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SOME FACTORS AFFECTING *Nicotiana glauca* GROWTH AND ACTIVE INGREDIENTS:
II- EFFECT OF IRRIGATION WATER RATE AND ANTITRANSPIRANTS

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ABSTRACT

This study was carried out during the two seasons of 2003/ 2004 and 2004/ 2005 at the Experimental Station of Desert Research Center at El-Sheikh Zewaied, North Sinai Governorate; aiming to investigate the effect of different irrigation water rates (4, 8 and 12 L/ plant/ week), antitranspirants (6% $CaCO_3$, 5% Folicote and 10% CaO) as well as their interactions on plant growth, active ingredients, total carbohydrates and chemical constituents of *Nicotiana glauca* plants.

The obtained results showed that, the highest values of vegetative growth parameters (plant height, number of branches/ plant and dry weights of plant and leaves/ plant), active ingredient (total alkaloids, anabasine and rutin percentages and contents/ plant), total carbohydrates content and chemical constituents (nitrogen, phosphorus and potassium percentages and contents/ plant) could be achieved by irrigating plants with the highest irrigation water rate (12 L/ plant/ week) combined with spraying plants with $CaCO_3$ at 6%.

INTRODUCTION

Nicotiana glauca R, Graham, also called wild tobacco or tree tobacco, is a fast growing shrub or small tree, native to South America, belongs to the family *Solanaceae* (Mizrachi *et al.,* 2000). It is widely spread as a wild shrub all over Arabian countries such as Egypt, Libya and Jordan and is known locality by the Arabic name Massas (Tokholm, 1956). Studies have demonstrated that *N. glauca* is highly toxic to humans (Mizrachi *et al.*, 2000) and animals (Panter *et al.*, 2000). The plant contains the alkaloid anabasine which is the isomer of nicotine. This substance is responsible for the clinical toxicology of this plant. This plant has been used medicinally (Watt and Breyer-Brandwijk, 1962) and in ethnoveterinary medicine (Gueye, 1997). Warmed leaves are applied to the head to relieve headache, on the throat to relieve pain, put in shoes for painful feet (Van Wyk, 2000) and an infusion of the leaves has been used as a steam bath in the treatment of rheumatism (Moerman, 1998). It is also used to treat burns and inflammatory diseases (Morel *et al.*, 1998). *Nicotiana glauca* also contained rutin which considered the main polyphenolic acid in this plant. The rutin is called vitamin D which has an important effect in resolving arteriosclerosis and in restoring the capillary function of assimilation (Clans, 1967).

The effects of sea level rise in North Africa, especially on the coast of the Delta region of Egypt, would impose additional constraints to the use of water resources (Intergovernmental Panel on Climate Change, 2001 and

Iglesias, 2002). If climate change results in intensification of drought, available water resources in the Mediterranean region may become increasingly unstable and vulnerable. This situation imposes an immediate movement toward establishing a data base about the optimum requirements of water irrigation of different crops in order to rationalize the irrigation water consumption.

Less than one per cent of the water absorbed by plant roots is retained within the plant, and a considerably smaller percentage is contained in the harvested crop. Thus, water use by plant actually constitutes the least efficient step in the system of precipitation, collection, water storage, conveyance, irrigation and conversion to the harvest crop. The possibility of reducing plant transpiration, thus saving water and also alleviating the adverse effects of water imbalance on plant growth transpiration exceeds the rate of water uptake presents a tremendous challenge in this ear which is increasingly plagued with dwindling water resources (Gale and Hagan, 1966).

Much attention has been given to maintaining favorable internal water balance in plants by suppression of water loss with film-type antitranspirants. Antitranspirants may be reflective materials that decrease the heat load on leaf film forming materials that hinder the scope of water vapor from the leaf or stomata closing materials (metabolic) that increase stomatal resistance film. Also, include the maintenance of more favorable water balance in plant, particularly in situation or a growth stages when high plant water potential in essential for desirable growth.

It was found that spraying plants with antitranspirants such as CaO at 10% (Saudan *et al.*, 1999 on *Mentha arvensis* and Eid and Abou Leilah, 2006 on croton), $CaCO_3$ at 6% (Mahfouz, 1997 on roselle; and El-Ghamriny *et al.*, 2005 on potato) or Folicote at 5% (Afify *et al.*, 2001 on roselle plants) resulted in enhancing vegetative growth parameters and chemical constituents of plants.

In light of these observations, the main objectives of this study were: (i) to assessment the optimum irrigation water requirement of *Nicotiana glauca* plant under north Sinai conditions by investigating different irrigation water rates (4, 8 and 12 L/ plant/ week); (ii) to investigate the effect of spraying plants with different antitranspirant agents and (iii) to determine the combined effect between both investigated factors on growth, active ingredients and chemical constituents of tree tobacco.

MATERIALS AND METHODS

This study was carried out during two successive seasons of 2003/2004 and 2004/2005 at the Experimental Station of Desert Research Center at El-Sheikh Zewaied, North Sinai Governorate.

Seeds of *Nicotiana glauca* R. Graham were sown in the nursery bed on 1st of August during both seasons. Meanwhile, seedlings were transplanted in the experimental farm on 15th of September (2003 and 2004). The experimental unit (plot) was 25 m^2 and contained 25 plants, since the distance between rows and plants within row was one meter. The mechanical and

chemical properties of experimental farm soil are shown in Table (A). The irrigation system of the experiment was drip irrigation. The chemical analysis of irrigation water was tabulated in Table (B). All experimental units received equal amounts of water during the first month from transplanting (102.857 m^3/ fad/ month). All plants have been received similar chemical fertilization at the rate of 300 Kg/fed ammonium nitrate, 250 Kg/ fad superphosphate and 100 Kg/ fad potassium sulphate. Plants received normal agricultural practices whenever they needed.

This study included 12 treatments which were the combinations between three irrigation water rates (4, 8 and 12 L/ plant/ week) and different antitranspirants (control, $CaCO_3$ at 6 %, Folicote at 5 % and CaO at 10%). These treatments were arranged in a split plot design with three replicates. Irrigation water rate treatments were randomly arranged in the main plots while antitranspirant treatments were randomly distributed in the sub plots. Irrigation water rates were calculated by multiplying the rate of water flow through the dripper (4 L/ h) by the irrigation hours per week as follows:

Treatments	Irrigation hours/ plant/ week	Applied water quantity (L/ plant/ week)	Total water consumption (m^3/ fad/ season)
First rate	1	4	371.657
Second rate	2	8	640.457
Third rate	3	12	909.257

Plants were sprayed with antitranspirants ($CaCO_3$, folicote or CaO solutions) at 50 and 70 days after transplanting by using hand pressure sprayer. Distilled water was used to dilute all antitranspirants. Plants were sprayed with a fine mist of antitranspirants till run off, with care being taken to cover all plant parts. Each plot received four liter of antitranspirants aqueous solution by using speeding agent (reflecting materials). Control plants were sprayed with distilled water and spreading agent only.

Data recorded

Five plants were randomly chosen from each plot on 8th February during both seasons and the following data were recorded:

A. Plant growth parameters:

1. Plant height (cm)
2. Number of branches per plant
3. Dry weight of plant (g) and leaves per plant (g)

B. Active ingredients:

1. Total alkaloids percentage in leaves was determined according to methods of Saitoh *et al.* (1985). Total alkaloids content per plant was determined by multiplying percentage of total alkaloids by the dry weight of leaves per plant.
2. Anabasine percentage in leaves was determined according to the method of Troje *et al.* (1997) and anabasine content per plant was calculated by multiplying the percentage of anabasine by the dry weight of leaves per plant.
3. Rutin percentage in leaves was estimated according the methods of Kreft *et al.* (2002) and then the rutin content per plant was calculated by multiplying the percentage of rutin by the dry weight of leaves per plant.

C. Chemical constituents:

1. Total carbohydrates percentage in leaves was determined according to Herbert *et al.* (1971). Total carbohydrates content per plant was estimated by multiplying the percentage of total carbohydrates by the dry weight of leaves per plant.
2. Nitrogen, phosphorus and potassium percentages and contents were estimated in leaves according the method of Chapman and Pratt (1961).

Statistical analysis:

The recoded data were statistically analyzed, and the means were compared using least significant difference (LSD) test at 5% level according to Snedecor and Cochran (1980).

Table A. Physical and chemical analysis of experimental farm soil in North Sinai Research Station

Mechanical analysis	Value	Chemical analysis					
		Soluble anions (mEg/L)	Value	Soluble Cations (mEg/L)	Value	Available (mg/l)	Value
Fine sand %	31.96	CO_3	-	Ca	4.08	N	9.13
Coarse sand %	56.16	Cl	1.30	Mg	0.82	P	2.71
Silt %	7.40	SO_4	4.74	Na	4.50	K	0.15
Clay %	2.25	pH	8.30	K	0.25	$CaCo_3$	2.30
Soil texture	Sandy						
E.C Mmhos/ cm	0.93						

Table (B): Chemical analysis of irrigation water in North Sinai Research Station

pH	Total salts concentration (ppm)	Soluble anions (mEg/L)				Total	Soluble cations (mEg/L)				Total
		H_2CO_3	Cl^-	$(SO_4)^{--}$	CO_3^-		Ca^{++}	Mg^+	Na^+	K^+	
7.8	3000	358.2	1059	625	0.00	1863	88.88	76.08	880.0	12.0	1057

RESULTS AND DISCUSSION

Plant growth

Effect of irrigation water rate

The main effect of irrigation water rate declares that all vegetative growth parameters (plant height, number of branches, plant dry weight and dry weight of leaves/ plant) were enhanced significantly by increasing irrigation water rate (Tables 1 and 2). The highest vegetative growth parameters were recorded with the highest irrigation water rate (12 L/ plant/ week).

The previous result is in harmony with these obtained by Khamis (2001) on *Melia azedarach, Populus nigra* and *Taxodium disticum,* Salem (2002) on jojoba plants and El-Hadad (2006) on *Cupressus macrocarpa.*

Effect of antitranspirants

Concerning the main effect of antitranspirants, data in Tables (1 and 2) show that treating plants with antitranspirants resulted in significant increase in all vegetative growth parameters compared with untreated plants (control). In this regard, $CaCO_3$ at 6% has proven to be the most effective

antitranspirant in increasing the values of all growth parameters. These results hold true during both seasons. The increments in plant growth parameters by using antitranspirant treatments may be attributed primarily to antitranspirant effect on increasing plant water potential at a time when the growth of that particular plant part was more dependent on water status than on photosynthesis (Boyer, 1970).

These results are in line with those reported by Mahfouz (1997) on roselle and Saudan *et al.* (1999) on *Mentha arvensis*.

Table (1): Effect of different irrigation water rates, antitranspirants and their interaction on plant height (cm) and number of branches per *Nicotiana glauca* plant at 2003/2004 and 2004/2005 seasons.

Irrigation water rate L/ plant/ week (A)	Antitranspirants (B)									
	Control	$CaCO_3$	Folicote	CaO	Mean (A)	Control	$CaCO_3$	Folicote	CaO	Mean (A)
	2003/2004					2004/2005				
	Plant height (cm)									
4	150.00	180.00	173.30	160.00	165.83	154.30	183.70	179.70	168.30	171.50
8	165.00	208.70	197.30	175.00	186.50	174.30	214.00	195.30	186.70	192.58
12	186.70	210.00	206.30	193.00	199.00	193.00	217.00	210.00	203.70	205.93
Mean (B)	167.23	199.56	192.30	176.00		173.867	204.90	195.00	186.233	
L.S.D. at 5% for	A = 3.04 B= 2.88 AB= 5.77					A=5.11 B=2.55 AB=5.10				
	Number of branches per plant									
4	17.00	27.00	25.67	19.00	22.17	16.00	25.00	22.00	21.00	21.00
8	20.00	32.00	27.00	23.00	25.50	19.00	28.67	27.00	23.00	24.42
12	22.00	36.00	28.00	26.00	28.00	22.00	36.33	31.67	28.00	29.50
Mean (B)	19.67	31.67	26.89	22.67		19.00	30.00	26.89	24.00	
L.S.D. at 5% for	A=0.82 B=0.59 AB=1.19					A=1.99 B=1.52 AB=3.05				

Table (2): Effect of different irrigation water rates, anti transparent and their interaction on dry weights of plant and leaves per *Nicotiana glauca* plant at 2003/2004 and 2004/2005 seasons.

Irrigation water rate L/ plant/ week (A)	Ant transparent (B)									
	Control	$CaCO_3$	Folicote	CaO	Mean (A)	Control	$CaCO_3$	Folicote	CaO	Mean (A)
	2003/2004					2004/2005				
	Dry weight of plant (g)									
4	240.00	302.30	291.33	261.00	273.66	225.00	308.00	289.00	272.00	273.50
8	257.33	374.66	329.00	289.00	312.50	286.33	369.00	337.00	307.00	324.83
12	278.00	390.00	362.00	328.00	339.50	308.66	401.00	371.00	324.33	351.25
Mean (B)	258.44	355.65	327.44	292.67		273.33	359.33	332.33	301.11	
L.S.D. at 5% for	A=34.27 B=8.46 AB=16.92					A=2.62 B=2.82 AB=5.65				
	Dry weight of leaves per plant (g)									
4	72.00	102.00	94.00	79.00	86.75	68.00	109.00	94.00	81.00	88.00
8	86.33	154.33	126.00	100.00	116.67	92.33	150.00	127.67	106.00	119.00
12	99.00	159.00	148.00	129.00	133.75	98.33	164.00	153.00	114.67	132.50
Mean (B)	85.78	138.44	122.67	102.67		86.22	141.00	124.89	100.56	
L.S.D. at 5% for	A=5.17 B=4.31 AB=8.63					A=1.03 B=2.24 AB=4.48				

Effect of interaction

Data in Tables (1 and 2) indicate that, the interaction between different irrigation water rates and antitranspirants had a significant effect on vegetative growth parameters. The highest values of plant height (210.00 and 217.00 cm), number of branches (36.00 and 36.33), plant dry weight (390.00 and 401.00 g) and dry weight of leaves (159.00 and 164.00 g) were recorded when plants irrigated with the highest rate (12 L/ plant/ week) and treated with $CaCO_3$ at 6% during both seasons, respectively. Similar results were recorded by El-Ghamriny *et al.* (2005) on potato.

Active ingredients (total alkaloids, anabasine and rutin contents)

Effect of irrigation water rate

As clear in Tables (3, 4 and 5), both total alkaloids percentage and content/ plant leaves and anabasine percentage and content/ plant leaves were gradually significantly increased with increasing irrigation water rate. The highest values of total alkaloids and anabasine percentages and contents/ plant leaves were belonging to the highest irrigation water rate (12 L/ plant /week). Similar trend was recorded with rutin percentage and content/ plant leaves, but these gradual increase did not reach to the significant level in most cases.

Effect of antitranspirants

Regarding total alkaloids and anabasine percentages and contents per plant leaves as affected by antitranspirant treatments were reported in (Tables 3 and 4). It was found that, treating the plants with antitranspirants resulted in significant increase in these characters compared with untreated plants except in the case of total alkaloids percentage during the first season since only the treatment of $CaCO_3$ reached to the significant level.

Concerning the effect of antitranspirant treatments on rutin percentage, it is clear that this percentage significantly enhanced when plants have been treated with $CaCO_3$, while there was no significant differences between other antitranspirant treatments and untreated plants. On the other hand, rutin content/ plant was significantly increased in most cases by treating plants with antitranspirants compared with untreated plants.

Table (3): Effect of different irrigation water rates, antitranspirants and their interaction on alkaloids percentage and content in leaves of *Nicotiana glauca* plant at 2003/2004 and 2004/2005 seasons.

Irrigation water rate L/ plant/ week (A)	Ant transparent (B)									
	Control	$CaCO_3$	Folicote	CaO	Mean (A)	Control	$CaCO_3$	Folicote	CaO	Mean (A)
	2003/2004					2004/2005				
	Total alkaloids percentage									
4	0.61	0.67	0.66	0.63	0.64	0.59	0.69	0.68	0.62	0.65
8	0.62	0.72	0.71	0.69	0.68	0.64	0.75	0.72	0.69	0.70
12	0.68	0.77	0.74	0.73	0.73	0.71	0.79	0.77	0.76	0.76
Mean (B)	0.63	0.72	0.70	0.68		0.64	0.74	0.72	0.69	
L.S.D. at 5% for	A=0.04 B=0.07 AB=0.15					A=0.01 B=0.01 AB=0.03				
	Total alkaloids content per plant (mg)									
4	443.87	688.07	625.07	502.37	564.85	400.87	752.43	639.20	501.87	573.59
8	539.60	1105.87	899.27	694.67	809.85	591.27	1124.33	917.20	732.07	841.22
12	677.87	1228.79	1099.87	946.37	988.23	698.50	1296.27	1177.43	868.80	1010.25
Mean (B)	553.78	1007.58	874.74	714.47		563.55	1057.68	911.28	700.91	
L.S.D. at 5% for	A=37.07 B=28.89 AB=57.79					A=44.67 B=30.72 AB=61.45				

Table (4): Effect of different irrigation water rates, anti transparent and their interaction on anabasine percentage and content in leaves of *Nicotiana glauca* plant at 2003/2004 and 2004/2005 seasons.

Irrigation water rate L/ plant/ week (A)	Ant transparent (B)									
	Control	$CaCO_3$	Folicote	CaO	Mean (A)	Control	$CaCO_3$	Folicote	CaO	Mean (A)
	2003/2004					2004/2005				
	Anabasine percentage									
4	0.29	0.350	0.320	0.320	0.320	0.260	0.360	0.350	0.310	0.320
8	0.31	0.380	0.370	0.330	0.350	0.320	0.410	0.380	0.360	0.370
12	0.34	0.430	0.410	0.390	0.390	0.370	0.440	0.420	0.390	0.410
Mean (B)	0.313	0.387	0.367	0.347		0.317	0.403	0.383	0.353	
L.S.D. at 5% for	A=0.007	B=0.005	AB=0.010			A=0.009	B=0.007	AB=0.014		
	Anabasine content per plant (mg)									
4	211.13	359.33	306.73	258.00	283.80	176.63	329.57	329.00	250.93	271.53
8	269.80	583.80	468.53	332.33	413.62	295.63	614.67	484.13	381.93	444.09
12	341.77	686.03	609.13	505.43	535.59	364.00	721.93	642.27	445.87	543.52
Mean (B)	274.23	543.05	461.46	365.25		278.75	555.39	485.13	359.58	
L.S.D. at 5% for	A=30.57	B=16.63	AB=33.26			A=22.14	B=15.58	AB=31.16		

Table (5): Effect of different irrigation water rates, antitranspirants and their interaction on rutin percentage and content in leaves of *Nicotiana glauca* plant at 2003/2004 and 2004/2005 seasons.

Irrigation water rate L/ plant/ week (A)	Ant transparent (B)									
	Control	$CaCO_3$	Folicote	CaO	Mean (A)	Control	$CaCO_3$	Folicote	CaO	Mean (A)
	2003/2004					2004/2005				
	Rutin percentage									
4	2.32	2.51	2.45	2.41	2.42	2.35	2.56	2.47	2.43	2.45
8	2.36	2. 59	2.54	2.49	2.59	2.42	2.58	2.53	2.47	2.50
12	2.53	2.71	2.66	2.55	2.61	2.51	2.77	2.71	2.62	2.65
Mean (B)	2.40	2.63	2.55	2.48		2.42	2.63	2.57	2.50	
L.S.D. at 5% for	A=0.20	B=0.16	AB=0.32			A=0.18	B=0.16	AB=0.33		
	Rutin content per plant (g)									
4	1.69	2.58	2.33	1.93	2.13	1.60	2.79	2.32	1.97	2.17
8	2.06	3.51	3.22	2.51	2.82	2.24	3.87	3.22	2.62	2.99
12	2.53	4.33	3.96	3.31	3.53	2.47	4.55	4.14	2.99	3.54
Mean (B)	2.09	3.47	3.17	2.58		2.10	3.74	3.23	2.53	
L.S.D. at 5% for	A=0.49	B=0.55	AB=1.11			A=0.14	B=0.23	AB=0.46		

The highest rutin content/ plant was belong to the treatment of $CaCO_3$ (6%) during both season.

Effect of interaction

Among the different interaction treatments between different irrigation water rates and antitranspirants, the treatment of 12 L/ plant /week combined with treating plants with $CaCO_3$ (6%) gave the highest total alkaloids percentage (0.77 and 0.79%), total alkaloids content/ plant (1228.79 and 1296.27 mg), anabasine percentage (0.43 and 0.44%), anabasine content/ plant (686.03 and 721.93 mg), rutin percentage (2.71 and 2.77%) and rutin content/ plant (4.33 and 4.55 g) during both seasons, respectively (Tables 3, 4 and 5).

Total carbohydrate content

Effect of irrigation water rate

The obtained results (Table 6) show that increasing the irrigation water rate resulted in gradually increasing in total carbohydrates percentage and content/ plant. These increments were significant in most cases during both seasons. The highest average of total carbohydrates percentage (18.1 and 18.85%) and total carbohydrates content/ plant (25.23 and 26.74 g) were recorded with the highest irrigation water rate (12 L/ plant/ week). These results are in accordance with those obtained by Khattab *et al.* (2002) on *Salvia splendens*, and El-Hadad (2006) on *Cupressus macrocarpa*.

Effect of antitranspirants

Regarding the total carbohydrate percentage and content per plant in leaves, the data in Table (6) show that all antitranspirant treatments exhibited stimulatory effect on carbohydrates accumulation in leaves compared with control treatment. The differences between the treatments and control were significant during both seasons. The highest values were resulted from plants sprayed with $CaCO_3$ at 6% during both seasons. These results are in agreement with those obtained by Mahfouz (1997) on roselle.

Table (6): Effect of different irrigation water rates, antitranspirants and their interaction on total carbohydrates percentage and content in leaves of *Nicotiana glauca* plant at 2003/2004 and 2004/2005 seasons.

Irrigation water rate L/ plant/ week (A)	Ant transparent (B)									
	Control	$CaCO_3$	Folicote	CaO	Mean (A)	Control	$CaCO_3$	Folicote	CaO	Mean (A)
	2003/2004					2004/2005				
	Total carbohydrates percentages									
4	16.20	17.40	17.30	16.70	16.90	17.10	17.90	17.80	17.20	17.50
8	16.90	18.10	17.70	17.50	17.55	17.60	19.37	18.30	18.10	18.34
12	17.60	18.80	18.50	18.30	18.30	18.40	19.30	19.10	18.80	18.90
Mean (B)	16.90	18.10	17.83	17.50		17.70	18.85	18.40	18.03	
L.S.D. at 5% for	A=0.08	B=0.00	AB=0.01			A=0.58	B=0.59	For AB=1.19		
	Total carbohydrates content per plant (gm)									
4	11.80	17.89	16.40	13.33	14.86	11.62	19.52	16.73	13.92	15.45
8	14.72	27.77	22.44	17.64	20.64	16.26	29.04	23.30	19.21	21.95
12	17.56	30.03	27.52	23.75	24.72	18.10	31.67	29.20	21.48	25.11
Mean (B)	14.69	25.23	22.12	18.24		15.33	26.74	23.08	18.20	
L.S.D. at 5% for	A=1.83	B=0.69	AB=1.39			A=1.37	For B=0.86	For AB=1.72		

Effect of interaction:

It is clear from data in Table (6) that interaction treatments showed significant increase in total carbohydrate percentage and content in leaves of tobacco tree plants compared with control treatment. The highest values in this concern were produced from plants irrigated with 12 L/ plant/ week and sprayed with $CaCO_3$ at 6%. These results hold true during both seasons.

Nitrogen, Phosphorus and Potassium percentages and contents:
Effect of irrigation water rate

Data in Tables (7, 8 and 9) show that nitrogen, phosphorus and potassium percentages and contents were gradually significantly increased with increasing the irrigation water rate up to 12 L/ plant / week which gave the highest values of these characters.

These results are in line with those recorded by, Salem (2002) on jojoba and El-Hadad (2006) on *Cupressus macrocarpa.* This may be due to the fact that increasing the irrigation water level in the soil within a reasonable range makes minerals more available to plant uptake, which led to enhance minerals accumulation in plant.

Effect of antitranspirants

Results in Tables (7, 8 and 9) declare that nitrogen, phosphorus and potassium percentages and contents were significantly increased when plants were treated with antitranspirants compared to untreated plants. The highest averages of all these characters have been obtained when plants were sprayed with $CaCO_3$ at 6% during both seasons.

Similar results were reported by Saudan *et al.* (1999) on *Mentha arvensis.*

Table (7): Effect of different irrigation water rates, antitranspirants and their interaction on nitrogen percentage and content in leaves of *Nicotiana glauca* plant at 2003/2004 and 2004/2005 seasons.

Irrigation water rate L/ plant/ week (A)	Ant transparent (B)									
	Control	$CaCO_3$	Folicote	CaO	Mean (A)	Control	$CaCO_3$	Folicote	CaO	Mean (A)
	2003/2004					2004/2005				
	Nitrogen percentage									
4	2.70	3.33	3.20	2.90	3.03	2.50	3.40	3.20	2.80	2.98
8	2.80	3.40	3.30	3.10	3.15	2.90	3.60	3.50	3.10	3.28
12	3.20	3.70	3.53	3.40	3.46	3.20	3.90	3.80	3.60	3.63
Mean (B)	2.90	3.47	3.34	3.13		2.86	3.63	3.50	3.16	
L.S.D. at 5% for	For A=0.01 B=0.02 AB=0.04					For A=0.05 For B=0.05 For AB=0.11				
	Nitrogen content per plant (gm)									
4	1.97	3.42	3.03	2.31	2.68	1.70	3.71	3.01	2.27	2.67
8	2.44	5.22	4.18	3.12	3.74	2.68	5.40	4.46	3.29	3.96
12	3.19	5.91	5.25	4.41	4.69	3.15	6.40	5.81	4.11	4.87
Mean (B)	2.53	4.85	4.15	3.28		2.51	5.17	4.43	3.22	
L.S.D. at 5% for	A=0.31 B=0.12 AB=0.25					A=1.08 B=0.98 AB=1.96				

Effect of interaction:

The combined effect between different irrigation water rates and antitranspirants (Tables 7, 8 and 9) show that the highest values of nitrogen percentage (3.70 and 3.90%) and content (5.91 and 6.40 g), phosphorus percentage (0.67 and 0.66%) and content (1069.97 and 1083.07 g) and potassium percentage (3.8 and 3.8%) and content (6.07 and 6.24 mg) were recorded when plants were irrigated with the highest rate (12 L/plant /week) and sprayed with $CaCO_3$ at 6% during both seasons, respectively.

Table (8): Effect of different irrigation water rates, anti transparent and their interaction on phosphorus percentage and content in leaves of *Nicotiana glauca* plant at 2003/2004 and 2004/2005 seasons.

Irrigation water rate L/ plant/ week (A)	Ant transparent (B)									
	Control	$CaCO_3$	Folicote	CaO	Mean (A)	Control	$CaCO_3$	Folicote	CaO	Mean (A)
	2003/2004					2004/2005				
	Phosphorus percentage									
4	0.47	0.53	0.52	0.49	0.50	0.44	0.49	0.49	0.46	0.47
8	0.51	0.62	0.57	0.55	0.56	0.47	0. 61	0.55	0.53	0.54
12	0.54	0.67	0.64	0.59	0.61	0.57	0.66	0.63	0.61	0.63
Mean (B)	0.50	0.60	0.57	0.54		0.49	0.58	0.55	0.53	
L.S.D. at 5% for	A=0.01		B=0.01		AB=0.03	A=0.01		B=0.01		AB=0.03
	Phosphorus content per plant (mg)									
4	343.07	545.27	493.47	391.77	443.40	298.87	530.47	460.60	372.27	415.55
8	444.63	951.53	722.87	554.67	668.43	434.30	914.33	700.17	562.47	652.82
12	539.27	1069.97	951.87	765.77	831.72	560.83	1083.07	958.07	696.80	824.69
Mean (B)	442.32	855.59	722.74	570.74		431.33	842.62	706.28	543.85	
L.S.D. at 5% for	A=65.58		B=24.55		AB=49.11	A=63.82		B=28.85		AB=57.71

Table (9): Effect of different irrigation water rates, antitranspirants and their interaction on potassium percentage and content in leaves of *Nicotiana glauca* plant at 2003/2004 and 2004/2005 seasons.

Irrigation water rate L/ plant/ week (A)	Ant transparent (B)									
	Control	$CaCO_3$	Folicote	CaO	Mean (A)	Control	$CaCO_3$	Folicote	CaO	Mean (A)
	2003/2004					2004/2005				
	Potassium percentage									
4	2.40	3.10	2.90	2.60	2.75	2.53	3.23	2.90	2.80	2.87
8	2.70	3.50	3.30	3.20	3.18	2.70	3.60	3.30	3.10	3.18
12	2.80	3.80	3.63	3.40	3.41	2.57	3.80	3.70	3.20	3.32
Mean (B)	2.63	3.46	3.27	3.06		2.60	3.543	3.30	3.033	
L.S.D. at 5% for	A=0.03		B=0.03		AB=0.06	A=0.18		B=0.16		AB=0.33
	Potassium content per plant (mg)									
4	1.75	3.19	2.75	2.08	2.44	1.72	3.53	2.73	2.27	2.56
8	2.35	5.38	4.18	3.22	3.78	2.49	5.40	4.20	3.29	3.85
12	2.80	6.07	5.41	4.41	4.67	2.52	6.24	5.66	3.66	4.52
Mean (B)	2.30	4.88	4.11	3.24		2.24	5.06	4.20	3.07	
L.S.D. at 5% for	A=0.39		B=0.15		AB=0.31	A=0.21		B=0.24		AB=0.49

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دراسة بعض العوامل المؤثرة على النمو والمواد الفعالة في نبات المصاص:
٢- تأثير معدل مياه الري وبعض مضادات النتح

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** قسم النباتات الطبية – معهد بحوث الصحراء – المطرية القاهرة

أجرى هذا البحث في مزرعة الشيخ زويد التابعة لمركز بحوث الصحراء في محافظة شمال سيناء خلال عامين متتاليين ٢٠٠٣/٢٠٠٤، ٢٠٠٤/٢٠٠٥ بهدف دراسة تأثير معدلات مختلفة من مياه الري (٤، ٨ و ١٢ لتر /نبات/ أسبوع) وكذلك استخدام بعض مضادات النتح (كربونات الكالسيوم ٦%، فولى كوت ٥%، أكسيد الكالسيوم ١٠%) والتفاعل بينهم على النمو والمواد الفعالة، وبعض المكونات الكيماوية لأوراق نبات المصاص.

و قد أشارت النتائج المتحصل عليها إلى إمكانية الحصول على أعلى قيم لصفات النمو الخضري (ارتفاع النبات، عدد الأفرع والوزن الجاف للنبات وللأوراق لكل نبات) والمحتوى من المواد الفعالة (القلويدات الكلية و الانابازين والروتين) والمكونات الكيميائية للنبات (الكربوهيدرات الكلية، النتروجين ، الفسفور و البوتاسيوم) بري النباتات بمعدل ١٢ لتر/نبات/ أسبوع مع رش النباتات بكربونات الكالسيوم بتركيز ٦ % .