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EFFECTS OF ALFALFA ON WHEAT ESTABLISHMENT

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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. |

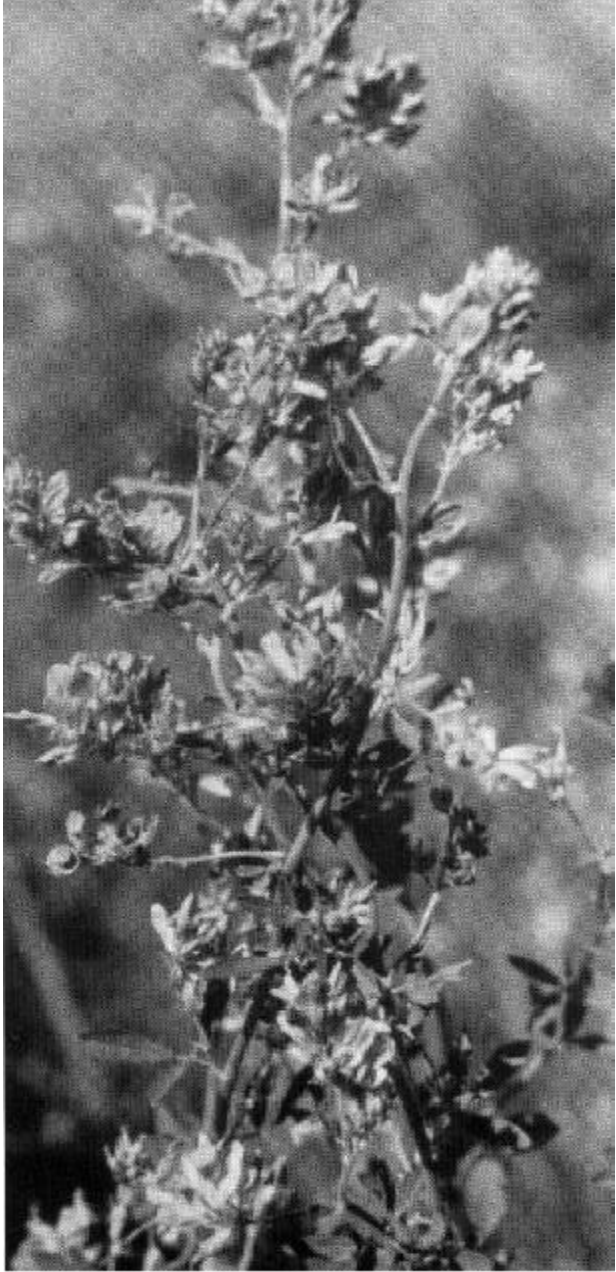


Table 2. Influence of alfalfa varieties on the succeeding wheat crop in 2000.

| 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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