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EFFECTS OF ALFALFA ON WHEAT ESTABLISHMENT

M. D. Witt and C. R. Thompson*

Alfalfa is a high value crop in southwest Kansas and is produced on about 220,000 acres. Approximately 50,000 of these acres are rotated to some other crop each year. The roots of alfalfa varieties have been reported to produce differing amounts of saponin, medicarpin, and phenolics, all water-soluble toxic materials that can inhibit growth of the succeeding crop. Although toxicity is less of a concern when seeding grasses into alfalfa than when reseeding alfalfa, it might affect wheat establishment and production, and variety differences have not been evaluated. The objective of this study was to evaluate currently utilized alfalfa varieties and identify those with an unusually large undesirable toxic influence upon the following crop of wheat.

Procedures

For each of 2 years, TAM 107 wheat was seeded at 90 lbs/acre into freshly harvested, 2-inch-tall alfalfa stubble immediately after a late fall cutting of alfalfa variety plots. When new growth of alfalfa began to appear in the spring, 2, 4-D/Banvel herbicides were applied to inhibit its growth.

Alfalfa stand counts were taken on 40 feet of row length (20 square feet) just prior to seeding the wheat. The wheat was drilled perpendicular to the alfalfa rows. Wheat emergence counts were taken in November on a 3-foot length of row.

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In 1998, wheat was seeded on September 30 into replicated 4X plots of 34 varieties of 5-year-old alfalfa. Wheat emergence was good, and herbicide for alfalfa suppression was applied on April 2, 1999. The resulting wheat plots were harvested on July 7, 1999.

In 1999, wheat was seeded on October 20 into replicated 4X plots of 33 varieties of 3-year-old alfalfa. Wheat emerged well, and herbicide for alfalfa suppression was applied on April 3, 2000. The resulting wheat plots were harvested on June 22, 2000.

Results

Results from each of the 2 years (Tables 1 & 2) indicated that wheat stand establishment, grain yield, and grain test weight were affected similarly regardless of the previously grown alfalfa variety. We did not identify differential influence by any of the alfalfa varieties tested upon the emergence or performance of the following wheat crop.

Both the alfalfa stands seeded into and the wheat stands that emerged were very typical. The alfalfa stand range of 2.6 to 3.7 plants per square foot is equivalent to 113,256 to 161,172 plants per acre. The wheat stand range of 10.9 to 14.8 plants per square foot is equal to 474,809 to 644,688 plants per acre.

Conclusions

Although alfalfa varieties have been reported to produce differing amounts of allelopathic root exudate that has a reputation for being toxic to the succeeding crop, 62 varieties tested in this 2-year study did not differentially influence the stand level or grain yield of the following wheat crop. Thus we identified no alfalfa varieties that should specifically be avoided when growing wheat as the next crop.

Table 1. Influence of alfalfa varieties on the succeeding wheat crop in 1999.

Brand	Variety	No. Alfalfa Stems/ft ²	No. Wheat Plants/ft ²	Wheat Produced	
				Yield bu/a	Test Wt. (lb/bu)
ABI	9045 Exp	3.3	14.5	40.6	55.5
ABI	9140 Exp	3.0	12.7	38.5	55.5
America's Alf	Agressor	2.9	13.9	40.5	55.8
America's Alf	Apollo Supreme	3.0	14.2	40.8	55.8
America's Alf	Archer	3.1	13.5	43.0	55.8
Casterline	Pro Gro 424	3.0	14.3	42.9	55.8
C/W	Shamrock	2.8	12.6	39.5	55.8
C/W	2514 Exp	2.6	13.9	39.1	55.7
DeKalb	DK133	2.9	13.1	36.6	55.6
Drussel	Reward	3.1	12.5	40.3	55.7
Golden Harvest	GH755	2.9	14.5	37.7	55.8
Great Plains	Belmont	3.1	12.2	40.1	55.8
Great Plains	Cimarron VR	2.9	13.1	41.3	55.8
Great Plains	Key	3.0	13.8	38.7	55.7
MBS	More	3.2	14.5	40.0	55.8
MBS	PGI 4212 Exp	3.1	13.9	39.7	55.6
MBS	PGI 14372 Exp	2.9	14.4	39.0	55.5
MBS	PGI 9047 Exp	2.9	13.3	41.7	55.7
NC+	Jade	3.0	14.0	42.6	55.7
NK	Fortress	3.0	14.2	42.1	55.8
Ohlde	Magnum IV	3.0	14.1	40.6	55.6
Pioneer	88C2P12 Exp	3.1	12.3	39.1	55.6
Pioneer	90W3PR1 Exp	3.2	14.3	40.3	55.6
Pioneer	91C01PR1 Exp	3.0	13.9	39.6	55.8
Pioneer	91C02PR1 Exp	3.0	13.4	41.1	55.1
Pioneer	91112 PJ1 Exp	2.8	14.1	37.3	55.1
Sharp	Alfaleaf	3.0	12.8	37.3	55.4
Wilbur-Ellis	Jewel	2.8	13.9	38.6	55.7
W-L	WL322HQ	3.2	13.9	40.0	55.7
W-L	WL323	2.9	12.6	39.7	55.7
	Riley	2.6	13.0	41.4	56.0
	Kanza	2.7	13.5	38.5	55.6
	Perry	2.9	14.8	42.0	55.9
	OK49	2.8	12.8	41.3	55.9
Mean		3.0	13.6	40.0	55.6
Coefficient of variation		8.0	11.5	9.6	1.7
Least significant difference. (5%)		0.33	n.s.	n.s.	n.s.

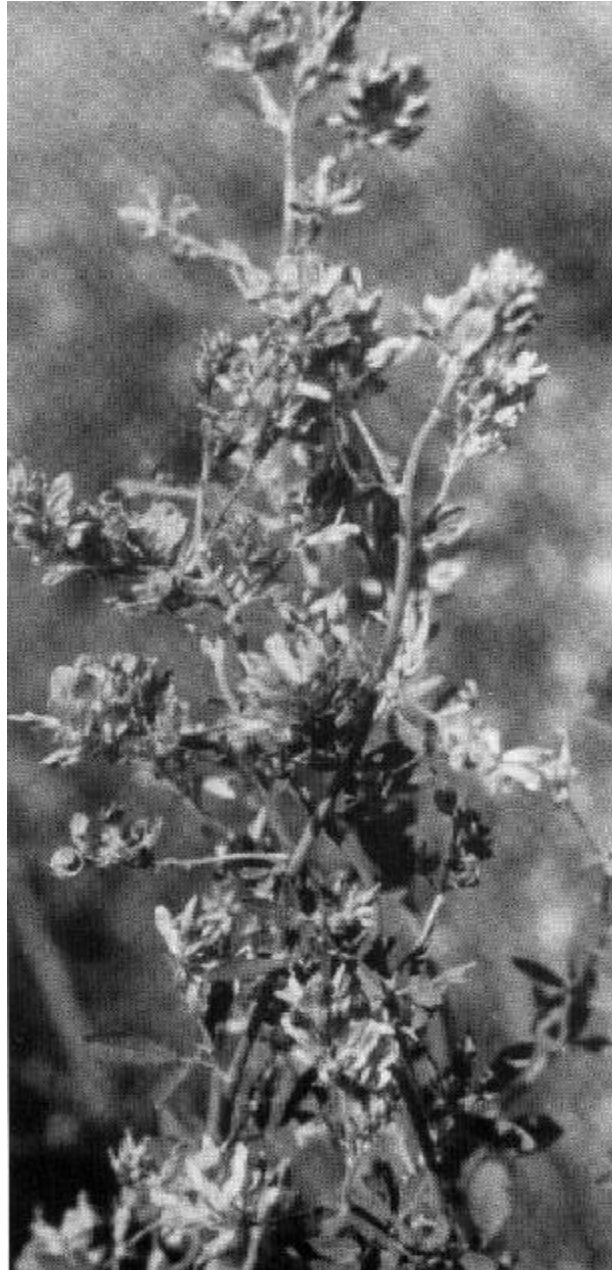


Table 2. Influence of alfalfa varieties on the succeeding wheat crop in 2000.

Brand	Variety	No. Alfalfa Stems/ft ²	No. Wheat Plants/ft ²	Wheat Produced	
				Yield bu/a	Test Wt. (lb/bu)
Allied	Asset	3.3	11.8	37.0	55.8
Allied	Excalibur II	3.4	12.0	34.6	55.6
Allied	Spur	3.3	12.3	31.7	55.5
Allied	Stamina	3.3	12.4	32.4	55.6
Cal/West	C/W 4429 Exp	3.5	12.3	31.4	55.4
Cal/West	C/W 4598 Exp	3.4	12.6	33.7	55.6
Cal/West	C/W 5406	3.4	12.8	35.7	55.8
Cal/West	C/W 5440	3.6	10.9	34.2	55.6
Cargill	Big Horn	3.4	11.4	33.7	55.6
Casterline	Pro Gro 424	3.4	11.4	33.4	55.6
DeKalb	DK 127	3.4	11.3	32.6	55.0
DeKalb	DK 133	3.6	11.2	32.5	55.8
Drussel	DSS 5106X Exp	3.7	11.7	33.0	55.6
Drussel	DSS 5211 Exp	3.3	11.6	32.0	55.2
Drussel	Enhancer	3.5	12.6	33.7	55.4
Golden Harvest	GH 766	3.1	12.8	32.9	55.1
Golden Harvest	GH 755	3.7	11.7	34.9	55.2
Jerry Weaver Seeds	Magnum III	3.6	10.8	30.8	55.3
Mycogen	TMF Multiplier II	3.3	12.4	31.6	55.6
Sharp	Alfaleaf II	3.2	11.6	32.9	56.0
Sharp	Shamrock	3.0	12.1	31.5	55.9
Sharp	Sure	3.2	11.9	37.1	56.2
Star	A-100	3.0	12.3	34.5	55.7
W-L Research	Ace	3.4	11.9	36.3	55.6
W-L Research	WL 323	3.0	11.6	34.6	55.3
W-L Research	WL 324	3.7	11.2	33.5	55.8
W-L Research	WL 325 HQ	3.6	11.4	32.1	55.6
W-L Research	WL 414	3.4	10.6	31.5	55.0
	Kanza	3.5	12.8	30.7	55.4
	Riley	3.5	11.3	30.8	55.6
	Perry	3.0	11.6	28.8	55.7
ICI	630	3.4	11.1	30.2	55.6
ICI	645	3.4	12.2	33.0	55.6
Mean		3.4	11.8	33.0	55.5
Coefficient of variation		8.8	11.0	10.3	0.99
Least significant difference (0.5%)		0.42	n.s.	n.s.	n.s.

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