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The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

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The effect of growth age on alfalfa's aboveground biomass

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Key words : alfalfa, aboveground biomass, community structure

Introduction Alfalfa in different growth ages has different dynamics of growth (Wu *et al.*, 1997). Growth rate, biomass accumulation and so on of 3 year and 5 year alfalfa were tested in this experiment.

Materials and methods Fixed 10 plants, measuring absolute height every 10 days. Choosing 3 plants, using harvest method, observed single plant weight and leaf-stem every 10 days. Using harvest method, choosing $1 \times 1\text{m}^2$ plot with 3 replications every 10 days, observed forage yield and calculated fresh-dry ratio and growth rate. Choosing 10 representative plants, and cut every 20 cm from root to top, obtained the community structure.

Results Plant height, growth speed, single plant weight, forage yield of 5 year alfalfa was higher than 3 year alfalfa, the leaf-stem and fresh-dry ratio of 5 year alfalfa was smaller than 3 year alfalfa (Table 1). The change tendency of absolutely and relatively growth rate was increase at first and then decrease. The distribution form of alfalfa aboveground biomass was a rhombus structure, which was big in the middle and point in both ends (Table 2).

Table 1 Plant height, single plant weight, leaf-stem ratio, fresh-dry ratio and yield of different growth age of alfalfa.

Date	Plant height(cm)		Single plant weight(g)		Leaf-stem ratio		Yield (g/m ²)		Fresh-dry ratio (F:D)	
	3 year	5 year	3 year	5 year	3 year	5 year	3 year	5 year	3 year	5 year
3.10	6.4±1.14	7.1±0.70	11.08±0.28	12.89±0.26	2.42±0.06**	1.67±0.03	443.2±6.75	515.6±4.65**	7.26±0.02**	6.69±0.02
3.20	7.3±1.16	8.3±0.70*	17.13±0.10	18.76±0.57	2.32±0.04**	1.47±0.03	685.2±4.00	750.4±6.08**	6.96±0.02	6.40±0.02
3.30	13.9±1.24	15.7±0.71**	23.93±0.62	25.25±1.30	1.76±0.04**	1.20±0.04	957.2±8.26	1010.0±7.07**	6.49±0.02**	6.22±0.29
4.09	31.8±1.30	36.0±0.80**	39.47±0.06	42.50±3.46	0.97±0.05**	0.74±0.02	1578.8±7.16	1700.0±5.77**	6.12±0.04**	5.88±0.03
4.19	51.6±1.40	60.1±0.78**	55.16±1.53	61.46±2.77**	0.74±0.04*	0.65±0.04	2206.4±8.29	2458.4±7.53**	5.73±0.01**	5.38±0.01
4.29	78.8±1.50	90.9±0.62**	77.82±1.56	110.33±4.05**	0.70±0.01*	0.62±0.04	3112.8±7.82	4413.2±5.45**	5.14±0.03**	4.89±0.02
5.09	98.5±1.37	119.6±0.60**	100.14±1.43	151.43±6.84**	0.58±0.05*	0.43±0.04	4005.6±6.24	6057.2±8.28**	4.79±0.01**	4.14±0.01
5.19	109.9±1.46	132.5±0.64**	102.32±2.05	152.47±1.86**	0.61±0.03	0.61±0.03	4092.8±6.89	6098.8±7.23**	4.26±0.01**	4.14±0.01
5.25							4097.0±7.62	6170.0±7.76**	4.12±0.03**	4.01±0.02

Note: * significant at the 0.05 level, ** significant at the 0.01 level in same line.

Table 2 Biomass and pattern of production of different growth age alfalfa's layer.

Height (cm)	Biomass(g/plant)		Leaf-stem ratio		3 year(g/plant)			5 year(g/plant)		
	3 year	5 year	3 year	5 year	Stem	Leaf	Flour	Stem	Leaf	Flour
140-160		6.8		1.54±0.05				2.2	3.4	1.2
120-140	7.2	54.1	3.33±0.36**	1.17±0.06	0.6	2.0	4.6	17.5	20.5	14.4
100-120	51.2	191.1	1.81±0.05**	1.02±0.08	15.0	27.3	8.8	72.4	74.0	44.7
80-100	174.1	348.4	1.51±0.05**	0.93±0.02	68.3	103.1	2.4	168.8	157.7	21.9
60-80	254.0	324.7	0.78±0.03**	0.57±0.04	143.0	111.0		206.6	117.4	0.6
40-60	207.9	260.4	0.32±0.04	0.28±0.07	157.7	50.2		202.9	57.5	
20-40	168.0	186.0	0.05±0.01	0.04±0.01	160.5	7.5		178.4	7.6	
0-20	161.8	170.8			161.8			170.8		

Conclusions Cutting at full bloom, the average height of 5 year alfalfa is 132cm, higher than 3 year alfalfa 109cm. The growth speed of 5 year alfalfa was higher than 3 year in each stage ($P < 0.01$). The single plant weight of 5 year alfalfa was 152.47g, heavier than 3 year 102.32g ($P < 0.01$). The leaf-stem ratio of 3 year alfalfa can reach 0.58~2.42, higher than 5 year alfalfa 0.43~1.67 ($P < 0.05$). The forage yield of 3 year alfalfa can reach 4.10 kg/m², heavier than 5 year 6.17 kg/m² ($P < 0.01$). The fresh-dry ratio of 3 year alfalfa can reach 4.12~7.26, higher than 5 year 4.01~6.69 ($P < 0.01$).

Reference

Wu, Q., Song, J. & Niu, F.Y. (1997). Study on the dynamics of aboveground biomass of alfalfa Meadow. *Grassland of China*, 6, 21-24.