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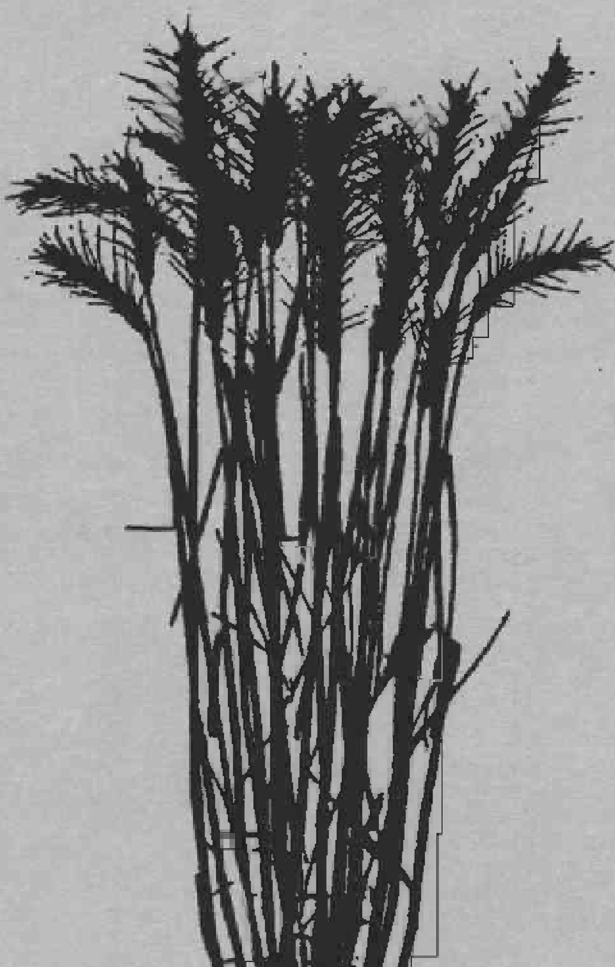
Winter Cereal Varieties for 1996



OREGON STATE UNIVERSITY EXTENSION SERVICE

Winter Cereal Varieties for 1996

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This publication describes winter wheats, barleys, oats, triticales, and ryes commonly grown in Oregon and provides, when available, yield and agronomic data to aid in variety selection. The wheat, barley, and triticale data presented in this publication were generated through a statewide variety testing program. This program was initiated in 1992 with funding and support dollars provided by the Oregon State University Agricultural Experiment Station, Oregon Wheat Commission, Oregon Grains Commission, and Oregon State University Extension Service. The testing program is centrally coordinated by Russ Karow and Helle Ruddenklau and involves research cooperators at experiment stations across Oregon. Grower cooperators made small plot testing possible at three sites. Research sites, site coordinators, and grower cooperators are listed below.

Site	Coordinator/Cooperator
Corvallis	Karow/Ruddenklau
Hermiston	Moore/Reed
Klamath	Dovel
LaGrande	Moore
	Grower: John Cuthbert
Madras	James/Bohle
Medford	Roseberg
Moro	Moore/Jacobsen
Morrow	Moore
	Grower: Charlie Anderson
North Valley	Karow/Ruddenklau
	Grower: Norm Goetze
Ontario	Barnum/Shock
Pendleton	Moore

Without the support of these funding organizations and research and grower cooperators, this data would not be available.

Data presented in Table 8 were obtained from an on-farm winter wheat drill strip testing program coordinated by Russ Karow and funded by STEEPII. In 1995, drill strip trials were conducted by growers in cooperation with county agents at 16 sites across the state. Seed for the 1995 program was provided by Anderson Seeds (Ione), Corvallis Feed and Seed (Albany), Madsen Grain (Carlton), and Pendleton Grain Growers (Pendleton).

If you have comments about or suggestions for improvement of this publication, please contact Russ Karow, Extension cereals specialist, Crop Science Bldg., Room 131, Oregon State University, Corvallis, OR, 97331-3002 (phone: 541-737-5857).

The authors thank Barbara Reed, office specialist in Crop and Soil Science, for her many hours of work in formatting this and other cereal variety publications. Without her skills, these publications would not exist.

Factors to Consider when Selecting Varieties

While yield often is the key factor in variety selection, other characteristics can be important. As you look through the data tables in this publication, you will discover that yield performance of recently released varieties often is quite similar. Rarely do we find one variety that consistently outyields all others. This is not surprising since intensive breeding efforts have improved the yield potential and stability of grains in general. What this means to you is that factors other than yield can receive greater attention as you select varieties to grow on your farm. The following criteria should be considered as you think about variety selection.

Disease/Pest/Stress Resistance. Diseases can be a major problem across the state; however, type of disease and disease pressure varies from location to location and from year to year. Select a variety with resistance or tolerance to the diseases and stresses commonly found in your area. Septoria is the major disease of winter wheats grown in western Oregon. Tolerant varieties are available. Stripe rust can be a serious disease of older club varieties. Newer, resistant varieties are available. Strawbreaker footrot is a common disease of both common and club wheats. The varieties Madsen and Hyak have shown good resistance. Cephalosporium stripe can severely limit yields in parts of eastern Oregon. It is not a problem in western Oregon. There are differences in tolerance among varieties but no true resistance. Barley yellow dwarf virus traditionally has been the most common disease of winter barley and oats. None of the locally adapted varieties has resistance. Late planting to avoid virus-laden aphids is the best control strategy. Barley stripe rust is a new disease of winter barley. It was positively identified in the Klamath Basin and in western Oregon in 1995. Other likely, but

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non-verifiable, infestations were in Wallowa and Gilliam counties. Kold barley has shown resistance. None of the currently grown winter wheats or barleys has resistance to Russian wheat aphid; however, oats are immune. Smut and bunt diseases are ever-present in Oregon and will cause yield losses if not controlled. Several common seed treatments are effective in controlling smuts if properly applied. Dividend seed treatment is especially effective against dwarf (TCK) bunt. Use of variety mixtures is becoming more common as a means to address disease and environmental stress problems. Mixtures are more genetically diverse than single varieties and sometimes offer greater environmental and disease stress buffering. Club mixtures for improved stripe rust control are in use. A Stephens/Daws mix is being used in areas with potential for winter or spring frost injury. Mixtures with Yamhill are being used on wet ground in western Oregon.

Height and Lodging. Varieties differ in height and lodging resistance. Though generally correlated, taller varieties do not necessarily have poorer lodging resistance. Lodging reduces both grain yield and grain quality. As soil fertility levels increase, stiffer-strawed varieties should be used. You also should pay careful attention to both timing and rate of fertilizer applications and irrigation, when used.

Maturity. As a group, barleys mature earlier than other grains; oats later. However, varieties differing in rate of maturity exist within each grain type. Early maturing varieties may avoid yield and quality reductions caused by heat or drought in mid-to-late summer. Later-maturing varieties may yield more when moderate temperatures and favorable moisture conditions persist into mid-summer; however, stem rust and other diseases favored by warm weather may become a problem. Choose varieties with a maturity that matches your environment and cropping needs.

Winter Hardiness. As a group, winter barleys are less winter-tolerant than wheats; however, winter varieties such as Gwen have better hardiness than most wheats. Winter hardiness is a complex characteristic that is determined not only by a variety's tolerance of cold, but also by its resistance to other stresses encountered during winter months. Winter hardiness is not a major limiting factor in winter wheat and barley production in Oregon. Varieties with only an average level of winter hardiness perform successfully in most years. Even facultative varieties, varieties that have a low vernalization requirement and can be planted in the fall or spring, can be grown in most parts of Oregon. If winter kill is a problem in your area, select varieties with a higher winter hardiness rating or consider using a mixed variety planting. Winter oats are the least hardy of the winter cereals. Production generally is limited to areas south of the 40th parallel except for regions with Mediterranean-type climates such as western Oregon. Winter survival in these areas generally is good. Winter-hardiness trials have been conducted at the Moro Experiment Station in the past. Over the 5-year period 1967-71, survival of Grey Winter, Walken, and Compact winter oats was 100 percent 3 of the 5 years and approximately 5 percent the other 2. It would appear that currently available winter oats can tolerate winter minimum temperatures of 10-15°F without snow cover. Minimums below this level are likely to cause damage unless snow cover is present. With adequate snow cover, temperatures as low as minus 22°F have not caused damage. Compact and Walken oats are less winter-hardy than Grey Winter or Crater. Kenoat has not been tested for winter hardiness in Oregon, but in Kentucky, its state of origin, it is reported to have a greater level of winter hardiness than Grey Winter, Walken, and Compact oats.

Yield Potential. Yield potential varies from variety to variety and, for a variety, from one area and from one year to another. Yield potential is a genetic trait but is moderated by other factors such as disease and stress tolerance. To evaluate the yield potential of a variety, review data from test sites with an environment similar to that in your area. Where possible, compare performance over several years, as a single year's data can be misleading. Yield data in tables 6-7 are presented in a different format – as a percent of trial average. In this format, if the average yield for a trial is 100 bu/a and a variety yields 103 bu/a, then its percent of average yield is 1.03. Use of this format simplifies combining of data over years and locations.

Intended Use. Barley varieties are classified either as feed or malting types. Feed types are generally classified as such because they did not meet malting barley quality requirements, not because they were bred specifically for feed use. If raising barley for feed, select varieties with consistently high test weight. There are no winter malting barley varieties approved by the American Malting Barley Association (AMBA) at this time. Oats are used as animal feed, for cover crop, and as human food. Some varieties are better suited for specific end uses than others. Amity is the preferred food-type winter oat. Amity, Kenoat, and Walken all can be used as feed oats. Grey winter generally is grown as a seed stock to be used for cover crops and forage, but also has some feed-grain potential. Soft white winter wheats, both common and club, have occupied 85 percent of Oregon's winter wheat acreage in recent years. Hard red winter wheats rarely are grown. Triticales have been grown for feed use, but there is some interest in Celia triticale as a milled food grain. We have mentioned use of mixtures to address various production problems. Keep in mind that mixtures cannot be grown for certified seed under current regulations.

Grain Quality. Test weight (bushel weight) is a price-determining factor in the market place. Choose varieties with good test weight records. All PNW-released varieties meet minimum quality standards established by PNW breeders, but suitability for different end use applications can vary. For an overview of wheat quality, see the article titled "A Wheat Quality Primer" on pages 18-20 of this publication. This article originally ran in the February 1994 *Oregon Wheat Growers Magazine*.

Wheats and Triticales

Agronomic characteristics, disease ratings, and yield data for commonly grown winter wheats and triticales are presented in written and tabular form below. Table contents are as follows:

General agronomic ratings	Table 1
Disease ratings	Table 2
1995 heading, height and lodging	Table 4
1995 yield data	Table 5
1993-95 yield data	Table 6
1994-95 yield data	Table 7
Drill strip yield data (wheat only)	Table 8
1995 test weight data	Table 9
1995 grain protein data	Table 10

Soft White Winter Wheats

GENE (OR8300801) is an awnletted, common soft white winter wheat released by OSU in 1991. It is an early maturing, short-statured, *Septoria tritici*-resistant variety. It is susceptible to *Septoria nodorum* and common bunt. Gene has outyielded Stephens and other commonly grown varieties when grown in western Oregon and in some areas of eastern Oregon. It has only fair winter hardiness.

MacVICAR (OR75336) is a mid-height, medium-maturity common soft white wheat released by OSU in 1992. It is an awned semidwarf with good lodging resistance. It appears to have tolerance to many wheat diseases. MacVicar grain protein levels are consistently lower than those of other commonly grown soft whites.

MADSEN (WA7163) is an awned, common soft white winter wheat with white and buff chaff. It was released by WSU in 1988. Madsen is a backcross progeny of Hill 81 and is similar to Hill 81 in appearance and agronomic characteristics, but is more resistant to strawbreaker footrot. Madsen has shown good field resistance to stripe, leaf, and stem rusts. Madsen is equal in height to Hill 81 and slightly earlier in maturity. Yield potential is similar to that of Hill 81.

ROD (WA7662) is an awned, common-type soft white winter wheat released by WSU in 1992. Rod is similar in height to Stephens but is weaker-strawed and later maturing. Rod has good stripe rust and common bunt resistance and appears to have Cephalosporium stripe tolerance, but is susceptible to other common wheat diseases. Winter hardiness is similar to that of Madsen. Rod has yielded well across environments.

ROHDE (OR855) is a high-yielding, stripe rust-resistant club wheat released by OSU in 1992. It is awned and has bronze chaff. It has yielded well across environments, an unusual trait for a club wheat. Rohde is very susceptible to strawbreaker footrot and needs to be treated with fungicide or grown in fields where strawbreaker has not been a problem. Rohde is taller than commonly grown soft white wheats, but has good lodging resistance. Winter hardiness is average.

STEPHENS is a high-yielding, widely adapted semidwarf released by OSU in 1977. It occupies approximately 55 percent of the wheat acreage in Oregon. Stephens has only an average level of winter hardiness and is susceptible to *Cephalosporium* stripe. In areas where either of these problems occurs frequently, it is best to grow several different varieties or variety mixtures to reduce loss risks.

YAMHILL is a standard-height, beardless, common soft white released by OSU in 1969. It has fair winter hardiness and a strong vernalization requirement. Its unique attribute is the ability to tolerate wet soil conditions better than any other soft white winter wheat. It is susceptible to stripe rust and may require fungicide treatment.

W301 is an early-maturing, stiff-strawed, snow-tolerant, common soft white wheat released by OSU in 1992. It is specifically intended for use in high-elevation, heavy-snow-cover regions of the Pacific Northwest. It is similar in maturity and height to Stephens but has a lower yield potential. It is earlier, stiffer-strawed, and has greater yield potential than Lewjain, John, Luke, or Eltan – varieties commonly grown in cold, snowy areas.

Winter Triticales

Triticales are wheat x rye hybrids grown primarily for feed. Winter, spring, and facultative types are available. Newer varieties have yield potentials similar to wheat and test weights nearly as good. Most triticales have a broad spectrum of disease resistance due to their rye parentage. Triticales are a feed grain alternative to corn and barley.

CELIA (FT91062) is a medium-height, early to medium-maturing, awned, stiff-strawed triticale released by OSU in 1993. It is a replacement for the variety Flora. Like Flora, Celia has prostrate early growth and an excellent disease-resistance profile. Celia is facultative and can be early spring planted. Celia test weights are significantly better than those of other winter triticales. Due to its short stature and prostrate early season growth, Celia is being used as a cover crop in orchards, hop yards, and row crop fields.

WHITMAN (WA80011) is a facultative (spring-winter) triticale released by WSU in 1988. It has had adequate winter-hardiness to survive winters at Pullman, Washington, if snow cover is present during coldest weather. Without snow cover, it is very susceptible to winter kill. It is resistant to current races of stripe and leaf rust. Whitman is a tall triticale with excellent yield potential. Whitman heads out early but is similar in harvest date to Daws or Nugaines. Test weights are only fair.

Winter Barleys

Agronomic characteristics, disease ratings, and yield data for commonly grown winter barleys are presented in written and tabular form below. Table contents are as follows:

General agronomic and disease ratings	Table 3
1995 heading, height and lodging	Table 4
1995 yield data	Table 5
1993-95 yield data	Table 6
1994-95 yield data	Table 7
1995 test weight data	Table 9
1995 grain protein data	Table 10

GWEN is a six-row feed barley released by OSU in 1991. It is a small-headed, rough-awned variety with early maturity and excellent winter hardiness. It was released for use in the low-rainfall, shallow-soil areas of the Columbia Basin but has performed well in other areas.

HOODY is a hooded (awnless) barley developed by Mat Kolding, retired OSU cereal breeder. It is intended for use as a cereal hay.

HUNDRED (WA6739) is a six-row feed barley released by WSU in 1990. It is slightly taller than Showin but has good lodging resistance. Field tests indicate winter hardiness is similar to that of Kamiak. Yield potential is good.

KOLD (ORWM8407) is a medium-height, lax-headed, six-row feed barley released by OSU in 1993. Kold has resistance to barley stripe rust. Kold is similar to other commonly grown winter barleys in heading date, lodging resistance, and test weight.

ORW6 is an experimental barley with resistance to barley stripe rust. It may be released under the name "Strider."

SCIO is a medium-short, mid-season, feed grain variety released by OSU in 1981. It is similar to Boyer in maturity and about 3 inches shorter than Boyer. It is very stiff-strawed and well-adapted to the Columbia Basin.

SDM204 and **SDM208** are experimental barleys bred by Don Sunderman, a private plant breeder in Idaho.

STEPTOE is a medium-height, early, spring feed grain variety released by WSU in 1973. Grain test weight is typically above average. Yield potential is high and is stable across environments. It is tolerant of cold and may be fall-seeded in areas where winter killing is not a serious problem. Spikes are lax and mid-long; kernels are white.

Winter Oats

Agronomic characteristics and yield data for commonly grown winter oats are presented in written and tabular form below. No trial work has been conducted in recent years. The data provided are the most recent or the only data available for an area. Table contents are as follows:

General agronomic ratings	Table 11
Western Oregon data	Table 12
Eastern Oregon data	Table 13

AMITY is a high-yielding, white-kerneled, late-maturing oat released by OSU in 1972. Winter hardiness is fair. The cultivar is tall with adequate lodging resistance. Test weights have been lighter than those of other varieties. Amity is the preferred food-type winter oat.

CRATER is an improved grey winter oat released by OSU in 1956. Yield is similar to or better than Grey Winter, with reduced height, improved lodging resistance, and earlier heading. Test weights have been lower than those for Grey Winter. The variety has been resurrected. Small amounts of foundation seed may be available through IMS Seeds Inc. in fall 1996.

GREY WINTER is a common grey oat released in the early 1900s. Winter hardiness and yield are good. Grey Winter is tall but has fair lodging resistance. Feed and food use are limited. Only common seed is available as breeder seed stocks are not known.

KENOAT. Kenoat is a red-grey winter oat released by Kentucky in 1981. Height and maturity are substantially reduced in comparison to Amity, Crater, and Grey Winter. Winter hardiness is very good. Yield and height are similar to Walken. Lodging resistance is less than that of Walken.

WALKEN. Walken is a yellow-red winter oat released by the University of Kentucky in 1970. It is a late-season, medium-height variety with good lodging resistance. Yields have been superior to most other winter oat varieties.

Winter Ryes

Most rye is sold as "common" seed in Oregon — no variety name is specified. Be aware that ryes can be either winter or spring habit. If you are buying common rye seed, ask for documentation on growth-habit type. Rye grain trials have not been conducted in Oregon in recent history. Information about rye varieties that have been grown in Oregon is given below.

ABRUZZI (ABRUZZES) was introduced from Italy by the USDA in the early 1900s. A number of Abruzzi strains have been re-selected from the original variety and are available as certified seed. Abruzzi's in general have only fair winter hardiness and are used as fall-seeded forage crops in the southeastern United States. Wrens Abruzzi was released by the University of Georgia in 1950. It is an early maturing, forage type. Seed is available in Georgia. Athens Abruzzi was released by the University of Georgia in 1972. It is similar in maturity to Wrens, but has shown superior yield. Athens Abruzzi is available in North Carolina.

HANCOCK is a winter-hardy grain rye developed by the University of Wisconsin. It is a short-statured, lodging-resistant, high-grain-yielding variety. Certified seed is available in Wisconsin.

PETKUS was developed in Germany by F. von Lokow in the late 1800s. It was introduced into the United States in 1900 by the USDA. A tetraploid variant was identified in the early 1900s and named Tetra Petkus. Tetra Petkus is a winter-hardy rye and has been grown in Oregon since the mid-1950s. Certified seed is not available.

WHEELER is a privately bred winter-hardy rye. Certified seed is available through Woodburn Fertilizer in Woodburn, Oregon. Wheeler has biopathic properties and is being evaluated for use in Oregon as a cover crop to suppress weeds and several soil-borne pests.

Table 1.—Agronomic characteristics of commonly grown winter wheats.

Variety	Released Year	Released Origin[1]	Emergence[2] index	Winter-[2] hardiness	Maturity	Height[3]	Lodging[4] resistance	Test[2] weight	Chaff[5] color	Head type
Common white										
Banner	1994	WPB	5	--	--	M	MR	6	W	Awned
Basin	1985	CBS	5	10	mid-late	SM	R	8	W	Awned
Cashup	1985	CBS	5	10	midseason	M	R	8	W	Awned
Daws	1976	WA	3	10	midseason	M	MR	8	W	Awned
Dur. Pride	1992	SC	--	--	mid-late	M	R	7	W	Awned
Dusty	1985	WA	5	9	late	M	MR	7	W	Awned
Eltan	1990	WA	5	10	mid-late	MT	MS	7	W	Awned
Gene	1991	OR	5	1	early	SM	R	6	W	Awnless
Hill 81	1981	OR	5	6	midseason	MT	MR	7	W	Awned
Kmor	1990	WA	5	8	mid-late	MT	MR	6	W	Awned
Lambert	1994	ID	5	3	early-mid	MT	MR	7	W	Awned
Lewjain	1982	WA	7	8	late	M	MR	7	W	Awned
MacVicar	1992	OR	5	2	midseason	M	R	7	W	Awned
Madsen	1988	WA	5	6	midseason	MT	R	8	W	Awned
Malcolm	1987	OR	5	3	early-mid	M	R	7	W	Awned
Nugaines	1961	WA	5	7	midseason	M	R	8	W	Awned
Rod	1992	WA	5	2	mid-late	M	MR	8	W	Awned
Stephens	1977	OR	5	2	early-mid	M	R	7	W	Awned
Yamhill	1969	OR	7	3	midseason	T	MR	7	W	Awnletted
W301	1992	OR	5	8	early-mid	M	R	7	W	Awned
Club										
Crew	1982	WA	5	-	midseason	MT	MR	6	W-B	Awnless
Faro	1976	OR	6	-	early-mid	MT	R	5	B	Awnless
Hyak	1988	WA	4	7	early-mid	MT	MR	6	W	Awnletted
Moro	1965	OR	8	6	early-mid	MT	MS	5	B	Awnless
Rely	1990	WA	4	5	midseason	M	MR	6	W	Awnless
Rohde	1992	OR	6	4	early-mid	MT	R	7	B	Awned
Tres	1984	WA	5	7	midseason	M	R	7	W	Awnless
Hard red										
Andrews	1987	WA	5	M	early	M	R	7	W	Awned
Batum	1985	WA	5	M	late	SM	R	6	W	Awned
Blizzard	1988	ID	9	H	mid-late	T	S	8	W	Awned
Bonneville	1994	ID	--	H	mid-late	MT	S	8	W	Awned
Buchanan	1989	WA	8	M	mid-late	MT	S	6	W	Awned
Hatton	1979	WA	6	H	mid-late	T	MR	8	W	Awned
Hoff	1991	OR	5	L	early-mid	M	MR	8	W	Awned
Meridian	1992	ID	5	-	early-mid	M	MR	-	W	Awned
Survivor	1991	ID	6	M	--	--	--	-	W	Awned
Wanser	1965	WA	6	M	midseason	MT	MS	8	B	Awned
Weston	1978	ID	6	M	early-mid	T	S	8	B	Awned
Triticale										
Bob	--	OR	5	H	late	MT	MR	2	W	Awned
Celia	1993	OR	5	H	early-mid	SM	R	4	W	Awned
Flora	1986	OR	6	H	early-mid	SM	R	2	B	Awned
Whitman	1988	WA	5	L	midseason	MT	MR	2	B	Awned

[1] WA = Washington, OR = Oregon, ID = Idaho, WPB = Western Plant Breeders, CBS = Columbia Basin Seeds, SC = Sunco Seeds.
[2] Scale of 1 to 10, poor to excellent, or rating - L = low, M = moderate, H = high; ratings of 2-3 are generally adequate for most of Oregon; ratings are based on
Washington State University test data.
[3] SM = short-medium, M = medium, MT = medium-tall, T = tall.
[4] R = resistant, MR = moderately resistant, MS = moderately susceptible.
[5] W = white, B = bronze.

Table 2.—Disease ratings for commonly grown winter wheats.

	Rust		Bunt		Flag	Cephalo-[1]		Foot[3]	Take	Snow
	Stripe	Leaf	Common	Dwarf	smut	sporium	Septoria[2]	rot	all	mold
Common white										
Basin	MR[4]	MS	R	MR	MS	6	--	--	--	S
Cashup	MR	MS	R	S	MS	6	--	S	--	S
Daws	MR	MS	R	S	MS	3	MS	S	S	S
Dur. Pride	MR	S	--	S	MS	3	S	S	S	S
Dusty	MR	MS	R	S	MS	--	--	S	S	S
Eltan	MR	S	R	MR	MS	5	--	S	S	MR
Gene	MR	R	S	S	MS	1	R	MR	S	S
Hill 81	MR	MR	S	S	MS	4	MR	S	S	S
Kmor	R	S	MR	MS	MS	5	S	S	S	S
Lambert	MR	MR	--	S	--	--	S	S		MS
Lewjain	MR	S	R	MR	MS	6	MR	S	S	MS
MacVicar	MR	MS	S	S	MS	1	MS	S	MS	S
Madsen	R	R	R	MR	MS	5	MR	R	--	S
Malcolm	MR	MS	R	S	MS	1	S	S	S	S
Nugaines	MR	S	R	S	--	--	MS	MS	S	S
Oveson	MR	MS	MR	S	MS	--	--	S	S	S
Rod	MR	MS	R	S	MS	6	S	S	--	S
Stephens	R	MS	S	S	MS	1	S	S	S	S
Yamhill	S	MR	S	S	MS	--	MR	MS	S	--
W301	MR	MR	MS	S	MS	--	S	S	--	MS
Club										
Crew[5]	M	MS	R	S	S	--	--	S	S	--
Faro	S	S	MR	S	S	--	MS	MS	S	--
Hyak	MS	MR	MS	MS	S	4	S	R	--	S
Moro	S	S	R	MR	MR	4	--	S	S	MS
Rely	MR	MR	MS	S	VS	4	--	S	S	S
Rohde	MR	MS	MR	S	VS	4	S	VS	--	S
Tres[6]	S	M	MS	S	VS	4	--	S	S	S
Hard red										
Andrews	MR	S	R	MR	R	2	--	S	--	MR
Batum	MR	S	R	MS	R	--	MS	S	S	S
Blizzard	MS	MR	R	R	R	--	--	S	S	MR
Bonneville	MR	MR	--	R	--	--	--	--	--	MR
Buchanan	MR	MS	MR	S	R	--	--	S	S	MR
Hatton	S	S	MR	S	R	3	--	S	--	S
Hoff	MR	MS	S	S	S	1	MR	S	S	S
Wanser	MR	MS	R	S	R	--	MR	--	--	S
Weston	S	MS	R	R	R	--	--	S	--	MR
Triticale										
Bob	R	MR	--	--	--	--	R	--	--	--
Celia	R	R	--	--	--	--	R	MR	MS	MR
Flora	R	R	R	MR	R	--	R	MR	MS	MR
Whitman	R	R	R	--	R	--	R	--	MS	--

[1] Resistance to cephalosporium may be due to morphological growth patterns rather than true genetic resistance, hence a tolerance index is used for rating 1=poor, 5=medium, 10=excellent.

[2] Rating is for *Septoria tritici*.

[3] Ratings are for Pseudocercosporella foot rot.

[4] R = resistant, MR = moderately resistant, M = intermediate reaction, MS = moderately susceptible, S = susceptible, VS = very susceptible, T = tolerant, -- = reaction unknown.

[5] Crew is a multiline variety composed of 10 separate lines, some of which are rust-susceptible.

[6] Tres is moderately resistant to powdery mildew.

Table 3.—Agronomic characteristics for winter barleys.

	Released			Agronomic Characteristics						Disease Reaction[5]		
	Year	State	Type[1]	Winter[2] hardiness	Heading[3] date	Hgt[4]	Lodging[5]	Test[6] Wgt.	Awn[7]	Scald	Smut	Stripe rust
AB 812	1988	ID	6F	G	M	M	I	5	R	--	--	S
Boyer	1975	WA	6F	F	M	M	MR	4	R	MS	MR	S
Gwen	1991	OR	6F	E	E	M	MR	8	R	MR	MR	S
Hesk	1980	OR	6F	F	M-L	M	MR	4	R	MS	S	S
Hoody	1994	OR	6F	F	E-M	MT	I	3	H	--	--	S
Hudson	1951	NY	6F	G	E-M	MT-T	MS	7	R	MR	MR	S
Hundred	1990	WA	6F	G	M-L	M	MR	4	R	MR	--	S
Kamiak	1971	WA	6F	G	E	MT	I	6	R	MR	MR	S
Kold	1993	OR	6F	F	M	MS	MR	7	R	MR	--	R
Luther	1966	WA	6F	F	L	MS	MS	4	R	MS	MR	S
Mal	1980	OR	6F	F	M-L	M	MR	4	R	MR	MR	S
ORW6	1997?	OR	6F	-	E-M	M	MR	6	R	--	--	R
Schuyler	1969	NY	6F	G-E	M-L	MS	MS	6	R	MR	-	S
Scio	1981	OR	6F	F	M	MS	VR	5	SR	MS	--	S
Showin	1985	WA	6F	G	M-L	MS	R	4	R	MS	--	S
Steptoe[8]	1973	WA	6F	F	E-M	M	I	7	R	MS	--	S
Wintermalt	1982	NY	6F	G	E-M	MS	MS	5	SR	S	MR	S

[1] 6F = six-row feed barley. No malt-type winter barleys are yet available.
[2] P = poor, F = fair, G = good, E = excellent.
[3] E = early, M = midseason, L = late.
[4] S = short, MS = midshort, M = medium, MT = midtall, T = tall.
[5] MS = moderately susceptible, I = intermediate, MR = moderately resistant, R = resistant, -- = reaction unknown.
[6] Scale of 1 to 10 with 5 being average.
[7] R = rough, SR = semi-rough, H = hooded.
[8] A spring barley with a moderate level of winter hardiness.

Table 4.—1995 state-wide variety testing program winter grain Julian heading dates, heights and lodging across locations in Oregon.

Variety/ line	Market class	Corvallis	Madras	Ontario	Corvallis	Madras	Moro	Morrow	North Valley	Ontario	Pendleton	Madras	Ontario
		Julian heading date			Plant height (inches)							Lodging percent	Lodging score*
Winter wheats and triticales													
Cashup	SW	147	162		39	40	28	30	39		39	100	–
Celia	Triticale	144	158	144	43	44	33	35	41	37	42	63	–
Daws	SW	145	160	144	41	40	30	29	42	36	39	98	–
Gene	SW	132	155	142	37	33	25	28	33	33	33	100	–
Hill 81	SW	148	161	146	43	42	26	34	44	37	44	93	–
Hoff	HR	140	154	142	44	38	28	34	44	36	40	98	–
Hyak	Club	138	159		45	40	27	32	44		44	98	–
Kmor	SW	148	163		41	40	26	27	39		40	100	–
Lambert	SW	142	157		45	42	29	38	43		42	67	–
Lewjain	SW	150	165		39	40	26	29	39		37	100	–
Mac 1	SW	145	156	144	45	42	30	37	45	41		100	–
MacVicar	SW	144	158	143	41	39	30	32	38	37	39	65	–
Madsen	SW	144	162	146	42	39	30	34	39	33	40	77	–
Malcolm	SW	144	156	143	44	40	29	31	41	38	38	83	–
Parma	Triticale	147	163	144	45	47	35	44	49	42	48	100	–
Rely	Club	149	160		43	44	29	33	40		37	97	–
Rod	SW	147	162		40	42	29	30	39			100	–
Rohde	Club	145	160	146	43	41	25	31	45	34		99	–
Rulo	Club	149	162		42	43	26	34	42		41	98	–
Stephens	SW	142	156	142	41	39	28	34	40	35	40	99	–
W301	SW	143	154	144	43	39	29	33	37	37	41	100	–
Whitman	Triticale	129	151	139	53	52	39	47	54	44	52	100	–
Yamhill	SW	144	163		47	42	27	39	47			98	–
Trial average		143	159	144	42	41	23	34	41	36	41	93	–
PLSD (5%)		1	3	1	4	4	–	–	3	2	–	NS	–
PLSD (10%)		1	2	1	3	3	–	–	3	2	–	NS	–
CV		1	1	1	5	6	–	–	5	3	–	26	–
P-VALUE		0.00	0.00	0.00	0.00	0.00	–	–	0.00	0.00	–	0.12	–
Winter barleys													
AB-812	6RF			137						35			3.3
Gwen	6RF	126	141		39	41	–	–	46		42	22	
Hesk	6RF	143	150	142	33	42	–	–	42	34	39	73	1.7
Hoody	6R hooded	141	152		39	46	–	–	50		39	72	
Hundred	6RF	141	150	142	34	38	–	–	40	36	42	43	4.7
Kamiak	6RF	124	141		42	39	–	–	52		52	77	
Kold	6RF	140	150	142	31	39	–	–	40	35	37	68	1.7
ORW6	6RF/M	130	146	137	34	39	–	–	42	33	39	72	3.7
ORW7	6RF/M	141	151	141	35	43	–	–	41	39	43	28	2.0
Scio	6RF	136	150		35	40	–	–	43		41	72	
Showin	6RF	137	150	140	31	31	–	–	30	29	32	73	5.0
Steptoe	6RF	135	150	138	42	45	–	–	52	35	46	88	4.3
SDM204	6RF		154			36	–	–				70	
SDM208	6RF		150	139		39	–	–		34		82	1.0
Trial average		136	149	140	36	40	–	–	44	34	41	65	3.2
PLSD (5%)		3	2	1	5	5	–	–	3	3	–	NS	2.1
PLSD (10%)		3	2	1	4	4	–	–	4	2	–	NS	1.7
CV		1	1	1	8	7	–	–	7	5	–	43	39
P-VALUE		0.00	0.00	0.00	0.00	0.00	–	–	0.00	0.00	–	0.15	0.01

Grain did not lodge at other sites.
*Lodging score: 1=none, 2=1-20%, 3=21-40%, 4=41-60%, 5=61-80%, 6=>80%

Table 5.—1995 state-wide variety testing program winter grain yield data across nine locations in Oregon.

Variety/ line	Market class	Corvallis	LaGrande	Madras	Medford	Moro	Morrow	North Valley	Ontario	Pendleton	8 site average*	8 site percent of average*
Winter wheats and triticales					Yield (bu/a; 60 lb bu; 10% moisture)							
Cashup	SW	84	92	100	113	42	45	107		101	85	1.02
Celia	Triticale	76	83	99	96	54	40	105	133	108	83	1.00
Daws	SW	75	102	114	112	56	46	118	140	81	88	1.06
Gene	SW	109	96	89	114	56	50	105	143	93	89	1.09
Hill 81	SW	74	91	113	101	49	41	115	135	87	84	1.00
Hoff	HR	65	91	118	120	51	47	97	137	61	81	0.97
Hyak	Club	71	80	73	117	52	36	119		82	79	0.94
Kmor	SW	85	76	84	105	53	38	108		80	79	0.95
Lambert	SW	69	90	107	124	53	47	99		82	84	1.01
Lewjain	SW	74	64	93	109	49	33	107		84	77	0.91
Mac 1	SW	88	87	100	131	55	41	105	149	51	82	0.98
MacVicar	SW	81	79	104	124	49	34	96	150	85	81	0.96
Madsen	SW	86	75	98	105	53	56	103	137	94	84	1.03
Malcolm	SW	90	105	113	129	57	53	117	150	80	93	1.12
Parma	Triticale	62	87	89	106	55	49	92	127	100	80	0.98
Rely	Club	56	85	93	123	56	41	84		74	76	0.92
Rod	SW	79	88	115	115	58	48	99		76	85	1.03
Rohde	Club	70	84	105	133	54	47	123	131	70	86	1.02
Rulo	Club	56	82	100	127	51	42	102		72	79	0.94
Stephens	SW	88	77	105	106	56	47	102	128	96	85	1.03
W301	SW	84	89	97	97	55	49	76	146	88	79	0.98
Whitman	Triticale	62	96	100	107	51	37	108	118	79	80	0.95
Yamhill	SW	79	68	74	90	53	44	113		63	73	0.89
Trial average		78	85	103	114	52	44	105	142	84	82	82
PLSD (5%)		13	NS	21	19	8	9	NS	19	15	NS	0.12
PLSD (10%)		11	17	18	16	6	7	NS	16	13	14	0.10
CV		11	15	13	12	8	13	18	8	11	12	12
P-VALUE		0.00	0.07	0.00	0.00	0.01	0.00	0.75	0.00	0.00	0.07	0.02
											7 site average*	7 site percent of average*
Winter barleys					Yield (lb/a; 10% moisture)							
AB-812	6RF								8669			
Gwen	6RF	2845	4182	2889	3994	–	3373	4290		3463	3577	0.89
Hesk	6RF	2608	5616	4078	3347	–	3174	5344	8001	3338	3929	0.96
Hoody	6R hooded	1778	2162	3040	2194	–	1247	3575		1400	2199	0.54
Hundred	6RF	3109	4862	3860	4678	–	3017	4956	7669	4448	4133	1.01
Kamiak	6RF	2814	4045	4077	4961	–	3622	4271		2655	3778	0.93
Kold	6RF	3106	5204	4215	5497	–	3470	5998	6637	5416	4701	1.15
ORW6	6RF/M	3966	5187	4984	5407	–	3868	5928	8535	5331	4953	1.23
ORW7	6RF/M	3819	5959	1945	4920	–	4082	4896	5786	4187	4258	1.06
Scio	6RF	3188	3025	3650	5269	–	4226	5196		4531	4155	1.04
Showin	6RF	2907	5433	5258	3105	–	3264	4516	6455	4457	4134	1.02
Steptoe	6RF	3743	5659	3932	3239	–	3132	5404	7454	4104	4173	1.02
SDM204	6RF			6257		–						
SDM208	6RF			4692		–			8255			
Trial average		3080	4667	4067	4408	–	3316	4943	7489	3939	4060	4060
PLSD (5%)		608	1100	1534	1237	–	735	1062	1240	1053	752	0.18
PLSD (10%)		503	910	1272	1030	–	608	878	1023	871	629	0.15
CV		12	14	22	20	–	13	13	10	16	18	17
P-VALUE		0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00

* does not include Ontario

Table 6.—1993-95 winter grain yields across nine Oregon locations expressed as a percent of trial average.

Variety	Market class	Corvallis	LaGrande	Madras	Medford	Moro	Morrow county	North Valley	Ontario	Pendleton	8-site average
Winter wheats and triticales						Yield as a percent of trial average					
Celia	Triticale	1.00	0.99	1.01	–	1.08	1.10	0.91	0.99	1.20	1.04
Daws	SW	0.94	1.08	0.97	–	0.99	0.99	1.04	0.96	0.92	0.99
Gene	SW	1.19	0.95	0.96	–	1.07	1.14	0.99	0.96	1.10	1.05
Hoff	HR	0.79	1.03	1.09	–	1.02	0.91	0.93	0.97	0.87	0.95
MacVicar	SW	1.07	0.93	1.06	–	0.99	0.95	0.99	1.11	1.04	1.02
Madsen	SW	1.09	1.02	0.99	–	0.98	1.07	0.94	1.01	1.06	1.02
Malcolm	SW	1.16	1.05	1.03	–	0.98	1.11	1.07	1.06	1.03	1.06
Rod	SW	0.98	1.14	1.04	–	1.13	1.11	1.02	0.69	0.96	1.01
Rohde	Club	0.84	0.96	0.98	–	1.14	0.97	1.07	0.97	1.01	0.99
Stephens	SW	1.05	1.00	1.03	–	1.07	1.19	1.00	1.01	1.17	1.07
W301	SW	1.03	0.93	1.04	–	1.05	1.15	0.96	1.08	1.10	1.04
Whitman	Triticale	1.08	1.09	0.97	–	1.08	0.95	1.02	0.91	1.14	1.03
PLSD (5%)											NS
PLSD (10%)											NS
1993-95 average yield (bu/a)		89	89	108	–	55	56	118	146	74	92
Winter barleys					Yield as a percent of trial average						5-site ave
AB-812	6RF					–		–	1.10		
Gwen	6RF	0.95	0.90	0.97	0.91	–	0.90	–		0.90	0.92
Hesk	6RF	0.92	1.12	1.03	0.98	–	1.11	–	1.07	1.05	1.04
Hundred	6RF	0.94	1.12	1.05	1.18	–	1.06	–	1.06	1.17	1.07
Kamiak	6RF	0.98	0.77	0.84		–	0.91	–		0.77	0.85
Kold	6RF	1.16	1.11	1.06	1.23	–	1.03	–	0.93	1.17	1.11
Showin	6RF	0.63	1.08	1.25		–	1.00	–	1.01	1.11	1.01
Steptoe	6RF	1.09	1.15	0.88		–	1.02	–	1.01	0.98	1.03
PLSD (5%)											0.16
PLSD (10%)											0.13
1993-95 average yield (lb/a)		4535	4298	4454	4066	–	3436	–	7552	4320	4209

Table 7.—1994-95 winter grain yields over nine locations expressed as a percent of trial average

Variety/ line	Market class	Corvallis	LaGrande	Madras	Medford	Moro	Morrow County	North Valley	Ontario	Pendleton	8-site average
Winter wheats and triticales					Yield as a percent of trial average						
Cashup	SW	1.21	1.06	1.03	0.99	0.91	1.01	0.99		1.06	1.03
Celia	Triticale	1.09	0.99	1.00	0.80	1.18	1.02	0.97	0.99	1.26	1.04
Daws	SW	1.07	1.12	0.97	0.96	1.03	0.96	1.07	1.00	1.00	1.02
Gene	SW	1.22	1.06	0.91	1.09	1.07	1.17	1.03	1.00	1.12	1.08
Hill 81	SW	1.11	1.04	1.05	0.91	0.97	1.01	1.07	0.99	1.04	1.02
Hoff	HR	0.73	1.04	1.14	1.16	1.08	0.98	0.98	0.97	0.83	0.99
Hyak	Club	0.91	0.92	0.83	0.98	1.04	0.92	0.57		1.05	0.90
Kmore	SW	1.03	0.96	0.90	0.91	0.87	0.96	0.51		0.99	0.89
Lambert	SW	0.91		1.01	1.12	0.82	1.06	0.95		0.94	
Lewjain	SW	0.85	0.80	0.93	0.88	1.02	0.85	0.51		0.99	0.85
MacVicar	SW	1.06	0.97	1.04	1.04	0.96	0.96	0.98	1.11	1.05	1.01
Madsen	SW	1.16	1.00	0.93	0.95	1.00	1.17	0.89	0.99	1.07	1.02
Malcolm	SW	1.12	1.09	1.10	1.05	1.02	1.24	1.02	1.10	1.03	1.08
Rely	Club	0.76	0.95	0.91	0.99	1.04	0.89	0.40		0.93	0.86
Rod	SW	0.89	1.06	1.04	0.98	1.17	1.05	0.95		0.91	1.00
Rohde	Club	0.75	1.02	1.01	1.14	1.16	1.01	1.12	0.97	0.92	1.02
Stephens	SW	1.08	0.93	1.05	0.95	1.06	1.18	1.01	1.02	1.15	1.05
W301	SW	1.01	1.02	1.00	0.86	1.06	1.17	0.90	1.11	1.11	1.02
Whitman	Triticale	1.13	1.07	0.97	0.96	1.11	0.96	1.04	0.90	1.10	1.04
Yamhill	SW	0.87	0.91	0.83	0.91	0.86	1.00	0.99		0.76	0.89
PLSD (5%)											0.11
PLSD (10%)											0.09
1994-95 average yield (bu/a)		87	88	107	102	45	54	117	142	80	85
											6-site average
Winter barleys					Yield as a percent of trial average						
AB-812	6RF					–		–	1.19		
Gwen	6RF	0.97	0.85	0.89	0.89	–	0.98	–		0.91	0.91
Hesk	6RF	0.87	1.18	1.05	1.03	–	1.10	–	1.09	1.08	1.05
Hoody	6RF	0.72	0.63	0.71	0.58	–	0.62	–		0.49	0.62
Hundred	6RF	1.01	1.10	1.10	1.24	–	1.07	–	1.08	1.20	1.12
Kamiak	6RF	0.93	0.80	0.80	0.93	–	0.86	–		0.67	0.83
Kold	6RF	1.10	1.10	1.05	1.28	–	1.07	–	0.92	1.23	1.14
Showin	6RF	0.94	1.15	1.29	0.90	–	1.03	–	0.99	1.15	1.08
Steptoe	6RF	1.16	1.17	0.92	0.65	–	0.93	–	0.98	0.99	0.97
PLSD (5%)											0.14
PLSD (10%)											0.12
1994-95 average yield (lb/a)		4556	4418	4036	4107	–	3658	–	7477	4436	4202

Table 8. —1995 grower drill strip winter wheat variety tests across Oregon and southeast Washington.

Variety	Johns Athena	Barnes Salem	Rudden-klau Amity	Klages Joseph	Hales Midway	Glasers Tangent	Miller Dufur	Newtson Pendl	Nichols* Dayton,W	Macnab Moro	Rietmann Ione	Weimer Clem	Ericksen Condon	Brown Wasco	Reser Condon	Peck Heppner	Average over 11 sites
Yield - bu/a																	
Celia			92														
Gene		109	114	92	96	82	73	64	54	58	36	54	40	34	33	31	77
MacVicar	123	119	119	99	91	91	66	65	66	58	61	49	42	41	36	25	92
Mac1	109				89			71									
Madsen		113	111	118	90	95	84	72	62	49	64	48	41	52		29	84
Rod	136	124	115	88	101	92	92	74	92	56	52	52	46	55	31	55	102
Rohde	119	116	113	95	98	84	80	73	74		38	55	46	48	38	30	93
Stephens	133	113	121	94	95	82	65	68	65	52	65	49	45		57	47	95
W301				108	100			71			46	52		26		32	
Yamhill						98											
Mixture		108					96			59					36		
Average	124	115	112	99	95	89	80	70	69	56	52	51	43	43	38	35	90
* Hail storm shattered grain. Estimated loss of 4-7 bushels for all varieties but MacVicar which was reduced in yield by @ 30 bu/a																	
Mixtures: Barnes = all six other varieties; Miller = Crew/Hyak; Macnab = Gene/MacVicar; Reser = Hyak/Rohde;																	
Test weight (lb/bu)																	
Celia			57.0														
Gene			56.8	55.4	57.4	57.5	57.4	55.8	57		58.0			60.5	54.3	57.0	
MacVicar			59.0	55.0	60.9	60.1	58.2	58.4	60.5		60.2			60.5	58.5	58.1	
Mac1					61.6			59.1									
Madsen			60.6	57.8	60.4	58.2	60.4	59.4	59		59.7			61.5		59.2	
Rod		62.8	57.1	55.3	58.0	58.5		57.4	59		57.0			59.1	56.1	57.6	
Rohde		59.9	60.9	58.4	60.6	58.1	60.5	59.9	63		59.7			62.2	58.5	60.6	
Stephens			59.6	57.3	60.4	60.3	58.3	57.6	60					60.7	56.4	58.9	
W301				57.9	60.7			58.5			60.0			61.7		59.9	
Yamhill						59.1											
Mixture							58.0								55.5		
Average		61.4	58.7	56.7	60.0	58.8	58.8	58.3	59.8		50.7			60.9	56.6	58.8	
Protein percent																	
Celia			9.4														
Gene			9.6	11.6	10.6	10.0	9.41	9.9						11.68	9.3	8.1	
MacVicar			9.5	11.0	10.2	8.3	9.00	9.2						11.84	8.5	8.3	
Mac1					11.1			9.7									
Madsen			9.6	11.4	11.3	8.8	9.16	9.6						12.38		8.7	
Rod		9.8	9.2	12.6	9.3	8.5		8.5						11.39	8.3	9.1	
Rohde		9.9	9.8	12.4	10.0	10.1	7.75	8.8						11.36	7.2	8.8	
Stephens			8.8	11.3	10.5	8.5	9.07	9.5						11.78	9.4	9.2	
W301				11.3	10.2			9.3						11.48		8.9	
Yamhill						10.7											
Mixture															8.5		
Average		9.9	9.4	11.6	10.4	9.3	8.9	9.3						11.7	8.5	8.7	

Due to field or harvest problems, some yield data were lost.

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Table 9.—1995 state-wide variety testing program winter grain test weight data across nine locations in Oregon.

Variety/ line	Market class	Corvallis	LaGrande	Madras	Medford	Moro	Morrow	North Valley	Ontario	Pendleton	8 site average*
Winter wheats and triticales						Test weight (lb/bu)					
Cashup	SW	61.0	61.3	57.4	60.9	62.1	58.7	59.6		61.6	60.3
Celia	Triticale	58.6	54.7	51.1	57.4	59.0	54.0	58.3	57.6	59.4	56.6
Daws	SW	60.7	62.4	58.6	61.0	60.8	58.8	62.2	62.8	61.4	60.7
Gene	SW	58.5	57.5	56.1	56.7	58.8	53.7	59.3	61.4	61.3	57.7
Hill 81	SW	59.7	62.3	59.0	61.7	61.3	57.8	61.6	61.5	61.3	60.6
Hoff	HR	62.4	64.0	60.0	63.0	63.3	59.8	63.7	63.9	64.7	62.6
Hyak	Club	57.0	60.3	55.5	58.3	59.5	55.5	60.5		60.8	58.4
Kmor	SW	59.6	61.1	54.6	59.2	59.7	57.3	60.1		60.9	59.1
Lambert	SW	60.4	59.5	56.3	60.8	61.2	55.8	61.1		61.5	59.6
Lewjain	SW	59.2	62.6	55.3	61.3	61.3	58.2	61.4		61.3	60.1
Mac 1	SW	60.4	62.3	58.2	62.6	61.7	58.4	59.9	63.4	61.8	60.6
MacVicar	SW	61.0	60.1	58.3	61.7	61.0	57.4	61.0	62.1	61.9	60.3
Madsen	SW	59.6	61.1	59.5	59.9	60.9	58.9	61.7	61.3	61.6	60.4
Malcolm	SW	61.2	61.3	57.3	61.2	61.4	58.6	62.4	62.2	61.8	60.6
Parma	Triticale	53.9	53.0	50.7	54.0	55.1	50.3	52.1	56.6	56.7	53.2
Rely	Club	58.5	59.2	56.6	60.7	59.5	58.1	56.3		60.1	58.6
Rod	SW	60.0	59.6	57.0	60.0	59.2	58.1	60.0		60.7	59.3
Rohde	Club	61.3	64.4	58.7	62.6	62.1	60.1	63.1	61.3	61.7	61.7
Rulo	Club	57.8	60.1	54.9	60.1	59.8	56.4	59.0		60.4	58.6
Stephens	SW	60.5	60.6	57.9	60.6	60.5	58.1	60.7	60.9	62.1	60.1
W301	SW	61.4	60.2	58.6	60.6	61.1	57.0	58.3	61.4	62.4	60.0
Whitman	Triticale	54.7	54.4	51.8	56.3	54.4	49.8	56.5	56.1	56.9	54.3
Yamhill	SW	58.8	59.7	57.7	58.3	58.9	56.6	58.7		59.5	58.5
Trial average		59.6	60.2	56.6	60.1	60.0	56.7	60.2	60.9	61.0	59.3
PLSD (5%)		0.9	2.4	2.4	1.3	1.3	2.1	2.3	0.9	1.0	1
PLSD (10%)		0.8	2.0	2.0	0.9	0.9	1.8	1.9	0.7	0.8	0.8
CV		1	2	3	1	1	2	2	1	1	2
P-VALUE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Variety/ line	Market class	Corvallis	LaGrande	Madras	Medford	Moro	Morrow	North Valley	Ontario	Pendleton	7 site average*
Winter barleys						Test weight (lb/bu)					
AB-812	6RF								48.9		
Gwen	6RF	50.3	53.5	52.8	51.3	–	54.0	53.3		52.4	52.5
Hesk	6RF	45.7	51.8	50.1	45.7	–	48.8	51.3	48.8	50.0	49.1
Hoody	6R hooded	42.0	48.2	47.8	46.2	–	42.2	49.9		45.7	46.0
Hundred	6RF	45.1	49.3	49.9	47.8	–	43.8	50.0	48.0	50.0	48.0
Kamiak	6RF	49.0	53.2	49.9	50.9	–	54.0	51.9		52.3	51.6
Kold	6RF	46.0	52.0	52.4	50.3	–	50.8	52.2	50.5	51.5	50.7
ORW6	6RF/M	47.4	51.8	50.4	47.5	–	50.6	49.7	49.1	49.9	49.6
ORW7	6RF/M	48.8	48.7	50.6	50.6	–	54.5	52.3	50.5	53.1	51.2
Scio	6RF	47.1	50.9	50.9	48.6	–	49.9	50.8		50.5	49.8
Showin	6RF	45.3	51.6	52.0	43.2	–	48.3	48.8	48.6	47.8	48.2
Steptoe	6RF	49.0	54.6	50.4	49.4	–	50.8	53.0	50.1	50.9	51.2
SDM204	6RF			48.8		–					
SDM208	6RF			50.8		–			50.3		
Trial average		46.9	51.4	50.5	48.8	–	49.8	51.2	49.5	50.4	49.8
PLSD (5%)		1.3	1.6	2.0	1.7	–	2.5	2.1	0.6	0.8	1.7
PLSD (10%)		1.1	1.4	1.7	1.4	–	2.0	2.1	0.5	0.7	1.4
CV		2	2	2	2	–	3	3	1	1	3
P-VALUE		0.00	0.00	0.00	0.00	–	0.00	0.02	0.00	0.00	0.00

*does not include Ontario

Table 10.—1995 state-wide variety testing program winter grain protein percents across nine locations in Oregon.

Variety/ line	Market class	Corvallis	LaGrande	Madras	Medford	Moro	Morrow	North Valley	Ontario	Pendleton	8 site average*
Winter wheats and triticales					Protein percent (12% moisture basis)						
Cashup	SW	7.0	11.2	11.8	8.5	8.2	8.0	8.1		8.6	8.9
Celia	Triticale	6.8	12.0	12.0	9.6	7.7	7.7	8.0	10.2	7.5	8.9
Daws	SW	7.7	11.1	11.7	9.1	7.5	9.4	7.9	9.8	8.1	9.0
Gene	SW	8.1	12.3	11.9	9.9	8.4	10.8	9.6	10.6	9.3	10.0
Hill 81	SW	7.8	12.0	12.2	9.4	8.4	9.0	8.5	9.5	8.4	9.4
Hoff	HR	8.1	11.3	12.0	9.6	8.7	8.7	8.8	10.3	10.0	9.6
Hyak	Club	7.3	12.3	12.3	8.5	8.2	10.0	7.9		8.5	9.4
Kmor	SW	7.6	12.3	12.3	9.0	7.3	9.2	8.5		8.7	9.4
Lambert	SW	7.9	12.2	12.0	9.1	8.2	8.9	8.4		8.6	9.4
Lewjain	SW	7.5	11.5	13.0	9.3	7.7	9.5	8.6		8.8	9.5
Mac 1	SW	7.8	11.5	11.9	9.1	8.6	9.1	9.1	11.1	9.6	9.6
MacVicar	SW	7.4	11.9	11.2	8.5	8.9	9.6	8.8	10.1	8.6	9.4
Madsen	SW	7.6	12.9	11.7	9.1	8.4	9.5	9.1	9.6	9.3	9.7
Malcolm	SW	7.7	11.7	11.5	8.7	8.5	9.6	8.7	9.6	8.0	9.3
Parma	Triticale	8.1	13.0	12.2	9.6	7.6	8.5	9.0	8.7	7.7	9.5
Rely	Club	7.6	11.4	12.2	8.6	7.2	9.1	8.8		8.7	9.2
Rod	SW	7.3	10.9	12.1	8.7	7.6	8.0	8.5		8.1	8.9
Rohde	Club	8.0	10.7	11.7	8.6	7.1	8.2	8.5	9.3	9.0	9.0
Rulo	Club	8.2	11.6	12.6	8.9	7.9	9.4	8.2		9.1	9.5
Stephens	SW	8.2	12.5	11.8	9.2	8.9	9.3	9.3	9.4	8.9	9.8
W301	SW	8.1	12.4	11.5	9.3	8.1	9.0	9.5	9.6	8.8	9.6
Whitman	Triticale	8.6	10.6	11.2	8.8	8.4	9.3	8.8	9.6	8.6	9.3
Yamhill	SW	7.7	12.1	11.7	9.3	8.7	9.6	8.8		9.0	9.6
Trial average		7.8	11.9	11.8	9.1	8.1	9.3	8.7	9.7	8.7	9.4
PLSD (5%)		0.5	1.1	0.7	0.6	0.9	NS	0.7	1.0	0.7	0.5
PLSD (10%)		0.4	0.9	0.6	0.5	0.6	1.4	0.5	0.8	0.5	0.4
CV		4	5	4	1	6	11	4	6	5	5
P-VALUE		0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.01	0.00	0.00
Winter barleys					Protein percent (12% moisture basis)						
AB-812	6RF								9.5		
Gwen	6RF	8.7	11.4	10.1	10	–	8.2	9.8		9.3	9.6
Hesk	6RF	8.7	10.6	9.5	9.9	–	7.8	8.5	9.9	9.2	9.2
Hoody	6R hooded	10.1	13.4	10.9	1.5	–	11.1	11.0		9.8	9.7
Hundred	6RF	8.7	11.7	9.6	10.1	–	9.0	9.0	10.2	8.1	9.5
Kamiak	6RF	8.2	11.9	11.1	10.3	–	6.7	9.2		8.1	9.3
Kold	6RF	8.5	11.2	9.3	9.9	–	7.6	9.0	10.5	8.6	9.2
ORW6	6RF/M	8.5	11.1	10.1	9.4	–	7.5	9.1	9.5	7.9	9.1
ORW7	6RF/M	8.3	10.7	9.0	9.6	–	7.3	8.4	9.8	7.9	8.7
Scio	6RF	8.3	11.6	9.6	9.8	–	7.0	8.5		8.2	9.0
Showin	6RF	8.6	10.4	9.0	11	–	8.3	9.7	10.5	9.5	9.5
Steptoe	6RF	8.3	10.5	9.9	9.2	–	7.5	8.7	9.8	8.0	8.9
SDM204	6RF			8.4		–					
SDM208	6RF			10.3		–			10.1		
Trial average		8.6	11.3	9.7	10	–	8.0	9.2	10	8.6	9.2
PLSD (5%)		0.4	0.7	NS	0.7	–	1.2	1.0	0.6	0.9	NS
PLSD (10%)		0.4	0.6	1.3	0.5	–	1.0	0.6	0.5	0.7	NS
CV		3	4	10	5	–	9	4	3	6	14
P-VALUE		0.00	0.00	0.07	0.00	–	0.00	0.00	0.00	0.00	0.94

*does not include Ontario

Table 11.—Agronomic data for winter oats.

Variety	Year released	State	Winter[1] hardiness	Maturity[2]	Height[3]	Lodging[1]	Test[1] Wgt	Kernel[4] color
Amity	1972	OR	4	L	MT	6	5	W
Compact	1968	KY	4	ML	S	6	6	RG
Crater	1956	OR	5	ML	T	5	5	G
Grey Winter	1900	--	5	L	VT	4	7	G
Kenoat	1981	KY	6	M	M	5	6	RG
Walken	1970	KY	4	L	M	6	7	YR

[1] Scale of 1 to 10; 1 = poor, 10 = excellent.
[2] Maturity; M = midseason, ML = midseason to late; L = late.
[3] Height; M = medium; MT = midtall; S = short; T = tall; VT = very tall.
[4] W = white; R = red; G = grey; Y = yellow.

Table 12.—Yields and agronomic data for winter oats grown in western Oregon.

Variety	1967-71	1981	1986	1986	1986	1995	1995	1995
	lb/a	lb/a	lb/a	lb/bu	Head[1] date	lb/a[2]	lb/bu	Head date
Amity	3619	3423	4745	38.4	155	3019	37.2	160
Compact	--	--	4610	39.8	149	--	--	--
Crater	3568	--	--	--	--	1796	35.7	155
Grey Winter	2768	--	3968	37.9	153	780	32.3	159
Kenoat	--	--	4269	40.3	149	--	--	--
Walken	--	3558	4692	41.1	154	679	34.7	157
Average	3318	3490	4457	--	--	1568	35.0	158
PLSD (5%)	--	--	499	--	--	533	1.4	1
CV	--	--	7	--	--	32	18	10

[1] Julian heading date—June 1 = 151.
[2] There was extensive bird damage on Grey Winter and Walken plots.

Table 13.—Yield, test weight, heading date, plant height, and protein ranges and averages for eight winter oat varieties and lines grown in Pendleton, OR, for 2 crop years (1964-65).

	Yield (lb/A)	Test weight (lb/bu)	Heading date[1]	Height (in)	Protein %
Range	1782-3000	38.2-42.2	148-154	27-38	13.9-19.1
Average	2484	40.1	151	32	16.6

The varieties and lines tested are no longer available, hence the use of ranges and averages. The lines tested were similar to Amity and Crater.

[1]Julian heading date—June 1 = 151.

Questions of Seed Quality

Seed Quality includes such factors as varietal identity, freedom from weed and other crop contaminants, and the ability of the seed to germinate. State and Federal seed laws require that seed offered for sale be tested and truthfully labeled for these and other quality factors. When evaluating grain for seeding or when buying seed from off-farm sources, ask the following questions.

What is the identity of this seed? Varieties are developed to improve yields through disease resistance and improved agronomic characteristics. Seed Certification is one method of ensuring varietal identity. Is the seed certified? Look for the "Blue Tag," bulk shipping certificate, or Transfer Certificate for Seed Pending Final Certification (be aware that the latter means the seed lot is not yet fully certified). These verify varietal identity. If the seed is uncertified, ask for information on how the seed was produced, what type of seed was used as seed stock, and what guarantee of varietal identity you can expect.

What is the pure seed percentage? Pure seed is the percentage of seed in the bag that is of the crop you are buying. A high percentage of pure seed will give best results. For example, if a seed lot has a 99 pure seed percentage, then from a 100-pound bag of seed you can expect 99 pounds of pure seed of the specified crop.

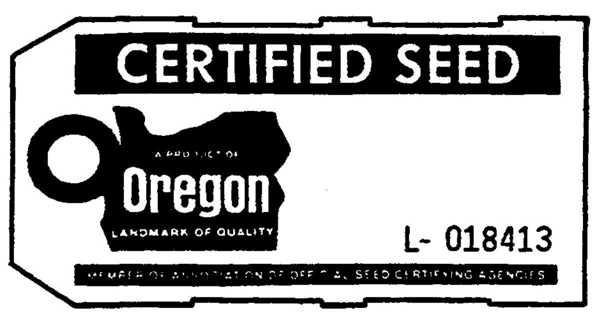
What is the percentage of other crop seeds? Barley, oats, vetch, and other crop seed can be found in seed lots. The percentage of other crop seed tells you how much of the seed you are buying is of these other crops.

What is the inert matter content of this seed? Sand, stones, dirt, sticks, pods, chaff, ergot bodies, and some broken seeds are all inert matter. These materials do not increase yield. A very low percentage of inert matter is preferable.

What is the weed seed percentage, and what types of weeds are present in this seed lot? This percentage indicates the number of seeds of plants recognized as weeds present in the seed lot. A zero percentage is best; however, in many states there are allowances for certain types of weeds. There are also weed seeds that are strictly prohibited from being in seed. Remember that many weed seeds are very small, and a low percentage may still mean a high number of weed seeds are present.

What is the germination percentage of this seed? Percentage of germination is a measure of the number of pure seeds in a lot that produce normal plants under favorable conditions. To be valid, the germination test for a seed lot must have been performed in the past 18 months for seed grown and sold in Oregon. Federal laws require germination tests within five months of sale for seed shipped across state lines. For the seed to be properly labeled, the date of test and germination percentage both must be stated. If you buy seed with a low germination, you are paying for dead seed. There are a number of seed labs in Oregon that do seed testing. Most only accept untreated seed for full seed analyses but will take treated seed for germination testing. Seed-borne fungal diseases can result in low germination in untreated seed. Seed treatment may correct this problem.

These are the major questions to ask yourself or to ask a supplier when buying seed. If you have questions about seed laws, contact your local county Extension Office, your seed dealer, or the Oregon Department of Agriculture Commodity Inspection Division, Salem, Oregon.



Certified seed is your assurance of varietal purity, high germination, uniform quality, and freedom from noxious weeds. Look for the blue tag or the seed-certification shipping certificate, your guarantee of these qualities. Certified seed does not cost—it pays.

Preliminary lists of current producers of certified seed are available in early summer at local offices of the OSU Extension Service. This information can be also be obtained through the Oregon Seed Certification Service Home Page at http:/www.oscs.orst.edu. Your local extension office also has information on seed certification procedures and Foundation Seed stocks.

A Wheat Quality Primer

by Russ Karow, OSU Extension Cereals Specialist

The wheat industry in the Pacific Northwest is at a turning point. For nearly a century, this region has been an exporter of generic wheat – soft white wheat with a little club sometimes mixed in. But today, in every article you read about the wheat industry you see mention of low-protein wheat, high-protein wheat, wheats with specific water absorptions, hard white wheat, etc. Our cash-paying wheat customers have become more sophisticated and are asking for wheat with specific characteristics. To maintain these customers, the Pacific Northwest wheat industry must respond. Decisions must be made on how to direct industry resources to meet customer demands. In this article, I will provide you with background information about wheat quality, information that you can use as you think about the direction our industry should take.

Wheat kernels are made up of three major parts – the germ, the bran, and the endosperm. The germ is an embryonic plant. It makes up about 3 percent of a wheat kernel by weight. The germ will grow into a new wheat plant if the kernel is planted. The bran (15 percent of kernel weight) is the outside covering. It is made up of tissues high in fiber that protect the kernel, and tissues high in protein that digest starch. The endosperm (82 percent of kernel weight) is on the inside of the kernel. It is comprised of starch and protein. The endosperm is the food source for the embryonic plant and becomes the material we commonly call flour.

When wheat is milled, the goal is to separate the endosperm (flour) from the other kernel parts. Millers talk about extraction rates. An extraction rate is the amount of flour derived from 100 pounds of grain. It can be thought of as a percent. The theoretical maximum pure flour yield is roughly 82 percent – the amount of endosperm in a kernel. However, normal rates are generally lower than this (70-75 percent) because complete separation of bran and endosperm is not possible. Incomplete separation is evidenced as colored specks (pieces of bran) in an otherwise white flour.

Wheat kernel color is only "skin-deep." The red or white coloration that a kernel has comes from a cell layer that is found in the bran. Red wheat bran flecks are much more obvious in a white flour than those from white wheat bran. In developing countries, millers often choose to use an extraction rate of 85-90 percent in order to maximize flour yield. Bran will always be present in such flours. Millers in developing countries prefer white wheats because high-extraction flours show less color.

Endosperm is composed of three major components - starch, protein, and other materials such as oils and fiber. Starch makes up roughly 70 percent of the endosperm, protein 8 percent or more, and oils and fiber the remaining portion.

Starch is glucose sugar molecules strung together. Starch is enclosed in granules in the endosperm. These granules are embedded in a protein matrix. The protein matrix found in hard wheats tends to be tough and to hold starch granules tightly. These tightly held granules tend to be sheared or broken in the milling process and release their starch contents. Free starch can absorb large amounts of water. Hard wheats generally have a high water-absorbing capacity. Hard wheat flours tend to be chunky and easily sieved.

Soft wheats, on the other hand, tend to have a weak, crumbly protein matrix. This matrix holds starch granules loosely and tends to release whole granules when milled. This results in a flour composed primarily of whole starch granules. Encapsulated starch absorbs less water than free starch. Soft wheats tend to have lower water-absorbing capacity than hard wheats.

What difference does water-holding capacity make? In a simplistic sense, if you are a bread-maker selling loaves by the pound, you want those loaves to contain as little flour (an expensive ingredient) and as much water as possible. You want your bread to be moist and chewy. You must use a flour with high water-holding capacity to obtain such loaves. If you are a fancy-cookie-maker, you want light, crunchy cookies. You must use a flour with a low water-holding capacity.

The desired water-holding capacity of a flour is going to vary with each different product. Microwave waffles, soft cookies, crisp cookies, soup noodles, sponge cakes, Chinese noodles, etc., all will require flours with slightly different absorption capacities. Wheat breeders will need to consider these different water-holding capacity needs as they breed new wheats for the marketplace.

Protein is the other major part of the endosperm. Protein makes up roughly 8 to 15 percent of a wheat kernel, depending on variety and environment. Four different types of protein are found in a wheat kernel – albumins, globulins, gliadins, and glutenins. Albumins and globulins are water- and salt-water soluble proteins, respectively.

They are biologically active proteins and are responsible for starch breakdown and other enzymatic activity. Gliadins and glutenins are storage proteins and are collectively referred to as gluten. These are the proteins we commonly associate with wheat flours.

Gluten proteins are readily soluble only in alcohol or acidic or basic solutions. When mixed with plain water, as in bread-making, they do not dissolve and form a tough, spongy dough. This dough can trap air bubbles produced by yeast or other leavening agents.

Gluten proteins can vary in quality. Wheat breeders have discovered that certain types have superior bread-making capability. These superior proteins can be identified through a laboratory procedure called electrophoresis. Through this procedure it is possible to screen breeding materials and to select for or against these higher-quality glutens. You may have heard or seen reference to the "5-10 gluten proteins." These are proteins that appear to convey superior quality.

While gluten proteins can vary in quality, greater variation is often seen in quantity. We know, for example, that MacVicar soft white wheat consistently produces about 1 percent less protein than Stephens wheat when grown under the same conditions. We also know that individual varieties can vary considerably in protein content, depending on the growing conditions.

Consider figure 1. This figure shows the soft white wheat protein distribution for Oregon in 1995. We know that Stephens occupied more than 55 percent of the white wheat acreage in the state that year, so much of the variation in protein content observed is due to environmental, not genetic, causes. Protein percent varied from 6.4 to 16.9 percent. Wide variation in protein is not uncommon.

Figure 2 shows protein distributions for Oregon over the past five years. Data for this graph comes from information gathered by the Oregon Wheat Commission and analyzed by Russ Karow as part of a tri-state survey. The Commission paid grain inspection services in the region to randomly sample all Oregon grain coming through their facilities. The values for each year are a composite of more than 1,450 samples. As you can see, more than 50 percent of the wheat produced over the last 5 years has had a protein content less than 10.5 percent. More than 30 percent has a content less than 9.5 percent. But there is variation over years. This is the environment at work.

Lower-protein soft white wheats tend to be best for cake and cookie flours, while high-protein soft whites can be used in noodles, breads, and other foods. There is a market for wheats of all protein levels. Our challenge is to identify the size, location, and stability of these markets.

I hope this article has given you a better understanding of some of the factors that affect wheat quality. As you can see, wheat quality is a function of both genetics and environment. As we identify the specific quality needs of our foreign customers, we will need to carefully survey our genetic and environmental resources and determine where it is best to grow grain to fit specific needs. This will not be an easy task. Our long, strong generic commodity history will tend to hold us back. But if we are to maintain and expand our markets, we must understand and deliver specified-quality wheat.

Figure 1. Protein distribution for the 1995 Oregon white wheat crop

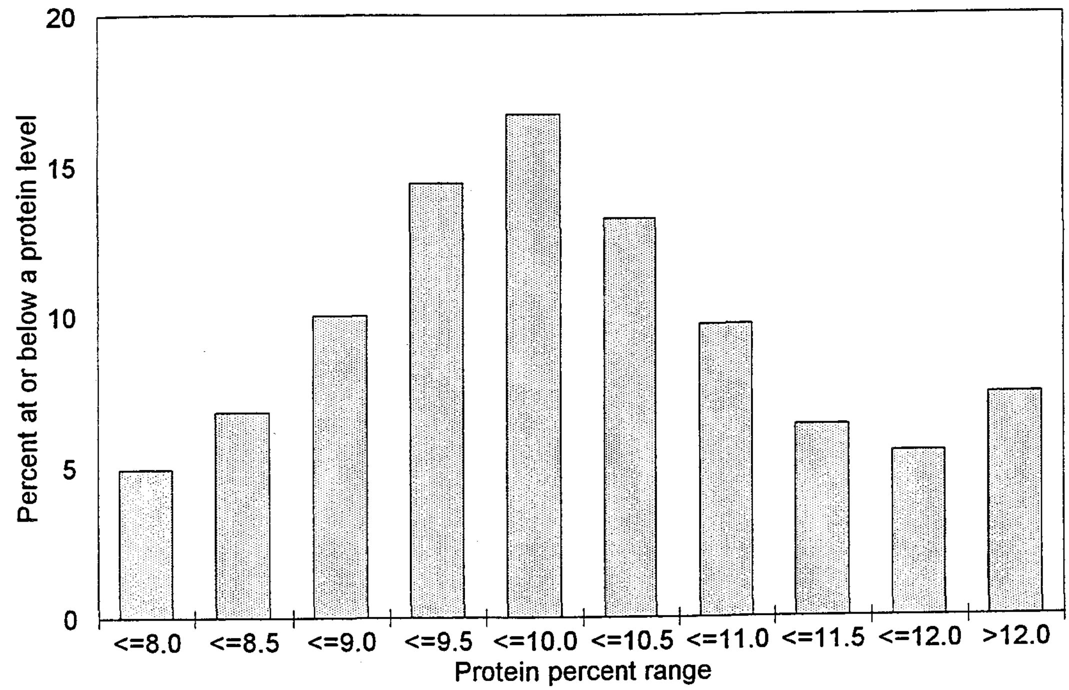


Figure 2.Protein distributions for the 1991-95 Oregon white wheat crops