Cool-Season Grass Response to Increasing Nitrogen Fertiliser Rates in Michigan

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Introduction Nitrogen (N) fertility recommendations for cool-season grasses in the north central region of the USA have not been species specific. This broad recommendation assumes that all grasses have similar N demands, while seasonal growth patterns and dry matter yield of cool-season grass species vary. Nitrogen fertiliser costs have steadily increased, but recommendations are to be below optimal levels for economic return (Klausner *et al*., 1998). A more specific N fertiliser recommendation may increase the producers' net income.

Materials and methods Five cultivars of four species ('Aries' diploid perennial ryegrass (PR) *(Lolium perenne)*, 'Quartet' tretaploid perennial ryegrass, 'Barolex' tall fescue *(Festuca arundinacea)*, 'Duo' festulolium *(Festuca x Lolium)*, and 'Sparta' orchard grass *(Dactylis glomerata*) were seeded in a split-block design with cultivar being the whole plot at East Lansing, MI., USA in 2001. Ammonium nitrate was applied in split applications (Table 1) to deliver 0,112, 224, 336, and 448 kg N/ha per year. Weeds were controlled as needed with Trimec (2,4-D, dicamba) herbicide. Yield, crude protein (CP), neutral detergent fibre (NDF), acid detergent fibre (ADF), tiller counts and visual ratings for ground cover and disease were collected annually.

Table 1 Nitrogen application (kg/ha) and timing

Rate	Timing
0	0
112	56 at new growth initiation, 56 after 1st cut
224	56 at new growth initiation , 56 after 1st cut, 56 after 2nd, 56 after 4th
336	112 at new growth initiation , 84 after 1st cut, 84 after 2nd, 56 after 4th
448	112 at new growth initiation , 112 after 1st cut, 112 after 2nd, 56 after 3rd, 56 after 4th

Results Three-year total yield responses by cultivar to N rates are presented in Figure 1. Both perennial ryegrass cultivars were winter killed and were reseeded in 2003 so yields of these are for 2002 and 2004 only. The greatest yield response from N application was observed in tall fescue. There was no gain in yield for any species above 224 kg N/ha. Tillering was increased by N applications in diploid PR and tall fescue. There was no change in ADF or NDF, but CP increased on average by 28 g/kg when N was applied at the lowest rate for all species. Leaf rust *(Puccinia brachypodii)* and Septoria leaf spot indices were decreased in all species by N application, but tall fescue had the greatest decrease from increased N.

Conclusions The importance of N is clearly demonstrated for all cultivars tested. While tall fescue was the most efficient in utilising N, all species optimised N use at 224 kg N/ha. Increased yield is often noted when N is applied, but increased CP and decreased occurrence of foliar disease should also be noted. The application of N encourages tiller initiation and this new growth is disease-free. Plants growing and initiating tillers more rapidly, due to N application, had less evidence of disease. While all grass species had the same optimal N level, the yield increase due to increasing the N rate from 122 to 224 kg/ha varied.

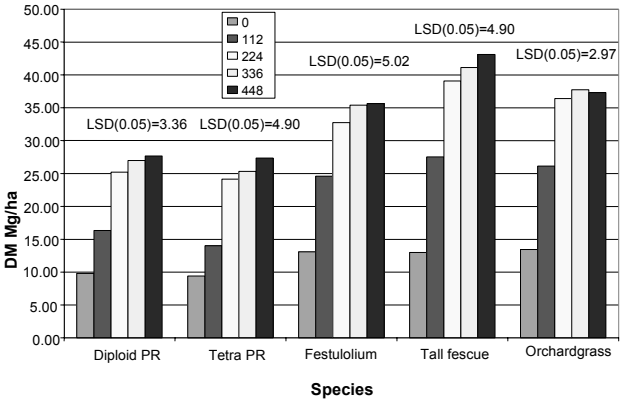

Figure 1 Yield response of pasture grasses to increasing nitrogen rates

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