

Winter Wheat Variety Performance Trial at Hayden, Colorado 2010

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Summary

Each year, small grain variety performance tests are conducted at Hayden, Colorado to identify varieties that are adapted for commercial production in northwest Colorado. Twenty-six varieties were evaluated in the 2010 winter wheat variety performance test conducted at Hayden. Growing conditions during the 2010 cropping season in Hayden were not as favorable for winter wheat production as other years. Grain yield in the winter wheat variety performance test averaged 2363 lbs/acre (39.4 bu/acre). The highest yielding entry was Hatcher at 2774 lbs/acre (46.2 bu/acre). Several winter wheat varieties were higher yielding than other varieties, with fifteen varieties in the top statistical (LSD) yield group. Protein concentration in 2010 was low compared to many other years and averaged 9.6%. Protein concentration ranged from a high of 11.6% for Avalanche to a low of 8.4% for Gary, Golden Spike, and Snowmass.

Introduction

Winter wheat variety performance testing has been ongoing in northwest Colorado for many years (Pearson et al., 2009; 2008; 2007; 2005; 2004; 2003; Golus et al., 1997). Winter wheat variety performance tests are conducted each year in northwest Colorado to identify varieties adapted for commercial production in the region. The 2010 winter wheat variety performance test was conducted at Hayden, Colorado.

Materials and Methods

Twenty-six winter wheat varieties and breeding lines were evaluated during the 2010 growing season at the Mike Williams Farm near Hayden at N40° 27.281', W107° 11.273'. The experiment design was a randomized complete block with four replications. Plot size was 4-ft. wide by 40-ft. long with six seed rows per plot. The seeding rate was 680,000 seeds/acre and

planting occurred on 29 Sept. 2009. An application of Ally at 1/10 oz/acre plus 4 oz/acre 2,4-D was applied in 8 gal. water per acre on June 10, 2010. No fertilizer was applied. Plant height and lodging were evaluated just prior to harvest (Photo 1). Harvest occurred on 25 Aug. 2010 using a small plot combine (Photo 2). Grain samples were cleaned in the laboratory using a small Clipper cleaner to remove plant tissue that remained in the grain sample following threshing. Grain moistures and test weights were determined



Photo. 1. Collecting plant height data prior to wheat harvest on Aug. 25, 2010 at Hayden, Colorado. Photo by Fred Judson.

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using a DICKEY-john GAC2100b™ Grain Analysis Computer³. Grain yields were calculated at 12% moisture content. Grain protein concentration was determined by whole grain near infrared reflectance spectroscopy with a Foss NIRSystems 6500 (reported on a 12% moisture

basis).

Results and Discussion

A field tour was held prior to harvest for the local producers to see the plots first hand (Photo 3). The results of the soil test analysis for the 2010 plot area at Hayden were: pH 6.2, 1.5 mmhos/cm, 2.5 % organic matter, 15.6 ppm NO₃-N, 18.7 ppm P, 319 ppm K, 4.8 ppm Zn, 27.7 ppm Fe, 11.3 ppm Mn, and 3.9 ppm Cu. Growing conditions during the 2010 cropping season in Hayden were not as favorable for winter wheat production as in other years. The average maximum temperature for July 2010 at Hayden, Colorado was 85.5°F (Fig. 1). Precipitation at Hayden during the 2009-10 winter/spring growing season (September 2009 through August 2010, 12-month period) totaled



Photo 2. Winter wheat plots at Hayden, Colorado at harvest. Aug. 25, 2010. Photo by Tammy Star.

17.74 inches. Winter moisture in the Hayden area was low (Fig. 2). During September 2009 through February 2010 a total of 6.56 inches of precipitation was received, and from March through Aug 2010 most of the growing season precipitation was received at Hayden with a total of 11.18 inches of precipitation, although most of that moisture came early in the spring with a much lower amount occurring during grain fill (Fig. 2).

Precipitation in the Craig/Hayden area is a major factor affecting crop production and varies considerably from month to month and year to year. If timely precipitation occurs, grain yields of winter wheat will be good. If precipitation does not occur in a timely fashion, grain yields of wheat can be low. Because the amount of precipitation is

so variable and spotty during the growing season in the Craig/Hayden area, wheat yields often vary considerably from year to year.

Grain moisture in the winter wheat variety performance test at Hayden averaged 9.7% (Table 1). Grain moisture content ranged from a high of 10.6% for Danby to a low of 9.1% for Curlew and Golden Spike.

Grain yield for the winter wheat varieties averaged 2363 lbs/acre (39.4 bu/acre) (Table 1). Grain yield ranged from a high of 2774 lbs/acre (46.2 bu/acre) for Hatcher to a low of 1912 lbs/acre (31.9 bu/acre) for Thunder CL. Many winter wheat varieties were higher yielding than others, with fifteen varieties having grain yields in the top group according to LSD (0.05) mean separation. According to the Colorado Agricultural Statistics Service, the average wheat yield in northwest Colorado in 2009 was 36.5 bu/acre (Colorado Department of Agriculture, 2010).

Wheat stands were thin in sporadic areas of the plot area and weeds, mainly wild oat, were a problem in various spots of the plot area. These two factors likely contributed to the higher than normal coefficient of variation than we typically experience in winter wheat trials that we have



Photo 3. Field tour of the winter wheat variety trial at Hayden, Colorado on Aug. 4, 2010. Photo by Calvin H. Pearson.

conducted at Hayden in past years.

Test weights averaged 57.5 lbs/bu (Table 1). Test weights ranged from a high of 60.3 lbs/bu for Deloris and TAM 112 to a low of 54.3 lbs/bu for IDO870.

There was no lodging in the winter wheat variety performance test in 2010.

Plant height averaged 24.3 inches (Table 1). Plant height ranged from a high of 29.3 inches for Hayden to a low of 19.1 inches for NuDakota.

Protein concentration was low compared to many other years and averaged 9.6% (Table 1). Protein concentration ranged from a high of 11.6% for Avalanche to a low of 8.4% for Gary, Golden Spike, and Snowmass.

At harvest, a small percentage of wheat grain was found to contain a fungal disease (Photo 4). Samples were sent to the CSU Plant Pathology Diagnostic Laboratory (Dr. Ned Tisserat) to confirm the casual agent. The fungus was found to be dwarf bunt. This diagnosis was also confirmed by Dr. Don Mathre, plant pathologist at Montana State University. It was recommended that if producers plan to use contaminated seed for planting, they should treat the seed with Dividend fungicide prior to planting.



Photo 4. Dark wheat seed shown to be infected with dwarf bunt (bottom left), disease-free seed (bottom right), and broken seed showing dwarf bunt (top left and top right). Seed was harvested on Aug. 25, 2010 at Hayden, Colorado from the winter wheat variety performance trial. Photo by Calvin H. Pearson.

Acknowledgments

The farmer-cooperator for this trial was Mike Williams. We thank Mike for his willingness to participate with us in conducting this research. We also thank Western Colorado Research Center staff (Fred Judson and Greg Irwin) and summer hourly employees Crosby Rock and Tammy Star who assisted with this research. Appreciation is also extended to the Colorado Wheat Administrative Committee for funding this research. Thanks to Dr. Ned Tisserat for diagnosing the fungal disease found in the Hayden winter wheat plots in 2010.

References

- Colorado Department of Agriculture. 2010. Colorado Agricultural Statistics: 2010. National Agric. Stat. Service and Colo. Dept. of Agric. Lakewood, CO.
- Golus, H.M., C.H. Pearson, R.W. Hammon, J.S. Quick, and J.F. Shanahan. 1997. Wheat and barley variety performance tests, 1987-96, in northwest Colorado. Colorado State University, Agricultural Experiment Station and Dept. of Soil and Crop Sciences. Technical Report TR97-10. Fort Collins, Colorado.
- Pearson, C.H., S. Haley, J.J. Johnson, and C. Johnson. 2009. Winter wheat variety performance trial at Hayden, Colorado 2009. Available at www.colostate.edu/programs/wcrc/ (verified 4 Mar. 2011). Agricultural Experiment Station. Fort Collins, CO.
- Pearson, C.H., S. Haley, and J.J. Johnson. 2008. Small Grain Performance Tests at Hayden, Colorado 2007. p. 31-33. *In: Western Colorado Research Center 2007 Research Report*. Colorado State University, Agricultural Experiment Station and Extension, Technical Report TR08-10. Fort Collins, Colorado.
- Pearson, C.H., S. Haley, J.J. Johnson, and C. Johnson. 2007. Small Grain Performance Tests at Hayden, Colorado 2006. p. 14-17. *In: Western Colorado Research Center 2006 Research Report*. Colorado State University, Agricultural Experiment Station and Extension, Technical Report TR07-08. Fort Collins, Colorado.
- Pearson, C.H., S. Haley, J.J. Johnson, and C. Johnson. 2004. Small grain variety performance tests at

Hayden, Colorado 2004. Available at www.colostate.edu/programs/wrc/ (verified 4 Mar. 2011).
Agricultural Experiment Station. Fort Collins, CO.

Pearson, C.H., S. Haley, J.J. Johnson, and C.L. Johnson. 2004. Small grain variety performance tests at Hayden, Colorado 2004. p. 23-28. *In* H.J. Larsen (ed.) Western Colorado Research Center 2003 research report. Technical Report TR04-05. Agricultural Exp. Stn. and Cooperative Ext., Colorado State Univ. Fort Collins, CO.

Pearson, Calvin H., Scott Haley, Jerry J. Johnson, and Cynthia Johnson. 2003. Small Grain Variety Performance Tests at Hayden, Colorado 2002. p. 51-55. *In*: Western Colorado Research Center 2002 Research Report. Colorado State University, Agricultural Experiment Station and Cooperative Extension, Technical Report TR03-7. Fort Collins, Colorado.

Table 1. Winter wheat variety performance test at Hayden, Colorado 2010. Farmer-Cooperator: Mike Williams.

Variety	Market class ¹	Grain moisture	Grain yield		Test weight	Plant height	Protein
		(%)	lbs/acre	bu/acre	lbs/bu	in.	(%)
Hatcher	HRW	9.6	2774	46.2	57.7	21.7	9.1
UI Darwin	HWW	9.7	2769	46.2	59.7	26.7	8.8
IDO651	HWW CL	9.2	2754	45.9	58.5	28.5	8.9
IDO660	HWW	9.2	2709	45.2	56.9	23.4	10.5
Deloris	HRW	9.5	2633	43.9	60.3	27.6	9.3
Gary	HWW	9.9	2605	43.4	56.3	24.5	8.4
Weston	HRW	10.5	2528	42.1	59.5	28.9	9.7
Curlew	HRW	9.1	2527	42.1	55.7	26.5	10.8
Ripper	HRW	9.0	2484	41.4	55.3	20.8	11.0
Bond CL	HRW CL	9.4	2445	40.8	57.2	24.0	10.4
Hayden	HRW	10.1	2434	40.6	60.1	29.3	10.0
IDO658	HWW	9.5	2408	40.1	57.6	25.1	9.3
Golden Spike	HWW	9.1	2386	39.8	55.7	25.3	8.4
IDO871	HWW	9.7	2386	39.8	59.0	24.7	9.7
Above	HRW CL	9.9	2335	38.9	55.8	21.0	10.3
Snowmass	HWW	9.8	2305	38.4	58.4	23.6	8.4
IDO656	HRW	10.1	2254	37.6	54.8	28.3	9.7
Fairview	HRW	9.6	2214	36.9	57.1	25.2	10.3
Danby	HWW	10.6	2200	36.7	60.0	22.5	10.1
IDO870	HWW	9.3	2153	35.9	54.3	23.8	11.5
Avalanche	HWW	9.7	2150	35.8	58.4	21.5	11.6
TAM 112	HRW	9.7	2105	35.1	60.3	23.0	9.1
Bill Brown	HRW	9.9	2065	34.4	57.7	20.4	10.7
IDO9120	HWW	9.5	1958	32.6	57.4	24.8	9.6
NuDakota	HWW	10.5	1936	32.3	55.5	19.1	9.7
Thunder CL	HWW CL	9.6	1912	31.9	56.1	21.1	9.3
Ave.		9.7	2363	39.4	57.5	24.3	9.6
LSD (0.05)		NS	463	7.7	2.6	2.5	
CV (%)		8.2	13.9	13.9	3.2	7.2	

¹HRW = hard red winter wheat; HWW = hard white winter wheat; CL = Clearfield* wheat.
Planted – September 29, 2009. Harvested – August 25, 2010.

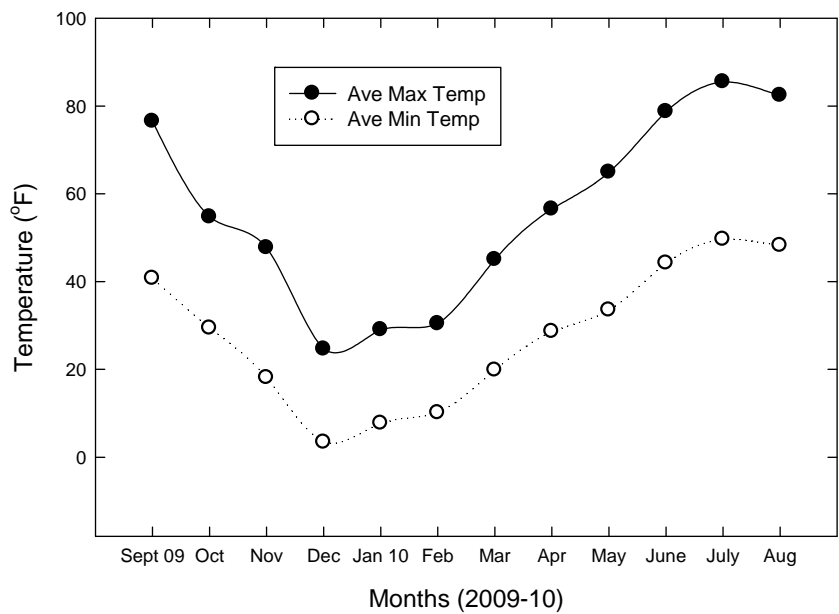


Fig. 1. Average maximum monthly and average minimum monthly temperatures for Sept 2009 through Aug 2010 at Hayden, Colorado.

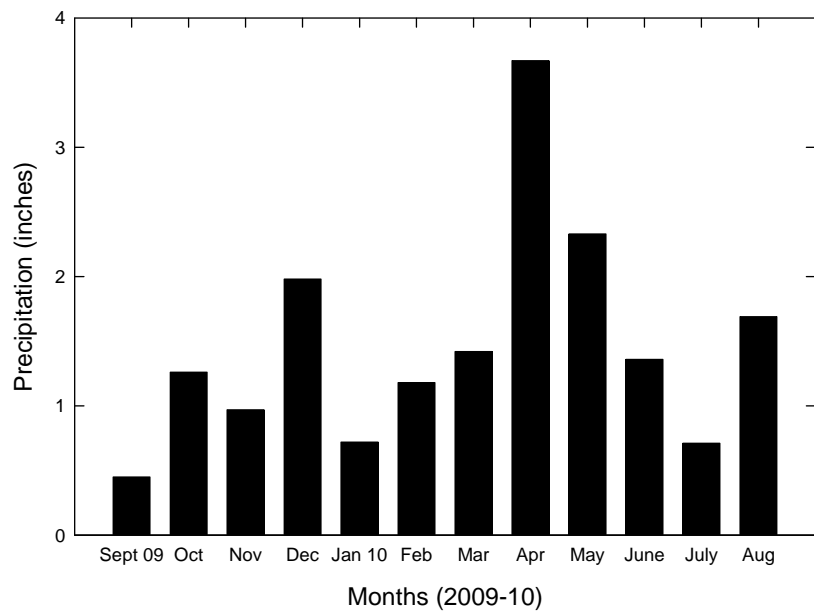


Fig. 2. Monthly precipitation for Sept. 2009 through Aug 2010 at Hayden, Colorado.