Non-thermal Residue Management in Kentucky Bluegrass

Richard Affeldt and Mike Weber

Abstract

Despite a significant amount of research that has investigated alternatives to field burning, a suitable replacement has not yet been discovered. A field trial to evaluate non-thermal residue management practices in large nonreplicated plots was established in the fall of 2006. Three treatments were applied to a third year stand of 'Geronimo' Kentucky bluegrass after harvest: 1) bale plus regular flail, 2) bale plus vacuum flail, and 3) bale plus vacuum flail plus propane flame. Chemical methods of residue degradation were investigated, but were not tested. This research seems to further indicate that no currently available technology adequately replaces field burning in Kentucky bluegrass seed production systems in Oregon.

Introduction

Open field burning is a residue management practice that benefits Kentucky bluegrass seed production but it has unfavorable impacts on communities and the environment where seed is produced. Despite a significant amount of research that has investigated alternatives to field burning, a suitable replacement has not yet been discovered (Crowe et al. 1996). The objective was to build on the research that has been done by evaluating previously investigated methods on a large scale, in order to more clearly document the economic impact of non-thermal residue management. Chemical methods of residue degradation were also under consideration for comparison in the planning stages of this project, but were not included in the list of treatments for reasons discussed below.

Materials and Methods

A field trial to evaluate non-thermal residue management practices in large non-replicated plots was established in the fall of 2006. Three treatments were applied to a third year stand of 'Geronimo' Kentucky bluegrass after harvest: 1) bale plus regular flail, 2) bale plus vacuum flail, and 3) bale plus vacuum flail plus propane flame. Each treatment was visually evaluated for pest pressure.

The 8-ft vacuum flail used was developed by Rear's Manufacturing in Eugene, Oregon. Plots were harvested with commercial equipment and seed yield was compared to the rest of the field, which was baled and burned. A sample of each seed lot was cleaned in order to determine clean seed yield for each treatment.

Results and Discussion

An effort to apply a bale plus sulfuric acid treatment in this trial was unsuccessful. The major obstacle was the deficiency in the application technology involved with sulfuric acid, which is highly corrosive to most materials. Furthermore, the existing data (which are minimal) indicate that sulfuric acid has very little utility for residue breakdown. Another treatment that was considered was urea-sulfuric acid sold as N-pHuric. There is already a substantial amount of data indicating that urea-sulfuric acid is also not useful for residue breakdown.

The residue management treatments that were applied in 2006 strongly influenced seed yield in 2007. Clean seed yield was 1,422 lb/acre from the field, which was baled and burned (Fig. 1). Clean seed yield from the bale plus regular flail treatment was 1,178 lb/acre, representing a 17 percent reduction compared to the field. Clean seed yield from the bale plus vacuum flail treatment was 1,337 lb/acre, representing a 6 percent reduction compared to the field. Clean seed yield from the bale plus vacuum flail plus propane flame treatment was 1,413 lb/acre, representing a decrease of less than 1 percent compared to the field.

There were no clear differences in pest pressure and no need to implement different pest management practices across treatments.

The vacuum flail removed post-harvest residues right down to the soil surface. Vacuum flailing plus propane flaming compared to burning resulted in minimal amounts of smoke and similar seed yield. However, it is highly unlikely that vacuum flailing will be a reasonable option for residue management. Aspects of vacuum flailing that were particularly problematic were: 1) flailing could only be performed at about 2 mph; 2) the collected residue is bulky and loose, making it difficult to transport; and 3) the residue contains enough soil to render it useless for livestock feed. We estimate that vacuum flailing took approximately 1 hour/acre. The operation of the vacuum flail was approximately $40/acre to cover maintenance and replacement cost. An additional $60/acre would cover cost of a tractor and operator. The total cost estimated to vacuum flail was $100/acre.

If there is no replacement for field burning that results in similar seed yield and crop vigor, then the price structure for Kentucky bluegrass seed production will need to change as field burning becomes more restricted. This research indicates that current technology does not adequately replace field burning in Kentucky bluegrass seed production systems in Oregon.

References

Crowe, F.J., D.D. Coats, N.A. Farris, C.L. Yang, M.K. Durette, M.D. Butler, G.W. Mueller-Warrant, D.S. Culver, and S.C. Rosato. 1996. Effects of various types of post-harvest residue management on Kentucky bluegrass seed yield in central Oregon, on-farm results from 1991-1996. Pages 60-64 *in* W.C. Young III, ed. Seed Production Research, Oregon State University..

Acknowledgements

We would like to thank the Jefferson County Smoke Management Committee for their involvement in planning this research. We would also like to thank Richard Coleman for accommodating the trial in his production field.

Bale + open burn
Clean seed yield = 1,422 lb/acre

Bale + vacuum flail + propane flaming
Clean seed yield = 1,413 lb/acre

Bale + vacuum flail
Clean seed yield = 1,337 lb/acre

Bale
Clean seed yield = 1,178 lb/acre

Figure 1. Images of 'Geronimo' Kentucky bluegrass residue and stubble remaining after post-harvest operations were carried out in August 2006, and clean seed yield from respective treatments in 2007.