان لها تأثير معنوي على كل الصفات المدروسة فى كل من الموسمين. أدى التسميد بـ٦٠% من السماد النيتروجينى المعدنى مع ٤٠% من السماد النيتروجينى العضوى (سبلة الدواجن) إلى الحصول على أعلى القيم لجميع الصفات تحت الدراسة ، فيما عدا صفة محتوى الأوراق الكلى من الكلوروفيل حيث أدى التسميد بـ١٠٠% من السماد النيتروجينى المعدنى إلى الحصول على أعلى القيم لهذه الصفة فى كل من الموسمين.

٣- أشارت النتائج أن التفاعل بين العوامل تحت الدراسة كان لها تأثير معنوي على كل من صفة طول النبات ، مساحة سطح الأوراق وعدد السيقان/نبات فى كل من الموسمين. وأيضاً على صفة الوزن الغض للعرش فى الموسم الثانى فقط. أدى الرى عند شد رطوبى ٢٦ سنتى بار أى حوالى ٥٣٦٠.١٧ م^{٣}/هكتار (أى ما يعادل ٥٤.١% من نسبة الرطوبة عند السعة الحقلية) والتسميد بـ٦٠% من السماد النيتروجينى المعدنى مع ٤٠% من السماد النيتروجينى العضوى (سبلة الدواجن) إلى الحصول على أعلى للصفات السابقة.

توصى الدراسة بأنه تحت ظروف محافظة الدقهلية لكى يتم تحقيق أعلى معدل للنمو الخضرى لنباتات البطاطس صنف أسبونتا فإنه ينصح بالرى عند شد رطوبى ٢٦ سنتي بار أى حوالى ٥٣٦٠.١٧ م^{٣}/هكتار (أى ما يعادل ٥٤.١% من نسبة الرطوبة عند السعة الحقلية) والتسميد بـ٦٠% من السماد النيتروجينى المعدنى مع ٤٠% من السماد النيتروجينى العضوى (سبلة الدواجن) فى كل من الموسمين.

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