Forage Research in Texas, 1992

PR-5025

Seeding Rate Effects on First Harvest Yield of Oat and Ryegrass Cultivars

J.N. Rahmes, W.R. Ocumpaugh, and D.F. Bryn

Summary

Winter annual forages are commonly used to supplement perennial warm-season pasture programs in Texas. Our research has shown that ryegrass (*Lolium multiflorum* Lam.) alone or with other winter annuals has advantages over traditional oat (*Avena sativa* L.) pastures used in South Texas. Recommended seeding rates vary and can become a major cost factor. Ryegrass and oat cultivars were evaluated for 2 years at various seeding rates to examine seeding rate effects on early forage production. First harvest yield of ryegrass did not increase at seeding rates above 20 lb/A, when rates of 10 to 40 lb/A were evaluated. Subsequent harvests showed no difference in yield. During Year 1, oats showed no response to seeding rate (50 to 125 lb/A). During Year 2, seeding rates were lowered (15 to 60 lb/A), and oat yield tended to level at 45 lb/A seeding rate. When compared at optimum seeding rates, oat and ryegrass yields did not differ in Year 1; however, a severe freeze before the first harvest greatly reduced oat stands. Freezing temperatures did not occur until after the first harvest in Year 2, and oat yields exceeded that of ryegrass.

Keywords: *Avena sativa* L. / *Lolium multiflorum* Lam. / South Texas / winter pastures.

Introduction

Annual ryegrass and oats have proven to be a valuable part of forage-based livestock production in South Texas. Oats are traditionally grown in South Texas; however ryegrass can compliment oats, either in combination or alone. Ryegrass tends to produce later into the spring, is more cold tolerant than oats, and is better adapted to the calcareous soils of South Texas. Oats, on the other hand, tend to produce earlier than ryegrass and require less soil moisture to germinate because oat seed can be planted deeper than ryegrass.

This research was conducted to evaluate first harvest yield of several ryegrass and oat cultivars at various seeding rates. Increased seeding rates tend mostly to affect early production but typically do not significantly increase later production. Early production is important because it can come when warm-season forages have stopped producing. For these reasons, the primary objective of this research was to evaluate seeding rate effects on early season production of oats and annual ryegrass.

Materials and Methods

Field research plots were established at the Texas A&M University Agricultural Research Station near Beeville in each of 2 years. Both years, irrigation supplemented natural rainfall, as the region was in a drought. Soil at the plots was Parrita sandy clay loam (pH 6.7), and plots were established using a five-row plot drill at a 10-in. row spacing. Seeding depth was 0.75 in. for ryegrass and 1.5 in. for oats. Ryegrass was seeded at 10, 20, 30, and 40 lb/A each year, while different rates were used between years for oats. Treatments were arranged in a randomized block design with three replications. Before seeding each year, 46 lb/A of phosphorus (P_2O_5) was incorporated. Forage samples were taken as indicated in the following text and dried in a forced-air oven for 48 hours at 145 °F. Observed yields were subjected to analysis of variance on a microcomputer.

Year 1: Before planting, plots were irrigated twice to induce weed seed germination; then glyphosate was applied at 2 qt/A. One oat and four ryegrass cultivars were planted at four seeding rates on November 1, 1989. 'TAMO 386' oats were seeded at 50, 75, 100, and 125 lb/A. Broadleaf weeds were controlled with an application of Weedmaster at 3 pt/A on January 22, 1990. On February 13, 1990, yields were estimated by hand clipping a 3-ft section of row to a 1.5-in. stubble height.

Year 2: Two ryegrass and two oat cultivars were seeded at four rates on October 5, 1990. TAMO 386 and 'Coronado' oats were seeded at 15, 30, 45, and 60 lb/A. Sweeps were used to control weeds between rows on October 25, 1990; then plots were sprayed with 1 lb/A of Surflan (oryzalin) to retard further weed germination. On November 19, 1990, 2,4-D amine was applied at a rate of 1 pt/A to control broadleaf weeds. Yields were determined by hand clipping a 3-ft section of row to a 1.5-in. stubble height on November 30, 1990. Plots were not mowed off after this harvest. On December 11, 1990, yields were again determined using a plot harvester to clip the entire plot. The clipping height was 1.5 to 2 in.

Results and Discussion

Year 1: Analysis of mean yield data indicates a significant first harvest yield response to seeding rates of ryegrass. However, the difference is significant ($P < 0.05$) only between the 10-lb/A rate and all others (Table 1). First harvest yield of TAMO 386 oats were 1,134, 1,149, 1,374, and 1,110 lb/A for the 50-, 75-, 100-, and 125-lb/A seeding rates, respectively. There were no differences ($P > 0.05$) among seeding rates for oat yield, suggesting that the seeding rates used for oats were too high to detect yield differences.

When averaged over seeding rates, first harvest yields indicate that 'Tetragold' ryegrass produced significantly less ($P > 0.05$) dry matter than did the other ryegrasses and oats, but there was no difference between the other ryegrasses and oats ($P < 0.05$). Typically, oats would produce higher first harvest yields than ryegrass; however a severe freeze before the first harvest resulted in a greatly reduced oat stand, while ryegrass remained unharmed.

Year 2: When averaged over seeding rate, yields did not differ between ryegrass cultivars for either harvest. There were yield differences for seeding rates of ryegrass ($P < 0.05$), as shown by mean yield of both cultivars, at the first harvest

Table 1. First harvest yields of four ryegrass cultivars seeded on November 1, 1989, and harvested on February 13, 1990 (Year 1).

Seeding rate	Beefbuilder	Gulf	Tetragold	TAM 90	Rate mean
	lb/A				
10	1087	719	642	703	788
20	1296	868	1075	1244	1121
30	1272	1100	867	1369	1152
40	1381	1413	968	1465	1307
Mean	1259	1025	888	1195	

LSD (0.05) cultivar x rate = 495; cultivar mean = 247; rate mean = 247.

(Table 2). As in Year 1, the yield difference was only between the 10-lb/A rate and all others (Tables 1 and 2). At the second harvest, taken only 11 days later, mean ryegrass yields were 1,460, 1,800, 1,833, and 1,540 lb/A for 10-, 20-, 30-, and 40-lb/A seeding rates. These yields were not different ($P > 0.05$), suggesting that seeding rate has its greatest effect on early yield.

Yields were different between oat cultivars, probably because of differences in germination percentage (TAMO 386 = 84%, Coronado = 46%). Seeding rate differences ($P < 0.05$) existed for oats at both harvests (Table 3). Note that seeding rates of oats were reduced from Year 1 to Year 2, and pure live seed (PLS) per acre was calculated for Year 2 (Table 3). This allows a better comparison between cultivars. For instance, the 60-lb/A (27-lb PLS/A) seeding rate of Coronado should be compared to the 30-lb/A (25-lb PLS/A) rate of TAMO 386. When viewed this way, differences between cultivars are minimal. TAMO 386 oat yield tended not to increase above the 45-lb/A seeding rate, or 38-lb PLS/A (Table 3). Coronado yields also did not increase above the 45-lb rate; however, this seeding rate was only 21 lb PLS/A, suggesting that the seeding rate that produces maximum yield may differ among cultivar. Freezing conditions did not occur before either harvest in Year 2, and as expected, oats produced more dry matter than did ryegrass when seeded at an optimum rate (Tables 2 and 3).

Table 2. First harvest yields of two ryegrass cultivars seeded on October 5, 1990, and harvested on November 30, 1990 (Year 2).

Seeding rate	Gulf	TAM 90	Rate mean
	............lb/A............		
10	574	674	624
20	959	1054	1007
30	1003	953	978
40	943	1005	974
Mean	870	922	

LSD (0.05) cultivar mean = 239; rate mean = 338.

Table 3. Mean harvest yields of two oat cultivars seeded on October 5, 1990, and harvested on November 30 and December 11, 1990 (Year 2).

Seeding rate			
Raw	PLS[†]	Nov. 30 harvest	Dec. 11 harvest
............lb/A............			
Coronado			
15	7	606	1078
30	14	1223	1337
45	21	1381	1887
60	27	1423	1923
TAMO 386			
15	13	1456	2977
30	25	2617	3407
45	38	3111	4207
60	50	2882	4364
LSD (0.05)		574	850

[†] PLS = pure live seed; Coronado germination = 46%; TAMO 386 germination = 84%.

From this study, it appears that increasing ryegrass seeding rate from 10 to 20 lb/A results in a 300- to 500-lb/A dry matter increase in first harvest yield. Seeding rates greater than 20 lb/A seem to have no merit. Both Year 1 (data not shown) and Year 2 tests indicate that the seeding rate effects in ryegrass are lost in later harvests; thus the producer must decide whether the added seed cost is worth the increased early forage production.

These studies were performed on a well-prepared seedbed with good weed control and supplemental irrigation and would likely not be extrapolatable to low- or no-tillage systems. Furthermore, the seed was precisely drilled and the drill was equipped with a packer wheel to ensure good soil-seed contact. However, these results would not support the indiscriminately high seeding rates that are sometimes suggested. The producer can use this information to evaluate the value of using high seeding rates to enhance early season production. One disadvantage to using low seeding rates is the chance that the seed may be of low quality, and thus effective seeding rate would be even lower than planned.