

Managing established white clover in pastures.

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In the November 2002 Georgia Cattleman, I discussed methods of establishing white clover in pastures. This article serves as a companion to that information. Once clovers are well established, various management practices can improve persistence and productivity. Nitrogen fixation, fertility needs, and grazing management of established clover stands will be discussed in this article. I'll also include recent animal performance data from a white clover grazing trial conducted by Dr. Carl Hoveland.

Nitrogen fixation by clovers and release to grasses

A frequently mentioned benefit of including clover in pastures is nitrogen fixation. This is one of many economically important features of clover, particularly when they make up a large proportion of available forage. Our atmosphere is made up of about 80% nitrogen; however, it is not in a form plants can utilize. Nitrogen is "fixed" in clovers through a symbiotic relationship with rhizobium bacteria that infect roots. The plant provides energy for the bacteria and bacteria provide the "machinery" necessary to convert atmospheric nitrogen to a form available to plants.

Most people picture a 'pipeline' that transports nitrogen directly from clover to grass. Unfortunately almost no nitrogen is contributed in this manner. Essentially all of the nitrogen supplied to grasses from clover is indirect. Because of this indirect route, nitrogen from clover root nodules is not immediately available to companion grasses. Root nodules must decompose and nitrogen must be converted into a form available to plants. This conversion or 'mineralization' releases nitrogen slowly- much like a time release fertilizer.

The time needed for fixed nitrogen to become available to grasses is important to consider. For example, crimson clover included in a small grain mixture will contribute little nitrogen to the companion small grain. Therefore, small grain-crimson clover mixtures should be fertilized with moderate rates of nitrogen to stimulate grass growth. Nitrogen fixed by crimson clover will be released later to the summer crop as root nodules decay. This slow nitrogen release can keep perennial warm season pastures green throughout the growing season or provide nitrogen to row crops like cotton or corn.

It may also be necessary to fertilize white clover stands with nitrogen. During the 1st year of clover establishment the nitrogen fixed by clover has not mineralized and is unavailable to grasses. Under these circumstances, small amounts of nitrogen (30-40 lbs per acre) will stimulate grass growth and improve overall forage production. If nitrogen is added to these stands, pastures *must* be grazed in a controlled manner to prevent grasses from outcompeting clover. Grazing should be conducted in a manner that avoids or minimizes clover injury. If controlled grazing methods are not feasible, do not apply nitrogen during the establishment year.

After perennial clovers are well established, nitrogen will be released to grasses at a relatively constant rate as nodules decompose. White clover will fix 75-150 pounds of nitrogen per year, depending on soil and growing conditions. At current prices this translates to \$20-\$40 per acre in added nitrogen.

It may also be beneficial to fertilize with nitrogen when clover makes up less than 15% of the stand. Under these conditions, clover is contributing little nitrogen to the system and overall forage production could be increased with nitrogen addition.

Clover leaves and stems contain approximately 5-6% nitrogen by weight. This nitrogen can be made available to grasses through animal urine and dung. Grazing activity recycles a large amount of nitrogen to the pasture. However, when grazing distribution is uneven, nitrogen may be concentrated around water sources or shade where animals congregate.

Grazing management

Even though white clover is tolerant of close grazing, it is still sensitive to grazing pressure. For example, white clover can become a weed in lawns that are frequently mowed. Close defoliation allows light to reach white clover leaves and favors clover growth over tall fescue. In contrast, white clover is seldom found in ungrazed pastures or hay fields that are cut infrequently. The tall grass in these uncut fields shades clover and favors grass growth.

When pastures are rotationally grazed to short residue heights, clover regrowth is favored over grass regrowth (Figure 1). Rotational grazing also increases utilization of grasses and allows storage of root carbohydrates. Pastures containing white clover should be grazed to roughly a 2 inch stubble height to encourage clover persistence. Rest periods of two to three weeks are generally adequate for white clover-bermudagrass mixtures, but three to four week regrowth periods may be necessary for tall fescue or orchardgrass pastures containing white clover.

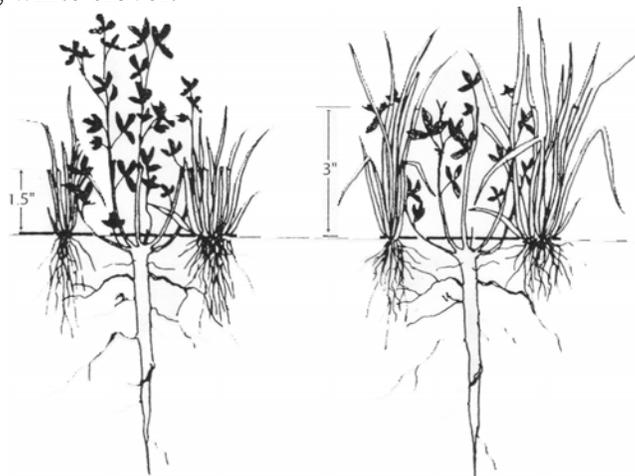


Figure 1. Diagram depicting effects of grazing pastures to 1.5" stubble height (left) versus 3" stubble height (right) on grass and clover regrowth. From Blaser et al., 1986 Virginia Polytechnic Institute Bulletin 86-7.

If pastures are continuously grazed, stocking rates should be monitored closely. Spot grazing and shading will occur at low stocking rates while high stocking rates reduce animal performance and plant vigor.

Animal Performance

Clover addition also improves animal production of bermudagrass and tall fescue pastures. In a recent study, Dr. Carl Hoveland examined performance of stocker cattle grazing toxic tall fescue seeded with Durana or Regal white clover. Pastures were established in 1998 and were grazed fall 1999, spring and fall 2000-2001, and spring 2002. Seeding either Regal or Durana clover in fescue pastures improved animal gains until summer 2001 when Regal stands began to fail (data not shown).

Grazing data from the spring of 2002 are shown in Table 1. Stands of Durana clover were thick and animal gains on these paddocks remained high while animal gains on Regal declined. Durana clover made up 19-62% of forage in pastures from March 27-June 17 2002 while only 0-3% clover was observed in Regal paddocks. While performance of animals grazing Regal was low during this third year of grazing, sodseeding ladino-type white clovers like Regal, Will, Osceola is an excellent short-term practice to combat fescue toxicosis and improve animal performance. However, new grazing persistent white clovers like Durana also improve animal performance and persist longer in well managed pastures.

Pasture species	Average daily gain, lbs	Gain/acre, lbs
Toxic tall fescue	0.60	187
Fescue + Durana white clover	1.79	296
Fescue + Regal white clover	0.89	136

Table 1. Stocker gains of cattle grazing fescue interseeded with two white clover varieties. Two acre paddocks grazed at Eatonton, GA from March 28-June 14, 2002. Clover seeded fall 1998.