

## Alfalfa Variety Test

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Four varieties of alfalfa commonly grown under irrigation in Cochise, Graham, and Greenlee counties, and two more recent releases from the University of Arizona Agricultural Experiment Station, were planted at the Safford Experiment Station on March 3, 1976. Planting rate was 25 lbs./acre. Plot size was 30' x 220', each replicated four times. The soil is a silty clay loam.

Heavy rains and wet fields preclude pickup of the last cutting in December, 1978. The experiment was terminated in March, 1979, due to excessive root rot in part of the area.

Yields, expressed in pounds baled hay/acre, are as follows:

Year	Variety					
	AS13R	Eldorado R	Mesa Sirsa	Hayden	Lew	Mex-Sonora
1976	9,709	10,633	10,791	10,760	11,996	11,392
1977	13,756	14,545	19,972	15,601	15,289	15,571
1978	13,218	13,558	13,477	13,806	14,655	14,852
3-yr Total	36,683	38,736	39,240	40,167	41,940	41,815
Percent of Lew	87.5	92.4	93.6	95.8	100	99.7

### Response of Alfalfa to Increasing Rates of KCl and K<sub>2</sub>SO<sub>4</sub> Fertilizers in Greenhouse Trials

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Alfalfa needs high levels of exchangeable soil K for stand survival and high herbage yields. Field trials in Arizona generally have shown little need for the application of potassium (K), but when required, K usually is applied in the form of KCl or K<sub>2</sub>SO<sub>4</sub>. KCl is the form most readily available, but at high application rates, the Cl<sup>-</sup> ion can reduce the full plant response to K. Legumes are much more apt to be damaged by Cl than are grasses. The K<sub>2</sub>SO<sub>4</sub> form is more expensive, but it carries both K and sulfur (S) needed for the growth of legumes.

A comparison of the response of alfalfa to KCl and K<sub>2</sub>SO<sub>4</sub> fertilizers applied at increasing rates was made during the winter of 1978-79 in the greenhouse. In the first trial, plugs of soil containing seedling plants of a phytophthora-resistant alfalfa strain were placed in four-liter, plastic pots in the greenhouse. The soil cores with plants were taken from a field on the SCS-Plant Materials Farm at Tucson. The Mohave clay loam soil contained 840 kg/ha of exchangeable K, 15 kg/ha of available phosphorus, 2.4 kg/ha of boron, and had a pH of 8.0. The seedling plants were 12 to 15 cm tall when removed from the field. Shoots were cut back to a stubble height of 3cm, and KCl and K<sub>2</sub>SO<sub>4</sub> were applied in solution at rates of zero, 300, and 600 kg/ha of K with three replications each. Symptoms of Cl-injury were soon visible at the high rate of KCl with the killing of plants and the yellowing and distortion of surviving plants. Shoots were harvested twice at first flower at 32-day intervals. Herbage dry matter yields given in Table 1 show that herbage yields were increased with the first increment of K as either KCl or K<sub>2</sub>SO<sub>4</sub>. The higher yields were maintained with highest rate of K<sub>2</sub>SO<sub>4</sub>, but were reduced markedly below the control with the highest rate of KCl.

Table 1

Herbage dry matter yields from alfalfa fertilized in the greenhouse with 300 and 600 kg/ha of K as KCl and K<sub>2</sub>SO<sub>4</sub>

Rate of K added-kg/ha	Source of K	First harvest		Second harvest		Total	
		g/pot	% of control	g/pot	% of control	g/pot	% of control
0	---	1.08	100	1.50	100	2.58	100
300	K <sub>2</sub> SO <sub>4</sub>	1.38	128	2.17	145	3.55	138
300	KCl	1.53	142	1.81	121	3.34	129
600	K <sub>2</sub> SO <sub>4</sub>	1.33	123	2.11	141	3.44	133
600	KCl	0.64	59	0.98	65	1.62	63
LSD, 0.05		0.34		NS		1.13	
CV, %		15.3		28.3		20.7	

The second trial was conducted with plants started from seed in the greenhouse. One-liter, plastic pots were filled with the same soil as used in the first trial (see above), and were seeded with 'Lew' and 'Ranger' alfalfa. When the seedlings were three weeks of age, they were thinned to 20 plants per pot. At four weeks after seeding (28 days), KCl and K<sub>2</sub>SO<sub>4</sub> were added in solution at rates of zero, 220, 440, 660, 880, and 1,100 kg/ha of K. The shoots from each pot were harvested to a 3-cm stubble height four weeks after fertilizing (eight weeks after seeding) and were harvested a second time eight weeks after fertilizing (12 weeks after seeding). At both harvests, the alfalfa was just beginning to flower.

Herbage dry matter yields from the combined results of the two alfalfa varieties (three replications each) are shown in Table 2. Herbage yields were significantly increased in the second harvest and total of two cuts with the first increment of K as KCl (220 kg K/ha). High application rates of KCl were not significantly different from the control, except at the 1,100 kg/ha rate of K as KCl where yields were significantly reduced. At this highest rate of KCl, 27% of the plants were killed soon after the fertilizer was applied. More plants were killed in Lew than in Ranger, and the possibility of varietal differences in Cl-tolerance will be checked in future studies.

All rates of K<sub>2</sub>SO<sub>4</sub> increased herbage yields above those of the control, but these increases were not always statistically significant in the first harvest. The yield data clearly show that a good growth of alfalfa was maintained even at very high rates of K<sub>2</sub>SO<sub>4</sub>, but plants were damaged and yields reduced a high rates of KCl.

Since alfalfa extracts large amounts of K from the soil with each crop of hay, older stands in Arizona may need topdressing with a K-fertilizer to upgrade and maintain production. It may be necessary to split large applications of KCl and allow several months between applications. An alternative is to apply part of the K as K<sub>2</sub>SO<sub>4</sub> as a means of reducing the possibility of plant damage from Cl<sup>-</sup> in KCl fertilizer.

Table 1

Herbage dry matter yields from alfalfa fertilized in a greenhouse trial with increasing rates of K applied as KCl and K<sub>2</sub>SO<sub>4</sub>

Rate of K added-kg/ha	Source of K	First harvest		Second harvest		Total	
		g/pot	% of control	g/pot	% of control	g/pot	% of control
0	---	1.56	100	2.12	100	3.68	100
220	KCl	1.59	102	2.68	126	4.27	116
440	KCl	1.54	99	2.40	113	3.94	107
660	KCl	1.49	96	2.24	106	3.73	101
880	KCl	1.46	94	2.14	101	3.60	98
1,100	KCl	1.10	71	1.31	62	2.41	65
220	K <sub>2</sub> SO <sub>4</sub>	1.55	99	2.77	131	4.32	117
440	K <sub>2</sub> SO <sub>4</sub>	1.68	108	2.88	136	4.56	124
660	K <sub>2</sub> SO <sub>4</sub>	1.76	113	3.01	142	4.77	130
880	K <sub>2</sub> SO <sub>4</sub>	1.73	111	3.05	144	4.78	130
1,100	K <sub>2</sub> SO <sub>4</sub>	1.58	101	3.15	149	4.73	129
LSD, 0.05		0.18		0.48		0.53	
CV, %		10.1		16.3		11.2	