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Study on leaf production of alfalfa at different planting densities

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Key words : alfalfa, planting density, leaf weight, leaf number, hay yield

Introduction Alfalfa (*Medicago sativa*) is a high-protein leguminous forage. Many studies showed that the leaf production of alfalfa was not only related to its nutritional value, but was also related to its hay yields (Frakes *et al.*, 1961; Smith *et al.*, 1964). How to improve the leaf yield of alfalfa has not been reported in the relevant references in the study of alfalfa cultivation. Therefore, the study of leaf production of alfalfa in different planting densities is of great significance to improve greatly its nutritional value and hay yield.

Materials and methods The experimental field was in Gongzhuling city, middle west of Jilin province, located at 43°31' N and 124°58' E. The cultivar of alfalfa is *Medicago sativa* L. cv. Gongnong No. 1. Planting density was designed into 5 density grades, the plant distance and row spacings were: A-20 cm×20 cm, B-30 cm×30 cm, C-40 cm×40 cm, D-50 cm×50 cm and E-60 cm×60 cm. The plot area was 12m² (3 m×4 m), using randomized block design and 5 replicates. The average plant absolute height, shoot number, compound leaf number, stem weight, leaf weight and hay yield of each treatment were measured at the first early flowering stage in the third year (June 10, 2007), 5 individual plants from each plot were sampled randomly. Ratio of stem to leaf and hay yield of per square meter were also calculated.

Results and analysis There was no significant difference in the average plant absolute height stem/leaf ratio among all the density grades ($P > 0.05$). However, there were significant differences in shoot number, compound leaf number, shoot weight, leaf weight and hay yield among some treatments ($P < 0.05$) (Table 1), they were all the highest in the density A and the lowest in the density E. The correlation coefficient (R^2) of leaf weight was 0.97 for hay yield, 0.94 for stem weight, 0.32 for leaf number and 0.25 for shoot number at the 0.05 level (Figure 1).

Table 1 Significant difference comparison for height, shoot numbers, compound leaf numbers, stem weight, leaf weight, hay yield and stem/leaf ratio in different densities (0.05 level).

	Height (cm)	Shoot number (no/m ²)	Leaf number (no/m ²)	Air-dried stem (g/m ²)	Air-dried leaf (g/m ²)	Hay (g/m ²)	Stem/leaf (%)
A	110.3a	615a	40170a	900.2a	479.9a	1379.1a	34.72a
B	118.9a	440abc	26310abc	759.2ab	418.1abc	1177.4abc	35.51a
C	125.9a	444ab	35200ab	801.6ab	426.2ab	1227.8ab	34.71a
D	114.4a	388bc	21347bc	468.3bc	263.7bc	732.0bc	36.03a
E	116.3a	225c	16716c	350.8c	213.8c	564.5c	37.86a

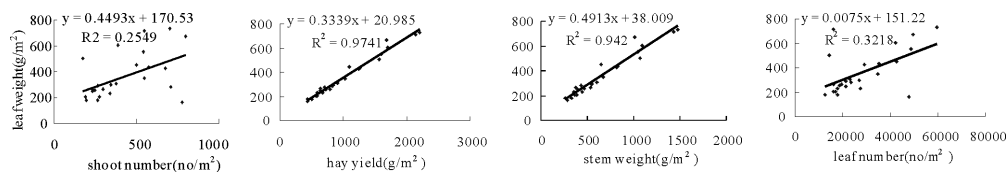


Figure 1 Relationship between leaf weight and the other characteristics of per square meter.

Conclusions Leaf weight of alfalfa per unit area was significantly different at differing planting densities, and it increased as the density increased. Leaf weight was closely related to hay yield and stem weight, lowly related to leaf number and not related to shoot number.

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