

Effect of Molybdenum and Boron on increasing alfalfa seed yield

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Introduction Although the content of microelements is low in plants, they play a role in translocation and energy exchange in metabolism, and have an important influence on crop yield (Guoxiao, etc., 2006; Chang Yao-hong, 2007; Hu Ai-tang, 2003). Different concentrations of borax and ammonium molybdate were sprayed at early florescence, squaring, and florescence of alfalfa in this study, and the effect of boron and molybdenum on yield of alfalfa seed was measured.

Experimental area survey The experimental area is located in the grassland research station, Hutubi, Xinjiang. E: 86°7', N: 44°8', H: 0.446km. Annual precipitation is 161.3 mm, annual evaporation is 2312.7mm, average humidity is 54% during growing season, the annual accumulated temperature over or equal to 10°C is 3561.3, the frost-free period is 173 days. The total salt content of the research area in 0~20cm is more than 1.5% and pH is more than 8.5.

Materials and methods Test materials are Xinmu No.1 Variegated Alfalfa, borax (the boron content is 11%), ammonium molybdate (the molybdenum content is 54%).

The treatments were foliar sprays of borax at 0.4%, 0.6% and 0.8%, ammonium molybdate at 0.05%, 0.07% and 0.09%, and normal water. There were sprayed during early florescence, squaring period and florescence, respectively. The size of plots were 10m². Each treatment was repeated three times in a randomized block design.

The following was measured on 10 plants: plant height, growth rate, branch numbers, the number of racemes, the pod numbers per inflorescence, the seed setting number in each pod after regrowth, and seed yield, 1000-grain weight, germination rate after harvest seed.

Table 1 The effects of boron and molybdenum on alfalfa seed yield and yield components.

treatment	1000-grain weight (g)	the number of branches (m ²)	pod / inflorescence(a)	inflorescence / branches (a)	seeds / pods(a)	seed yield (kg/hm ²)
Ammonium Molybdate 0.05%	1.900±0.0262	421.66±30.1	15.53±0.68	15.13±1.5	5.97±0.20	592.31±65.2
Ammonium Molybdate 0.07%	2.052±0.0258	392.33±25.6	14.23±0.70	14.36±1.6	5.00±0.23	513.3±70.8
Ammonium Molybdate 0.09%	1.899±0.0203	388.67±23.6	11.66±0.42	13.36±2.0	5.20±0.27	408.00±42.9
borax 0.4%	1.872±0.0199	472.67±45.1	15.26±1.1	11.26±1.2	5.77±0.21	471.00±68.5
borax 0.6%	1.900±0.0234	484.00±33.5	13.8±0.90	12.1±1.2	5.37±0.22	492.00±73.2
borax 0.8%	1.900±0.0123	492.00±50.1	16.3±1.3	13.46±1.3	5.73±0.26	507.00±68.6
ck	1.944±0.0244	380.00±32.6	10.06±0.51	16.66±2.2	4.40±0.19	438.75±61.4

Results and discussion The results showed that alfalfa seed yield, branch numbers, the pod numbers per inflorescence and the seed setting number in each pod were higher than in the control after spraying boron and molybdenum. When 0.05% ammonium molybdate was sprayed, the yield increased 35% compared to the control. Branch numbers, the pod numbers per inflorescence and the seed setting number in each pod increased 10.96%, 54.37%, 35.68% ($p < 0.05$), respectively. When 0.8% borax was sprayed, the yield increased 15.56% relative to the control. Branch numbers, the pod numbers per inflorescence and the seed setting number in each pod also increased ($p < 0.05$). When 0.07% ammonium molybdate was sprayed, thousand-grain weight increased 5.6% compared to the control. After the different concentrations of borax and ammonium molybdate were sprayed, the numbers of racemes per reproductive branch were lower than that in the control.

The effect of boron and molybdenum on increasing yield of alfalfa seed is evident from this study. With increasing concentrations of Ammonium Molybdate, the seed production decreased gradually, and seed production increased with increasing concentrations of borax. Various factors related to the formation of seed production were affected, especially inflorescences per pod and per pod seed of alfalfa.