Annals of Agric. Sci., Moshtohor **ISSN 1110-0419**
Vol. 51(1) (2013), 1– 8 **http://annagricmoshj.com**

Forage production Potential of Saltbush (*Atriplex halimus* L.) grown under stress conditions at Ras Sudr, South Sinai

Roshdy, A.[1]; F. T. El-Sheikh[1]; E. T. Kishek[2] and O. M. Abd El-hafez[2]
[1] Faculty of Agriculture- Banha University.
[2] Desert Research Center.

Abstract

A field trial was conducted at the experimental Station of the Desert Research Center at Wadi Sudr, South Sinai. The experiment was set up over two successive growing seasons (2009 and 2010) to investigate the effect of three irrigation intervals (15- 30 and 45 d) and two cutting height (50 and 75 cm) on growth, forage yield and chemical content of ***Atriplex halimus***. The obtained results revealed that all growth traits (plant height- crown cover (CC)- crown volume (CV)- leaf/stems (L/S) ratio and fresh and dry forage yields were better built up when ***Atriplex*** shrubs were irrigated every 45 d intervals. Rather high values of crude fiber (CF) and ash content were obtained by frequent irrigation (15 d) whereas, total carbohydrates and crude protein (CP) significantly affected by irrigation intervals. Furthermore, mineral content of K^{+1}, Na^{+1} and K/Na ratio were significantly affected by irrigation intervals only at the 2nd cut of 2010 growing season. Most growth parameters insignificantly responded to varying cutting height. However, cutting at 75 cm gave insignificant increase in dry forage yield and the greatest magnitude of fresh forage yield was gained at higher level of 75 cm cutting height. Moreover, there was significant increase in CP and significant reduction in CF and ash percentages with raising height of cutting (75 cm).

The interaction between irrigation intervals and cutting height had a significant effect on CC, CV and K/Na ratio only in the 2nd cuts of 2009 and 2010 growing seasons. Moreover, the highest value of fresh forage yield was obtained when ***Atriplex*** plants were irrigated every 45 d intervals and 75 cm cutting height.

Key words: irrigation intervals, cutting height, fodder shrubs, salinity, drought.

Introduction

In Egypt, there is an urgent necessity to develop the indigenous livestock particularly in arid desert areas. However, the scanty of green fodder is the main constraint to boost the productivity of such livestock especially in summer season. Moreover, in arid deserts, high temperature, saline soil and brackish water irrigation restrict plant growth and development **(Tomar** and **Yadav, 1980)**. Because halophytes have been used as forages in arid regions and their values are recognized in feeding livestock. The recent approach is to select halophytic shrubs species with high biomass production and protein content as well as the ability to survive stressful conditions (drought and salt stresses).

Atriplex halimus L. shrub plants are considered the best halophytic shrubs that have considerable forage production in arid and semiarid rangelands (**Le Houerou, 1992**). They are very useful source of protein and mainly utilized by sheep and goat (**Tag El-Din, 1994**). Saltbushes are native shrubs existing in salty and arid regions of the Mediterranean basin and represent a good candidate for forage in desert areas. However, a particular attention is being given to ***Atriplex halimus* L**. due to its xero-halophytic character and palatability that makes it suitable fodder for grazing animals especially during drought periods **(Abbad *et al*., 2004).**

Saline water is the sole source of irrigation in arid and semi arid regions, so a keen management for high biomass production was attempted by adjusting the irrigation schedule. In this regard, under South Sinai, **Abou-Deya** and **Abd El-Aziz (1991)** reported that plant height is the sole growth trait significantly affected by increasing intervals between irrigations up to 60 d. Whereas, other agronomic parameters i.e. CC, CV, L/S ratio and fresh and dry forage yields were significantly increased with irrigation every 30 d. On the other hand, **El-Nazer (1992)** reported that with ***Atriplex nummularia***, extending irrigation intervals from 15 to 30 d increased most growth and yield traits whereas, CP percentage merely increased at the irrigation interval of 15 d. Meanwhile, CF and ash were increased with maintaining irrigation at 30 d. However, **Abou-Deya (1995)** mentioned that irrigation every 10 d has a dramatic effect on growth and forage yield of ***Acacia Cyclops*** in comparison with the irrigation interval of 30 d. Moreover, **Khalifa (1996)** illustrated that fresh weight/plant and total fresh fodder yield of ***Atriplex canescens*** were the highest with irrigation at 20 d interval. On the contrary, frequent irrigation at 10 days was preferable for dry matter yield. He also mentioned that irrigation interval was of non-significant effect on CP, ash and CF during summer and winter seasons. **Abd El-hafez (2005)** elucidated that the fluctuations in growth traits, forage productivity and chemical content (CP, CF and Ash) of four ***Atriplex*** species (***A. nummularia, A. leucoclada, A. canescens and A. lentiformis***) were not significant with extending irrigation intervals from 10 to 30 d. In as much as, the most important objective of the herder is to improve the nutritive value of fodder product. It is equally important to measure the most profitable height of cutting that is reflected on the forage quality and growth recovery. **Abou-Deya** and **Kandil (1996)** conducted a field experiment to study the effect of cutting height (25 and 50 cm) on the growth and productivity of ***Atriplex nummularia*** under different levels of water deficit and cutting height. Pooled data manifested that there were significant variations in fresh and dry fodder yields due to higher level of cutting; furthermore, more cutting height of 50 cm was favorable for obtaining more suitable recovery. Under rainfed conditions **Mikheil *et al*. (1999)** mentioned that the highest CP for ***Atriplex nummularia*** and ***Acacia saligna*** was obtained when the higher cutting height of 30 cm was adopted compared with the lowest level of 20 cm. **El-Hossini *et al*. (2002)** examined the fluctuations in chemical contents of ***Atriplex canescens*** in terms of CP, CF and ash content as affected by cutting seasons (winter- spring- summer-autumn) and three cutting height (25- 50 and 75 cm) in a field trial over two years. The obtained results revealed that cutting height treatments were of non significant effect on the former components with the exception of CF which significantly decreased at highest level of cutting (75 cm).

This work was adopted to investigate the effect of three irrigation intervals with brackish water and cutting height on the growth and forage yield as well as chemical content of ***Atriplex halimus*** under Wadi sudr conditions.

Materials and methods

A field experiment was conducted over two successive growing seasons (2009 and 2010) at Ras Sudr experimental station, Desert Research Center, South Sinai governorate.

Seed treatment Initially, seeds of ***A. halimus*** were collected from plants grown under natural condition of Wadi Sudr on October 2007, collected seeds were exposed to fluent tap water for 24 hours to remove the accumulated salts from their fruit bracts.

Seedlings preparation, treated seeds were sown on January 2008 in 8 x 12 x 25 cm polyethylene bags filled with 1:1 mixture of sand and clay soil under the greenhouse conditions. After complete emergence of seedlings, irrigation of beds continued with tap water.

Seedling establishment, Six months later, uniform and healthy seedlings were transplanted in the manured permanent site in holes of (50 x50 x 50 cm) with sheep dung at the rate of 0.02 m^3/hole. The experimental area (648 m^2) was divided into 2 m strips 2 m apart, three shrubs were settled per experimental unit of 12 m^2 size. All shrubs were regularly irrigated every 7 d until suitable shrub establishment.

Experimental treatments and layout, the experiment includes 6 treatments which were the combinations of three irrigation intervals (15- 30 and 45 d) and two cutting height (50 and 75 cm height). The treatments were distributed in split plot design with three replicates with main plots as irrigation intervals. The sub plots as cutting height. In this concern, it is illustrated below the chemical analysis of irrigation water, physical and chemical properties of the experimental soil.

Table 1- a. Chemical analysis of the irrigation water.

Well water		EC	Soluble anions (meg/l)				Soluble cations (meg/l)			
(ppm)	pH	Ds/m^2	Ca^-_3	HCO_3	SO_4	Cl^-	Ca^{++}	Mg^{++}	Na^+	K^+
3500	7.8	5.47	-	2.50	16.42	81.08	25.29	19.43	54.83	0.45

Table 1- b. Physical and chemical properties of the experimental soil.

Physical properties					
depth	Coarse sand (%)	Fine sand (%)	Silt (%)	Clay (%)	Class texture
0 - 30	54.51	25.88	8.24	11.15	Sandy loam
30 - 60	25.49	64.12	7.20	6.45	Sandy loam

chemical properties									
Depth	pH	EC	Soluble cations and anions (meq / L)						$CaCO_3$
			Na^+	K^+	Ca^{++}	MG^{++}	Cl^-	SO_4^{--}	%
0- 30	7.7	4.77	10.52	2.18	24.00	11.00	31.20	10.50	55.85
30- 60	7.4	4.16	17.80	0.097	16.83	6.00	22.50	16.10	51.21

Recorded Data

Growth and forage yield:

1- Plant height measured from the soil surface to the highest point of the plant canopy.

2- **Crown cover (CC)** $\mathbf{C = 1/4\ \pi\ D_1\ D_2}$

3- **Crown volume (CV)** $\mathbf{CV = 1/6\ \pi\ D_1\ D_2\ H}$

Crwon cover and Crown volume were measured according to **Thalen (1979)**.

Where D_1 D_2 are the perpendicular diameters and plant height (H).

4- The Leaf/stem (L/S) ratio which was given by dividing dry leaves/dry stems in the sample.
5- Fresh and dry forage yield were estimated in ton/fed. Enough samples of oven-dry shoots from each treatment were used for subsequent chemical analysis.

Chemical content:

1- Total carbohydrates were estimated using the phenol-sulfuric assay (**Chaplin** and **Kennedy 1994**).
2- Crude protein, total nitrogen was determined using micro-Kjeldahl method as described by **Peach and Tracey (1956)**. Crude protein was calculated by multiplying total nitrogen by 6.26 (**Tripathi *et al* 1971**)
3- Crude fiber and total ash were determined by using the method outlined by **A.O.A.C. (1980)**
4- Mineral content (K^{+1}- Na^{+1}) were assessed using flame photometer according to **Brown** and **Lililand (1964)**.

Statistical analysis

Data were subjected to the proper statistical analysis according to **Snedecor** and **Cochran (1982).** Least significance differences LSD at 0.05 probability was applied for comparing means.

Results and discussion

A- Effect of irrigation intervals on.
1- Growth traits and forage yield.

Results in **Table (2)** manifested that the mean of growth and forage yield performance of ***Atriplex halimus*** i.e. plant height, CC, CV, L/S ratio, fresh and dry forage yield significantly responded to different irrigation intervals at both cuts of 2009 and 2010 except CC in 2009 growing season. Variations between frequent irrigation (15 d) and the medium period 30 d were nonsignificant for most growth parameters and forage yield. This was true in both cuts of the 1st growing season (2009).

Table 2. Effect of irrigation intervals on growth traits and forage yield of *Atriplex halimus* at 1st and 2nd cuts in 2009 and 2010 growing seasons.

Traits	No. of cut	2009 Irrigation intervals (Days)			LSD 5%	2010 Irrigation intervals (Days)			LSD 5%
		15	30	45		15	30	45	
Plant height	1st	1.23	1.29	1.39	0.06	1.46	1.51	1.62	0.07
(m)	2nd	1.35	1.40	1.50	0.04	1.47	1.59	1.64	0.08
Crown cover									
(m2)	1st	1.80	1.97	2.18	0.23	1.78	2.45	3.12	0.32
	2nd	2.35	2.38	2.51	NS	2.27	2.65	3.63	0.93
Crown volume (m3)									
	1st	1.49	1.74	2.14	0.28	1.91	2.54	3.22	0.63
L/S ratio	2nd	2.05	2.26	2.51	0.18	2.71	2.86	3.65	0.28
FFY	1st	1.43	1.50	1.60	0.04	1.50	1.67	1.81	0.13
(ton/fed)	2nd	1.48	1.57	1.78	0.06	1.62	1.73	1.83	0.06
DFY	1st	2.35	2.36	2.55	0.14	3.70	3.89	4.10	0.23
(ton/fed)	2nd	3.01	3.57	3.84	0.16	3.66	3.44	3.79	0.38
	1st	0.70	0.74	0.83	0.08	1.26	1.34	1.36	NS
	2nd	0.99	1.21	1.26	0.05	1.26	1.49	1.48	0.10

FFY = Fresh forage yield, DFY = Dry forage yield, L/S = Leaf/stem ratio

However, as plants grow older (more than 2 years) increasing irrigation intervals up to 45 d led to significant increase in different growth traits as well as forage yield. Moreover, the L/S ratio was significantly affected with intervals between irrigation keeping elongated up to 45 d in both cuts of both growing seasons, being the percentage increase in fresh yield reached 21%, 31% as keeping intervals at 30 and 45 d, respectively and 18% in dry forage yield as keeping at 45 d. Such increases could be attributed to irrigation with saline water every 45 d under salt-affected soil led to diminish the salt accumulation around the root zone versus frequent ones (15 d) which increasing salt load around root zone.

Obtained results are in accordance with that obtained by **Abou-Deya (1995)** who studied the fresh and dry matter yields of ***Acacia Cyclops*** as affected by different irrigation intervals i.e. 10, 20, and 30 d. He reported that adult shrubs (over 2 years) produced the highest fresh and dry matter yields when the medium irrigation interval of 20 d was applied, Moreover, the 30 d intervals resulted in higher dry yield of ***Acacia*** shrubs in comparison with the interval of 10 d. Also, **Maraghni1 *et al*. (2011)** studied the influence of three levels of water deficit stress at 100, 70 and 40% at field capacity on dry matter production of ***Ziziphus lotus***. Results revealed that whole plant dry mass was successively reduced as plants were exposed to sever water deficit of 40%. However, the dry matter production of plants was 48% and 35% from that of the controls when treated with 70 and 40%, respectively.

2- Chemical content.

It is apparent from results presented in **Table (3)** that total carbohydrates and CP of ***Atriplex halimus*** insignificantly responded to different irrigation intervals at both cuts taken in both growing season Whereas, CF and ash content significantly decreased with extending irrigation intervals. However, iterating irrigation every 15 d led to significant build up of CF at all cuts taken except the 2nd cut of the 1st season (2009) and led to significant increase in ash content only in 2nd cuts of both growing seasons (2009- 2010). Moreover, the sole significant effect for mineral contents (K- Na) was exhibited in the 2nd cut of 2010 growing season, irrigation every 45 d led to increase in K^{+1}, decrease in Na^{+1} and increase in K/Na ratio of plant tissues.

These results may be due to that irrigation with saline water every 15 d increased salt level around the shrub root zone.

Table 3. Effect of irrigation intervals on chemical content of *Atriplex halimus* shoots at 1st and 2nd cuts in 2009 and 2010 growing seasons.

Traits	No. of cut	2009 Irrigation intervals (Days) 15	30	45	LSD 5%	2010 Irrigation intervals (Days) 15	30	45	LSD 5%
TC (%)	1st	30.4	30.5	31.9	NS	32.5	32.6	33.0	NS
	2nd	31.2	31.5	32.5	NS	32.9	33.2	33.6	NS
CP (%)	1st	13.4	13.0	13.8	NS	13.8	13.9	14.3	NS
	2nd	14.0	14.2	14.4	NS	13.9	14.3	15.0	NS
CF (%)	1st	22.1	20.3	20.4	0.80	24.0	23.2	22.7	0.51
	2nd	22.7	21.8	21.1	NS	25.2	23.7	22.2	1.26
Ash (%)	1st	23.6	21.9	21.8	NS	24.3	23.1	22.4	NS
	2nd	24.3	23.2	23.1	0.15	23.6	23.2	22.7	0.42
K^{+1} (meq/l)	1st	1.21	1.35	1.44	NS	1.56	1.78	1.61	NS
	2nd	1.24	1.28	1.35	NS	1.34	1.54	1.52	0.12
Na^{+1} (meq/l)	1st	9.15	9.10	9.06	NS	8.42	8.41	6.48	NS
	2nd	8.41	8.48	8.33	NS	9.10	8.33	8.26	0.43
K/Na	1st	0.14	0.15	0.17	NS	0.22	0.21	0.25	NS
	2nd	0.13	0.14	0.16	NS	0.15	0.18	0.19	0.02

TC = Total Carbohydrates, CP = Crude Protein, CF = Crude Fiber.

These results are in harmony with that obtained by **Khalifa (1996)** who studied chemical content of two halophytic fodder species (***Atriplex canescens*** and ***Acacia saligna***) under different irrigation intervals (10- 20- 30 d). He mentioned that irrigation interval was of non-significant effect on CP, ash and CF during summer and winter seasons. Whereas, total carbohydrates were positively affected with prolonged water intervals up to 30 d. Furthermore, **Abd El-hafez (2005)** mentioned that the fluctuations in chemical content (CP, CF and Ash) of four ***Atriplex*** species (***A. nummularia, A. leucoclada, A. canescens and A. lentiformis***) did not reach the significant levels with extending irrigation intervals to 30 d.

B- Effect of cutting height on

1- Growth traits and forage yield.

Results in **Table (4)** manifested the effect of cutting height on growth traits of ***Atriplex halimus***. Results illustrated that there were insignificant increments in growth parameters as a result of raising cutting height from 50 to 75 cm from the soil surface. Raising cutting height from 50 to 75 cm did not significantly affect plant height except of, the 2nd cut of 2010 growing season. However, the 75 cutting level led to slight significant increase in plant height of 5 % compared with the low level of 50 cm. Regarding the influence of cutting height on CC and CV, results in the table illustrated that cutting at 75 cm led to significant differences in the previous traits only in the 2nd cut of the 1st season for CC and 2nd season for CV. However, data showed as plant grow older the compactness of the shrub canopy increased due to build up the level of cutting height up to 75 cm. Furthermore, the agronomic character L/S ratio was significantly promoted as a result of increasing cutting height from 50 up to 75 cm in both cuts of both growing seasons instead of the 1st cut of the 2nd growing season. Cutting height had no significant effect on dry forge yield at all cuts and fresh forge yield except the 1st and 2nd cuts of 2010 season. Whereas, maximum fresh forage production (4.45 ton/fed) occurred when the higher level of cutting (75 cm) was adopted. This may be attributed to that cutting stimulated the growth of lateral buds at the lower nodes of the stems and encouraged the formation of new branches on the stump which contain a large number of nodes and lateral buds in case of higher cutting. These results are in accordance with that elucidated by **Maybodi *et al.* (2006)** who mentioned that raising cutting height to 60 cm was favorable for most growth traits of ***Atriplex lentiformis***.

Table 4. Effect of cutting height on growth traits and forage yield of *Atriplex halimus* at 1st and 2nd cuts in 2009 and 2010 growing seasons.

Traits	No. of cut	2009 Cutting height (cm)		LSD 5%	2010 Cutting height (cm)		LSD 5%
		50	75		50	75	
Plant height (m)	1st	1.3	1.31	NS	1.51	1.55	NS
	2nd	1.41	1.43	NS	1.52	1.61	0.05
Crown cover (m2)	1st	1.99	1.98	NS	2.35	2.56	NS
	2nd	2.36	2.47	0.11	2.78	2.91	NS
Crown volume (m3)	1st	1.78	1.80	NS	2.43	2.69	NS
	2nd	2.22	2.32	NS	2.95	3.20	0.18
L/S ratio	1st	1.47	1.55	0.04	1.64	0.68	NS
	2nd	1.58	1.63	0.03	1.70	1.75	0.03
FFY (ton/fed)	1st	2.43	2.41	NS	3.77	4.02	0.17
	2nd	3.45	3.50	NS	4.15	4.45	0.09
DFY (ton/fed)	1st	0.75	0.76	NS	1.30	1.33	NS
	2nd	1.14	1.16	NS	1.39	1.42	NS

FFY = Fresh forage yield, DFY = Dry forage yield, L/S = Leaf/stem ratio

2- Chemical content.

Regarding the effect of cutting height on chemical content, results in **Table (5)** showed that there was significant increase in CP as raising height of cutting (75 cm) only in the 2nd cuts of both growing season. Whereas, cutting at 75 cm led to significant decrease in CF content at all cuts taken throughout this experiment. However, the vice versa was true for ash content except the 2nd cut of the 1st season of growth (2009). Whereas, total carbohydrates, mineral content (K^{+1}, Na^{+1} and K/Na) did not significantly respond to any level of cutting height throughout this work. These results are in accordance with that revealed by **Mikheil *et al*. (1999)** who mentioned that the highest CP for ***Atriplex nummularia*** and ***Acacia saligna*** was obtained when cutting was operated at 30 cm compared with 20 cm cutting height. **El-Hossini *et al.* (2002)** examined the fluctuations in chemical contents of ***Atriplex canescens*** in terms of CP, CF and ash content as affected by cutting season (winter- spring- summer- autumn) and three cutting heights (25- 50 and 75 cm above). The obtained results revealed that cutting height treatments were of non significant effect on the former components with an exception of CF which significantly decreased with the highest level of cutting (75 cm).

C- Interaction effects.

Data in **Table (6)** elucidated the interaction effects between irrigation intervals (15– 30 and 45 d) and cutting height (50 and 75 cm) on the agronomic traits of ***Atriplex halimus*** (CC- CV- fresh forage yield- K/Na ratio) during (2009 and 2010) growing seasons.

It is clear that the interaction was significant at the 2nd cut of the 2nd growing season of 2010 for CC and

K/Na ratio whereas, the highest value of CC and K/Na ratio were obtained at 75 cm cutting height and the irrigation interval of 45 d. Whereas, the shortest level of coverage and K/Na ratio were noticed at 50 cm cutting height and iterating irrigation of 15 d.

Table 5. Effect of cutting height on chemical content of *Atriplex halimus* shoots at 1st and 2nd cuts in 2009 and 2010 growing seasons.

Traits	No. of cut	2009 Cutting height (cm)		LSD 5%	2010 Cutting height (cm)		LSD 5%
		50	75		50	75	
TC	1st	30.7	31.2	NS	32.6	32.8	NS
(%)	2nd	31.4	31.8	NS	33.2	33.3	NS
CP	1st	13.6	13.4	NS	13.9	14.1	NS
(%)	2nd	13.9	14.5	0.32	14.2	14.8	0.26
CF	1st	21.2	20.7	0.36	23.7	22.8	0.26
(%)	2nd	22.3	21.4	0.30	24.1	23.3	0.36
Ash	1st	22.6	22.3	NS	23.4	23.1	NS
(%)	2nd	23.9	23.2	0.36	23.3	23.0	NS
K^{+1}	1st	1.32	1.35	NS	1.50	1.60	NS
(meq/l)	2nd	1.27	1.32	NS	1.45	1.49	NS
Na^{+1}	1st	9.10	9.13	NS	7.51	8.03	NS
(meq/l)	2nd	8.55	8.27	NS	8.76	8.35	NS
K/Na	1st	0.14	0.15	NS	0.23	0.22	NS
	2nd	0.15	0.16	NS	0.17	0.18	NS

TC = Total Carbohydrates, CP = Crude Protein, CF = Crude Fiber.

Table 6. Effect of interaction between irrigation intervals and cutting height on crown cover, crown volume, fresh forage yield and K/Na ratio of *Atriplex halimus* at 1st and 2nd cuts in 2009 and 2010 growing seasons**.**

Irrigation intervals(days)	Cutting height (cm)	No. of cut	CC (m^2)	CV (m^3)	FFY (ton/fed)	K/Na ratio
15	50		-	-	2.49	-
	75		-	-	2.20	-
30	50	1st cut	-	-	2.32	-
	75	2009	-	-	2.40	-
45	50		-	-	2.48	-
	75		-	-	2.62	-
LSD 5%					0.22	
15	50		-	2.11	-	-
	75		-	1.99	-	-
30	50	2nd cut	-	2.13	-	-
	75	2009	-	2.39	-	-
45	50		-	2.44	-	-
	75		-	2.58	-	-
LSD 5%				0.19		
15	50		-	-	-	-
	75		-	-	-	-
30	50	1st cut	-	-	-	-
	75	2010	-	-	-	-
45	50		-	-	-	-
	75		-	-	-	-
LSD 5%						
15	50		2.45	2.76	3.61	0.16
	75		2.08	2.67	3.71	0.15
30	50	2nd cut	2.63	2.72	4.37	0.18
	75	2010	2.67	3.01	4.52	0.19
45	50		3.26	3.37	4.47	0.17
	75		3.99	3.93	5.12	0.21
LSD 5%			0.48	0.30	0.16	0.05

FFY = Fresh forage yield, CC = crown cover, CV = crown volume

Furthermore, the CV trait was affected the interaction only in the 2nd cuts of both growing seasons. The highest compactness of the shrub canopy was obtained when shrubs were cut at the higher level of 75 cm and irrigated every 45 d but the low compact canopy was achieved at frequent irrigation of 15 d and/or the medium ones of 30 d at any level of cutting height.

Moreover, data in **Table (6)** manifested that interaction did not affect the fresh forage yield except in the 1st and 4th cuts. However, the greatest fresh yield was recorded when shrubs irrigated every 45 d intervals and cutting at 75 cm, whereas, the lowest fresh yield was obtained at frequent irrigation of 15 and/or 30 d at any level of cutting height.

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الملخص العربى

القدرة الإنتاجية العلفية لنبات القطف الملحى تحت ظروف الإجهاد بجنوب سيناء

احمد رشدى محمد [1] , فاضل طلبة الشيخ[1] , الحسينى توفيق كشك[2] و اسامة محروس عبد الحفيظ [2]
[1] كلية الزراعة بمشتهر جامعة بنها [2] مركز بحوث الصحراء

أجريت تجربة حقلية لمدة عامين (2009– 2010) بمحطة بحوث رأس سدر بمحافظة جنوب سيناء لدراسة تأثير ثلاث فترات للرى (15 –30– 45 يوم) و ارتفاعين للحش (50– 75 سم) على صفات النمو والإنتاجية العلفية الغضة والجافة والمحتوي الكيميائي لنبات القطف الملحي وكانت أهم النتائج ما يلى:

1– أدى زيادة فترات الرى بمياة تركيز الملوحة بها 3000 جزء فى المليون من 15 إلي 45 يوم إلي زيادة معنوية لصفات النمو (إرتفاع الشجيرة – الغطاء التاجي – الحجم التاجي – نسبة الأوراق إلي السيقان) وكذلك الإنتاجية العلفية الغاضة والجافة في الحشات التى تم الحصول عليها خلال سنتي الدراسةعدا الغطاء التاجى فى الموسم الاول.

2– وصلت نسبة الألياف الخام والرماد الكلى إلي أعلى قيم عندما كانت تروى النباتات رياً متكرراً (15 يوم) في حين لم تصل تلك الفروق إلي حدود المعنوية لمحتوي النبات من البروتين الخام والكربوهيدرات الكلية وكذلك محتوي النبات من الصوديوم والبوتاسيوم بينما نسبة البوتاسيوم / الصوديوم لم تصل إلي حد المعنوية إلا في الحشة الثانية من الموسم الزراعي الثاني (2010).

3– معظم صفات النمو لم تستجب معنوياً الى ارتفاع الحش وكذلك الإنتاجية العلفية الجافة بينما وصلت أعلى إنتاجية علفية لنبات القطف عند حشة على ارتفاع 75 سم من سطح الأرض.

4– أدت زيادة ارتفاع الحش إلي 75سم إلي زيادة معنوية في محتوي النبات من البروتين الخام نقص معنوي في الألياف الخام والرماد الكلى ولكن لم تصل تلك الفروق إلي حد المعنوية لمحتوي النبات من الكربوهيدرات والصوديوم والبوتاسيوم ونسبة البوتاسيوم إلي الصوديوم.

5– أدى التفاعل بين فترات الري وارتفاع الحش إلي حدوث تأثير معنوي للغطاء التاجي والحجم التاجي ونسبة البوتاسيوم / الصوديوم في الحشات الثانية من الموسمين الزراعيين (2009–2010) حيث وصلت أعلى إنتاجية علفية غضة عندما كانت تروى تلك النباتات كل 45 يوم وتحش على ارتفاع 75سم من سطح الارض.