Sowing Method Effects on Clover Establishment into Permanent Pasture

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ABSTRACT

A study was conducted from 2009 to 2011 near Blacksburg, VA, to gain a better understanding of how sowing method affected establishment and persistence of clover in permanent cool-season grass pastures. Four 1.1-ha pastures were split in half and assigned a broadcasted or no-till drilled sowing treatment. Pasture treatments were sown with an equal proportion of red (Trifolium pratense L.) and white clover (Trifolium repens L.) each at 4.4 kg ha⁻¹ in February 2009. Residual grass biomass on pastures was measured at sowing, and clover seedling density was counted 2 mo later. Grass, white clover, red clover, and weed biomass were measured four times during each growing season. Broadcast treatments had 56% more clover seedlings than drilled treatments 2 mo after sowing, but this difference was not significant (P = 0.1087). No difference (P > 0.10) for clover biomass was observed between sowing treatments in any year, yet clover establishment was considered successful (>25% of pasture composition). In the drilled treatments, clover seedling density was negatively affected by the amount of residual grass biomass present during sowing (P = 0.0196). In the broadcasted treatment, a negative quadratic relationship between clover seedling density and residual grass biomass at sowing was found (P = 0.0516). For successful establishment of clovers into permanent pastures, these data imply that removing residual grass biomass before sowing was more important than seeding method.

Establishing clover (Trifolium spp.) into permanent pasture can be challenging, because many factors like competition from existing the sward, subsequent grazing management, or weather fluctuations can affect this process. Two common overseeding methods for clover include surface sowing without disturbance (broadcasting) or drilling of seed through undisturbed sod and residue (Pearson and Ison, 1997). Frost-seeding is a form of overseeding when seed is broadcasted mid-winter on top of snow and frozen ground or in early spring after snowmelt (Casler et al., 1999). Once sown, the freezing and thawing of the ground helps to incorporate seed into the soil. This allows for better seed-to-soil contact and reduces the equipment required for planting (Kankanen et al., 2001). Both no-till drilling and broadcasting have strengths and weaknesses. The advantage of no-till drilling is more control over seeding depth to ensure good seed-to-soil contact (Campbell, 1985a). A disadvantage of no-till drilling is that use can be limited by steep topography. Broadcasting requires less machinery and is virtually unrestrained by topography. However, no-till drilling is considered superior to broadcasting, because more control helps ensure a proper seeding depth (Taylor et al., 1972).

Several experiments that have compared broadcasting with no-till drilling found varying results. Taylor et al. (1969) discovered that drilling clover seed was important for successful establishment of red clover (Trifolium pratense L.). They found that extreme moisture and temperature fluctuations on the surface of the soil caused low establishment of broadcasted seed. Cuomo et al. (2001) found no difference between drilling and broadcasting in establishment across several forage legumes. They learned that the main factor that determined legume establishment was the suppression of grass species. Byers and Templeton (1988) discovered that drilling produced more alfalfa (Medicago sativa L.) biomass over broadcasting, and Mueller and Chamblee (1984) found that broadcasting was more effective when sowing was done in late winter than in spring. In their experiment, white clover broadcasted in mid-February had greater establishment than when broadcasted in mid-March. When averaged between the two sowing dates, however, white clover (Trifolium repens L.) establishment was greater in the drilled treatments.

Although sowing method should have a major impact on clover establishment, relatively few studies have compared broadcasting (frost-seeding) to no-till drilling. More information is needed about clover overseeding methods to provide guidelines to help improve establishment success. To add to this body of research, a pasture experiment was conducted from 2009 to 2011 near Blacksburg, VA. The primary objective of this study was to compare the effectiveness of broadcasting (frost-seeding) and no-till drilling for establishment of white and red clover. A secondary objective was to identify potential management variables that may help explain the success or failure of seeding methods.

MATERIALS AND METHODS

Study Site

The pasture experiment was conducted at Virginia Tech College Farm near Blacksburg in Montgomery County, Virginia (37°11’ N lat, 80°35’ W long) during the 2009, 2010, and 2011...