Clovers in Response to Broadcast vs. No-Till Drill Planting—Second Year Results

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Introduction

Legumes have been used for centuries by producers and researchers that led to the adoption of appropriate legume species for particular requirements. One of the desirable effects of legume production is the biological ability of legume plants to use atmospheric N, but with the development of synthetic N fertilizer (McNeill, 2000) early in the last century, the use of legumes, and especially clovers, has been replaced with easily applicable and inexpensive commercial fertilizer. The recent, immense increase in energy costs may reverse this trend as N fertilizers, produced from natural gas, have become relatively expensive.

Poor legume establishment can be problematic especially on soils with low water holding capacity, low pH, and unfavorable soil texture that can be detrimental to the large taproot system of some legumes. Therefore, the objective of this study was to test the establishment of white and crimson clover by no-till or broadcast seeding into an existing bermudagrass (Cynodon dactylon L.) sward at two seeding rates and to determine the effect of canopy removal before or after planting via grazing animals on legume plant persistence. This report summarizes the results from the second year of this study.

Experimental Procedures

The study was conducted at the University of Arkansas-Watershed Research and Education Center (WREC) located in Washington County, Arkansas. The soil at the site was classified as a Captina silt loam soil (fine-silty, siliceous, active, mesic Typic Fragiaudults) which is moderately to well drained and slowly permeable. Slopes are 1 to 3% with rolling hills to moderately level land.

Experimental plots were marked at the beginning of October 2009 in an existing ‘Greenfield’ bermudagrass sward. Whole plots (grazed before/grazed after treatments) were 0.15 acres with three replications of each. Whole plots assigned to the ‘grazed before’ treatment were grazed between September 28 and October 2, 2009 with 3 non-lactating fistulated cows each, resulting in a theoretical stocking rate of approximately 9 animal units (AU)/acre. During the 5 days of grazing, animals were placed on paddocks at 8 am and removed at 5 pm each day. Canopy height was reduced from approximately 5 inches at day 1 to 2 inches at the end of day 5.

On October 3, 2009, subplots were randomly planted within whole plots and included the following treatment combinations each for crimson and white clovers: a) No-till high seeding rate; b) no-till low seeding rate; c) broadcast high seeding rate; d) broadcast low seeding rate. High and low seeding rates were 16.8 and 8.4 lbs pure live seeds (PLS) for crimson clover, respectively, and 6.2 and 3.1 lbs PLS for white clover, respectively. No-till planting was performed using a 7-foot wide Tye drill with 0.5-foot row spacing and a planting depth of approximately 0.5 inches. Seeds were broadcasted using a hand-held fertilizer spreader. After planting, cattle were stocked on whole plots assigned to ‘grazed after’ and remained for the same amount of time as in ‘grazed before’ plots (5 days) between October 5 and 9, 2009.

Seedling counts were performed randomly four times in each plot on October 26 through October 29, 2009, using a metal grid frame (Vogel and Masters, 2001). Seedlings were counted within a total area of 4 square feet at each of the four locations. Seedling counts were repeated on March 30 through April 2, 2010. Data were analyzed as a randomized block design with factorial treatment arrangement at the subplot level using the Proc GLM of SAS (SAS Inst., Cary, N.C.). Species were analyzed separately due to their botanical differences. Statistical differences were considered significant at $P < 0.05$ unless otherwise indicated.

Results and Discussion

Fall 2009. In general, grazing appeared to have little impact on the success of clover establishment (Fig. 1). With the exception of broadcasting crimson clover and white clover at high rates, seedling counts for either ‘grazed before’ or ‘grazed after’ were similar. It also appeared that broadcasting white clover at either high or low rates resulted in similar seedling counts as no-till planting at a low rate (Fig. 1). Further, broadcast establishment of white clover at a high rate appeared to increase seedling counts in ‘grazed after’ compared
with ‘grazed before.’ However, total seedling count numbers may have been too low to draw a reliable conclusion despite similarities to the previous year. There seemed to be little evidence that cattle hoof action may play a role in clover establishment. Unlike during the previous year, soils at the experimental site were saturated due to strong precipitation events during the month of September 2009, and good seed-soil contact may have been provided by favorable soil moisture conditions.

Spring 2009. Six months after planting, seedling counts were generally reduced. Seeding method and rate interacted in the case of crimson clover; thus, differences among treatments were displayed accordingly (Fig. 2). In white clover, seeding rate and method both affected \( P < 0.05 \) seedling counts independently. Winter survival in no-till drilled crimson clover may have been affected by the proximity of plants in drill rows that influenced their survivability. Overall, clover plant density positively affected weed suppression in plots of both species that were established using the no-till drill method.

For both crimson and white clovers, various establishment strategies were evaluated with the objective of providing producers with alternatives tailored to their production system. After the second year of this study, broadcasting clover seeds still appears to be feasible, but decisions on the establishment method should take production goals, cost, and ease of establishment into consideration.

**Implications**

Both crimson and white clovers can be established using either the no-till drill or broadcasting method. However, because no-till planting will result in better stand establishment, producers should choose that scenario if financially feasible. Grazing may not have a large effect if soil is relatively wet during planting.

**Literature Cited**


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**Fig. 1. Effect of no-till drill and broadcast planting methods on seedling counts/square foot in crimson clover and white clover grazed before and after planting in fall of 2009. Treatments were crimson no-till high seeding rate (CNTH), crimson no-till low seeding rate (CNTL), crimson broadcast high seeding rate (CBH), crimson broadcast low seeding rate (CBL), white no-till high seeding rate (WNTH), white no-till low seeding rate (WNTL) white broadcast high seeding rate (WBH), and white broadcast low seeding rate (WBL). Means displaying the same letter within same species are not significant different \( P < 0.05 \). Both species were analyzed separately.**
Fig. 2. Effect of no-till drill and broadcast planting methods on seedling counts/square foot in crimson clover and white clover grazed before and after planting in spring of 2010. Treatments were crimson no-till high seeding rate (CNTH), crimson no-till low seeding rate (CNTL), crimson broadcast high seeding rate (CBH), crimson broadcast low seeding rate (CBL), white no-till high seeding rate (WNTH), white no-till low seeding rate (WNTL) white broadcast high seeding rate (WBH), and white broadcast low seeding rate (WBL). Means displaying the same letter within same species are not significant different ($P < 0.05$). Both species were analyzed separately. There was no seeding rate by planting method interaction present with white clover.