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INOCULATION OF CRIMSON AND ARROWLEAF CLOVER

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SUMMARY

A field study was conducted to evaluate seed inoculation methods for crimson and arrowleaf clover. Several inoculant adhesives, various rates of inoculum, and lime-coating of inoculated seed were evaluated. Nodulation of crimson clover was two to four times better in plots planted with inoculated seed as compared to plots planted with uninoculated seed. In addition, a 40% gum arabic solution provided for significantly better nodulation for crimson clover when contrasted to either a water or 25% sucrose solution. Arrowleaf clover seedlings responded to application of inoculum with four to six times higher yields when compared to uninoculated seedlings. The 10x rate of inoculum was a significant benefit when contrasted with the 1x rate for both crimson and arrowleaf clovers. The 25% sucrose solution was equal to the 40% gum arabic solution as an adhesant in this study. Lime coating of inoculated seed did not significantly improve seedling taproot nodulation.

OBJECTIVES

This field study was initiated to evaluate the regional need for clover seed inoculation; to test a higher than recommended rate of inoculum; to compare inoculant adhesives; and to evaluate the practice of coating inoculated clover seed with lime.

PROCEDURE

The study area was a 'Coastal' bermudagrass hay meadow at the Texas A&M University Agricultural Research and Extension Center at Overton.

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The bermudagrass was growing in a Ruston loamy sand with a pH of 4.2, and had received annual rates of approximately 200-100-100 lbs/ac of N-P_2O_5-K_2O for the previous 7 years. Plots were arranged in a randomized complete block design with three replications. Inoculant adhesives for 'Dixie' crimson and 'Yuchi' arrowleaf clover were water, 25% sucrose solution, and 40% gum arabic solution. In addition, for arrowleaf clover only, a commercial adhesive, Pelgel*, was used. For each adhesive, two rates (1x and 10x) of inoculum were applied. Finely ground agricultural limestone, calcium carbonate, was also used to coat the inoculated seed of selected treatments. An uninoculated treatment was included to serve as a control plot.

Seeding rates were 20 lbs/ac for crimson and 8 lbs/ac for arrowleaf clover. One week after seeding, 400 lbs/ac of 0-20-20 was applied to all plots. Approximately 6 weeks after planting, all plots were sampled to assess clover root nodulation. Ten seedlings were dug from each plot and the percentage of plants with taproot nodules was recorded. Yield data was also taken in April and May by mowing each plot to a 2-inch height.

RESULTS

In comparing inoculated seed treatments with the uninoculated control for crimson clover, there was a significant 3-fold increase in percentage of seedlings with taproot nodules from seed treated with 40% gum arabic plus 1x inoculum, and a 4-fold increase in taproot nodulation from seed treated with the gum arabic plus 10x inoculum rate (Table 1). Other treatments caused an increase in taproot nodulation, but these differences were not significant at the .05 level of probability. Arrowleaf clover seedlings showed significant increases in taproot nodulation that was 4 to 6 times greater than the control plots (Table 1). However, the 25% sucrose plus 1x inoculum rate did not increase the percent of taproot nodules.

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*Pelgel and Pelinoc are commercial products of the Nitragin Co. Mention of companies or commercial products does not imply recommendation or endorsement by The Texas Agricultural Experiment Station over others not mentioned.

Lime coating of both inoculated crimson and arrowleaf clover seed was of no significant benefit in promoting seedling taproot nodulation. This lack of response to lime pelleting was probably due to the fact that rain occurred immediately after seeding and that lime had been broadcast on all plots at planting. The primary reasons for pelleting seed are to hold inoculum close to seed until climatic conditions permit germination, and to protect the rhizobia from acidic soil conditions.

Inoculation treatments which featured a 10x rate of inoculum were the most advantageous for both varieties. This does not suggest that a lesser rate would not accomplish the same objective, but does suggest that many of the rhizobia in the 1x treatments did not survive on the seed. Since additional inoculum is relatively inexpensive in comparison to other seeding costs, the practice of using a much higher than recommended rate of inoculum is justifiable and is encouraged.

For crimson clover, yield data indicated that all plots that were planted with inoculated seed produced 2 to 3 times more forage than uninoculated plots. Four to five-fold increases were evident for all inoculated arrowleaf seed treatments as compared to uninoculated seed. The 25% sucrose solution produced yields equal to those of the 40% gum arabic-treated seed. Previous research has indicated, however, that gum arabic is generally superior to sugar solution as an inoculant adhesive.

Table 1. Mean percentage of clover seedlings with taproot nodules.

Adhesive	Inoculant rate	% Taproot Nodules	
		Crimson	Arrowleaf
Uninoculated	0	25 a*	15 a
Pelgel	Pelinoc	NA	61 bc
Pelgel	Pelinoc + lime coat	NA	74 bc
Water	1X	50 ab	69 bc
25% Sucrose	1X	61 abc	43 ab
25% Sucrose	1X + lime coat	48 ab	65 bc
25% Sucrose	10X + lime coat	52 ab	92 c
40% gum arabic	1X	73 bc	62 bc
40% gum arabic	1X + lime coat	46 ab	57 bc
40% gum arabic	10X + lime coat	96 c	94 c

*Means within any column and followed by the same letter are not significantly different at the 0.05 level of probability.