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INFLUENCE OF NITROGEN FERTILIZER ON ARROWLEAF CLOVER SEEDLING GROWTH

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Background. Cool-season annual clovers are planted in mixtures with annual ryegrass to aid in distributing the small-seeded clover over the pasture, provide earlier grazing than the clover alone, and reduce the potential of bloat by livestock. Ryegrass requires some nitrogen (N) fertilization for growth. However, applying N fertilizer to clover seedlings may decrease nodule formation and nitrogen fixation from the air. Planning a N fertilization program for a clover-ryegrass mixture presents a problem. Clover will be reduced, and may be lost, because of the more rapid ryegrass growth due to N fertilization. An arrowleaf-ryegrass mixture was fertilized with 0, 30, 60, or 90 lb N/acre at planting or delayed until the clover seedling reached the first true leaf stage to study the effects on arrowleaf seedling growth.

Research Findings. Clover seedlings were removed about 4 and 6 weeks after N was applied at the first true clover leaf stage in 1990 and 1991, respectively. After washing the soil from the roots, the number of leaves and nodules per seedling was recorded. Dry weight per seedling was then determined. There were no major differences in number of leaves and nodules per seedling in 1990 (Table 1). Dry weight per seedling increased as N rate at planting increased. The second year (Table 2) at a new site there were no significant differences between any of the N fertilizer treatments. Seedling weight was slightly higher when 60 or 90 lb N was applied at planting or 30, 60, and 90 lb N applied at the first clover leaf stage.

Table 1. Response of arrowleaf clover seedlings in a ryegrass mixture to nitrogen rate and time of application 1990.

Nitrogen Rate		Clover Seedling		
At planting	1st clover leaf	Leaf no.	Nodule no.	Weight
-----lb/ac-----				---g---
0	0	4.65	12.4	0.047 bc†
30	0	4.60	12.3	0.053 bc
60	0	4.50	11.6	0.060 ab
90	0	5.05	12.2	0.073 a
0	30	4.23	9.8	0.042 c
0	60	4.60	12.1	0.046 bc
0	90	4.20	10.2	0.044 c

†Values within a column followed by the same letter are not significantly different at the 0.05 level, Waller-Duncan Multiple Range Test.

Table 2. Response of arrowleaf clover seedlings in a ryegrass mixture to nitrogen rate and time of application 1991.

Nitrogen Rate		Clover Seedling		
At planting	1st clover leaf	Leaf no.	Nodule no.	Weight
-----lb/ac-----				---g---
0	0	5.12	10.7	0.041
30	0	5.25	10.4	0.042
60	0	5.25	10.9	0.047
90	0	5.20	8.7	0.048
0	30	5.23	9.3	0.049
0	60	4.93	9.5	0.048
0	90	5.05	10.2	0.051

Application. Nitrogen fertilizer applied at planting or when clover seedlings reached the first true leaf stage did not reduce leaf number, nodule number, or weight of arrowleaf clover seedlings on these sandy soils. Similar studies on loam and clay soils in southeast Texas resulted in reduced nodulation as N fertilizer rate increased. Clover seedling weights were also reduced at N rates greater than 50 lb/acre because of increased competition from ryegrass. We believe N fertilizer did not reduce arrowleaf clover seedling growth in this study because the sandy soils in East Texas have a very low N holding capacity and are subject to leaching with average or greater rainfall. Most N fertilizer not taken up by plants within 4 to 6 weeks is probably lost.

Based on the data from this study, we recommend the following autumn N fertilization program for clover-ryegrass mixtures in East Texas. Delay N fertilization until ryegrass and clover have emerged. This will reduce leaching of N from the soil before ryegrass seedlings have developed a root system to take up N. Nitrogen rate should be from 30 to 50 lb N/acre. A second N application can be applied about 6 weeks later if temperatures are not too cold and ryegrass is a pale green. Begin grazing when the ryegrass reaches a 6-inch height to prevent the shading out and reduction of the clover.