Early Spring Establishment of Cereals to Determine Vernalization and Production Potential

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Abstract

A trial was established to determine vernalization and yield potential of selected winter cereals. These included Bogo and Celia winter triticale and Stephens, Nugaines, Lambert, and Yamhill winter wheat. For comparison, Alpowa spring wheat, Baronesse and Xena spring barley, and Sprinter, a facultative barley, were included. Seven weeks after seeding (WAS), Baronesse and Xena barley exhibited the most vigor for the varieties. By harvest time, all of the varieties had formed reproductive tillers except for Lambert and Yamhill winter wheat. Baronesse, Xena, and Bogo produced the most grain. Without irrigation, grain production was less than 1,000 lb/acre.

Introduction

Initial data indicate that triticale has the potential to provide Klamath Basin growers a source of grain and forage. Trials at the Klamath Experiment Station (KES) during the 2000 growing season included two spring varieties of triticale with production averages of 6,490 lb/acre. In a similar trial on a Lower Klamath Lake (LKL) site, yields averaged 5,290 lb/acre. This LKL trial experienced a severe frost when the cereals were about 4 in tall, which reduced yields. In a cover crop trial at KES in the 2001 growing season, forage production of over 4 tons/acre was achieved with no in-season irrigation.

Over the past 4 years, Oregon State University Extension and Research trials have investigated triticale varieties developed by a group of breeders at the Plant Breeding and Acclimatization Institute, Malyszyn Experiment Station, Poland. Most of these efforts have focused on two varieties, Bogo and Alzo. These varieties were introduced to the United States by Dr. Bob Metzger, retired Agricultural Research Service (ARS) geneticist and long-time triticale believer and breeder, and by Resource Seeds, a triticale breeding company in California. In a fertility trial near Corvallis, Oregon in 1999, Bogo, with 200 lb/acre spring-applied nitrogen, had an average grain yield of 11,280 lb/acre. In an adjoining variety trial, Bogo yielded 10,680 lb/acre, while Madsen winter wheat produced 9,060 lb/acre. Madsen is one of the two leading soft white wheats grown in the state. In an adjoining statewide variety trial, Bogo and Madsen averaged 9,790 and 9,060 lb/acre, respectively.

Steve Orloff, University of California at Davis Siskiyou County Farm Advisor, has been investigating winter triticale for springtime grazing in April before the cereal is in the jointing stage. If livestock could be removed after this early season grazing, a hay or grain crop could also be produced. This practice of obtaining early grazing and a later crop is common in more temperate regions of the country, especially the high plains of Texas and New Mexico. Stand losses from winter temperatures

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have prevented this from being more common in the Klamath Basin. The winter climate in the Klamath Basin has been a major reason that spring grain far exceeds winter grain production. Spring frosts during winter grain pollination also limit production of fall-planted grain.

To produce heads, a vernalization period of cold temperatures is required for winter grains. Interest was expressed by the Wilbur-Ellis Company in determining if the cold temperatures of March and April could vernalize these high-producing triticales and avoid the adverse winter climate in the Klamath Basin. A trial was thus established at KES with Bogo triticale, winter and spring wheats, and spring barleys.

Procedures

The trial was established on a Poe fine sandy loam soil, in a field that had grown forage and grain sorghum the previous year. The sorghum residue was chopped and incorporated with three passes of a tandem-disk. Ten varieties in the trial included Bogo and Celia (winter triticales), Stephens, Nugaines, Lambert, and Yamhill (soft white winter wheats), Alpowa (soft white spring wheat), Sprinter (facultative barley), and Baronesse and Xena (spring barley). Seed was planted at 1-in depth at 15 and 30 seeds/ft^2 with a Kincaid plot planter on March 12 in a 10 by 2 factorial randomized block design with three replications. Plots were 4.5 ft wide (9 rows at 6-in spacing) and 20 ft long. Along ends of plots, 5.5-ft-wide borders were shredded resulting in 14.5- by 4.5-ft harvest areas. All plots were fertilized with 50 lb N, 25 lb P_2O_5, 25 lb K_2O, and 44 lb S/acre banded at planting (16-8-8-14 at 315 lb/acre). No irrigation was applied. During the trial, 2.81 in of precipitation was recorded. This precipitation occurred in 34 events with 12 days of over 0.1 in. The largest events included 0.25 in on March 27, 0.33 in on April 18, and 0.48 in on May 15. Below-freezing temperatures were recorded on 38 nights; 4 of these were below 20^oF and 14 nights were between 20^oF and 25^oF.

Seven weeks after seeding (WAS) and 2 days after a 23^oF frost, visual vigor ratings were taken on the plots. These ranked the plots from 0, total death, to 100, no injury, on leaf burn, size, and stand establishment. During the trial, two of the winter wheats, Lambert and Yamhill, did not receive adequate vernalization conditions to cause reproductive tillering. The rest of the plots were harvested 22 WAS with a 4.5-ft-wide header Hege (Hans-Ulrich Hege) plot combine. Grain was moisture tested and yields were adjusted to 10 percent moisture content. All data were analyzed statistically using SAS software for a 10 by 2 factorial in a randomized complete block design.

Results and Discussion

Vigor ratings, 10 percent moisture yields, and test weights are presented in Table 1. The most vigor was exhibited by the barleys Xena, Baroness, and Sprinter. Triticale and wheat varieties were significantly less vigorous than any of the barley varieties and were similar to each other in vigor except for the least vigorous selection, Celia. Celia's lack of vigor was mainly due to low establishment numbers.

Except for Lambert and Yamhill, all of the varieties vernalized and produced reproductive tillers. Grain yields were seriously reduced in this trial due to the lack of water during the

growing season. Stored moisture in the soil at the start of the trial plus the 2.81 in of rainfall was inadequate to allow the genetic potential of the varieties to be expressed. The two seeding rates did not differ from each other and no seeding rate by variety interaction was indicated. Thus the data presented are the average of the two seeding rates.

Highest yielding varieties in the trial were Baronesse, Xena, and Bogo. However, production was less than 1,000 lb/acre. It is unknown if the ranking of these entries would have changed with adequate moisture. Nugaines, Alpowa, and Sprinter produced less grain than the other entries. Test weights for all entries were less than typically observed under irrigated production in the region.

Table 1. Cereal vigor of 10 varieties 7 weeks after seeding and grain yield and test weights 22 weeks after seeding averaged over two seeding rates grown at Klamath Falls, OR, 2001.

Type and (Variety)	Vigor	Yield	Test weight
	visual	lb/acre	lb/bu
Baronesse (Spring barley)	74 b[1]	950 a	49.7 d
Xena (Spring barley)	82 a	780 ab	47.1 e
Bogo (Winter triticale)	47 de	720 abc	50.2 d
Stephens (Soft white winter wheat)	40 e	560 bcd	53.8 b
Celia (Winter triticale)	22 f	420 cd	52.2 c
Nugaines (Soft white winter wheat)	42 de	290 d	60.8 a
Alpowa (Soft white spring wheat)	48 d	280 d	60.0 a
Sprinter (Facultative barley)	66 c	260 d	44.6 f
Lambert (Soft white winter wheat)	40 e	--[2]	--
Yamhill (Soft white winter wheat)	42 de	--[2]	--
Mean	51	530	52.3
CV (%)	12	52	2
LSD (0.05)	7	320	1.4

[1]Values within columns followed by the same letter are not significantly different (p = 0.05).
[2]Varieties did not vernalize, resulting in no grain yields.