Pasture Herbicide Residue Effects on Crimson Clover

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Introduction

To extend the grazing season and provide high quality cool season forage, southern forage producers frequently overseed their warm season perennial grass pastures with legume crops in autumn. Herbicides are regularly used by producers in the summer months to control broadleaf weeds in grass pastures. Often those herbicides, or components of them, have considerable residual activity in the soil such that they cause production issues with the fall-planted legumes. Mikkelson and Lym (2011) measured significant damage to soybean, sunflower and alfalfa up to eight months following application of aminopyralid (active ingrdient in GrazonNext HL™ and Chaparral™) at 120 g ha^{-1}. Merkle, Bovey and Davis (1967) found detectable quantities of picloram (an active ingredient in Grazon P+D™) in treated soil up to a year after application to Houston clay, Axtell sandy loam, and commercial sand from rates as low as 0.25 µg per g. Dow AgroSciences recommends forage legumes not be planted following application of GrazonNext HL™ or Grazon P+D™ for 4 to 18 months, depending on rate used and location (2011).

Objectives

The primary objective of this research was the determine an approximate safe time interval between application of the tested herbicides and sowing of crimson clover under environmental conditions similar to those present in this study.

A secondary objective was to evaluate rates of herbicide application on crimson clover germination, phytotoxicity and growth when applied 6, 5, 4, and 3 months prior to seeding of crimson clover.

Methods

- Four replicates of each Chaparral™ (2 oz/A and 2.5 oz/A), GrazonNext HL™ (1.5 pt/A and 2.1 pt/A), and Grazon P+D™ (2 pt/A) were applied to a mixed common/Coastal bermudagrass pasture on April 15, May 15, June 15, and July 15, 2013.
- All applications were made with a CO_2 powered backpack sprayer to plots measuring 7' X 20' in a completely randomized design.
- Crimson clover (*Trifolium incarnatum*) was overseeded (surface applied) across all treatment plots on October 15, 2013 at a rate of 25 lb/A.
- The soil at the study site was a Falba fine sandy loam.
- To determine the differences between combinations of herbicide treatment and application date, the GLM procedure of SAS 9.2 was utilized. Means were separated using the lsmeans option (α=.05).

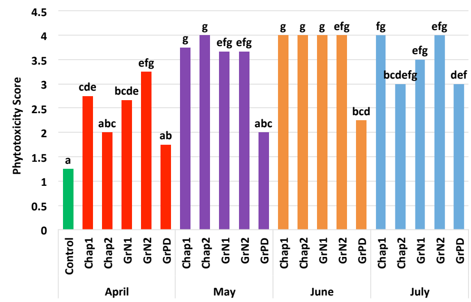


Figure 1. Mean phytotoxicity scores* (February 2014) of crimson clover planted in plots sprayed with Chaparral™ at 2 oz/A and 2.5 oz/A, GrazonNext HL™ (1- 1.5 pt/A and 2 - 2.1 pt/A), or Grazon P+D™ (2 pt/A) the previous April, May, June or July.
*(0 = no damage; 5 = all necrotic)

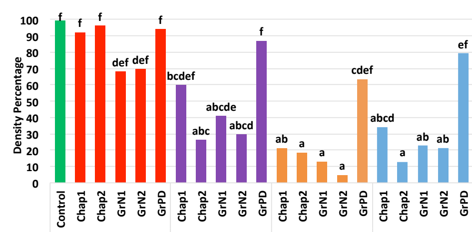


Figure 2. Mean vegetative density (%) (February 2014) of crimson clover planted in plots sprayed with Chaparral™ (1- 2 oz/A and 2 - 2.5 oz/A), GrazonNext HL™ (1- 1.5 pt/A and 2 - 2.1 pt/A), or Grazon P+D™ (2 pt/A) the previous April, May, June or July.

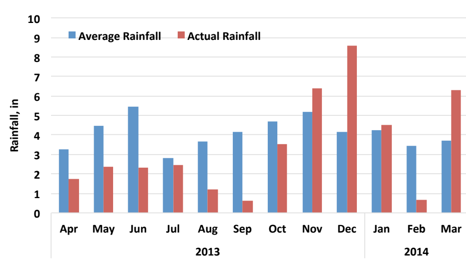
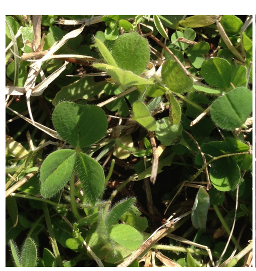


Figure 3. Average and actual rainfall in Huntsville TX from April 2013 to March 2014.



Crimson clover leaves from control plot (normal).

Crimson clover leaves from GrazonNext™ plot (cupping).

Results

While germination (seedling counts) were unaffected by herbicide treatments (data not shown), late October phytotoxicity ratings (not shown) followed the same general trends as those seen in Figure 1, with April applications showing the least phytotoxicity. The slight phytotoxicity observed in the control treatment was likely due to herbicide drift. The Grazon P+D™ was the least damaging treatment to crimson clover across all dates of application in this study, though statistically significant from all other herbicide treatments at only the May and June applications. When applied six months prior to clover seeding (April), only the low rate of Chaparral™ and both rates of GrazonNext HL™ showed significantly higher levels of damage than the control (Figure 1), however, GrazonNext HL™ was the only treatment that reduced stand density at this interval (Figure 2).

At five months prior to seeding (May) only the Grazon P+D™ treatment remained statistically insignificant from the control for both phytotoxicity and stand density the following spring (February 2014). While the Grazon P+D™ means for stand density were not significantly different from the control for any interval, there were noticeable slight declines in stand density and significant increases in phytotoxicity ratings as the interval between herbicide treatment and seeding decreased to three months. Herbicides containing aminopyralid had the most significant effects on phytotoxicity and stand density of crimson clover. Stand density of the Grazon P+D™ treatment was not statistically different from the control for any treatment interval at the February rating (Figure 2), however some phytotoxicity from this herbicide was apparent from the June and July applications (Figure 2). Mean stand density of the July Grazon P+D™ application did decline to about 40 percent at the April evaluation, compared to 80 percent density for the control treatment (data not shown).

Conclusions

Rainfall data from the study period show that precipitation during the months following herbicide treatment and prior to seeding was considerably lower than normal (Figure 3). The winter months were generally wetter than normal. The dry conditions during the summer months likely reduced the natural degradation processes of all herbicides, contributing to longer residual activity than might have been observed under normal or wetter conditions. Under conditions similar to those encountered here, of the herbicides used in this study it appears that Grazon P+D™ is the least likely to cause damage to fall seeded crimson clover. Products containing aminopyralid may persist at levels harmful to fall seeded legumes beyond six months, even in the warm, humid conditions of southeast Texas. Since most pasture herbicides in this region are typically applied from May-July, we would recommend not using such products in the same year in pastures where volunteer crimson clover is expected or fall seedings are anticipated.

References

Jonathan R. Mikkelson and Rodney G. Lym (*2011*) Aminopyralid Soil Residues Affect Crop Rotation in North Dakota Soils. Weed Technology: July-September, Vol. 25, No. 3, pp. 422-429.

M. G. Merkle, Bovey, R. W., and Davis, F. S. (1967) Factors Affecting the Persistence of Picloram in Soil. Agron. J. 59:413–415.

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