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THE SUITABLE CLIPPING TIME FOR SALTBUSH (*ATRIPLEX NUMMULARIA* L.) GROWN UNDER RAINFED CONDITIONS OF THE NORTH WEST COAST OF EGYPT

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ABSTRACT

Three on-farm trials were carried out under rainfed conditions at Ras El-Hekma (10 km inland), 56 Km east of Marsa Matrouh at the North west coast of Egypt, during three rainfall years (2005, 2006 and 2007). This study aimed to define the suitable clipping time for saltbush, to obtain the highest forage production with a good quality. Therefore, eight clipping time treatments were tried. Where, saltbush shrubs were clipped once every year, but at different times, i.e., on mid of each of May, June, July, Aug., Sept., Oct., Nov. and Dec. The obtained results cleared that the clipping times of May and June produced higher fresh and dry forage yields. However, dry matter content was increased significantly with the proceeding from May up to Nov., then it was decreased on Dec. Nevertheless, the early three clipping times could be maximized Scandinavian feed units (SFUs)/ ha. Meanwhile, clipping on May and June produced higher edible forage compared to the other treatments, where values of SFU were decreased with each delay in clipping time up to the end of year. Also, there were sharp decrease in crude protein (CP) content and increase in crude fiber (CF) content with the delay in clipping times, particularly when shrubs were exposed to drought through dry months. Meantime, the clipping times which attained the highest soluble carbohydrate (SC) content i.e. the clipping on Oct. also had the lowest CP % while, the lowest SC % clipping treatment i.e. clipping on Dec. attained the highest CF % with relatively higher CP %. However, clipping on May produced higher crude protein yield than the other clipping times overall years, where the decreases of this yield became more severe with the decreases in dry forage yield and CP %. Meantime, the higher intake of CP was recorded when clipping was applied on May or June only in the two first years. In general, clipping on mid May or mid June are could be produced higher fresh forage yield with good quality. This was more pronounced in years of a low rainfall, but, it may be extended to mid July in the years of a high rainfall.

Keywords: **Saltbush shrub, clipping, crude protein, crude fibers, crude protein intake scandivaian feed units, rainfed conditions.**

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INTRODUCTION

The Northwest coastal (NWC) zone of Egypt extends about 500 km from west of Alexandria to the Egyptian - Libyan border. Like most dryland regions, this area possesses a meagre natural resource base. The average annual rainfall during last 10 years is 140 mm. The total arable land is about 16% of the forementioned total area. Approximately 48% of that area is rangelands, while, 35% is barren lands, which facilitates water catchments and generates run-offs (document 870 of Matrouh Resources Management Project "MRMP", 2002). The formerly nomadic Bedouin agro pastoralist inhabitants of the region commenced sedenterlization approximately fifty years ago. Sheep and goat populations have increased substantially over time (about 627,000 small ruminants mainly sheep, and goats) and opportunistic barley cultivation has encroached on formerly productive rangeland. The region faces many of the challenges found in similar dryland areas of the Middle East, concerning, how to reverse environmental degradation and manage the natural resource base, whilst providing sustainable livelihoods for inhabitants. Heavy grazing pressure on natural forage resources has increased and led to deterioration in nature vegetation. Since largely, livestock still the main source of Bedouin's income, establishment and conservation of rainfed forage crops, especially barley is an important way to overcome feeding gap (Moselhy, 2001). Watts and El-Mourid (1988), cited that, the main feeding resources in the arid regions are cereal residues including straw and field stubbles. However, continuous conventional cultivation of barley led to native plant resources deterioration and soil surface exposes to wind erosion. In addition, heavy grazing by small ruminants on field stubble and fallen spikes after harvest of barley has provided these animals with unbalanced nutritive diet and increased erosion problem during the dry summer season.

Annuals has the potential to provide greatest dry matter production, it is stressed that this is not the most important factor in driving agriculture production especially in areas with a highly variable and fluctuated seasonal rainfall pattern. Similarly, monocultures are not the most desirable systems to optimize production and there is a need to consider total feed supply and quality for the whole year. The concept of using forage shrubs as a drought feed has largely failed due to the inappropriate diet supply and difficulties in management (De Koning and Milthorpe, 2008). On the other hand, Le Houerou (2000) suggests planting a corner of each

paddock so it can be easily fenced and managed. In addition, forage shrub areas can be used to spell pasture paddocks particularly at the break of season to give new or regenerating pastures a chance to establish (Atiq-ur-Rehman, 2002 and Milthorpe *et al*., 2001)

It was noticeable that, new adapted plant materials were introduced to that area through MRMP project activities. The main reasons were, to fill the feed gap-grazing animals as a protein source supply, improve forage quality and protect soil surface against the detrimental effects of wind erosion and other environmental stress. One example is old man saltbush (*Atriplex nummularia* L.). Under the drought stress conditions, saltbush shrubs are used once per year throughout cutting or direct browsing. Saltbush species are growing under 100-400 mm rainfall and produce one to three tons dry matter/ ha /year (Sankary 1986). There are some studies conducted on introduced fodder shrubs were devoted to production and water use efficiency under rainfed conditions. Moselhy (2001), showed that, dry matter yield of interplanted saltbush with barley increased by increasing shrub population under rainfed conditions. Moreover, saltbush (*Atriplex nummularia* L.) had high crude protein content and high fresh yield, these characters give it a high priority for rangeland improvement and soil conservation (Tag El Din and Al-Sheikh, 1995). Furthermore, Fodder shrubs are major components of arid and semi-arid rangelands throughout the world and are important forage resources for domestic animals. Saltbush has evolved and adapted to the harsh environmental conditions, where, water supply is the limiting factor in such areas. Browsing is considered important in low rainfall areas as a reserve feed in times of drought (Wilson, 1969).

The main objective of this study was to define the suitable clipping time for saltbush, to produce the highest forage production with a good quality.

MATERIALS AND METHODS

Three on-farm trials were carried out under rainfed conditions at Ras El-Hekma (10 km inland), 56 Km east of Marsa Matrouh, NWC of Egypt, during three rainfall years (2005, 2006 and 2007). This study aimed to define the suitable clipping time for saltbush, to achieve the highest forage production with a good quality. Therefore, eight clipping time treatments were tried. Where, saltbush shrubs were clipped once every year, but at different times i.e. on mid of each of May, June,

July, Aug., Sept., Oct., Nov. and Dec.

The seedlings of saltbush (*Atriplex nummularia* L.) were nursed by Matrouh Resources Management Project (MRMP) during April, 2003, then transplanted with the onset of effective rain on Dec, 11th of the same season. Long furrows perpendicular to the land slope were made by using ditcher. Seven months old saltbush seedlings of 35 cm height were transplanted at intensive populations (1018 shrub/ ha) in rows 5 m apart with 2 m within each row. Survival saltbush shrubs were accounted during April, 2004 and treatments were started on mide May of the same year.

The average recorded rainfall of the last ten -years in the NWC was 140 mm/year (.Documents of MRMP) However, the amount and distributions of rainfall during the on-farm trials are shown in Table 1. The amount of rainfall in each year was less than the general average excep the latter year.

The soil of the on-farm trials was sandy-loam in texture, calcareous with a shallow profile (Galda in Bedouin terminology). It has 0.021-0.023 % available nitrogen, 20-22 ppm phosphorous and high Ca Co_3 content (23-26 %). The EC of soil ranged between 0.27 to 0.29 m mhos/cm.

The experiments were laid out in a randomized complete block design with six replicates. The plot size was 300 m^2 (15 m width x 20 m long) and each plot included 30 shrubs which resulted from three rows of shrubs/ plot with 10 shrubs/ row.

At time of each clipping treatment every year, shrubs of each plot were used to determine forage yield. Saltbush shrubs were clipped on 35 cm height form soil surface. The clipped fresh forage from each plot was fed to a group of 5 Barqi sheep to determine the edible forage. Five saltbush shrubs from each plot were labeled to estimate the forage quality, where, five samples of fresh forage were taken and washed with distilled water, oven dried at 65 ^{o}C and milled through 1 mm mesh sieve and stored in sealed jars for chemical analysis. The samples were analyzed to determine the dry matter (DM %), crude fiber (CF %) and crude protein (CP %). DM % was calculated from fresh sub-samples of approximately 200 gm dried at 65 ^{o}C and weighed. Crude protein (N x 6.25) was determined by AOAC method (1980). Fiber % was determine according to the procedure

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RESULTS AND DISCUSSION

Forage Yields

Fresh forage yield

As shown in Table 2, results of different years clearly indicated that the clipping times of May and June produced similar and higher fresh forage yield than the other clipping treatments followed by clipping on July. However, the differences in fresh forage yield between Aug. and Dec. clippings did not reach to the level of significance over different years, clipping of Dec. surpassed the rest clipping times (Sept., Oct. and Nov.) in fresh forage yield overall years. Certainly, saltbush shrubs of Sept., Oct. and Nov. clippings were prone to the detrimental effects of drought during the hot and dry summer months. It was noticed that the exposure to drought accelerated the dropping of old leaves and curtailed the growth of new organs. Whereas, the prevailing of mild temperature and the onset of rainfall precipitation through the autumn months has been mitigate the unfavorable effects of drought. Consequently, a somewhat recovery in growth of new twigs and leaves was induced as reflected in fresh forage yield of Dec. clipping time. These results are agreed with those obtained by Sankary 1986; Mikhiel *et al*, 1999 and Moselhy, 2001.

Dry forage yield

Data illustrated in Fig. 1 generally demonstrated that there were a significant increases in dry matter (DM) content of forage with the advancing in shrub age through the year and this was more pronounced with the exposure to the detrimental effects of drought up to Nov clipping. But, with the recovery in growth after rainfall precipitation in late months of autumn Table 1, dry matter content of Dec. clipping, in turn, was decreased to be a comparable with that of Oct. clipping time. However, the increases in dry matter content failed to compensate the decreases in forage production due to delaying clipping time, but, with few exceptions, as obvious from results of dry forage yield presented in Table 3. Accordingly, the early three clipping times in different years, as well as, the late clipping times in the first two years could be maximized dry forage production. Like as in fresh forage yield Table 2, results reflected that the dry forage yields of late

Table 1. Monthly rainfall precipitation (mm) during the three years of the study.

Season	Month						Total
	Oct.	Nov.	Dec.	Jan.	Feb.	March	
2004/2005	17.4	25.4	42.7	36.5	0	0	122
2005/2006	7.6	32.9	34.2	33.5	5	0	113.2
2006/2007	0.0	33.5	22.6	31	33	20	140.1

Table 2. Fresh forage yields (t/ ha) of saltbush as affected by clipping times during 2005, 2006 and 2007 years

Clipping times	Fresh forage yields (t/ ha)		
	2005	2006	2007
May	3.369 a	3.425 a	3.654 a
June	3.239 a	3.298 a	3.511 a
July	3.025 b	3.138 b	3.325 b
Aug.	2.830 cd	2.873 cd	3.035 cd
Sept.	2.658 de	2.734 e	2.865de
Oct.	2.530 e	2.595 f	2.684 ef
Nov.	2.693 de	2.748 de	2.800 f
Dec.	2.994 bc	2.901 c	3.124 c
F. test	**	**	**

**: significant at 0.01 level of probability.
Mean values followed by the similar letter are not significant different at $P < 0.05$.

summer and early autumn months were also prone to the detrimental effects of drought.

Scandinavian Feed Units (SFUs)

Typically as in dry forage yield, data presented in Table 4, clearly indicated that the early three clipping times in the different years, as well as, the late ones in the first two years could be maximized SFUs values/ ha. The obtained results also stressed that the exposure to severe drought during the late summer and early autumn clippings significantly decreased SFUs/ ha over the different years.

Edible Forage Yield

As illustrated graphically in Fig. 2, it is evident that the clipping of May and June ensured statistically equal and higher edible forage percentage compared to the other clipping times. This percentage was decreased consistently with each month delay in clipping time up to the end of the year i.e. the edible forage percentage become constant with the prevailing of mild temperature and the onset of rainfall precipitation during autumn clippings.

In similarity with fresh forage yield Table 2 and edible forage percentage Fig. 2, results in Table 5 generally, exhibited that clipping of May and June gave the maximum amount of edible forage followed by clipping on July, then the clipping on Aug. without significance with clipping on Dec. of the three years. In the different years, clippings of Sept., Nov. and Dec. gave a comparable amount of edible forage. But, clipping on Dec. outyielded those of Oct. in edible forage amount overall years. This was also the case in comparison between Sept. and Oct. clipping infavor of the first one. In regarding of saltbush use in animal feeding, these results were harmony with those obtained by El-Shaer and Kandil 1990; El-Shaer 1995 and Mikhiel *et al*, 1999.

Chemical Contents of Forage

Crude protein content (CP%)

As shown in Table 6, it is evident that in most cases the crude protein content on the dry matter base was decreased gradually with the saltbush shrubs age. In other words, the present results showed sharp decrease in crude protein content of forage with the delay in clipping time

Table 3. Dry forage yields (t/ ha) of saltbush as affected by clipping times during 2005, 2006 and 2007 years

Clipping times	Dry forage yields (t/ ha)		
	2005	2006	2007
May	0.803 a	0.784 ab	0.893 a
June	0.792 a	0.792 a	0.887 ab
July	0.766 ab	0.770 ab	0.855 ab
Aug.	0.734 bc	0.727 cd	0.796 cd
Sept.	0.710 cd	0.710 cd	0.768 de
Oct.	0.685 d	0.689 d	0.734 e
Nov.	0.734 bc	0.746 bc	0.773 de
Dec.	0.809 a	0.775 ab	0.842 bc
F. test	**	**	**

**: significant at 0.01 level of probability.
Mean values followed by the similar letter are not significant different at P < 0.05.

Table 4. Scandinavian feed units (FUs) yield/ ha as affected by clipping times during 2005, 2006 and 2007 years

Clipping times	SFUs/ ha		
	2005	2006	2007
May	361.3 a	352.7 ab	401.7 a
June	356.5 a	356.2 a	398.9 ab
July	344.5 ab	346.7 ab	384.6 ab
Aug.	330.4 bc	327.1 cd	358.1 cd
Sept.	319.4 cd	319.5 cd	345.5 de
Oct.	308.2 d	310.0 d	330.5 e
Nov.	330.2 bc	335.6 bc	347.7 de
Dec.	364.1 a	348.9 ab	378.9 bc
F. test	**	**	**

**: significant at 0.01 level of probability.
Mean values followed by the similar letter are not significant different at P < 0.05.

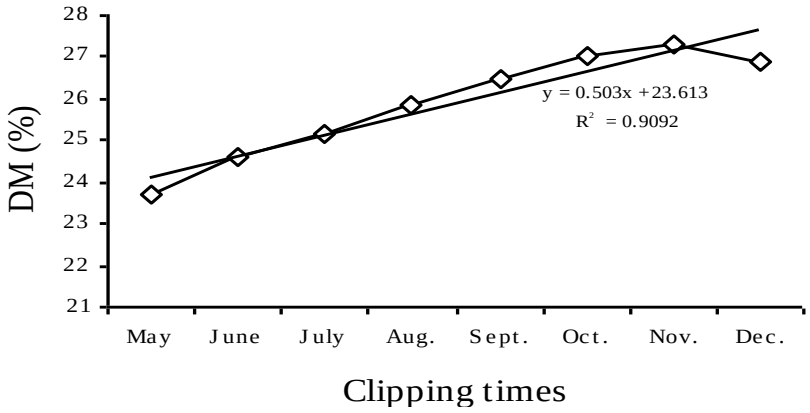

Fig. 1. Average of dry matter (DM)% as affected by different clipping times.

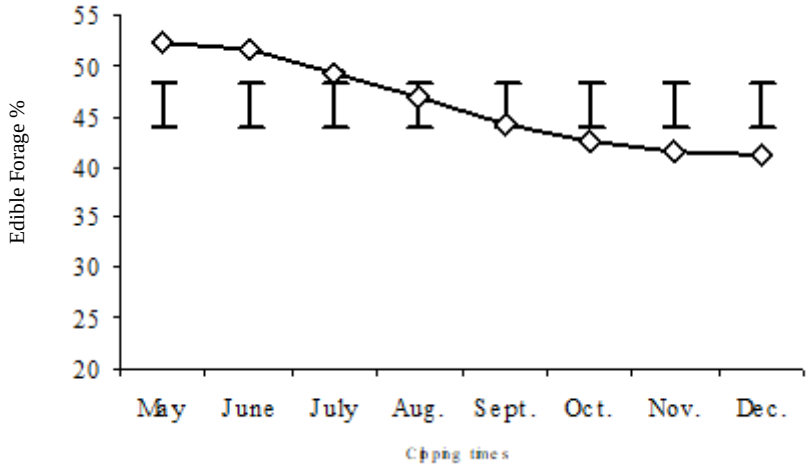

Fig 2. Average of edible for age (%) as affected by different clipping times

Table 5. Effect of clipping times on edible forage (Kg/ ha) in the 2005, 2006 and 2007 years

Clipping times	Edible forage (Kg/ ha)		
	2005	2006	2007
May	414.6 ab	390.9 a	494.7 a
June	426.5 a	379.5 a	468.4 a
July	391.4 bc	353.6 b	431.0 b
Aug.	359.4 cd	314.8 c	383.1 c
Sept.	326.3def	290.7 d	349.6 d
Oct.	304.9 f	270.8 e	318.5 e
Nov.	320.4 ef	287.7 de	328.6 de
Dec.	349.6 de	301.2 cd	352.6 d
F. test	**	**	**

**: significant at 0.01 level of probability.

Mean values followed by the similar letter are not significant different at $P < 0.05$.

Table 6. Effect of clipping times on crude protein content (%) during 2005, 2006 and 2007 years

Clipping times	Crude protein content (%)		
	2005	2006	2007
May	17.80 a	17.20 a	19.93 a
June	17.15 b	16.88 ab	19.13 b
July	16.78 b	16.45 b	18.47 c
Aug.	16.20 c	15.88 c	17.97 c
Sept.	15.73 cd	15.33 cd	17.43 d
Oct.	15.13 e	15.05 d	16.90 e
Nov.	15.50 de	14.90 d	16.63 e
Dec.	15.78 cd	15.28 d	17.10 e
F. test	**	**	**

**: significant at 0.01 level of probability.

Mean values followed by the similar letter are not significant different at $P < 0.05$.

especially when saltbush shrubs were exposed to drought through the hot and dry months of the year. Therefore, the highest CP percentages were recorded with clipping on May overall years, followed by clipping on June or July. In this respect, Tag El Din and Al-Sheikh, 1995) found that, saltbush (*Atriplex nummularia* L.) had high crude protein content and high fresh yield, these characters give it a high priority for rangeland improvement and soil conservation.

Crude fiber content (CF %)

As presented in Table 7, results of different years exhibited that the crude fiber content of saltbush forage were increased with the delay in clipping time from May to Aug then further gradual significant increases in CF % were also induced with each month delay in clipping time from Aug up to Dec in the first two years, but, up to Nov in the third year, which was received the high amount of rainfall. It can be concluded that there is a contradadictory relationship between crude protein and crude fiber contents, but with some exceptions, especially in late clippings. Where, a relative increase in crude protein content was also observed with the resume in growth of new leaves at late clipping time Table 6, which recorded the highest values of crude fiber. El-Shatnawi and Mohawesh (2000) found that leaves of saltbush had relatively higher concentration of crude protein and nitrogen free extract during the period from February to April. Crude protein of leaves reached to its maximum in March. However, the concentration decreased to 15 % during the dry period from June to Oct. But, fiber content of leaves was lowest during Feb and March and reached to its maximum values during Aug and Oct.

Soluble carbohydrate content

Results of different years presented in Table 8, showed that the clipping on Oct had the highest soluble carbohydrate content followed by the clipping on Sept, then the clipping on May followed by the clipping on Aug. of the three years. However, the clipping on Dec recorded the lowest soluble carbohydrate content. It is worth to note that the plants attained the highest soluble carbohydrate % contained the lowest crude protein content. The reverse was not true in the case of the lowest soluble carbohydrate content, which was the highest crude fiber content

Table 7. Crude fiber content (%) as affected by clipping dates during the three years

Clipping times	Crude fiber content (%)		
	2005	2006	2007
May	14.95 f	13.73 f	16.67 e
June	15.35 f	14.10 ef	17.03 de
July	15.78 f	14.50 ef	17.33 de
Aug.	17.08 e	15.08 e	17.97 d
Sept.	18.70 d	16.80 d	19.43 c
Oct.	19.70 c	18.43 c	21.17 b
Nov.	21.28 b	20.10 b	23.13 a
Dec.	22.40 a	21.60 a	24.57 a
F. test	**	**	**

**: significant at 0.01 level of probability.
Mean values followed by the similar letter are not significant different at $P < 0.05$.

Table 8. Soluble carbohydrate content (%) as affected by clipping times in the three years

Clipping times	Soluble carbohydrate content (%)		
	2005	2006	2007
May	29.35 c	28.14 c	29.85 c
June	27.15 e	26.50 e	27.65 e
July	27.32 e	27.31 d	27.96 e
Aug.	28.30 d	27.75 d	28.76 d
Sept.	30.55 b	28.87 b	31.11 b
Oct.	31.65 a	30.55 a	32.55 a
Nov.	26.54 f	26.33 e	27.12 f
Dec.	22.30 g	21.12 f	23.50 g
F. test	**	**	**

**: significant at 0.01 level of probability.
Mean values followed by the similar letter are not significant different at $P < 0.05$.

Table 7 with relatively higher crude protein content Table 6.

Crude Protein Yield and Intake

Crude protein yield

Data presented in Table 9, demonstrated that clipping of May produced higher crude protein yields than the rest clipping times in the different years. It is conspicuous that the decreases in crude protein yield become more severe with the decreases in dry forage yield and crude protein content due to the exposure to hot and dry weather in the late summer and early autumn months, before the regrowth of new twigs and leaves, which caused a relative increases in dry forage yield, crude protein content and hence crude protein yield of Dec clipping time. These results are in harmony with those obtained under the conditions of the NWC of Egypt by Mikhiel et al, 1999.

Crude protein intake (Kg/ ha)

As shown in Table 10, crude protein intake by sheep for May clipping overestimated those of the rest clipping times except June clipping only in the first two years, where, the differences between both times were not significant. However, the obtained data evident that the crude protein intake was decreased gradually with the delay in clipping time up to Oct. Also, it is observed that the intake of crude protein was not altered with the proceeding from Oct to Nov clipping time. But, it was tuned to increase with the proceeding to Dec clipping time. Even though, the crude protein intake in Dec clipping was comparable to that of Sept one. The advantages in crude protein intake at Dec clipping was in accordance with the regrowth of new organs and the relative increase in edible dry forage and crude protein yield (Tables 3 and 9, respectively). El-Shaer, 1995 reported that the stage of growth and maturity considerably affect the nutritive value, palatability and utilization of *Atriplex* species.

Table 9. Crude protein yield (Kg/ ha) as affected by clipping times overall three years

Clipping times	Crude protein yield (Kg/ ha)		
	2005	2006	2007
May	143.5 a	134.7 a	166.3 a
June	136.6 b	133.4 a	158.4 a
July	128.9 c	126.5 ab	146.4 b
Aug.	119.4 d	115.1 cd	133.1 c
Sept.	112.0 e	108.6 de	123.7 d
Oct.	104.0 f	103.4 e	115.1 d
Nov.	114.9 de	111.7de	119.2 d
Dec.	129.4 c	119.5 bc	132.7 c
F. test	**	**	**

**: significant at 0.01 level of probability.
Mean values followed by the similar letter are not significant different at $P < 0.05$.

Table 10. Crude protein intake (Kg/ ha) as affected by clipping times overall three years

Clipping times	Crude protein intake (Kg/ ha)		
	2005	2006	2007
May	73.9 a	67.3 a	92.3 a
June	73.7 a	64.0 a	83.7 b
July	66.1 b	58.1 b	73.9 c
Aug.	58.5 c	50.0 c	64.1 d
Sept.	51.6 de	44.5 de	56.3 e
Oct.	46.3 e	40.8 f	49.9 f
Nov.	50.2 de	43.2 ef	50.8 ef
Dec.	55.9 cd	46.5 d	55.7 e
F. test	**	**	**

**: significant at 0.01 level of probability.
Mean values followed by the similar letter are not significant different at $P < 0.05$.

CONCLUSION

Results of the present study clearly indicated that the clipping times of May and June produced higher fresh and dry forage yields. However, DM content increased significantly with the proceeding in clippings from May up to Nov., and then it was returned to decline on Dec due to regrowth after rainfall precipitation. Meantime, the early three clipping times in the different years could be maximized SFUs/ ha. In the different rainfall years, clipping on May and June ensured higher percentage and amount of edible forage compared to other treatments and these values were decreased with each delay clipping time up to the end of year. While, it is evident that there were sharp decrease in crude protein (CP) content and increase in crude fiber (CF) content with the delay in clipping times, especially when shrubs were exposed to drought through dry months.

It can be concluded that clipping of saltbush shrubs on mid May or mid June are the suitable times to securing high forage production with good quality, particularly in the low rainfall years and may be extended to mid July in the case of high rainfall years. In the above mentioned times, there no available other green forage such as saltbush shrubs under the conditions of the NWC area. Generally, saltbush can serve as a dietary supplement and provide important nutritional component such as protein when this component is less than the adequate in the other available forage under the adverse environmental conditions at the NWC of Egypt.

REFERENCES

AOAC. 1980. Official Methods of Analysis. 13th (ed.). Washington, D.C.: Association of Official Analytical Chemists, 1980.

Atiq-ur-Rehman. 2002. Role of saltbush (Atriplex spp.) in animal production systems of Mediterranean climate. Prospects for Saline Agriculture, 37: 385-401.

De Koning, C. and P. Milthorpe. 2008. "Integrating Forage Shrubs"- their potential in mixed-farming enterprises in low rainfall regions. An Australian Government Initiative, Publication No. 08/044, Project No. SAR-51A., 1-58.

El-Shaer, H. M. 1995. Potential use of cultivated range plants as animal feed in the Mediterranean coastal zone of Egypt. Institute National de la

Recherche Agronomique., 31: 15-19.

El-Shaer, H. M. and H. M. Kandil .1990. Comparative study on the nutritional value of wild and cultivated Atriplex hulimus by sheep and goats in Sinai. Commun. Sci. Develop. Res., 29: 81-91.

El-Shatnawi, M. Kh. J. and Y. M. Mohawesh . 2000. Seasonal chemical composition of saltbush in semiarid grassland of Jordan. Journal of Range Management, 53, (2) 211-214.

Le Houerou, H. N. 1986. Salt tolerant plants of economic value in the Mediterranean basin. Reclamation and Re-vegetation Research 5, 319-341.

Le Houerou, H.N. 2000. Utilization of fodder trees and shrubs in the arid and semi-arid zones of West Asia and North Africa. Arid Soil Research and Rehabilitation, 14 (2), 101-135.

Mikhiel, G. S., M. S. El-Hakeem and T. H. Kasseh . 1999. Harvesting rainfed Acacia and Atriplex in the NWC of Egypt. Proceeding of sixth International Conference on the Development of Dry Lands. 22-27 Aug. Cairo, Egypt, 584-586.

Milthorpe P.L.; B.M. Honeysett; D.A. Patton and M.J. Wynne . 2001. Integration of alternative forage sources in drought management. Final report, Program 6, Drought Regional Initiatives Program, NSW Agriculture.

Moselhy, N. M. M. 2001. Agronomic practices that enhance the productivity of interplanted barley and saltbush (*Atriplex nummularia* L.) shrubs under rainfed conditions on the North West coast of Egypt. Desert inst. Bull., Egypt, 51(1): 197-215.

MRMP. 2002. Matrouh Resource Management Project (MRMP) Documents 870, -IDA Credit 2504-EGT.

Sankary, M. N. 1986. Species distribution and growth in salt affected land in Syria. Reclamation and Revegetation Research, 5: 125-143.

Snedecor, G.W. and W.G. Cochran 1990. "Statistical Methods". 8th ed. Iowa State Univ. Press, Ames, Iowa, USA.

Tag El Din, S.S. and A.A. Al-Sheikh 1995. Nutritive value parameters of seven Atriplex spp. around the year. J. King

Saud Univ., Agric. Sci., 7 (2), 259-270.

Van Soest, P.J. and R.H. Wine . 1976. "Use of detergentis in the analysis of fibrous feeds. 4. Methods for determination of plant cell walls". J. Ass. Offie. Anal. Chem., 50, 50-55.

Watts, D. and El-Mourid, M. 1988. Rainfall pattern and probabilities in the semi-arid cereal production region of Morocco. Institute National de la Researche Agronomique, Settat, Morocco, PP: 124-131.

Wilson, A.D. 1969. A review of browse in the nutrition of grazing animals. J. Range Manage., 22, 23-28

الميعاد المناسب لقطع شجيرات القطف الاسترالى(*Atriplex nummularia* L.) تحت ظروف التغذية المطرية بالساحل الشمالى الغربى لمصر

نعيم مصلحى محمد مصلحى
قسم الانتاج النباتى – شعبة البيئة وزراعات المناطق الجافة
مركز بحوث الصحراء- القاهرة – مصر.

أجريت هذه الدراسة تحت ظروف التغذية المطرية بمنطقة رأس الحكمة بالشريحة الثانية (١٠ كم جنوب ساحل البحر المتوسط) ٥٦ كم شرق مدينة مرسى مطروح بالساحل الشمالى الغربي لمصر، خلال ثلاث سنوات متتالية(٢٠٠٥ – ٢٠٠٦ – ٢٠٠٧) ذلك بهدف تحديد الميعاد المناسب لقطع شجيرات القطف الاسترالى ، حيث تم القطع مرة واحدة كل عام ، لكن فى

ثمانية مواعيد مختلفة بمنتصف أشهر مايو ، يونية ، يوليو ، أغسطس ، سبتمبر ، أكتوبر ، نوفمبر ، وديسمبر. أوضحت النتائج ما يلى:

- تحقق أعلى محصول علف غصن وجاف بإتمام القطع فى منتصف مايو أو منتصف يونيه برغم ذلك ذادت نسبة المادة الجافة بتأخير ميعاد القطع حتى منتصف، نوفمبر ثم نقصت فى منتصف ديسمبر، وكان هذا جليا خلال السنوات الثلاث.
- أدى القطع خلال المواعيد الثلاثة الأولى إلى تعظيم إنتاج الوحدات العلفية/هكتار غير أن ميعاد القطع الأول والثاني حققا قيما أعلى للعلف المأكول مقارنة بمواعيد القطع الأخري.
- نقص محتوي العلف من البروتين الخام ، وذادت نسبة الألياف الخام مع تأخير مواعيد القطع ، خاصة عندما تعرضت شجيرات القطف للجفاف خلال أشهر الصيف.
- أوضحت النتائج أن مواعيد القطع التى سجلت أعلى نسبة من الكربوهيدات الذائبة قد حققت أقل نسبة من البروتين الخام، مع احتفاظها بمحتوى مرتفع نسبياً من البروتين الخام.
- حقق القطع فى منتصف مايو أعلى محصول من البروتين الخام واكبر كمية من البروتين الخام الماكول، مع هذا فإن الفرق بين القطع فى منتصف مايو ومنتصف يونية فى كمية البروتين الخام المأكول لم يكن معنوياً خلال العامين الأول والثانى. عليه يوصى بقطع القطف تحت ظروف التغذية المطرية بمنطقة الدراسة خلال شهري مايو ويونيه.