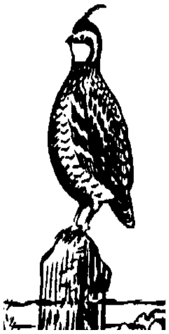

University of Idaho
Cooperative Extension System

The Cereal Sentinel

May 20, 2002 Issue No. 30

Topics: **Page**

Important Dates:

July 10, 2002 **Malheur Station Field Day, Ontario**

The goal of this newsletter is to serve the best interests of Treasure Valley cereal producers. It will be issued periodically as information warrants. Correspondence and inquiries should be addressed to: **Parma Research and Extension Center, 29603 U of I Lane, Parma, ID 83660 (208-722-6701 Ext. 216) (Fax-208-722-6708) (Email bradb@uidaho.edu).**

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Durum Wheat

Pendleton Flour Mills used over 2 million bushels of durum wheat annually until this last year, most of which was produced outside the PNW. Contracts were written for several years for durum production from within the region, including irrigated southem Idaho. Their were two primary concerns with our irrigated production, the occurrence of black tip and flour ash content. Black tip is the discoloration on the germ end of the kernel which tends to discolor the flour.

Pendleton is no longer milling durum wheats. But there may be other markets for Idaho's limited production.

A number of durum releases have been evaluated in the Treasure Valley over the past several years (Table 1). Some wheat breeders continue to have interest in the performance of their durum lines and we evaluate them on a fee basis.

Protein and the percentage of vitreous kernels were highest at Weiser and Kuna which suggests that available N (soil plus fertilizer) was higher at those sites than at Parma . Protein values have averaged less than 13% in many sites in previous years because the trials have not been managed for high protein durum production. Even so, a minimum of 85% vitreous kernels has typically been easier to achieve at these sites than a 13% protein requirement.

Durum entries were evaluated against the long term quality standard WPB 881. While several varieties appeared to yield better than WPB 881, only the advanced line GM90009 was statistically higher yielding.

Kronos is an Arizona Plant Breeders variety. It is probably the most commonly grown durum in southern Idaho.

Table 1. Durum performance in 2001 and over other years and locations.

Variety	Yield	Protein	Height	Test Weight	HVAK	Lodged
	bu/A	%	in	lb/bu	%	%
			Parma 2001			
D-95-434	82[1]	8.4	31	63.9	64	0
GM90009	90	7.6	30	64.4	48	0
Kronos	106	9.7	31	64.4	67	0
Matt	87	8.0	30	64.0	71	0
Utopia	94	8.4	30	64.9	33	0
WPB 881	91	9.2	34	64.3	68	0
$LSD_{.10}$	16	1.2	2.7	1.0	20	-
			Weiser 2001			
D-95-434	102[1]	13.6	32	63.6	97	0
GM90009	114	13.2	30	63.1	96	0
Kronos	100	13.7	30	64.3	95	0
Utopia	108	13.4	30	63.1	94	0
WPB 881	96	13.3	32	62.8	92	0
$LSD_{.10}$	10	0.2	1.4	1.6	6	-
			Kuna 2001			
D-95-434	97[1]	13.1	32	63.8	95	0
GM90009	101	12.9	32	61.5	97	0
Kronos	84	13.3	30	61.3	92	18
Utopia	99	13.0	31	63.1	94	5
WPB 881	106	13.1	35	62.0	98	0
$LSD_{.10}$	27	0.2	1.4	1.4	7	10
			2001 (3 sites)			
D-95-434	96[1]	11.9	31	63.7	85	0
GM90009	106	11.4	30	63.5	81	0
Kronos	102	12.4	30	64.3	86	6
Utopia	103	11.7	30	63.7	73	2
WPB 881	94	11.9	33	63.3	85	0
$LSD_{.10}$	11	2.0	1.0	0.8	16	2.1
			1994-98 (13 site years)			
WPB Cortez	103	13.0	31	62.6	93	2
WPB Kofa	99	13.2	32	61.5	94	4
WPB 881	97	13.0	32	61.4	92	4
$LSD_{.10}$	3	0.3	1	0.4	1	3
			1997-99 (9 site years)			
Kronos	90	13.4	30	61.6	87	2
WPB Cortez	87	13.8	30	62.2	95	1
WPB 881	83	13.5	31	61.1	92	4
$LSD_{.10}$	9	0.8	1	1.3	3	2

[1]Means within columns must differ more than the $LSD_{.10}$ to be significantly different at the 10% probability level.

Protein As Affected by Late Season

Introduction

Higher market prices for high protein hard red spring wheat relative to soft white wheat have increased grower interest in this alternative market class. The price difference is less now than it has been in some recent years, but is still predicted to run about $.55 per bushel higher than soft white wheat for the current marketing year based on the Cooperative Extension price outlook.

More HRS wheat would be currently grown in SW Idaho were it not for concerns about the management required for producing wheat with acceptable protein. Wheat with protein lower than 14% is discounted in price.

Planting dates have significant impact on wheat production and possibly quality. Delayed spring plantings typically reduce wheat yield. Even early spring planted spring wheat in southern Idaho has yielded less than late fall seedings of spring wheat. Varieties also differ in yield and protein.

Discounts for low protein need to be avoided or minimized to maximize the returns for HRS wheat. Late season applied N is frequently used to enhance grain protein of irrigated HRS wheat.

The higher the yield the more difficult it may be to raise protein at harvest to levels that enable growers to avoid low protein discounts. This could be particularly true for spring wheat yields that vary due to planting dates.

An irrigated field study was conducted at Parma for three seasons (1999-2001) to evaluate the effects of wide ranging planting dates and varieties on the yield, protein, and quality response to late season applied N. Three hard spring varieties (Vandal and WPB 936 hard reds, and ID377S hard white) were planted late fall (11-23 November), early spring (7-15 March), or late spring (10-14 April), with four late season urea N rates (0, 25, 50, and 75 lb per acre) applied dry at heading and incorporated with about one inch of sprinkler irrigation.

Fertilizer N as urea was topdressed uniformly over the entire experiment to support yields of 120 bu per acre according to the UI Fertilizer Guide for Spring Wheat. This urea N (158, 170, and 95 lb N per acre for 1999, 2000, and 2001 seasons respectively) was topdressed each year to the entire experiment when the early spring planting was emerging (dates ranged from 23-30 March). Timing corresponded to the tillering stage for the late fall planting and preceded the late spring planting by 15 to 19 days. This N was dependent on rainfall for incorporation and significant rain in one event in any year exceeding 0.2 inches did not occur prior to the first irrigation on 23 April (1999), 24 April (2000), or 19 April (2001). The trial was irrigated each year with sprinklers. Nitrogen was the only limiting nutrient based on fall soil tests.

Yield was measured with a small plot combine. Protein and baking quality of harvest samples were determined at the University of Idaho Aberdeen Wheat Quality Laboratory.

Results

Yields in excess of the 120 bu per acre target were achieved in each year for the late fall planting. The 2000 season was especially productive (Fig. 1). There was no winter kill of these late fall planted spring wheats in any year.

Late fall planting dates were the highest yielding in two of three years and late spring plantings were invariably the lowest. Earlier plantings are more productive due to better tillering (more stems and heads) and more favorable temperatures during grain filling (larger kernels). In the absence of winterkill, late fall and early spring plantings will be more similar in yield the fewer growing degree days there are between plantings.

Variety performance depended on the planting date (Fig. 1). Vandal was as high yielding as WPB 936 in two of three years when late fall planted, but Vandal yielded less than others when either early spring or late spring planted. Vandal is less well adapted to spring plantings in part because it is later and matures under warmer less favorable conditions. WPB 936 was the highest yielding spring planted variety in two of three years.

Late season N at the 75 lb N per acre rate increased lodging in 1999 and reduced yield. There was a similar reduced yield trend with high late season N in other years but the effect was nonsignificant.

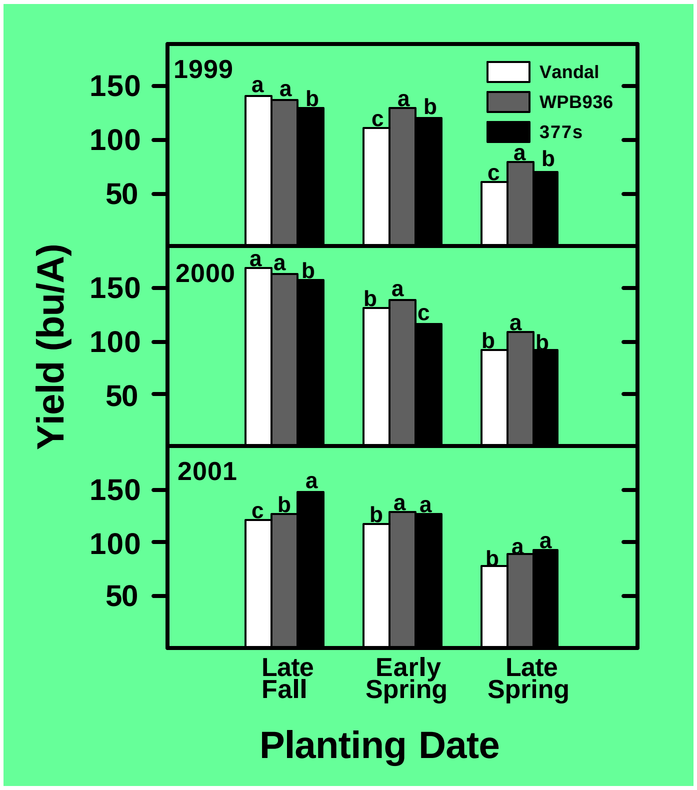

Figure 1. Yield of hard spring wheat varieties as affected by planting date in each of three years,

Protein was highest with late fall plantings in the first two years and lowest in the late spring planting (Fig. 2). In contrast, the late fall planting was lowest in protein in the 2001 season and protein for the late spring planting was highest. It is not clear why planting date effects on protein were inconsistent between years.

Vandal in all seasons was consistently the highest in protein and the hard white ID377s was lowest. Protein differed more among varieties generally than among planting dates. Not all varieties were capable, under these conditions, of producing 14% protein wheat despite high rates of late season N. Averaged across planting dates, Vandal was the only variety that consistently produced 14% or higher protein with the highest late season N rate. Although late season N was essential in this study for increasing protein to 14%, variety selection was also critical.

Late season N increased protein in all years (Fig. 2). The protein increase with the highest late N rate averaged 1.1% in 1999, 1.2% in 2000 and 1.6% in 2001 when averaged across planting dates and varieties. Although planting dates and varieties significantly affected protein they did not affect the protein increase with late season N. The protein increase with late season N is more sensitive to growing conditions that change from year to year than to varieties or planting dates.

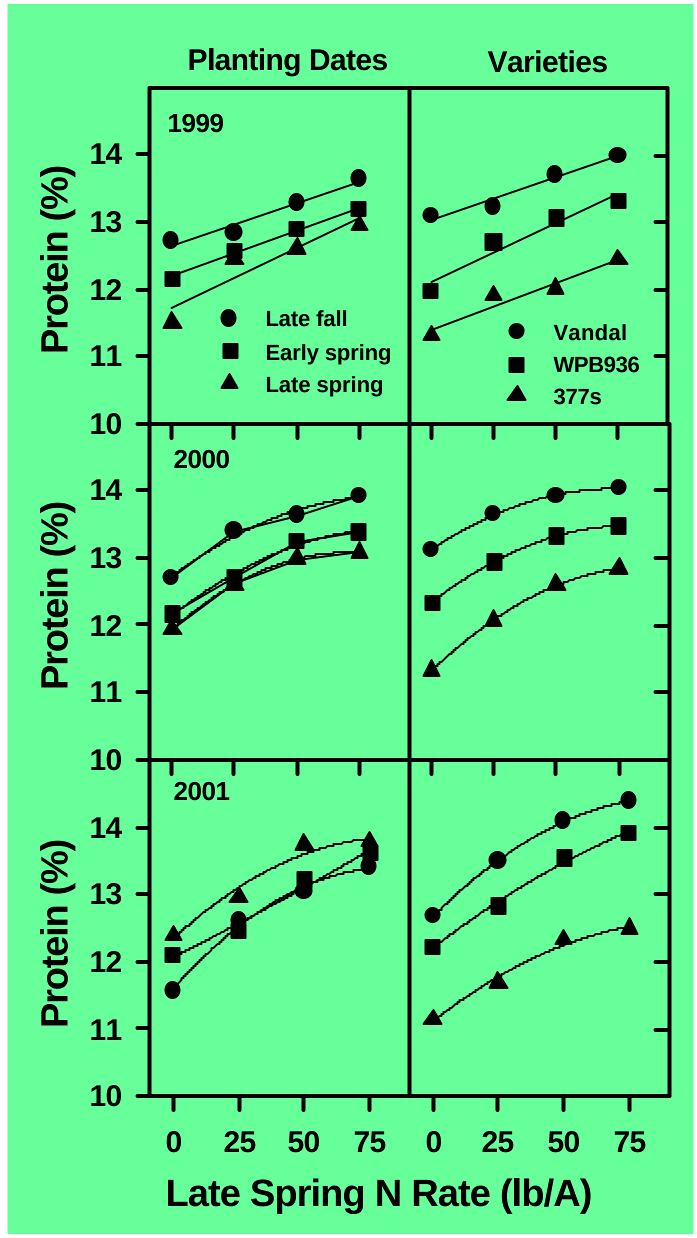

Figure 2. Late spring N affect on grain protein as affected by planting dates and varieties in each of three years, 1999-2001. Parma, Idaho.

With no late season N, grain protein averaged 12.5% or less for WPB 936 in each year. Previous field research suggests that 12.5% protein is associated with maximum yield. In this study, available N was apparently adequate be-

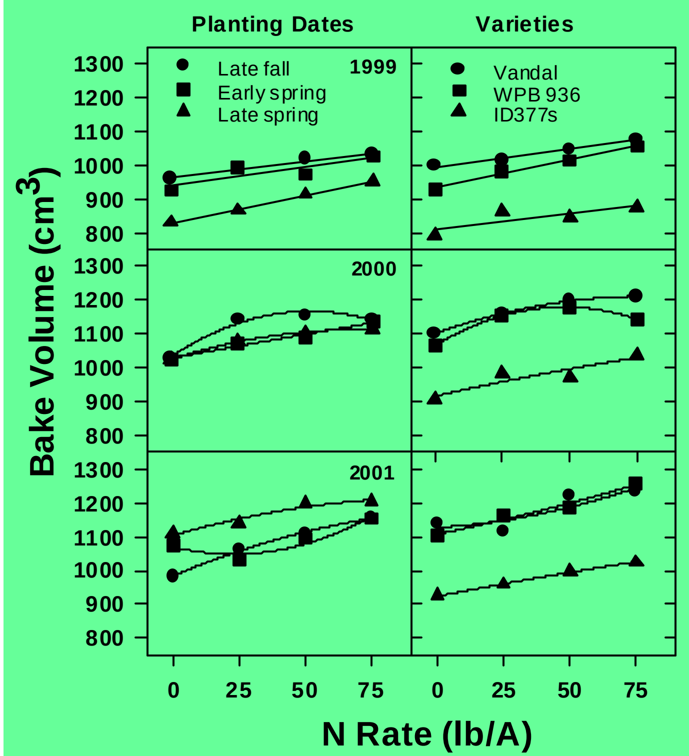

Figure 3. Wheat quality, represented by bake volume, as affected by planting dates, varieties, and late season N in each year, 1999-2001. Parma,

cause late season N did not increase yield. But 12.5% protein is far from the 14% required to avoid low protein discounts in price. The 1.5% protein deficit between wheat adequately fertilized for yield (12.5%) and the protein content that avoids the price discount (14%) is the protein difference that many growers try to address with late season N. The results from this study show how difficult it is to increase protein from 12.5% or less to 14.0% with moderate late season N rates. The results are similar to many frustrating experiences of producers who purchase additional N for a late season application, yet fail to reach 14% protein.

Most HRS producers use less than the highest N rate (75 lb N per acre) used in this study. More typical rates for irrigated HRS range from 25 to 50 lb N per acre. This more typical range was clearly inadequate for the most commonly grown HRS variety in irrigated southern Idaho.

Baking quality, as represented by bake volume, was influenced by both varieties and planting dates (Fig. 3). Bake volume was always lowest with the lower protein hard white spring ID377s. Vandal and WPB 936 were comparable in bake volume although Vandal averaged somewhat higher at some N levels.

Planting dates also affected bake volume. Bake volume for the late fall planting was higher than for the late spring planting in 1999 and 2000, but not in 2001. Despite significant variety and planting date effects on bake volume, there was no significant interaction of planting dates or varieties in the bake volume response to late season N. Bake volume was lowest in 1999.

Bake volume increased with late season N in all years. Other quality parameters of importance include flour protein, mixograph time to peak, mixograph peak height, and water absorption, all of which were improved with late season N. The only parameters which were adversely affected by high rates of late season N were flour yield and mixograph tolerance.

The bake volume to protein ratio provides a rough indication of protein quality. Despite reports and concerns that late season N enhanced protein may not result in increased protein quality, the calculated ratios here suggest otherwise. We found the bake volume to protein ratio in each year to be stable over a considerable range of late season applied N, applications that resulted in protein increases ranging from 1.1 to 1.6% protein when averaged across planting dates and varieties.

Varieties affected all baking quality parameters as expected given the mix of hard white and reds. Within the hard reds, Vandal had higher flour protein, mixograph time to peak, and mixograph peak height than WPB 936. Late fall plantings consistently resulted in higher flour yield.

Summary

This study demonstrates the challenge of producing both high yields and high protein irrigated HRS wheat. Relatively high rates of late N were essential for avoiding low protein discounts.

Protein was consistently enhanced with late season N. Both varieties and planting dates affected yield and protein, but neither affected the protein response to late season N.

Despite previous reports or concerns about limited baking quality improvements with late N

Cereal Leaf Beetle Update

The cereal leaf beetle (*Oulema melanopus*) is well established in SW Idaho and far eastern Oregon. Local infestations have been reported in our area for the last several years. Eggs were present on small grain leaves in late April and larvae will begin feeding as soon as they hatch. Eggs hatch after one half to 3.5 weeks depending on the temperature. Eggs turn from yellow to black before hatching. This can be a serious pest if present in large enough numbers. Some infested fields in the past two years have required treatment.

Although adults feed on the leaves, the damage is generally of little significance. It is the larval feeding that causes the greatest cosmetic and economic damage. Larval feeding is distinctive and easily identified. Whereas the adults chew through the entire leaf, the larvae feed on the surface green layer of leaf mesophyll cells between leaf veins, so the feeding occurs in narrow strips on leaf surfaces and does not extend through the leaf. Larvae feed for up to two weeks before pupating in the soil.

If larval feeding is evident, the larvae are generally present. If they aren't, it's possible they were blown or washed off. They are poor climbers and may not make it back up on the leaf. It is also possible that they have dropped to the soil to pupate. In any event, if larvae are not present on the plant, regardless of larval feeding evidence, there may not be any point in a treatment for control.

If you had cereal leaf beetle last year in your area, you may want to scout fields for the presence of eggs or larvae to get an early indication of the infestation. The adults prefer spring planted barley to wheat. Many infestations were not found in previous years until substantial damage had been done. Earlier scouting and control, if warranted, is more timely if infestations in excess of the economic thresholds are detected earlier. Look for larvae on warm still afternoons as they may retreat to the lower stem otherwise.

Threshold infestations that warrant control are three larvae or three eggs per plant prior to the boot stage and one larvae per flag leaf after the boot stage. Larval feeding is very noticeable and it is easy to over react to this pest. Small grains can withstand considerable cosmetic damage. Control is not warranted if the thresholds are not exceeded.

Control recommendations are available in the Pacific Northwest Control Handbook (available from Ag Publications at 208-885-7982 or your local Cooperative Extension Office). For more details consider ordering the recently revised publication "**Cereal Leaf Beetle** " CIS No. 994 from Ag Publications. The text of this publication can be viewed on the Ag Communications website (http://info.ag.uidaho.edu/) by browsing the online catalogue.

Biological controls have been effective for this pest in other areas and have been introduced in some Treasure Valley fields by Mike Cooper from the Idaho Dept. of Ag, OSU Extension Educator Ben Simko, or in the Magic Valley, Bob Stolz, UI Extension Entomologist. More parasites may be available for release this spring. If you have the pest and an interest in a

Wheat and Barley Response to Phosphorus

Winter vs Spring Wheat Varieties

The University of Idaho fertilizer phosphorus (P) recommendations for irrigated wheat were developed in the late 60s. The P recommendations have been evaluated only sporadically since. There was little information on the wheat response to P in high lime soil. Increased lime reduces P solubility in soils and increases the fertilizer P requirement for some crops.

The relative P requirements for spring wheat have historically been thought to be higher than for winter wheat due to more rapid growth and less developed root systems. But winter wheat actually has greater yield potential. Few studies have been conducted to compare spring and winter wheat P requirements because they were seldom grown under the same conditions. Currently both winter and spring wheat are late fall planted in western Idaho. If the P requirements do not differ for the two wheat types it will expedite the development of P fertilizer recommendations. If winter and spring wheat differ in P requirements, those differences need to be quantified.

Also, UI food chemists have discovered a significant association between phospholipid content of starch and starch quality. It is not clear to what extent available soil P can influence this association. Available soil P effects on soft wheat quality have largely been ignored.

1999-2001 Wheat Study

An irrigated winter wheat field study was conducted on a high lime soil (lime 12%) at the Parma Research and Extension Center following previous onion trials involving two fumigation levels (with or without Metam Sodium) and two P rates (0 or 58 lb P_20_5/A) applied in the fall previous to the onion crop. Onion growth and development were reduced with the fumigation treatment in each of the three years that the onion study was conducted (1998-2000). The P added in some years helped to ameliorate the effect of fumigation.

Stephens winter wheat was fall planted over the same treated areas after each onion study. The P and fumigation treatments were quite evident in the early winter wheat growth in the first year but less so the following years.

Whole plant P concentrations below 0.16% at heading were associated with reduced biomass production at that growth stage and significant grain yield reductions at maturity. Whole plant P concentrations below 0.10% at late dough were also associated with reduced biomass production and significant grain yield reductions. Grain P concentrations <0.27% were also associated with lower grain yields.

Table 2. Stephens wheat biomass, biomass P uptake, grain yield, and protein as affected by previous fumigation and P treatments. Parma, 1999-2001.

Treatment		Biomass[1]	P uptake	Grain yield	Grain protein
Vapam	P_2O_5				
Gal/A	lb/A	T/A	lb/A	bu/A	%
<u>1999</u>					
0	0	3.67	11.8	80	10.2
0	58	4.69	17.1	113	10.1
35	0	2.94	8.0	92	10.3
35	58	3.91	12.4	105	9.6
	$LSD_{.10}$	0.61	3.6	12	0.4
<u>2000</u>					
0	0	7.0	12.3	124	11.5
0	150	7.2	15.1	141	11.3
35	0	5.9	11.4	108	11.9
35	150	7.8	19.3	143	11.2
	$LSD_{.10}$	1.3	9.0	13	0.6
<u>2001</u>					
0	0	5.50	14.5	114	12.5
0	150	8.30	18.9	133	11.7
35	0	7.00	17.7	114	12.0
35	150	8.33	24.6	128	11.5

The results from the 1999 study led to an expansion of the treatments in the 2000 and 2001 seasons. The wheat treatments were expanded to include two soft white winter (Stephens and Madsen) and two spring wheats (Treasure and Whitebird) for their response to P. Plots were split to accommodate additional P rates as well.

The affects of added P and previous crop fumigation on Stephens wheat biomass, biomass P uptake, yield, and protein are shown for all three years in Table 2. The results were mixed.

If no P was added, previous fumigation reduced Stephens biomass in two of three years but increased biomass the other year. P uptake was reduced with fumigation only the first year. Fumigation increased, reduced or did not affect yield depending on the year.

Added P tended to compensate for the effects of fumigation. With P, fumigation reduced biomass, P uptake, and yield in only the first year. Added P increased biomass and yield in all years. Yield increases from P were typically associated with lower grain protein. The protein reduction did not result in a significant difference in milling and baking quality as measured by flour yield and baked cookie diameter.

Lower protein with higher yields is typical when cultural practices increase yield with no additional N provided. Whereas low protein is desired in most soft wheats, this phenomena should be kept in mind for hard wheats where higher protein is desired.

We found no appreciable difference between the yield response of fall planted spring and winter varieties to applied P. There were greater differences between winter varieties than between winter and spring varieties in the yield response to P and fumigation. Winter varieties were more productive but the fall planted spring varieties were lower in protein, higher in test weight, and milling yields.

This work was supported by the Idaho Wheat Commis-

sion.

P Requirements of Fall vs Spring Plantings

To determine the effect of planting date on the response to P, spring wheat varieties (Treasure and Whitebird) were planted in the fall (Nov 7) and spring (March 21) for the 2001 season. The first year results are given in Table 3.

Average grain yield was about 11% higher for the fall planted spring varieties when averaged across P rates. A better indication of the yield potential difference in the fall and winter plantings can be seen in Figure 3 where the yield response to P is shown for both planting dates. With adequate P, yield differed by about 15 bu per acre. Yield for the fall planting increased more rapidly as residual P increased. Added P increased yield about 46%. But yield for both planting dates was maximized at the same P rate. The grain yield response to P was not affected by variety or planting date.

Table 3. Average response of spring wheat to P and fall vs spring planting dates.

	Planting Date		P Rate (lb P_2O_5/A)			
	Fall	Spring	0	50	130	210
Biomass (T/A)	7.72	7.10	6.34	7.14	8.05	8.11
P uptake (lb/A)	16.3	15.1	12.2	14.7	16.0	20.0
Yield (bu/A)	114	103	87	107	118	127
Protein (%)	11.2	11.1	11.4	11.1	11.0	11.1
Test Weight (lb/bu)	62.2	61.1	62.0	62.1	61.8	61.4
Lodging (%)	0	7.1	0	0	0	9
200 Kernel wt (g)	7.89	7.67	7.87	7.68	7.81	7.75
Seed filling (days)	54.6	47.8	51.1	51.9	53.2	53.2
Milling yield (%)	67.6	66.8	67.4	--	--	67.0
Final Pasting	558	562	568	--	--	551

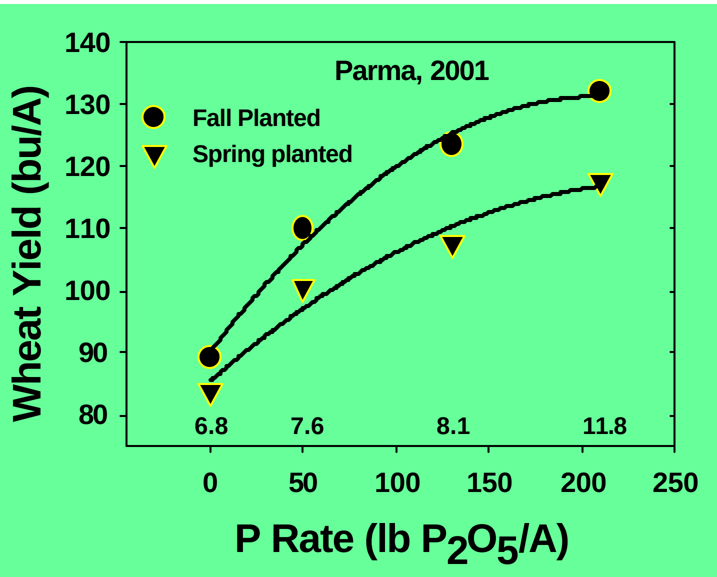

Figure 4. Average spring wheat variety yield response to residual P as affected by fall vs spring plantings. Numbers just above the bottom axis are residual P soil test

The highest P rate also increased biomass, P uptake, and lodging (in the spring planting only). In terms of quality, added P reduced test weight and milling yield due primarily to the induced lodging, but added P also lowered protein and final pasting viscosity.

The results suggest that there is a greater yield penalty for low P the greater the yield potential. But no more P is required to maximize yield. The implication is that P requirements will not differ for varieties and planting dates. This could simplify our efforts to calibrate soil test P for different variety and planting date situations with considerable savings of resources.

Fall planting also resulted in higher test weight, earlier heading, longer seed fill, heavier kernels, slightly lower protein, higher milling yield, and lower peak viscosity.

Varieties also differed in several aspects. Whitebird was higher in test weight, protein, and milling yield, had fewer days of seed filling and lower final viscosity. Treasure was lower in pro-

Table 4. Wheat and Barley response to original P rates. Parma, 2001							
Original P Rates	Grain Yield	Height	Test Weight	P Uptake	Biomass	Heads	Kernels per Head
(lb P/A)	Cwt/A	in	lb/bu	lb/A	Tons/A		
0	48.8	31.5	54.4	11.7	5.19	136	21.4
50	60.8	33.4	55.4	13.8	6.77	152	25.5
130	69.8	35.8	55.2	14.6	8.00	181	24.2
210	75.3	37.1	54.8	16.5	7.88	178	27.2
$LSD_{.10}$	4.9	1.7	0.7	3.6	0.83	16	3.3

Barley vs Wheat Response to Phosphorus

Irrigated spring barley and wheat have seldom been compared for their response to phosphorus. For much the same reason that we wanted to compare winter and spring wheat, or fall planted and spring plantings of wheat, we were also interested in whether barley and wheat would respond differently to P.

This field study was begun at Parma in the same field and conditions as the planting date trial was conducted. A two row (C32, from Coors) and six row (Millenium, from Utah State) spring barley were compared to Treasure and Whitebird spring wheat in their response to soils treated previously with varying amounts of P fertilizer (0, 50, 130, 210 lb P_2O_5 per acre) to give a range in soil test P values.

Previously applied P increased tillering, plant height, P uptake, biomass, and grain yield (Table 4). Mean barley yield was more productive than wheat and was more responsive to residual P than wheat (Fig. 5). The yield

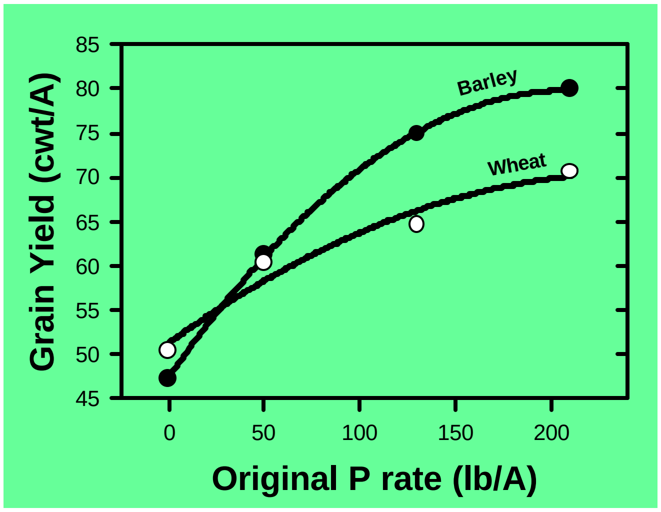

Figure 5. Mean wheat and barley yield as affected previously applied P. Parma, 2001

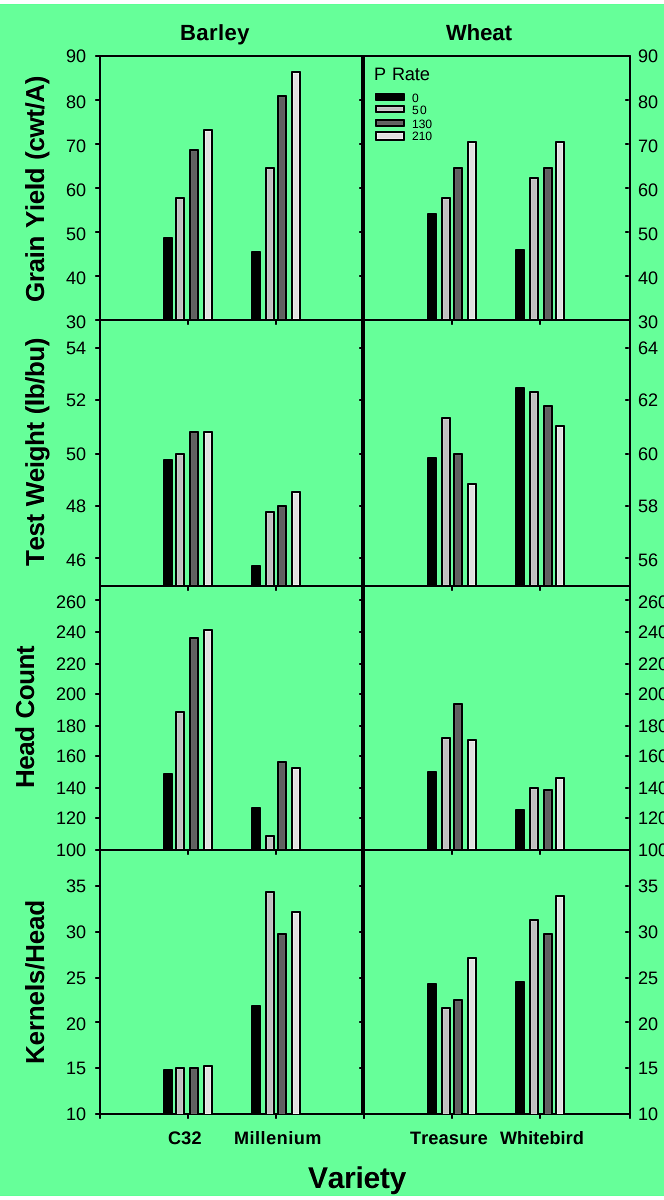

Figure 6. Yield, test weight, tillering (heads), and kernels per head, as affected by P rate and individ-

response was similar to that for the more productive fall planted spring wheat. The greater the yield potential the greater the penalty for being short of P.

The results also indicate that though there may be a greater yield penalty in barley with a shortage of P, the amount of P required to maximize yield for barley and wheat is similar. The results suggest that information on the yield response to P developed for spring wheat can be applied to barley as well, and vice versa.

Yield increased with P but the yield components responsible for higher yields differed among varieties. C32, The two row barley, had the greatest capacity to tiller with additional P and increased tillering for C32 was the only yield component responsible for increasing yield (Fig. 6). In fact, seed weight for C32 actually decreased about 12% with more tillers at higher P (data not shown) . In contrast, Millenium, the six row barley, and the wheat varieties were able to increase both the number of tillers as well as the number of seeds per head with higher P, without sacrificing seed size or weight. Apparently the six row barley yield component response to available P is more similar to wheat than it is to the two row barley.

Varieties also differed in the maturity and seed filling response to higher P. Both C32 and Millenium headed earlier with higher P, but whereas C32 headed only two days earlier, Millenium headed seven days earlier (data not shown). Maturation dates weren't appreciably affected by P. Higher P resulted in an extended seed filling period for the barley, especially Millenium.

Barley and wheat differed in the test weight response to higher P. Barley test weight increased as P increased. In contrast, wheat test weight was actually reduced with higher P.

Southwest Idaho Extension Cereals Website

Previous issues of the ***Cereal Sentinel*** newsletter back to 1996 can be viewed as PDF files on the Southwest Idaho Extension Cereals Homepage at http://agweb.ag.uidaho.edu/swidaho. If you would like to receive electronic notice of new ***Cereal Sentinel*** newsletters posted to the website, rather than the hard copy through the mail, send an e-mail message to me at

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