Jointed Goatgrass Best Management Practices and Clearfield® Wheat Risk Assessment

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Introduction

Two multi-year field studies were conducted in central and west-central Kansas to evaluate the effects of integrated, multi-practice management systems and to assess the benefits and risks of including use of Clearfield* technology for jointed goatgrass management in winter wheat.

Study 1

Hypothesis. Integrating use of competitive winter wheat cultivars, limited tillage during fallow periods as compared to no tillage, and multi-year crop rotations will hasten control and reduce the impact of jointed goatgrass more than any component practice alone.

Objective. Evaluate integrated, multi-practice systems for jointed goatgrass management in winter wheat-based crop rotations.

Treatments consisted of winter wheat-fallow (W-F), winter wheat-grain sorghum-fallow (W-GS-F), and wheat wheat-grain sorghum-sunflower-fallow (W-GS-SF-F) crop rotations; mechanical versus chemical fallow management; and two winter wheat cultivars.

Key Findings

- Extending a 2-yr wheat-fallow rotation to include grain sorghum (3 yr) or grain sorghum and sunflower (4 yr) reduced jointed goatgrass densities more than any other practice tested (Fig. 1).
- Method of fallow management did not affect jointed goatgrass emergence in most year. However, under drought conditions more jointed goatgrass emerged and were destroyed in mechanical fallow than in chemical fallow (data not shown).
- Wheat cultivar had little or no effect on jointed goatgrass populations (data not shown).
- No one combination of crop rotation, fallow weed management, and wheat cultivar consistently reduced jointed goatgrass population more than other combinations in all years.

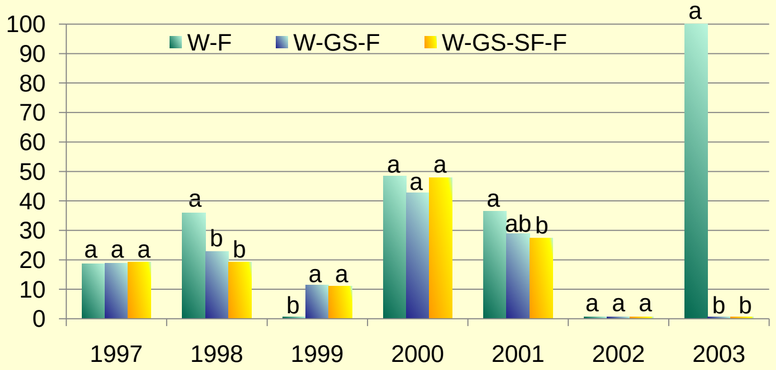

Figure 1. Effect of year and crop rotation on jointed goatgrass density per square meter in March at Hays, KS.

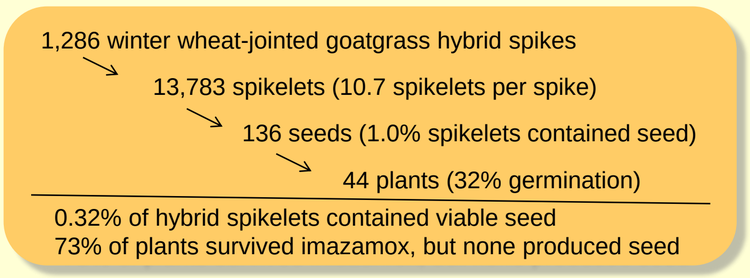

Figure 2. Reproductive potential of wheat-JGG hybrid progeny.

Study 2

Hypothesis. Prolonged use of Clearfield® winter wheat will increase the risk of transferring herbicide resistance from wheat to jointed goatgrass and increase selection pressure for resistance.

Objectives. (1) Investigate the risk of moving imidazolinone herbicide resistance from winter wheat to jointed goatgrass and determine the rate of integration; (2) study jointed goatgrass-wheat hybrid population dynamics; and (3) determine the effectiveness of coupling Best Management Practices (BMPs) and Clearfield® Production System for jointed goatgrass management in wheat.

We compared BMPs with conventional production practices in certified and saved Clearfield wheat vs. standard wheat and BMPs:

- 50% higher seeding rate (90 vs. 60 lb/A)
- Narrow row spacing (7.5" vs. 10")
- In-furrow starter fertilizer (10-34-0 vs. none)
- Sized seed (>14/64 screen vs. non-sized)
- Inversion tillage after 3rd crop versus surface tillage all years

Key Findings

- 2 of 104,000 jointed goatgrass plants from plot borders survived repeated applications of imazamox at 1.5x and 3x normal use rates. Following vernalization, the two plants remained vegetative and did not produce reproductive spikes.
- 1,286 winter wheat-jointed goatgrass hybrid spikes collected in 4 of 6 years averaged 1% viable spikelets. Several plants survived high rates of imazamox but none produced viable seed (Fig. 2).
- Combining BMPS and imazamox herbicide use in Clearfield wheat dramatically reduced jointed goatgrass populations compared to standard wheat grown using BMPs (Fig 3).
- Applying imazamox at lower-than-recommended rate and using saved (bin-run) Clearfield seed resulted in a trend of higher jointed goatgrass population (Fig. 3) and significantly lower wheat yield (Fig. 4).

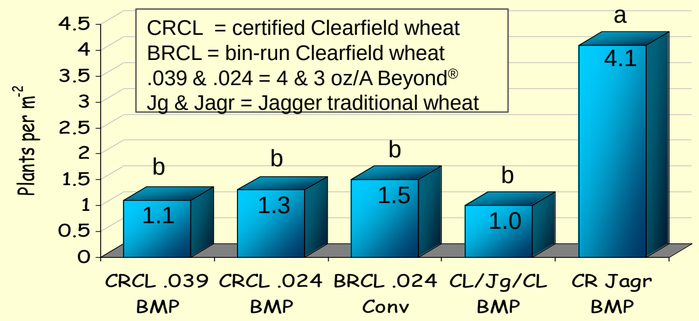

Figure 3. In-crop jointed goatgrass density, St. John, 2002-2006.

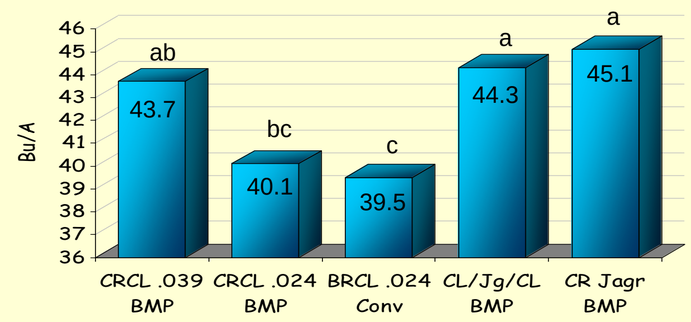

Figure 4. Winter wheat yields, St. John , KS, 2002-2006.

Publication Contributions

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