Agronomic Evaluation of New Oregon Winter Wheat Varieties – Planting Date and Seeding Rate Studies

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Introduction

Soft white winter wheat is the primary grain crop for Oregon with nearly 850,000 acres planted annually and a gross production value greater than 150 million dollars. The most widely grown soft white winter wheat variety in Oregon is 'Stephens' which was introduced in 1977. However, growers are rapidly adopting newer varieties such as 'Tubbs', 'ORCF-101', and 'ORCF-102'. In 2006 these varieties accounted for over 20% of the total soft white winter wheat acreage (approximately 170,000 acres). Clearly, production information on these newer soft white winter wheat varieties is needed by growers.

Currently, all newer and soon to be released soft white winter wheat varieties are evaluated in the Oregon Winter Elite Yield Trials. These trials are placed throughout the state and focus on evaluating varieties for yield and adaptability. However, these trials do not provide growers with important management and production information that is required to optimize variety performance and economic return.

Planting date has a large influence on winter wheat yields in Oregon dryland cropping systems. This is due in part to the regions winter rainfall pattern where 75% of the annual precipitation occurs from October to May. Late September to early October plantings of winter wheat are considered "on-time" in this region. However, growers may plant as early as August if soil moisture is available. Likewise, delayed plantings and/or emergence are not uncommon if soil moisture is unavailable and growers must wait for rain. Therefore, information on variety performance across a range of planting dates is required.

Currently planting date and other production information is only available for older varieties such as 'Stephens'. However, it is unknown whether the newer Oregon wheat varieties have similar agronomic characteristics as these older varieties. Thus, production and management information based on the older varieties may not be relevant for these newer varieties.

Therefore, a study was initiated in 2005 to evaluate the agronomic characteristics of the newer Oregon soft white winter wheat varieties.

Objectives

1) To evaluate the agronomic characteristics such as tillering capacity, stem number, and the yield components of the newer Oregon soft white winter wheat varieties.

2) To develop research based recommended management practices for the newer Oregon soft white winter wheat varieties.

Materials and Methods

Trial sites were positioned to capture a range of environmental and production conditions within Oregon's largest wheat producing region. Sites were located on the Columbia Basin Agricultural Center at Moro and Pendleton Oregon. The Moro site was located in the 10 to 12 inch rainfall zone and is best described as rolling hills with slopes of 3 to 30%. The soil is predominately Walla Walla silt loam (Typic Haploxerolls). The Pendleton trial was located in the 16 inch or greater rainfall zone as is best described as gentle rolling hills with slopes ranging from 0 to 5%. Similar to the Moro site, the soil at the Pendleton location is predominately Walla Walla silt loam (Typic Haploxerolls).

At each site a randomized complete block design with three replications was used. Treatments consisted of multiple soft white winter wheat varieties, three seeding rates, and four planting dates. Five by 20 foot research plots were established using a small plot drill. Measurements of Growth Stage (GS) 25 tiller density were taken in early March. Prior to harvest plots were sampled for measurements of head density, head size, and spikelet fertility. Plots were harvested using a Hege small plot combine and measurements of yield and test weight obtained. Data was analyzed using SAS software and means were separated using least square means.

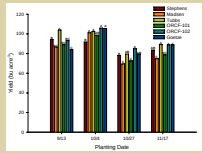
Experimental Treatments

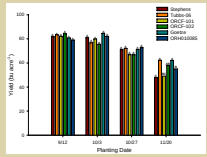
Variety Treatments	Seeding Rate Treatments	Planting Date Treatments	
	(seeds ft^{-2})	Moro	Pendleton
Stephens	11	9/14	9/13
Madsen	22	10/5	10/4
Tubbs	33	10/28	10/27
Tubbs-06		11/16	11/17
ORCF-101			
ORCF-102			
Goetze			
ORH010085			

Results

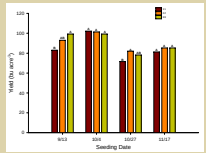
High Rainfall - Pendleton

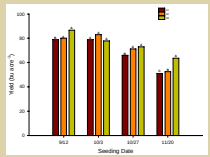
Varietal Differences





Seeding Rate Differences

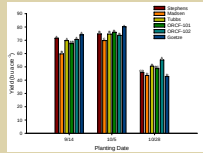


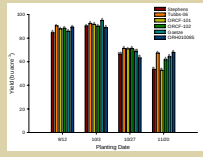


Means followed by the same letter are not significantly different at the 0.05 level.

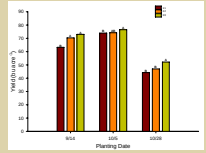
Low Rainfall - Moro

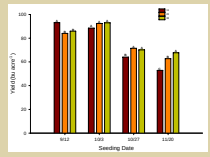
Varietal Differences





Seeding Rate Differences





Means followed by the same letter are not significantly different at the 0.05 level.

Yield Component Analysis - Pendleton

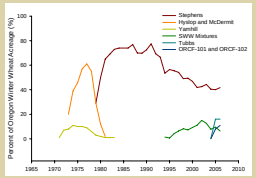
Variety	Test Weight (lbs bu^{-1})		GS 25 Tiller Density (Tillers ft^{-2})		Harvest Head Density (Heads ft^{-2})		Head Size (Florets head^{-1})		Floret Fertility (Seeds floret^{-1})		1000 Kernel Weight (g)	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Stephens	57.6 bc	55.5 c	94.0 a	35.7 c	65.3 a	46.4 ab	15.8 b	17.0 c	2.2 ab	2.7 a	39.0 a	33.7 a
Madsen	58.7 ab		78.7 b		58.4 ab		17.9 a		2.1 b		33.7 b	
Tubbs	57.6 bc		93.0 a		56.2 b		15.1 b		2.8 a		35.7 ab	
Tubbs-06		56.3 bc		47.0 a		45.0 ab		18.3 b		2.5 a		35.8 a
ORCF-101	55.9 c	56.6 b	91.2 a	42.8 ab	54.2 b	42.6 b	17.5 ab	19.8 a	2.4 ab	2.6 a	32.5 b	36.6 a
ORCF-102	59.9 a	58.2 a	97.4 a	42.2 ab	53.0 b	42.9 b	15.4 b	17.1 c	2.7 ab	2.6 a	36.2 ab	37.0 a
Goetze	57.1 bc	58.0 a	93.8 a	38.1 bc	59.3 ab	49.9 a	16.1 ab	19.5 a	2.4 ab	2.8 a	32.6 b	34.5 a
ORH010085		57.0 b		36.8 bc		46.2 ab		16.8 c		2.6 a		34.5 a

Yield Component Analysis - Moro

Variety	Test Weight (lbs bu^{-1})		GS 25 Tiller Density (Tillers ft^{-2})		Harvest Head Density (Heads ft^{-2})		Head Size (Florets head^{-1})		Floret Fertility (Seeds floret^{-1})		1000 Kernel Weight (g)	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Stephens	60.9 ab	60.9 ab	68.0 ab	25.1 ab	65.6 a	56.5 a	12.0 c	15.6 c	1.7 c	3.4 a	44.6 a	36.3 b
Madsen	60.3 cd		62.0 b		47.9 c		14.7 a		2.0 a		38.9 b	
Tubbs	60.0 d		75.1 a		47.8 c		13.6 b		1.8 bc		39.4 b	
Tubbs-06		60.6 b		27.2 ab		50.8 ab		16.5 b		3.0 b		40.3 a
ORCF-101	60.5 bc	60.7 ab	65.9 ab	29.0 a	54.6 bc	47.2 b	14.2 ab	17.3 a	1.9 ab	3.0 b	39.7 b	38.3 ab
ORCF-102	60.8 bc	61.0 ab	73.2 ab	29.8 a	50.7 c	55.1 ab	13.7 b	15.6 c	1.9 ab	3.0 b	41.2 ab	39.0 ab
Goetze	61.4 a	61.0 ab	69.6 ab	22.0 b	63.2 ab	53.5 ab	14.8 a	17.8 a	1.8 bc	3.3 ab	40.5 b	38.1 ab
ORH010085		61.1 a		25.1 ab		49.1 ab		14.6 d		3.2 ab		41.4 a

Means shown are for the 10/3 – 10/5 planting date. Means followed by the same letter are not significantly different at the 0.05 level.

Variety Acreage in Oregon



2006 Site Images

Images taken 4/18 (Moro) and 4/19 (Pendleton)

Implications for Management

1) Planting date had the largest effect on grain yield. Delayed planting reduced grain yield by 6 – 47% compared to "on-time" plantings.

2) There were no significant variety by seeding rate interactions.

3) There was little difference among varieties for the first two planting dates (except Madsen), indicating that variety choice is less important for these planting dates.

4) ORCF-102, Tubbs/Tubbs-06, Goetze, and ORH010085 performed well in later plantings.

5) Stephens, Madsen, and ORCF-101 are not recommended for later plantings.

6) Increasing seeding rates for later plantings is recommended and resulted in a significant yield increase of 5 – 11 bu acre^{-1} in 3 of 4 site-years.

Oregon Winter Wheat Variety Characteristics

Stephens – High head counts, smaller heads, average to high spikelet fertility, and high 1000 kernel weight.

Madsen – Average head counts, large heads, high spikelet fertility, and average to low 1000 kernel weight.

Tubbs/Tubbs-06 – High to average head counts, average head size, average spikelet fertility, and average 1000 kernel weight.

ORCF-101 – Average to low head counts, large heads, high spikelet fertility, and low to average 1000 kernel weights.

ORCF-102 – High to average head counts, smaller heads, average spikelet fertility, and high 1000 kernel weight.

Goetze – High head counts, large heads, high to average spikelet fertility, and low 1000 kernel weight.

ORH010085 – Low head counts, smaller heads, high spikelet fertility, and high 1000 kernel weight.