

Establishment and Survival of Red, White, and Berseem Clover on a Sandy Soil

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Story in Brief

This small plot demonstration was conducted to determine the establishment and production of 3 clover types (berseem, white, and red clovers) on a sandy loam soil. The berseem clover (28.4% cover) did not establish or survive well during this study ($P < 0.0001$). The white clover varieties cover ranged from 54.6% for 'Tripoli' to 95.8% for 'Patriot' with an average of 85%. The red clovers flourished on this type soil averaging a 98.5% cover. The 'Start' red clover had the highest stand of all clovers with a 100% stand. When yields were collected, berseem clover was omitted due to the lack of the legume. There were no observed differences in DM percent (mean = 20.1%) ($P = 0.90$) or yield (mean = 4,453 lb/acre) ($P = 0.98$) across red and white clover varieties. The white clovers averaged 4,160 lb an acre with 'Barblanca' producing the greatest amount at 4,648 lb DM/acre and 'Tripoli' producing only 3,358 lb DM/acre. The red clovers averaged 4,893 lb/acre with 'Freedom' producing 5,949 lb DM/acre and 'Start' producing 4,278 lb DM/acre. No differences were found ($P > 0.42$) in chemical composition between red and white clover.

Introduction

Legumes can be a very important part of grasslands. Legumes can fix from 50 up to 200 lb of nitrogen a year and this nitrogen becomes available to other forages when the legume plants decay. Nitrogen fixation and availability can reduce the need for other N fertilization, which reduces fertilization cost. Legumes can also increase the nutritional value of pasture and hays.

Legume species can be difficult to establish and maintain in a grass sod. Factors influencing a successful establishment include adequate nutrient requirements, proper pH, matching your legume to your soil characteristics, removal of grass competition (whether by disking or mowing), and seed inoculation. Sandy soils are droughty soils that pose particular problems to legume establishment and maintenance. Most sandy soils are medium to strongly acidic; therefore lime should be applied to raise the soil pH. Some species of legumes, such as a red clover, are more tolerant to droughty and acidic conditions, while others, such as white clover, are less tolerant.

Red clover (*Trifolium pretense*) is a short lived perennial (usually 2 years in the South) that is an erect growing, leafy plant 2 to 3 feet tall. It is fairly drought tolerant and can persist in soils with a pH as low as 5.5. Seedling vigor is better than for any other clover. White clover (*Trifolium repens*) is a short lived perennial in the lower South that is leafy, grows to a height of 8 to 12 inches, and spreads by stolons. Seeds are extremely small and do not reseed well. It is not productive on droughty soils, but will survive considerable dry weather. Berseem clover (*Trifolium alexandrinum*) is a winter annual that grows erect to a height of about 2 feet. The winter hardy variety produces hard seed and will often reseed. It is adapted to loamy soils of pH 6 or above (Ball et al., 2002). The objective of this study was to determine the establishment and production of berseem, white, and red clovers on a sandy loam soil.

Experimental Procedures

Replicated plots (10 x 40 ft) were mowed to a 2-inch stubble and sown on November 1, 2006 into a Savannah fine sandy loam soil using a no-till planter. Savannah soils are deep, moderately well drained, moderately to moderately slowly permeable, nearly level to gently sloping soils that formed in thick beds of loamy, marine sediment (Hoelscher and Laurent, 1979). Six varieties of white clover, three varieties of red clover, and berseem clover were used in this study. White clover was planted at 3 lb/acre, red clover at 8 lb/acre, and berseem clover at 15 lb/acre. All legumes, whether pre-inoculated or not, were inoculated with appropriate rhizobia before planting. The legumes were seeded into a dallisgrass/bermudagrass mixed sod. Plots were limed with 1 ton lime/acre on the 7th of November. Previously collected soil test showed adequate phosphorus and potassium levels.

A 30-inch by 30-inch square quadrant equally divided into 25 (6 inch x 6 inch) squares was used to collect stand counts on June 7, 2007. Ten squares were visually scored from each plot. Dry matter yields in lb/acre were collected on plots with a substantial legume percentage (75% or higher). Three 1-foot square quadrants were clipped, weighed, and dried in a forced air oven at 120°C to determine DM content, which was used to determine dry forage yield (lb/acre).

Samples were ground to pass a 2-mm screen (Thomas A. Wiley Laboratory Mill; Model 4; Thomas Scientific, Swedesboro, N.J.). Forage CP, NDF, ADF, and TDN were estimated using near infrared reflectance spectroscopy (Feed and Forage Analyzer, Model 6500, FOSS North America, Eden Prairie, Minn.).

Data were analyzed using PROC GLM of SAS (SAS Inst. Inc., Cary, N.C.). Response variables included percent cover, DM percentage, DM yield (lb/acre), and chemical composition. Legume species was analyzed using the residual error mean square as the error term.

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Results and Discussion

Table 1 shows that berseem clover (28.4 % cover) did not establish or survive well during this study ($P < 0.0001$). The white clover cover ranged from 54.6% for ‘Tripoli’ to 95.8% for ‘Patriot’ with an average of 85%. The red clovers flourished on this type soil averaging a 98.5 % cover. ‘Start’ red clover had the highest of all clovers with a 100% stand. As clover percentages increased, a decrease in the amount of grass was observed..

When yields were collected, berseem clover was omitted due to the lack of the legume. Table 2 shows that there were no observed differences in DM% (mean = 20.1%) ($P = 0.90$) or yield (mean = 4,453 lb/acre) ($P = 0.98$) across red and white clover varieties. The white clovers averaged 4,160 lb an acre with ‘Barblanca’ producing the greatest amount at 4,648 lb DM/acre and ‘Tripoli’ producing only 3,358 lb DM//acre. The red clovers averaged 4,893 lb/acre with ‘Freedom’ producing 5,949 lb DM/acre and ‘Start’ producing only 4,278 lb DM/acre.

Table 3 shows chemical constituents of the red and white clovers. There were no ($P > 0.42$) observed differences in crude protein (average 15.6%), NDF (57.0%), ADF (39.4%), and TDN (58.2%). All were above the daily requirements of a lactating beef cow.

Implications

Berseem clover did not establish or survive well during this study. However, the red and white clover varieties performed very well on this soil type under proper growing conditions. Wider drill spacing’s or a lower planting rate could be used to help reduce the impact on grass growth.

Literature Cited

Ball, D.M., et. al. 2002. Southern Forages. Potash & Phosphate Inst. and Foundation for Agronomic Research, Norcross, Ga.
 Hoelscher J.E., and Laurent, G.D. 1979. Soil Survey of Hempstead County, Arkansas.

Table 1. Observed percent cover across varieties.

Variety	Species	% Cover
Start	Red	100.0 a
Freedom	Red	99.4 a
FLMD	Red	96.2 a
Patriot	White	95.8 a
Durana	White	94.2 a
Ladino	White	93.6 a
Regalgraze	White	90.2 a
Barblanca	White	81.6 ab
Tripoli	White	54.6 bc
Bigbee	Berseem	28.4 c
	SE	19.00

a,b,c Means within column with no letters in common differ ($P < 0.05$).

Table 2. Observed dry matter % and yields across varieties of red and white clovers^a.

Variety	Species	DM %	Yield, lb/acre
Freedom	Red	20.0	5,949
Barblanca	White	20.0	4,648
FLMD	Red	21.0	4,454
Patriot	White	21.8	4,406
Start	Red	19.8	4,278
Ladino	White	19.3	4,190
Durana	White	18.7	4,030
Regalgraze	White	19.3	3,976
Tripoli	White	21.0	3,358
	SE	0.03	2,442.7

^aNo differences were observed among DM % and yields among varieties ($P > 0.05$).

Table 3. Observed chemical composition constituents by species^a.

	Red		White	
	Mean	SE	Mean	SE
Crude protein	15.1	1.92	16.1	2.89
Neutral detergent fiber	58.5	6.95	55.4	6.78
Acid detergent fiber	41.9	4.93	36.9	6.10
Total digestible nutrients	55.4	5.46	60.9	6.85
Relative feed value	91.0	17.58	103.1	19.78

^aNo differences were found between red and white clover means ($P > 0.05$).