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EFFECT OF RYE AND RYEGRASS SEEDING RATES AND MIXTURE RATIOS ON FORAGE YIELD AND QUALITY AT UVALDE, 1993-1994.

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Summary

'Elbon' rye (*Secale cereale*) and 'TAM-90' ryegrass (*Lolium multiflorum* Lam.) were seeded at three levels and four combinations on fully irrigated plots and on initially irrigated, dryland plots to measure the effects of these factors on dry matter yield and forage quality. Except for the first harvest, irrigated plots that had been seeded with ryegrass at the rate of 10 lbs/acre or higher had similar dry matter yields. Increasing ryegrass seeding rate to 30 lbs/acre increased first harvest forage yield by almost 1000 lbs/acre. Dryland plots seeded with only ryegrass at the rate of 30 lbs/acre had lower yields than plots seeded at 20 lbs/acre. Seeding rates of 40, 80, and 120 lbs/acre for rye had no effect on dry matter yields on either irrigated or dryland plots. Forage quality was very high early in the season and declined in a typical manner as the plants matured.

Introduction

Increased interest in grazing ryegrass in Southwest Texas has brought into focus the need to ascertain optimum seeding rates and the potential value of mixtures with rye that have been recommended for East Texas. The rye component of the mixture improves forage production in autumn and winter. Two trials were conducted, one with full irrigation and another with only an initial irrigation, to determine the effect of seeding rates of Elbon rye and TAM-90 ryegrass, alone and in mixtures, on forage yield and quality.

Keywords: *Lolium multiflorum* Lam. / *Secale cereale* / protein / neutral detergent fiber / acid detergent fiber / irrigation

Procedures

Elbon rye and TAM-90 ryegrass were seeded alone and in mixtures in separate planting operations on a silty clay loam soil on 14 Oct. 1993. Nitrogen (N) (64 lbs/acre) and phosphorus (P_2O_5) (41 lbs/acre) were applied broadcast and incorporated into the soil during final seedbed preparation. Nitrogen in the form of urea was top-dressed onto the irrigated plots at the rate of 55 lbs/acre on 3 Mar. 1994. The plots were 60 ft long and were drilled in 7 rows with a 7-in. row spacing on 76-in. beds.

Plots were seeded to provide high, medium, and low plant populations in four combinations of rye and ryegrass. The highest seeding level contained the specific combinations, (1) 120 lbs/acre of rye, (2) 80 lbs/acre of rye plus 10 lbs/acre of ryegrass, (3) 40 lbs/acre of rye plus 20 lbs/acre of ryegrass, and (4) 30 lbs/acre of ryegrass, and these were identified by the rye: ryegrass ratios, 1:0, 2:1, 1:2, and 0:1, respectively. For the medium and low populations, each of the amounts in the high level seeding treatments was reduced by one-third and two-thirds, respectively. Seed weights were 1.96 grams and .273 grams per hundred seeds for the rye and ryegrass, respectively. Seedling counts were taken in one, randomly selected, 2.7-ft^2 area in each plot in mid-December.

An initial irrigation (3.5 in.) was applied to dryland plots with sprinklers 12 days after planting. Irrigated plots were furrow watered to saturation one week after planting and were again watered to saturation on 20 Dec. 1993. Midwinter and spring rainfall (19.5 in.) alleviated the need for additional irrigation.

The center five rows of each plot were harvested and weighed with a sickle-type plot harvester at a 4-in. cutting height. Irrigated plots were harvested five times beginning 9 Feb. 1994, and dryland plots were harvested three times beginning 16 Mar. 1994. At each harvest a sample of forage from each plot was taken for dry matter determination and forage quality analyses. The samples were dried in open pans at 220°F until constant weight was achieved, usually 1.5 hr. Dried plant material was ground and retained for acid detergent fiber (ADF) and crude protein (CP) analyses. These procedures were common to both irrigated and dryland trials.

Using the ADF and CP values, a software program, FORAGVAL, (Lippke and Herd, 1990) was used to calculate estimated daily dry matter intake and average daily gain (ADG) by stocker steers that would be supported by the forage from each plot and harvest. These estimates were arithmetically combined with yield data to calculate estimated gain per acre.

Results and Discussion

Seedling counts revealed a large disparity in plant survival between rye and ryegrass. Average numbers of rye seedlings per 100 live seeds planted were 35 on furrow irrigated plots and 50 on plots receiving an initial sprinkle irrigation. For ryegrass the numbers of seedlings were 82 and 85 per 100 live seeds planted for furrow irrigated and dryland plots, respectively. At the high seeding level on both irrigated and dryland plots, ryegrass seedling survival appeared slightly depressed at the 2:1 ratio of rye: ryegrass, and rye survival was slightly depressed at the 1:2 ratio.

On irrigated plots, pure rye stands had distinctly lower total dry matter yields than pure ryegrass stands (Fig. 1). Dry matter yields on the dryland trial were approximately half those on the fully irrigated plots (Fig. 2), and, overall, dryland plots where ryegrass was predominant yielded more than plots where rye was predominant (Fig. 4a).

Rye seeding rate had no effect on yield at any harvest date in the irrigated trial. However, first harvest yields for plots with ryegrass alone increased with increasing seeding rate ($P<.05$), ranging from 1730 to 2710 lbs/acre. At the late April harvest, yield differences among treatments with ryegrass alone were about the same magnitude as the first harvest but ranked in inverse order, suggesting that soil nutrients were limiting. An additional interaction effect between harvest date and seeding treatment was noted for plots seeded primarily to rye and those containing primarily ryegrass (Fig. 3a). The greater late season decline in forage production from rye (Fig. 3a) was due to its earlier maturity.

A seeding treatment x harvest date interaction ($P<.05$) was also noted in the dry matter yield data from the dryland trial. It was caused by slightly lower yields from plots that were predominantly ryegrass at the first harvest but higher yields for those plots at each of the subsequent harvests. Except for plots that had only ryegrass, seeding rates had no effect on dry matter yields of dryland plots. A comparison among the plots with ryegrass alone showed that those seeded at the rate of 20 lbs/acre yielded more ($P=.055$) than plots seeded at the rate of 30 lbs/acre.

Patterns of ADF and CP concentrations with time are shown in Figures 3b and 3c and in Figures 4b and 4c for the irrigated and dryland trials, respectively. In the irrigated trial, first cutting forage from predominantly rye plots and plots with the lowest seeding rates tended to be higher in quality, i.e., lower in ADF and higher in CP (Fig. 3b and 3c). Consequently, when the entire season was considered, rye forage from the lowest seeding rate had lower ADF and higher CP ($P<.05$) than forage from all other seeding combinations. The CP content of ryegrass responded positively to N fertilizer applied on irrigated plots in early March (Fig. 3c). Otherwise, the rising levels of ADF and declining CP with time were as expected with advancing maturity.

Seeding combinations had no effect on ADF or CP of forage harvested from dryland plots. The precipitous decline in CP content of forage from dryland plots in late March (Fig. 4c) may have been caused by a deficiency in soil N, although forages from irrigated plots remained higher in CP while removing more N prior to the early March N application to those plots.

Figure 3d shows that the advantage in estimated steer gain/acre for ryegrass on irrigated plots came primarily at the first cutting and widened somewhat as rye started maturing earlier than ryegrass. Comparing the estimated gain/acre between irrigated and dryland trials (Fig. 3d and 4d) reveals the large production advantage for fully irrigated plots in this experiment.

When total yields for the season were considered, no advantage was found for seeding more than 10 lbs ryegrass/acre in either trial. However, there is at least the suggestion in the data that a shortage of soil N may have restricted potential late season yields from the higher seeding rate of ryegrass. Rye provided no benefit in these trials. The somewhat delayed planting date may have been partly responsible for the lack of an early season yield advantage of rye. Oats would likely have provided higher yields than rye in this experiment. Ryegrass and oat seeding rates are currently being tested singly and in combinations in a study of similar design using a well adapted oat variety.

Literature Cited

Lippke, H., and D. B. Herd. 1990. FORAGVAL: Intake and gain estimated from acid detergent fiber and crude protein of the forage diet. Tex. Agric. Expt. Sta. MP-1708.

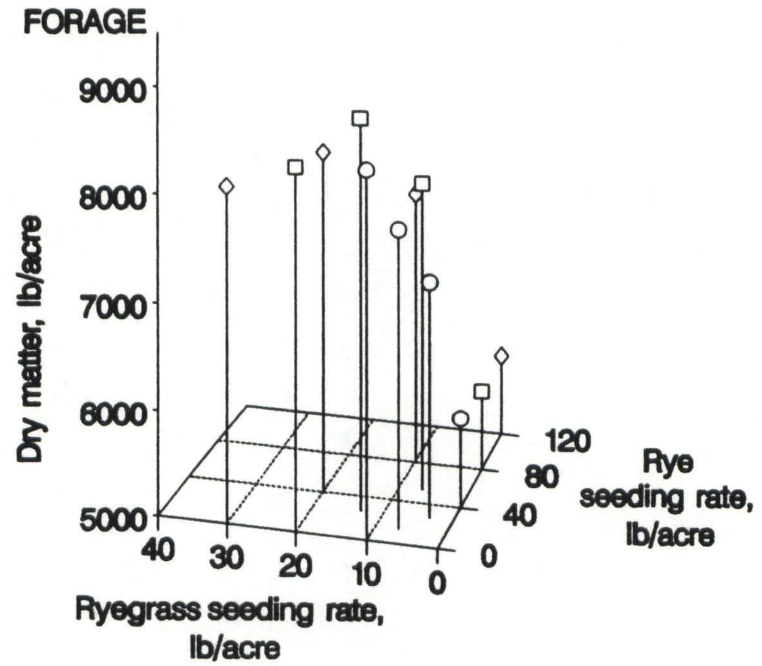

Figure 1. Total dry matter yields for low (○), medium (□), and high (◊) seeding levels on irrigated plots.

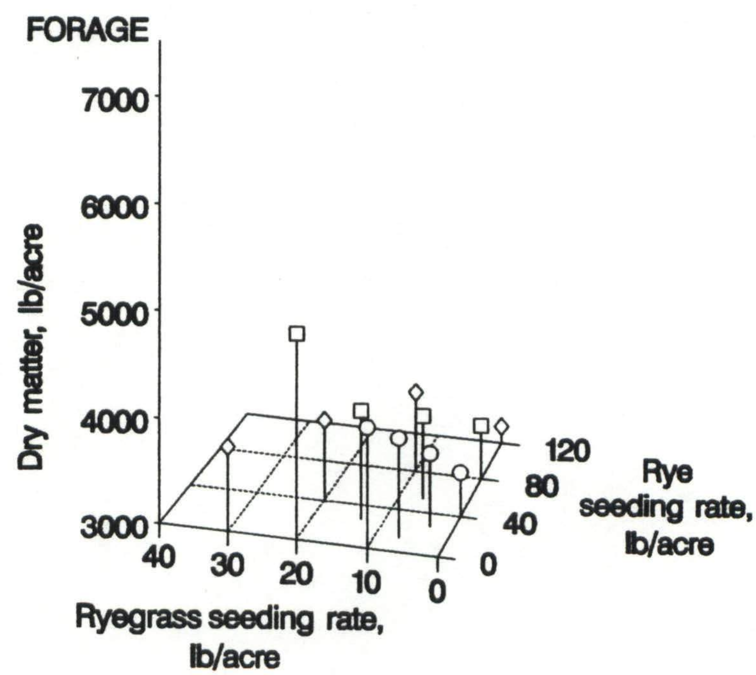

Figure 2. Total dry matter yields for low (○), medium (□), and high (◊) seeding levels on dryland plots.

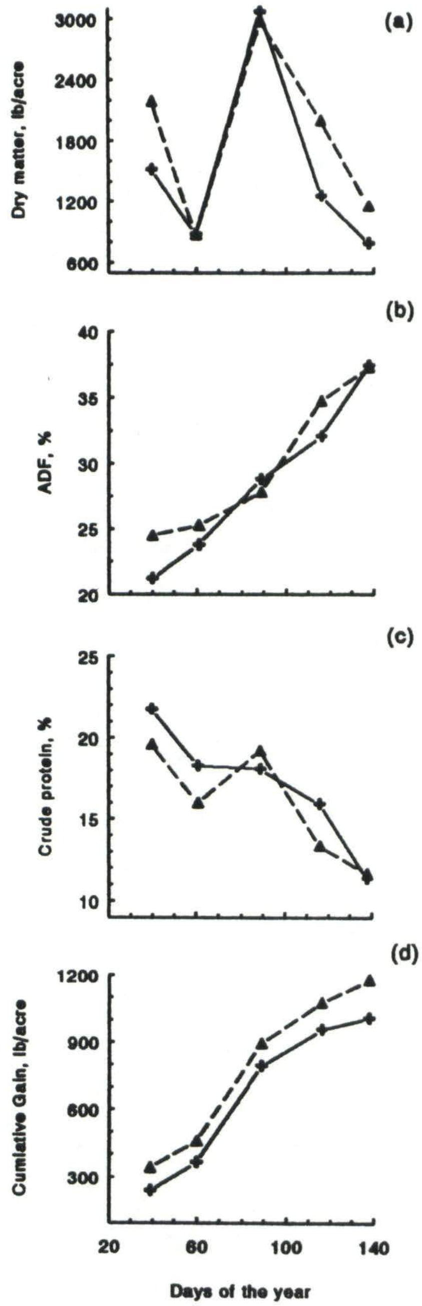

Figure 3. Dry matter yield (a), acid detergent fiber content (b), crude protein content (c), and estimated gain (d) for predominantly ryegrass (--▲--) and predominantly rye (— + —) plots in the irrigated trial.

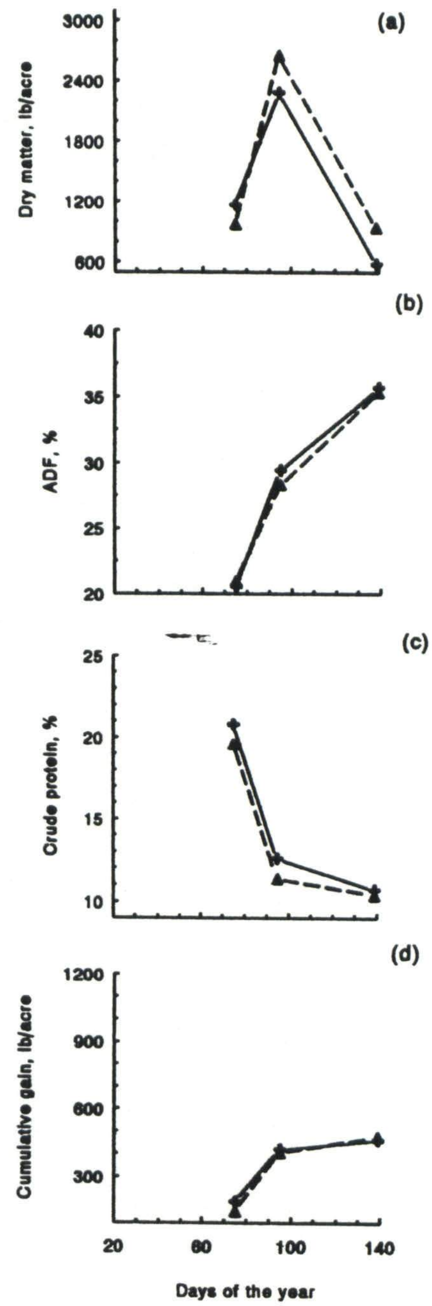

Figure 4. Dry matter yield (a), acid detergent fiber content (b), crude protein content (c), and estimated gain (d) for predominantly ryegrass (--▲--) and predominantly rye (— + —) plots in the dryland trial.