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INFLUENCE OF NITROGEN FERTILIZER ON CLOVER SEEDLING GROWTH IN RYEGRASS MIXTURES

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Background. Cool-season annual clovers are planted with annual ryegrass to aid in distributing the small-seeded clover over the pasture, provide earlier grazing than the clover planted alone, and reduce the potential of bloat by livestock. Ryegrass requires nitrogen (N) fertilizer for growth on the infertile, sandy soils in East Texas. Applying N to a clover-ryegrass mixture during establishment can have a direct and indirect effect on the clover seedlings. The direct effect is a reduction in nodulation on the clover root system because the clover seedling can obtain N from the soil instead of by N_2 -fixation. The indirect effect is greater competition for light and moisture from the enhanced ryegrass growth. A reduction in clover stand will result in a corresponding decrease in spring clover production and N_2 -fixation.

'Yuchi' arrowleaf, 'Dixie' crimson, and 'Overton R18' rose clovers were overseeded on a 'Coastal' bermudagrass sod in mixtures with 'TAM 90' annual ryegrass. Nitrogen fertilizer treatments were 0, 30, 60, and 90 lb N at planting and 30, 60, and 90 lb N when the clover seedlings reached the first true leaf stage (approximately 1 month after planting). An additional treatment was the clover without N fertilizer and ryegrass. Clover seedlings were sampled in early January to record leaves, nodules, and weight per seedling.

Research Findings. None of the N fertilizer treatments had a major impact on the growth and development of the three clover species (Table 1). Nodules/seedling were slightly lower on arrowleaf clover and higher on crimson clover when N fertilization was delayed. Arrowleaf and crimson clover seedlings planted without ryegrass and N fertilizer always had more leaves and nodules than other treatments which reflects the lack of competition from the ryegrass for light, moisture, and nutrients. Nitrogen fertilization, especially when delayed until a month after planting, improved the seedling weight of arrowleaf clovers. Crimson clover seedlings had twice as many leaves and nodules and were three times heavier than arrowleaf and rose clover seedlings.

Application. Applying N to clover-ryegrass mixtures at planting or 1 month later did not influence clover seedling nodulation or growth. It is recommended to delay N fertilization until after the clover-ryegrass is up. This would prevent N loss by leaching before the seedlings are established and uptake by the grass sod which would increase competition to the emerging seedlings.

Table 1. Influence of nitrogen rate and time of application on clover seedling growth in ryegrass mixtures.

Planting 22 Oct.	First clover leaf 22 Nov.	Per seedling		
		leaves	nodules	weight (g)
-----lbs N/ac-----		Arrowleaf clover		
0	0	5.1 b†	10.7 ab	0.041
30	0	5.3 ab	10.4 ab	0.042
60	0	5.3 ab	10.9 ab	0.047
90	0	5.2 ab	8.7 b	0.048
0	30	5.2 ab	9.3 b	0.049
0	60	4.9 b	9.5 b	0.048
0	90	5.1 b	10.2 ab	0.051
0	0 (clover only)	5.7 a	12.6 a	0.050
average		5.2	10.3	0.047
		Crimson clover		
0	0	11.0	20.2 ab	0.157
30	0	10.5	17.2 ab	0.150
60	0	11.0	16.5 b	0.165
90	0	11.1	16.9 b	0.176
0	30	9.6	20.2 ab	0.132
0	60	11.0	20.8 ab	0.149
0	90	9.8	20.1 ab	0.131
0	0 (clover only)	12.4	22.0 a	0.172
average		10.8	19.2	0.154
		Rose clover		
0	0	6.8	5.3	0.052
30	0	6.3	5.3	0.054
60	0	6.1	5.9	0.049
90	0	5.9	5.4	0.052
0	30	6.1	5.7	0.053
0	60	5.9	5.2	0.051
0	90	6.5	6.6	0.055
0	0 (clover only)	6.9	5.5	0.062
average		6.3	5.6	0.054

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