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THE EFFECT OF CUTTING HEIGHT ON FORAGE YIELD AND PERFORMANCE OF ALFALFA CULTIVARS

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تم تقييم ستة أصناف مستوردة من علف البرسيم (الجت) لمعرفة الإنتاجية وإستمرارية النمو تحت مستوى قطع (جز) مختلف وذلك في عامي ١٩٩١م و١٩٩٢م بدولة الأمارات العربية المتحدة. أوضحت الدراسة تباين النتائج بين الأصناف حيث أعطت معظم القطعات فروقات معنوية عدا القطعة التاسعة والأخيرة. كما كانت الفروقات معنوية في مستويات القطع إلا أن التداخل بين الأصناف ومستوى القطع لم يكن معنوياً.

وقد وجد أن قطع البرسيم عند إرتفاع ستة سنتيمترات فوق سطح الأرض هو الأفضل يليه القطع عند ثلاثة سنتيمترات. وقد قل الإنتاج في وحدة المساحة عند إرتفاع القطع لتسعة سنتيمترات. أما القطع عند مستوى الأرض فقد أعطى أعلى إنتاجية للقطعة الأولى إلا أن الإنتاج قد قل كثيراً للقطعات التالية بسبب تأثر منطقة التاج مما أثر على فترة بقاء المحصول وقد كان صنف كف ١٠١ هو الأحسن تحت ظروف دولة الأمارات يليه الصنف كوندورا - ٧٣.

Key words : Cutting height, forage, performance, persistency.

ABSTRACT

Six exotic alfalfa (Medicago sativa L.) cultivars were evaluated for their forage yield performance and persistency under different cuttings heights during 1991/1992 in UAE. Cultivars revealed a highly significant difference throughout cuts except for the third and fifth cut where they were significant and the ninth cut where they were not significant. There was a highly significant difference between cutting heights for all cuts. However, there was no significant cultivar/cutting height interaction.

The best cutting height for all cultivars was 6 cm above ground level followed by 3 cm. Increasing cutting height to 9 cm significantly reduced yield per unit area. Cutting at ground level had the highest yield for the first cut but it damaged the crown, cut new shoots and decreased persistency. The best performing cultivar under Emirates condition was Cuf 101 followed by Condura 73.

INTRODUCTION

Alfalfa (Medicago sativa L.) often called "Queen of forages" is the principal forage crop in United Arab Emirates (UAE) and probably in the entire Gulf. The crop forms an integral part of farm life, as every farmer desires to grow it at least in small piece of land depending on his holding. There is a general feeling that the local cultivars perform well when cut at ground level while the exotic ones don't (1).

Cutting of alfalfa at a proper time is important, because a certain period is required for proper vegetative growth, which is reflected in higher yields (2). Health et. al.,(3) added that cutting by calendar date or time interval can not take all the necessary factors into consideration. Recommended harvest schedules must consider forage yield, forage quality, stand persistence and morphological development. Gramshaw et. al., (4) reported that time of cutting is now determined by the stage of development of basal shoots rather than the older "one-tenth bloom" technique.

Regrowth following harvest can occur from either crown or axillary stem buds depending on height of cutting and plant type (5). Cut stands close to the ground level damaged the crowns and cut new shoots which will decrease stand persistence (4). At the same time, increasing cutting height significantly and progressively reduced yields per unit area (6). Techrep. Fc4,(1) added that exotic cultivars from USA and Australia show gradual loss of stand persistency and reduction in yield levels in the following cuts specially when cut by hand.However,the local variety Hasawi performed better when cut by hand and yielded as much as 85t/ha.

Many exotic cultivars are present in the area with different habits and different regrowth rates after defoliation. Some of these cultivars stand persistent owing to their adaptability to the normal practice of ground level cutting by the farmers. Hence, the objective of this experiment was to evaluate some imported cultivars for higher yield and longer persistency at different cutting heights.

Materials and Methods

The experiment was conducted at Al-oha, Al-Ain, UAE (Latitude 24o 15~, Longitude 55o 45~ and Altitude 301.6 m above sea level) on a sandy loam soil. Six exotic alfalfa cultivars namely Condura 73, DK 185, Cuf 101, Highworth, Hunter River and Pioneer 581 were planted on 23 October 1991 with a seed rate of 40 kg/ ha. The seeds were broadcasted in plots of 5 x 5 m, covered with a thin layer of soil and a light irrigation was given frequently till germination. Irrigation was performed by sprinkler irrigation when it was needed till the soil reached field capacity.

The layout was split plot in a randomized complete block design with three replications. The cultivars were assigned to the main plot, while cutting heights were assigned to the subplots. Subplots were cut by hand at an area of 3x3m as a sampling unit at ground level, 3 cm, 6 cm and 9 cm above ground level. The crop was fertilized with 200 kg N, 150 kg P2 O5 and 250 kg K2 O per hectare. The entire P2 O5 was applied before sowing while N and K2 O were applied in ten equal splits, before sowing and after each cut.

The first cut was taken after 50 days from planting and then subsequent cuts were taken at 25-35 days intervals, depending on the season, till the 9th cut. Fresh weight of the green forage was recorded for each cultivar after each cut. Other cultural operations were performed as practiced in the area. The data was subjected to statistical analysis with the aid of MSTAT computer programme.

Results and Discussion

The results revealed a highly significant difference between cultivars for most cuts, significant difference for cut 3 and 5, and not significant for cut 9 (Table 1). Cutting heights were highly significant for all cuts. However, there

was no significant difference for the interaction between cultivars and cutting heights for all cuts (Table 1). The coefficient of variation for the different cuts varied between 9.18% (2nd cut) and 28.06% (9th cut).

Ground level cut showed a significantly higher forage yield for the first cut of Condura 73 and DK 185 (Table 2), while the 9 cm cut was significantly lower than other for Cuf 101. Highworth showed no significant difference for cutting heights while Hunter River showed a significantly higher yield for ground level and 3 cm than the other two cutting heights. However, Pioneer showed a significant higher yield for ground level than 9 cm cut (Table 2). For the second cut the 6 cm cutting height was statistically superior for DK 185, Cuf 101, and Hunter River, while for Condura 73 and Highworth, cutting heights of 3 cm and 6 cm were significantly better than others. Pioneer, on the other hand, showed a significantly lower yield for 9 cm cutting than others (Table 2). The third cut showed the significant dominance of the 6 cm cutting height for all cultivars. However, the 3 cm cutting height was at par with 6 cm cutting height for Condura 73 (Table 2). The same trend continued for the fourth, fifth and sixth cuts. However, the 3 cm cutting height was at par with the 6 cm cutting height for DK 185, Hunter River and Pioneer 581 for the 4th, 5th and 6th cuts respectively (Table 2).

Cutting heights of 6 and 3 cm gave a significantly higher forage yield at the 7th cut than ground level and 9 cm cuts for most cultivars. However, there was no significant difference between cutting heights for Highworth (Table 2). The 8th cut revealed a significantly higher forage yield for the 6 cm cutting height for all cultivars, while the 3 cm cutting height showed the same for Condura 73 and Hunter River (Table 2). The results of the ninth cut showed the superiority of the 6 cm cutting height for Condura 73, DK 185, High worth and Pioneer ; and the superiority of the 3 cm cutting height for Cuf 101, High worth and Hunter River. Table 2 also revealed that the lowest significant forage yield for all cultivar throughout the cuts was obtained at 9 cm cutting height. The ground level cutting was the next lowest for all cultivars for all cuts except the first cut.

The results of Table 2 clearly indicated the variation in results among cultivars for the different cutting heights and throughout the cuts. The first cut was higher for all cultivars at different cutting heights. The ground level cut had the greater forage yield at the first cut but not at the subsequent cuts for all cultivars. Similar results were obtained by(7) and (8). Gramshaw et. al. (4) stated that cut stands close to ground level damaged the crown and cut the new shoots which decreased stand persistence.

Generally forage yield decreased with subsequent cuts for all cutting levels and the reduction was sharp for ground level and 9 cm. The yield began to increase for the ninth cut for acultivars for 3 cm and 6 cm cutting height. This was because the ninth cut coincide with the beginning of winter, where alfalfa yielded better. Increasing cutting height to 9 cm significantly reduced yield. This was supported by (4) who stated that increasing cutting height significantly and progressively reduced yields per unit area. The highest yield obtained was for 6 cm cutting height followed by 3 cm cutting height (40.19-54.90).This was close to farm yield which was normally cut by hand. Cuf 101 performed better for most cuts followed by Condura 73.

In conclusion, alfalfa cultivars performed differently throughout the cuts for the different cutting height but the general trend was the same although cultivars were different in activity level. There was no significant cultivar cutting height interaction. 6 cm cutting height followed by 3 cm cutting height achieved the maximum yields for all cultivars, especially the winter active with higher crowns and rapid basal shoot growth ones. Cuf 101 performed well followed by Condura 73 throughout the cuts.

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Table 1. Analysis of variance of Alfalfa cultivars at different cutting heights and numbers.

Source of variation	Degrees of freedom	F - values								
		Cuts								
		1	2	3	4	5	6	7	8	9
Replications	2	15.68	75.18	40.61	370.05	32.19	499.25	351.04	983.10	34.03
Cultivars (main plot)	5	20.24**	79.70**	4.44*	48.24**	4.08*	31.93**	6.44**	419.77*	2.26NS
Error (a)	10	--	--	--	--	--	--	--	--	--
Cutting height (subplot)	3	21.47**	62.10**	26.43**	54.36**	40.28**	74.77**	50.15**	98.96**	74.87**
Cultivar X cutting (interaction)	15	1.00NS	1.86NS	0.47NS	0.78NS	0.46NS	1.51NS	0.62NS	0.68NS	0.44NS
Error (b)	36	--	--	--	--	--	--	--	--	--
Mean square (Error b)	-	1.19	0.43	1.07	0.30	0.42	0.13	0.11	0.09	0.59
CV %	-	11.78	9.18	20.38	12.76	13.99	14.34	16.94	14.26	28.06

NS = not significant

* = significant at 5% level (significant)

** = significant at 1% level (highly significant)

Table 2. Green forage yield of Alfalfa cultivars at different cutting heights.

Cultivars	Cutting heights	Cuts (t / ha)										
		1	2	3	4	5	6	7	8	9	Total	Mean
Condura 73	ground level	13.82	7.28	3.84	3.84	3.17	2.05	1.63	1.50	1.09	39.35	4.37
	3 cm	9.73	8.48	5.81	4.81	3.90	2.81	2.27	2.27	3.89	44.07	4.90
	6 cm	9.43	8.89	6.59	5.77	4.77	3.82	2.89	2.88	4.16	49.15	5.46
	9 cm	9.00	6.57	3.60	3.54	2.76	1.88	1.88	1.65	1.38	32.26	3.58
DK 185	ground level	11.56	7.36	5.07	3.78	4.10	1.65	1.43	1.13	1.18	37.29	4.14
	3 cm	9.95	7.94	5.58	5.28	4.52	2.61	2.18	2.58	4.48	50.75	4.85
	6 cm	9.95	7.94	5.58	5.28	4.52	2.61	2.88	1.74	3.88	43.68	5.64
	9 cm	8.22	7.11	4.32	3.89	3.78	1.75	1.65	1.44	1.39	33.55	3.73
Cuf 101	ground level	12.21	7.61	7.47	4.87	4.41	1.84	1.41	2.14	1.47	41.44	4.60
	3 cm	10.84	9.09	5.47	5.41	5.49	1.88	2.28	2.80	4.08	47.34	5.26
	6 cm	10.56	11.06	8.09	6.11	6.17	2.78	2.90	3.68	3.55	54.90	6.10
	9 cm	9.43	6.48	3.55	3.79	3.71	1.75	1.55	1.74	1.55	33.55	3.73
Highworth	ground level	9.08	4.84	4.13	3.15	4.37	2.34	1.22	1.54	1.43	32.1	3.57
	3 cm	8.47	6.34	4.89	3.89	3.36	3.41	1.87	2.48	4.32	41.03	4/56
	6 cm	7.94	6.88	5.65	5.28	7.08	4.08	1.94	3.10	4,51	46.46	5.16
	9 cm	7.35	3.58	3.06	2.84	3.88	2.65	1.49	1.53	1.53	27.91	3.10
Hunter River	ground level	10.08	6.68	4.97	3.83	4.50	1.54	1.41	1.41	1.47	35.89	3.99
	3 cm	8.51	7.48	5.77	4.78	5.39	2.77	2.19	2.28	4.19	43.36	4.82
	6 cm	8.19	7.78	6.28	5.58	6.15	3.58	2.78	2,92	3.45	46.71	5.19
	9 cm	792	5.29	3.62	2.95	3.79	1.75	1.53	1.54	1.48	29.89	3.32
Pioneer 581	ground level	8.69	6.40	4.06	3.18	3.64	1.87	1.59	1.49	1.15	32.07	3.56
	3 cm	8.14	6.73	4.91	3.89	5.46	2.49	2.28	2.40	3.89	40.19	4.47
	6 cm	7.55	7.20	5.49	4.71	5.68	2.86	2.71	3.04	4.49	43.73	4.86
	9 cm	6.52	5.20	3.20	2.79	4.01	1.93	1.64	1.58	1.39	28.26	3.14
LSD (0.05) Cultivars		1.75	0.82	1.60	0.47	1.56	0.41	0.46	0.08	0.49	--	--
LSD (0.05) Cutting ht.		1.74	1.05	1.65	0.88	1.03	0.57	0.54	0.48	1.22	--	--