Wheat and Barley Rate and Date Studies
Safford Agricultural Center 1988 to 1990

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Abstract

Seeding rates of wheat and barley varying from 50 to 250 pounds per acre were planted at four or five planting dates from the 1987-88 season to the 1989-90 season. Optimum seeding rates for wheat seemed to be near the upper limit whereas for barley it fell between 150 and 250 pounds per acre. This is considerably higher than what is commonly recommended in other parts of the state.

Introduction

A controversy over seeding rates of small grains has been brewing over the past several years in the Safford valley. Rex Thompson, at the University of Arizona has contended that between 80 and 100 pounds of seed per acre is sufficient (1), general recommendations call for between 100 and 150 pounds of seed per acre (2) and some local farmers are planting between 200 and 300 pounds of seed per acre. A three year study was undertaken to find the optimal planting rate on the Safford Agricultural Center.

Feeling that the date of planting would affect the rate of planting, the study was expanded to include several dates of planting.

Materials and Methods

As is customary in the area, the grain experiments were placed in fields that were previously cropped to cotton. Since the second pick on cotton normally takes place in early December, a date of planting earlier than the middle of December was not possible. Four or five dates of planting were selected between the middle of December and the middle of February to cover normal planting practices in the area.

Gustoe barley and Aldura wheat were planted with the exception of the first year when Yecora rojo was used as the wheat cultivar. Rates from 50 to 250 pounds of seed were selected with the feeling that that range should contain the optimum rate as well as the extremes.

After the cotton stalks were shredded, the ground was discd and ripped and then discd again before being bedded up in preparation for planting. Ammonium phosphate (16-20-0) and urea (46-0-0) were applied at rates of 200 to 300 and 150 to 220 pounds per acre, respectively, before bedding and then additional nitrogen was side dressed later in the season. Seed was drilled on east-west beds using a Kincaid precision grain drill with a ZeroMax seeding rate selector. Each planting date was irrigated up and four additional irrigations were applied during the growing season.
The soils in this study were clay loams with pH of 8, electroconductivity of 1.5 dS/m, sodium of 13 meq/l, calcium of 2.4 meq/l, magnesium of 0.6 meq/l and potassium of 0.4 meq/l.

Results and Discussion

The wheat yields over the three year study are seen in Figure 1. The 250 pound seeding rate had the highest yield in 8 out of the 13 dates over the entire study, whereas the 200, 150, 100 and 50 pound rates only had the highest yield for 2, 1, 2, and 0 out of 13 dates, respectively. Over the thirteen planting dates the 250 pound seeding rate out yielded the other rates by 188, 292, 465, and 659 pounds per acre, respectively, as the seeding rates decreased from 200 to 50 pounds per acre. The average yield from the 250 pound rate was significantly higher than that for the 100 pound seeding rate in all trials at the 5% level of significance, and significantly higher than the yields for the 150 and 200 pound rates in one third of the trials.

Other trends can be seen. The first and second years had significant interactions between rate and date of planting at the 8 percent level of significance, whereas there was no interaction in the last year. This interaction is probably caused by the stronger dependance of yield on seeding rate in the later plantings. Between the 1987-88 and 1989-90 seasons a strange phenomena is noted. The first planting had the lowest yields on the 87-88 season and the highest yield on the 89-90 season. This can be explained by the weather data shown in Figure 3. Note the dip in minimum temperatures to 20 degrees in March of 1988. That dip apparently caused frost damage to the flowers of the early planting. The dip below freezing in March of 1990 apparently did not affect the flowers of the Aldura, which is not as precocious as the Yecora rojo, grown in the 87-88 season. The extremely cold weather in February of 1990 apparently delayed the growth of the last three planting and reduced their yield potential.

The barley yields over the period of the study are found in Figure 2. As in the case of the wheat, the 250 pound seeding rate produced the highest yield in more cases than the other seeding rates with the highest yield in 4 out of the 8 dates. The other seeding rates decreasing from 200 to 50 pounds per acre had the highest yield in 2, 2, 0, and 0 out of the 8 dates, respectively. Barley was different from the wheat in the magnitude of the average yields, however. The 200 pound seeding rate had the highest average yield but only exceeding the yields of the 250 and 150 pound rates by 93 and 89 pounds per acre, respectively. The yields of the 100 and 50 pound rates fell behind the leader by 430 and 887 pounds per acre, respectively. It would appear that the optimal seeding rate would fall between 150 and 250 pounds per acre and would vary from season to season.

Reviewing the weather data on Figure 3, there were more days below 20 degrees in 1990 than in 1988, yet yields were higher in 1990. Barley appears to be more cold tolerant than wheat. The earlier plantings of barley generally yielded more than the later planted plots in both years.

Tremendous differences were seen between the yields of wheat and barley, even though both sets of plots were treated in the same manner. Total amounts of nitrogen applied per year were 209, 149, and 189 pounds per acre for 87-88, 88-89 and 89-90, respectively, which was adequate to produce an acceptable crop of barley, but not of wheat. Nitrogen may have been a limiting factor for wheat production, but the sodium level of the soil may also have been cause for yield reduction.
References


Figure 1. Wheat seeding rate and date of planting data from 1987-8 to 1989-90 in Graham county.
Figure 2. Barley seeding rate and date of planting data from 1987-8 to 1989-90 in Graham county.
Figure 3. Temperature ranges for grain growing seasons from 1987-8 to 1989-90 at the Safford Ag Center.