

Alfalfa yield and quality response to molybdenum, boron and lime applications

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During the mid 1980's molybdenum (Mo) deficiency in alfalfa was identified in several intermountain valleys of Northern California by plant tissue analysis and the generally recommended pound of sodium or ammonium molybdate per acre (0.4 lbs Mo/A) based on research in Washington gave adequate growth and high yields of alfalfa. Since the mid 1990's numerous samples of alfalfa coming from the same areas have shown lower levels of Mo (<0.5 ppm). The objective of our study was to characterize the relationship between plant tissue Mo and copper concentrations and alfalfa yield response at different stages of alfalfa growth where Mo is applied at several rates. Treatments listed in Table 1 were applied to the soil surface when the alfalfa was dormant at the two sites in late winter. Plant growth stage samples of the top 1/3 of the plant were taken at 6 in. and 12 in. height, at pre-bud and at harvest (usually early bud). Yields for the first harvest of 2001 and top 1/3 of plant Mo concentrations are given in Table 1. As might be expected, Mo concentrations showed a dramatic increase in response to the increasing rates of applied Mo in the first harvest of 2001 at both sites. Stage of growth sampling indicated similar Mo trends to the harvest samples. Alfalfa yield was significantly increased in each of the first two harvests at the two sites but this was not the case with some of the later two harvests.

Preliminary indications are that nearly all stages of growth will indicate equally well the Mo status of alfalfa and that the current guidelines of <0.3 ppm for deficiency, 0.3-1 ppm for marginal, 1-5 ppm for adequate and >5-10 ppm for potentially high levels are acceptable

Table 1. Alfalfa yields and top 1/3 of plant Mo concentrations in the first harvest of 2001 as influenced by Mo, boron and lime treatments.

Treatments Site No. 1* 2	Mo (lbs/ A)	B (lbs/ A)	Lime (tons /A)	May 25 Yield (tons DM/A)	May 25 Mo ppm	May 18 Yield (tons DM/A)	May 18 Mo ppm
1* 1. Control	0		0	1.76 b	0.27 d	1.56ab	0.37 g
2. Mo + B	0.2	4	0			1.57ab	1.77 fg
3. Mo + B	0.3	4	0			1.65ab	4.67 de
4. Mo + B	0.4	4	0			1.76a	5.00 de
5. Mo + B	0.6	4	0			1.71ab	7.17 bc
6. Mo + B	0.8	4	0			1.66ab	8.30 bc
7. Mo + B	1.2	4	0			1.68ab	14.73a
2*. Mo	0.2	0	0	1.91ab	0.50 cd		
3*. Mo	0.3	0	0	1.88ab	0.70 cd		
4* 8. Mo	0.4	0	0	1.89ab	0.70 cd	1.65ab	4.37 de
5*. Mo	0.6	0	0	1.96ab	1.37 b		
6* 9. Mo	0.8	0	0	2.00a	1.30 b	1.60ab	8.93 b
7* Mo	1.2	0	0	1.89ab	2.47a		
10. B	0	2	0			1.68ab	0.83 g
11. B	0	4	0			1.72a	0.33 g
8*12. Lime(L)	0		2	1.92ab	0.97 bc	1.46 b	0.27 g
13. Mo+B+L	0.2	4	2			1.61ab	3.87 ef
14. Mo+B+L	0.4	4	2			1.69ab	6.47 cd
LSD _{0.05}				0.228	0.505	0.260	2.124