

Project Title: Effects of Boron Fertilizer on Alfalfa Yield and Quality — 2016

Objective: To evaluate the effects of boron fertilizer rate and timing on alfalfa yield and quality.

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Summary:

Boron treatments were applied at five rates with amounts and timing detailed in Table 1. The experimental design was a randomized complete block with four replications. There was a full soil profile beginning at green up; rainfall received in the fall and early spring was above average. From the first green up to the last cutting (April to October 24, 2016) 14.75 inches of rain was received (October received record precipitation of 5.48 inches). Supplemental irrigation was applied when needed from June to September. Height measurements were taken prior to cutting when plants achieved 10% flowering. Three cuttings were made.

No significant differences were observed for height or yield (Table 3). Average total yields were 5.4 T/A. First harvest had the highest yield at 2.4 T/A.

Significant differences were observed in boron uptake and alfalfa quality (Table 4). Crude protein was highest at second harvest. Significance in boron uptake was observed for all three harvests.

Table 1. Total B applied per treatment and application timing.

Treatment	Total B (lb/A/year)	Application
1	Untreated check	None
2	0.5	0.25 lb/A applied at 3-in regrowth in early spring + 0.25 lb/A at 3-in regrowth after first cutting
3	1.0	0.50 lb/A applied at 3-in regrowth in early spring + 0.50 lb/A at 3-in regrowth after first cutting
4	2.0	1.0 lb/A applied at 3-in regrowth in early spring + 1.0 lb/A at 3-in regrowth after first cutting
5	2.0	2.0 lb/A applied at 3-in regrowth in early spring

Table 2. Materials and methods.

Variety:	Pioneer58V09	Fertilizer:	0-0-62
Seeding Date:	5/15/14	Sulfur Fertilizer:	21-0-0-24S
Julian Date:	135	Boron Fertilizer:	10% Liquid - Agrisolutions
Seeding Rate:	12 lbs/A	1st Boron Application Date:	4/11/16
Previous Crop:	Barley	2nd Boron Application Date:	7/5/16
Tillage:	Conventional	1st Harvest Date:	6/13/16
Irrigation:	Yes	2nd Harvest Date:	8/2/16
Soil Type:	Fine sandy loam	3rd Harvest Date:	10/24/16
Soil Test:	22-18-88		

Table 3. Effects of boron fertilizer on alfalfa yield

Treatment	1st Harvest - Jun 13		2nd Harvest -Aug 2		3rd Harvest -Oct 24		Harvest Total
	HT in	YLD T/A	HT in	YLD T/A	HT in	YLD T/A	YLD T/A
0 lbs B	44	2.0	33	1.6	28	1.4	5.1
0.25 lb B begin + mid season	43	2.6	32	1.6	28	1.4	5.6
0.5 lb B begin + mid season	45	2.6	33	1.5	29	1.4	5.4
1 lb B begin + mid season	46	2.5	33	1.6	29	1.5	5.5
2 lbs B begin season	43	2.4	35	1.5	29	1.5	5.4
Mean	44	2.4	33	1.6	28	1.4	5.4
CV	7	20	4	11	4	6	7
LSD	ns	ns	ns	ns	ns	ns	ns
Pr>F	0.4898	0.4502	0.0726	0.9166	0.5289	0.2741	0.4377

HT: height, YLD: yield, ns: nonsignificant, B: boron (amount applied begin season same as mid season)

Table 4. Boron uptake and hay quality

Treatment	CP %	ADF %	NDF %	TDN %	RFV %	B ppm
1st Harvest - Jun 13						
0 lbs B	24.0	34.7	42.9	61.3	135.8	21.3
0.25 lb B begin + mid season	22.5	38.7	47.5	56.9	115.0	25.8
0.5 lb B begin + mid season	23.1	36.9	46.3	58.9	123.0	30.0
1 lb B begin + mid season	22.7	35.0	44.0	60.9	131.3	29.5
2 lbs B begin season	22.4	37.6	47.5	55.7	117.0	30.0
LSD	ns	ns	ns	ns	ns	3
Pr>F _{(0.05)-B}	0.8512	0.5509	0.3537	0.4078	0.4525	0.0003
2nd Harvest - Aug 2						
0 lbs B	27.8	33.5	42.4	62.6	138.0	25.8
0.25 lb B begin + mid season	27.0	33.0	39.0	63.1	151.5	31.5
0.5 lb B begin + mid season	26.7	32.0	41.3	64.1	144.8	35.5
1 lb B begin + mid season	25.8	34.0	41.6	62.0	140.3	39.0
2 lbs B begin season	24.1	35.0	42.0	61.0	137.0	38.3
LSD	2	ns	ns	ns	ns	7
Pr>F _{(0.05)-B}	0.0540	0.1618	0.3698	0.1591	0.3369	0.0051
3rd Harvest - Oct 24						
0 lbs B	20.5	33.5	42.6	62.6	137.8	34.3
0.25 lb B begin + mid season	20.7	33.3	41.1	62.8	143.0	44.8
0.5 lb B begin + mid season	20.3	34.6	42.2	61.4	136.8	53.5
1 lb B begin + mid season	21.1	32.9	39.5	63.1	150.3	54.5
2 lbs B begin season	20.2	34.3	40.1	61.7	144.8	55.3
LSD	ns	ns	ns	ns	ns	8
Pr>F _{(0.05)-B}	0.4609	0.7009	0.3062	0.7127	0.4076	0.0006

CP: crude protein, ADF: acid detergent fiber, NDF: neutral detergent fiber, TDN: total digestible nutrients, RFV: relative feed value, B: boron (amount applied begin season same as mid season)