

**Proposal for Final Release of SWW  
'Xerpha'**

*Propose To Release  
MR 2-17-08*

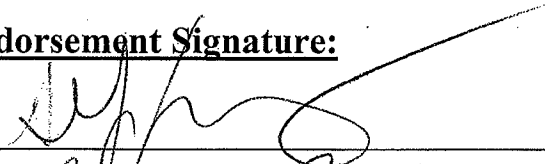
**Date:** February 21, 2008

**Plant Breeder:** S.S. Jones, S.R. Lyon

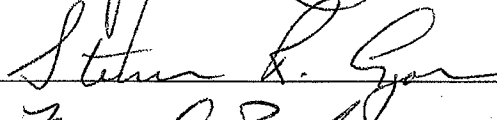
**Percentage of Contribution  
of Breeding Team Members:**

**Endorsement Signature:**

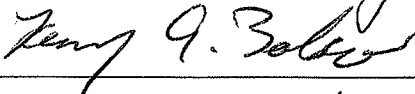
43.5% SS Jones



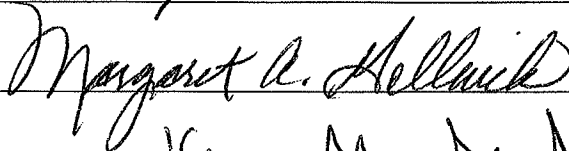
40% SR Lyon



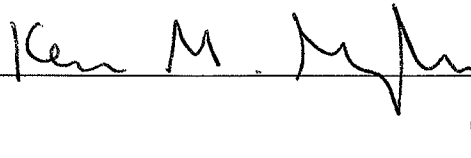
2.5% KA Balow



2.5% MA Gollnick



2.5% KM Murphy

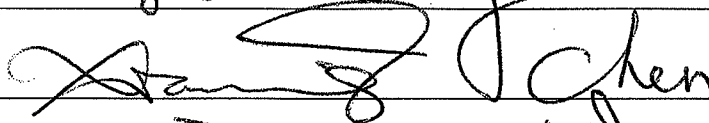


2% JW Burns

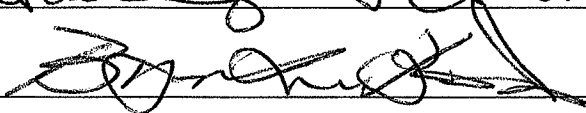
2% TD Murray



2% XM Chen



1% BK Baik



1% K Garland Campbell



1% B Goates

# Proposal for Final Release of SWW 'Xerpha'

## A. General situation

1. **Need for cultivar:** Madsen and Eltan have been the predominant soft white common winter cultivars in Washington for over a decade. Xerpha is adapted to a broad range of production areas and consistently ranks among the top cultivars in all agronomic categories. When compared to Madsen, Eltan, and Tubbs, extensive data indicate that Xerpha is equal or superior in grain yield (Table 1-7), cold tolerance (Table 9), end-use quality (see WWQL summary), and resistance to various diseases (Tables 14-17). Xerpha will have a strong positive impact on the production of soft white winter wheat grown in Washington.
2. **Use type:** Soft white common winter wheat. FGIS grain grading results for samples collected from the 2005 and 2006 WSU Variety Testing trials grade Xerpha as soft white (Table 8).
3. **Description:** Semi dwarf, soft white wheat with mid-season maturity, common head type, awns, white straw and white glumes.
4. **Intention:** General varietal improvement. Xerpha is targeted to replace Eltan and Madsen in all rainfall zones as it consistently produces higher grain yields.

## B. Identification

1. **Selection No's:** SSD01061, WA007973
2. **Proposed Name:** Xerpha
3. **Pedigree:** Eltan/Estica

## C. General Agronomics

1. **Agronomic evaluations:** Xerpha has been evaluated in field trials since 2001. Grain yields of Xerpha, were generally greater than Madsen and Eltan, and equal to or greater than Tubbs, across all precipitation zones. Specifically, the mean yield from 55 WSU Variety Testing yield trials in 2005 through 2007 of Xerpha, Madsen, Eltan and Tubbs were 110.9, 102.2 and 97.8 and 110.9 bushels/acre, respectively (Table 5). Xerpha also performed well in 2007 Oregon, Idaho and California variety testing trials (Tables 6a-6c).
2. **Other agronomic traits:**

- a. **Test Weight:** Grain volume weight in general indicate that Xerpha is equal to Madsen and Eltan, and 0.7 lbs/bu heavier than Tubbs (Tables 1-5).
  - b. **Grain Protein Content:** Grain protein concentrations of Xerpha tend to be equal to Eltan and Tubbs, and 0.6 % less than Madsen (Tables 1-5).
  - c. **Plant Height:** Xerpha, Madsen, Eltan and Tubbs are similar in plant height (1-2" difference) within each precipitation zone (Table 11).
  - d. **Seedling Emergence/Coleoptile:** Xerpha generally has a coleoptile length and emergence capabilities similar to Eltan (Table 10).
  - e. **Cold Tolerance:** Cold tolerance tests conducted by Dr. K. Garland Campbell indicate Xerpha is slightly more cold tolerant than Tubbs and Madsen, and similar to Eltan (Table 9).
  - f. **Maturity:** Xerpha matures approximately 2 days earlier than Eltan, similar to Madsen, and 2 days later than Tubbs (Table 12).
  - g. **Lodging:** Xerpha resists lodging slightly less than Tubbs, but significantly better than Eltan (Table 13).
3. **Quality:** See assessment of the quality of Xerpha by Dr. B. Baik and the USDA-ARS Western Wheat Quality Lab.
4. **Resistance to disease:**
- a. **Stripe Rust:** As reported by Dr X. Chen, Xerpha has durable high-temperature, adult-plant resistance to stripe rust (caused by *Puccinia striiformis* Westend.). (Table 14).
  - b. **Leaf Rust:** Not tested (caused by *Puccinia triticina* Eriks: syn *Puccinia recondita* Roberge ex Desmaz. f. sp. tritici Eriks. and E. Henn.).
  - c. **Stem Rust:** Not tested (caused by *Puccinia graminis* Pers.:Pers.).
  - d. **Cephalosporium Stripe:** Dr T. Murray reported that in inoculated field trials (Table 15) Xerpha is tolerant of Cephalosporium stripe (caused by *Cephalosporium gramineum* Nis. & Ika), comparable to Eltan and Bruehl, the most tolerant commercial varieties in Washington. Under sever Cephalosporium stripe pressure, yield of Xerpha was similar to Eltan and Bruehl, but greater than Madsen (Table 15).

e. **Foot Rot:** Inoculated field evaluations show Xerpha had an elevated disease index level, but little yield effect from eyespot foot rot (caused by *Tapesia yallundae* Wallwork and Spooner). See inoculated field results by Dr. T. Murray (Table 16).

f. **Speckled Snow Mold:** Xerpha was tested under severe natural field infections of speckled snow mold (caused by *Typhula idahoensis* Rems and *T. ishikariensis* Imai.) in 2005/06 and moderate levels in 2006/07 (Table 17). Dr T. Murray's results indicate its tolerance is significantly better than Madsen and Tubbs, but less than Eltan.

g. **Dwarf Bunt:** Xerpha tested similar to Madsen for dwarf bunt (caused by *Tilletia controversa* Kühn) in Dr. B. Goates inoculated field trials.

5. **Area of Adaptation:** Xerpha appears to have a broad range of adaptation. It has emerged and yielded well for semi dwarf soft white common varieties under deep-furrow seeding with very dry conditions. It also has performed very well in the intermediate and high precipitation zones. Xerpha may be best suited to replace Eltan in areas south of Highway 2 where snow mold is generally not a problem.

6. **Weaknesses:** Xerpha has not had a strong field winter hardiness test.

**D. Seed Source, Status, and Availability:** Washington State Crop Improvement Association planted one acre of head rows of Xerpha on Oct. 19, 2006 near Othello, WA. Breeder's seed of Xerpha will be increased in the 2006/07 crop year. Foundation seed should be available for fall, 2008.

**E. Other Comments:** This release request is based on Xerpha's general varietal improvement, broad adaptability, and overall yield stability exceeding the other predominant soft white common winter wheats grown in Washington State.

**F. Probable Date for Possible Release:** 2008.

**G. Provisions for PVP:** The PVP application will be submitted when approved for full release.

**Table 1. Mean grain yield (bu/a), test weight (lbs/bu) and grain protein content (%) of Xerpha, Eltan, Madsen and Tubbs in the 2005-2007 WSU Extension Uniform Cereal Variety Testing winter wheat variety performance trials with 7-14" annual precipitation.**

	Year	Yield (bu/a)					Test Weight (lbs/bu)					Protein (%)				
		Xerpha	Madsen	Eltan	Tubbs	LSD @.10	Xerpha	Madsen	Eltan	Tubbs	LSD @.10	Xerpha	Madsen	Eltan	Tubbs	LSD @.10
<b>Lind</b>	2005	<b>53.4</b>	51.3	47.2	54.7	5.8	<b>58.8</b>	58.6	58.1	57.5	0.4	<b>12.6</b>	13.4	12.8	13.1	0.6
	2007	<b>57.6</b>	43.2	50.0	46.6	5.5	<b>61.0</b>	60.3	61.7	60.3	0.5	<b>11.6</b>	12.7	12.0	11.6	0.5
<b>Anatone</b>	2005	<b>108.6</b>	102.9	91.1	115.1	17.1	<b>59.3</b>	59.8	59.9	60.3	0.7	<b>7.3</b>	7.5	7.9	7.7	0.8
	2006	<b>96.0</b>	90.5	91.1	86.6	16.7	<b>58.9</b>	58.2	58.5	57.2	0.7	<b>10.3</b>	10.8	10.6	10.2	1.0
	2007	<b>79.3</b>	64.4	71.9	69.6	9.0	<b>57.3</b>	57.7	59.5	57.1	1.2	<b>12.7</b>	13.1	12.2	11.5	1.1
	Mean	<b>94.6</b>	85.9	84.7	90.4		<b>58.5</b>	58.6	59.3	58.2		<b>10.1</b>	10.5	10.2	9.8	
<b>Bickleton</b>	2006	<b>63.5</b>	49.4	63.8	61.7	9.9	<b>57.1</b>	56.6	57.9	55.3	1.9	<b>11.9</b>	12.7	12.1	12.5	1.1
	2007	<b>41.1</b>	49.8	40.8	50.3	7.6	<b>56.5</b>	57.0	56.7	55.8	1.4	<b>11.9</b>	10.7	11.6	10.7	0.7
	Mean	<b>52.3</b>	49.6	52.3	56.0		<b>56.8</b>	56.8	57.3	55.6		<b>11.9</b>	11.7	11.9	11.6	
<b>Connell</b>	2006	<b>81.7</b>	72.2	69.0	79.6	7.6	<b>60.6</b>	61.0	60.8	61.0	0.4	<b>10.7</b>	11.5	12.2	11.4	0.6
<b>Zone Mean</b>		<b>72.7</b>	65.5	65.6	70.5		<b>58.7</b>	58.7	59.1	58.1		<b>11.1</b>	11.6	11.4	11.1	

**Table 2. Mean grain yield (bu/a), test weight (lbs/bu) and grain protein content (%) of Xerpha, Eltan, Madsen and Tubbs in the 2005-2007 WSU Extension Uniform Cereal Variety Testing winter wheat variety performance trials with 11-15" annual precipitation.**

	Year	Yield (bu/a)					Test Weight (lbs/bu)					Protein (%)				
		Xerpha	Madsen	Eltan	Tubbs	LSD @.10	Xerpha	Madsen	Eltan	Tubbs	LSD @.10	Xerpha	Madsen	Eltan	Tubbs	LSD @.10
Ritzville	2005	73.6	59.8	58.9	72.9	8.5	60.2	60.2	59.9	59.3	0.3	9.8	11.4	10.7	9.5	0.8
	2006	72.8	66.5	66.7	67.6	9.7	60.0	60.6	60.8	60.3	0.8	12.0	13.1	12.6	11.9	0.8
	2007	51.1	40.2	50.0	44.1	7.6	61.2	60.3	61.2	59.9	0.5	11.2	13.4	12.1	11.4	1.0
	Mean	65.8	55.5	58.5	61.5	4.7	60.5	60.4	60.6	59.8		11.0	12.6	11.8	10.9	
Lamont	2005	61.2	94.1	49.2	96.7	10.6	55.5	58.3	55.7	57.7	0.9	9.2	9.3	8.6	7.8	0.8
	2006	126.9	121.8	124.3	124.0	16.7	58.4	59.1	59.7	59.5	0.9	8.1	8.0	8.0	7.9	1.0
	2007	102.8	89.4	96.6	99.1	9.7	59.4	59.1	59.5	58.5	0.4	9.2	10.7	9.3	9.5	1.0
	Mean	97.0	101.8	90.0	106.6	6.4	57.8	58.8	58.3	58.6		8.8	9.3	8.6	8.4	
Harrington	2006	78.9	65.6	62.9	78.5	9.6	60.1	59.8	60.5	59.7	0.5	11.2	11.6	11.8	10.9	0.9
	2007	60.0	64.2	61.3	66.0	5.2	59.2	59.9	59.7	59.5	0.3	10.1	10.3	9.8	9.5	0.6
	Mean	69.4	64.9	62.1	72.2	4.1	59.7	59.9	60.1	59.6		10.7	11.0	10.8	10.2	
Dusty	2005	101.4	89.1	95.4	104.2	6.3	60.5	60.0	59.2	59.2	0.4	8.8	8.9	8.6	8.3	0.6
	2006	91.8	73.3	78.8	83.3	6.7	58.9	59.7	59.8	59.2	1.1	10.5	11.3	11.4	10.5	0.9
	2007	77.3	71.0	64.3	79.8	8.8	56.8	56.8	56.5	56.7	1.3	12.0	12.6	12.6	11.2	1.0
	Mean	90.2	77.8	79.5	89.1	4.1	58.7	58.8	58.5	58.4		10.4	10.9	10.9	10.0	
St. Andrews	2005	91.2	79.8	87.9	95.0	19.6	60.3	61.0	60.0	60.4	1.0	8.3	9.3	8.4	9.3	0.9
	2007	45.6	36.5	50.5	41.4	7.9	57.8	58.7	59.5	57.8	0.7	10.3	11.5	10.9	9.8	1.1
Creston	2005	114.7	108.0	94.7	119.7	11.4	60.0	60.4	59.4	59.5	0.7	8.2	8.4	7.1	7.5	0.6
	2006	119.1	100.4	116.3	113.6	17.0	58.5	58.7	59.3	58.7	0.8	10.2	10.9	10.2	9.5	1.4
	2007	150.2	126.3	127.9	146.7	9.3	59.5	60.2	59.9	59.2	0.5	9.3	9.9	8.5	9.1	0.8
	Mean	128.0	111.6	112.9	126.7	6.1	59.3	59.8	59.5	59.1		9.2	9.7	8.6	8.7	
Almira	2005	121.7	94.3	96.3	117.8	15.1	61.0	61.0	60.2	60.4	0.8	10.4	11.5	10.4	10.2	0.9
	2006	156.6	132.6	151.2	153.2	13.7	60.1	60.5	60.2	60.3	0.7	10.0	10.4	9.4	10.0	1.2
	2007	136.0	119.9	98.3	116.8	11.8	55.4	56.7	54.1	53.7	1.7	13.3	14.5	15.1	14.3	0.8
	Mean	138.1	115.6	115.2	129.2	6.5	58.8	59.4	58.2	58.1		11.2	12.1	11.6	11.5	
Zone Mean		98.0	87.2	87.2	97.4		59.1	59.5	59.2	58.9		10.1	10.8	10.2	9.8	

**Table 3. Mean grain yield (bu/a), test weight (lbs/bu) and grain protein content (%) of Xerpha, Eltan, Madsen and Tubbs in the 2005-2007 WSU Extension Uniform Cereal Variety Testing winter wheat variety performance trials with 16-18" annual precipitation.**

	Year	Yield (bu/a)					Test Weight (lbs/bu)					Protein (%)				
		Xerpha	Madsen	Eltan	Tubbs	LSD @.10	Xerpha	Madsen	Eltan	Tubbs	LSD @.10	Xerpha	Madsen	Eltan	Tubbs	LSD @.10
<b>Walla Walla</b>	2005	<b>96.7</b>	107.4	91.7	121.5	13.8	<b>57.3</b>	59.4	57.5	58.3	1.3	<b>8.7</b>	8.6	8.2	8.5	0.5
<b>Dayton</b>	2005	<b>115.6</b>	127.4	111.0	124.8	15.2	<b>54.4</b>	57.2	54.9	54.3	0.8	<b>13.9</b>	14.7	13.2	13.7	0.4
	2006	<b>130.5</b>	129.8	114.9	140.1	15.1	<b>59.8</b>	60.0	59.5	59.5	0.6	<b>10.7</b>	10.7	10.9	10.0	1.0
	2007	<b>121.5</b>	111.9	117.9	123.5	10.7	<b>61.3</b>	61.2	61.4	60.5	0.4	<b>11.4</b>	12.0	11.2	11.0	0.5
	Mean	<b>122.6</b>	123.1	114.6	129.5	5.9	<b>58.5</b>	59.5	58.6	58.1		<b>12.0</b>	12.5	11.8	11.6	
<b>St. John</b>	2005	<b>79.6</b>	112.1	70.5	104.9	27.9	<b>60.5</b>	60.4	59.7	59.5	0.8	<b>10.4</b>	11.3	10.0	9.9	0.6
	2006	<b>151.2</b>	143.4	117.2	162.2	9.7	<b>60.1</b>	60.9	60.3	60.6	0.5	<b>10.3</b>	10.7	10.5	10.1	0.7
	2007	<b>176.9</b>	134.6	161.9	169.6	15.0	<b>60.2</b>	60.1	60.5	60.0	1.2	<b>12.4</b>	12.9	12.4	11.9	0.6
	Mean	<b>135.9</b>	127.8	93.8	145.6	8.9	<b>60.3</b>	60.5	60.2	60.0		<b>11.0</b>	11.6	11.0	10.6	
<b>Reardan</b>	2005	<b>120.7</b>	104.6	114.6	94.7	14.0	<b>60.5</b>	60.1	60.1	58.3	0.6	<b>9.0</b>	9.6	8.7	8.9	0.3
	2006	<b>119.7</b>	100.4	117.3	103.3	11.4	<b>59.7</b>	59.2	60.0	57.8	0.9	<b>11.0</b>	11.7	11.6	11.3	1.4
	2007	<b>83.5</b>	79.9	74.5	76.0	9.7	<b>58.5</b>	59.2	59.9	56.8	1.1	<b>13.2</b>	13.7	13.3	13.5	0.4
	Mean	<b>108.0</b>	95.0	102.1	91.4	6.1	<b>59.6</b>	59.5	60.0	57.6		<b>11.1</b>	11.7	11.2	11.2	
<b>Mayview</b>	2005	<b>117.5</b>	113.2	94.6	121.8	9.0	<b>61.0</b>	60.6	60.6	59.3	0.6	<b>10.6</b>	11.4	10.2	10.5	0.5
	2006	<b>97.6</b>	88.4	73.2	94.6	5.0	<b>58.7</b>	58.9	58.5	56.7	1.1	<b>11.6</b>	12.0	11.8	12.0	1.2
	2007	<b>131.9</b>	114.1	119.5	133.8	10.2	<b>61.0</b>	61.0	60.2	59.9	0.5	<b>10.7</b>	10.2	9.9	10.2	0.7
	Mean	<b>107.6</b>	100.8	95.8	116.7	4.9	<b>60.2</b>	60.2	59.8	58.6	0.5	<b>11.0</b>	11.2	10.6	10.9	0.4
<b>Zone Mean</b>		<b>118.7</b>	112.9	106.1	120.8		<b>59.5</b>	59.9	59.5	58.6		<b>11.1</b>	11.5	10.9	10.9	

**Table 4. Mean grain yield (bu/a), test weight (lbs/bu) and grain protein content (%) of Xerpha, Eltan, Madsen and Tubbs in the 2005-2007 WSU Extension Uniform Cereal Variety Testing winter wheat variety performance trials with 20-24" annual precipitation.**

	Year	Yield (bu/a)					Test Weight (lbs/bu)					Protein (%)				
		Xerpha	Madsen	Eltan	Tubbs	LSD @.10	Xerpha	Madsen	Eltan	Tubbs	LSD @.10	Xerpha	Madsen	Eltan	Tubbs	LSD @.10
<b>Pullman</b>	2005	<b>155.2</b>	160.7	129.3	142.8	25.7	<b>58.6</b>	59.8	58.7	56.7	1.7	<b>11.4</b>	12.1	10.9	11.5	0.9
	2006	<b>164.6</b>	145.5	126.4	159.5	13.6	<b>59.1</b>	58.7	58.8	58.9	1.1	<b>10.9</b>	11.6	10.5	10.0	0.9
	2007	<b>160.8</b>	137.0	154.6	155.8	14.6	<b>60.0</b>	60.4	61.0	60.1	0.7	<b>10.5</b>	12.0	10.0	10.2	1.0
	Mean	<b>160.2</b>	147.7	136.8	152.7	8.9	<b>59.2</b>	59.6	59.5	58.6	0.8	<b>10.9</b>	11.9	10.5	10.6	0.6
<b>Fairfield</b>	2005	<b>147.1</b>	129.6	129.0	155.9	12.9	<b>60.6</b>	60.0	60.7	54.6	0.4	<b>9.9</b>	11.0	9.9	9.6	0.8
	2006	<b>125.3</b>	121.1	126.9	122.9	15.1	<b>59.0</b>	59.7	58.8	59.3	0.4	<b>9.2</b>	9.5	8.4	8.5	0.6
	2007	<b>113.5</b>	101.5	108.0	110.0	8.9	<b>60.0</b>	60.4	61.1	58.3	0.9	<b>10.1</b>	10.1	9.6	10.2	0.4
	Mean	<b>128.6</b>	117.4	121.3	129.6	6.4	<b>59.8</b>	59.9	59.8	57.0	3.0	<b>9.6</b>	10.3	9.1	9.1	0.4
<b>Farmington</b>	2005	<b>138.0</b>	130.0	101.9	144.3	13.9	<b>57.3</b>	57.0	55.3	55.6	0.9	<b>11.8</b>	12.8	12.5	12.0	0.5
	2006	<b>146.0</b>	133.3	119.1	147.1	6.2	<b>58.6</b>	58.3	57.8	57.6	1.0	<b>12.1</b>	12.4	12.0	11.7	0.6
	2007	<b>113.2</b>	103.5	84.1	125.4	18.2	<b>54.3</b>	54.1	54.0	54.0	2.1	<b>12.8</b>	13.6	13.2	12.2	1.0
	Mean	<b>132.4</b>	122.3	101.7	138.9	7.7	<b>58.0</b>	57.7	56.6	56.6	0.7	<b>12.0</b>	12.6	12.3	11.9	0.4
<b>Colton</b>	2005	<b>170.2</b>	149.3	160.9	168.0	7.9	<b>61.1</b>	60.6	61.2	60.8	0.5	<b>11.5</b>	12.8	11.9	11.6	0.5
	2006	<b>124.4</b>	118.0	114.9	128.8	14.2	<b>58.8</b>	59.7	60.2	58.9	1.1	<b>11.1</b>	11.5	11.0	10.8	0.7
	2007	<b>115.4</b>	103.7	121.8	113.2	7.8	<b>60.5</b>	59.5	61.1	60.2	0.7	<b>9.1</b>	11.1	10.3	10.0	0.7
	Mean	<b>136.7</b>	123.7	132.5	136.7	5.5	<b>60.0</b>	60.2	60.7	59.9	0.4	<b>11.3</b>	12.1	11.5	11.2	0.4
<b>Zone Mean</b>		<b>139.5</b>	127.8	123.1	139.5	4.4	<b>59.0</b>	59.0	59.1	57.9		<b>10.9</b>	11.7	10.9	10.7	



**Table 5. Mean grain yield (bu/a), test weight (lb/bu) and grain protein content (%) of Xerpha, Eltan, Madsen and Tubbs in the 2005-2007 WSU Extension Uniform Cereal Variety Testing winter wheat variety performance irrigated trials .**

	Year	Yield (bu/a)					Test Weight (lbs/bu)					Protein (%)				
		Xerpha	Madsen	Eltan	Tubbs	LSD @.10	Xerpha	Madsen	Eltan	Tubbs	LSD @.10	Xerpha	Madsen	Eltan	Tubbs	LSD @.10
Moses Lake	2005	136.4	158.3	75.6	138.3	34.1	59.5	60.0	58.0	57.9	1.3	11.5	11.9	11.5	11.8	0.5
	2006	159.4	150.8	135.7	158.6	14.7	58.1	57.2	56.3	57.9	1.6	12.2	12.4	12.6	11.8	0.3
	2007	141.9	132.9	132.4	144.0	13.5	58.1	58.8	57.9	56.7	1.5	13.2	13.3	13.1	12.6	0.6
<b>Zone Mean</b>		<b>145.9</b>	<b>147.3</b>	<b>114.6</b>	<b>147.0</b>	<b>9.9</b>	<b>58.8</b>	<b>58.6</b>	<b>57.2</b>	<b>57.9</b>		<b>11.9</b>	<b>12.2</b>	<b>12.1</b>	<b>11.8</b>	

		Yield (bu/a)					Test Weight (lbs/bu)					Protein (%)				
<b>Grand Mean</b>	<b>2005-07</b>	<b>110.9</b>	<b>102.2</b>	<b>97.8</b>	<b>110.9</b>		<b>59.1</b>	<b>59.3</b>	<b>59.1</b>	<b>58.4</b>		<b>10.7</b>	<b>11.4</b>	<b>10.8</b>	<b>10.6</b>	

Table 6. WSU Variety Testing summarized analysis of Xerpha

Precip. Zone	Year	Yield (bu/a)				Test Weight (lbs/bu)				Protein (%)			
		Xerpha	Madsen	Eltan	Tubbs	Xerpha	Madsen	Eltan	Tubbs	Xerpha	Madsen	Eltan	Tubbs
<16"	2005	90.8	84.9	77.6	97.0	59.5	59.9	59.1	59.5	9.3	10.0	9.3	9.2
	2006	98.6	85.8	91.6	94.3	59.2	59.4	59.8	59.2	10.6	11.2	10.9	10.5
	2007	80.1	72.6	70.6	75.7	58.4	58.7	58.8	57.8	11.2	11.9	11.4	10.9
<b>Zone Mean</b>		<b>89.8</b>	<b>81.1</b>	<b>79.9</b>	<b>89.0</b>	<b>59.0</b>	<b>59.3</b>	<b>59.2</b>	<b>58.8</b>	<b>10.4</b>	<b>11.0</b>	<b>10.5</b>	<b>10.2</b>
<b>% of Xerpha</b>			90.0	89.0	99.1		100.5	100.3	99.7		105.7	101.0	98.1

Locations: Almira, Anatone, Bickleton, Connel, Creston, Dusty, Harrington, Lamont, Ritzville, Lind, St Andrews

16-20"	2005	108.4	114.3	97.7	111.6	59.2	59.6	58.9	57.9	11.0	11.8	10.6	10.8
	2006	124.8	115.5	105.7	125.1	59.6	59.8	59.6	58.7	10.9	11.3	11.2	10.9
	2007	128.5	110.1	118.5	125.7	60.3	60.4	60.5	59.3	11.9	12.2	11.7	11.7
<b>Zone Mean</b>		<b>120.6</b>	<b>113.3</b>	<b>107.3</b>	<b>120.8</b>	<b>59.7</b>	<b>59.9</b>	<b>59.7</b>	<b>58.6</b>	<b>11.3</b>	<b>11.8</b>	<b>11.2</b>	<b>11.1</b>
<b>% of Xerpha</b>			93.9	89.0	100.2		100.3	100.0	98.2		104.4	99.1	98.2

Locations: Dayton, Mayview, Reardan, St John, Walla Walla

>20"	2005	149.4	145.6	119.3	149.9	59.4	59.5	58.8	57.1	11.3	12.2	11.4	11.4
	2006	143.9	133.7	124.6	143.4	58.7	58.7	58.4	58.5	11.1	11.5	10.9	10.6
	2007	125.7	111.4	117.1	126.1	58.7	58.6	59.3	58.2	10.6	11.7	10.8	10.7
<b>Zone Mean</b>		<b>139.7</b>	<b>130.2</b>	<b>120.3</b>	<b>139.8</b>	<b>58.9</b>	<b>58.9</b>	<b>58.8</b>	<b>57.9</b>	<b>11.0</b>	<b>11.8</b>	<b>11.0</b>	<b>10.9</b>
<b>% of Xerpha</b>			93.2	86.1	100.1		100.0	99.8	98.3		107.3	100.0	99.1

Locations: Colton, Fairfield, Farmington, Pullman, Moses Lake

Table 6a. University of Idaho Variety Testing analysis of Xerpha , southern Idaho

Location	Year	Yield (bu/a)				Test Weight (lbs/bu)			
		Xerpha	Madsen	Stephens	Tubbs reselect	Xerpha	Madsen	Stephens	Tubbs reselect
Kimberely	2007	122.9	115.9	113.5	126.3	57.3	60.1	59.9	58.9
Rupert	2007	122.5	120.3	118.9	115.6	55.0	54.7	54.6	53.4
Aberdeen	2007	137.1	126.7	124.9	143.0	57.6	58.1	57.5	57.3
irr. mean		127.5	121.0	119.1	128.3	56.6	57.6	57.3	56.5
dryland									
Ririe	2007	23.1	21.1	17.9	24.3	not available			

Table 6b. 2007 Oregon Soft Winter Elite Yield Trials

Location	Year	Yield (bu/a)				LSD @0.5	Test Weight (lbs/bu)				
		Xerpha	Madsen	Stephens	Tubbs		Xerpha	Madsen	Stephens	Tubbs	LSD @0.5
Moro -Kaseberg	2007	75.0	70.2	65.3	61.3	11.2	61.5	60.5	58.2	58.5	1.7
Moro - Exp. St.	2007	85.6	94.4	93.1	81.9	23.1	62.3	62.2	61.1	60.7	1.1
Lexington	2007	48.9	45.2	46.8	46.1	5.2	60.4	59.9	60.6	59.3	0.3
Madras	2007	148.2	150.9	157.0	172.3	16.0	60.8	60.6	61.1	60.6	1.3
Pendleton-Ruggs	2007	114.7	111.3	110.1	114.4	10.7	59.1	60.1	59.4	59.1	1.4
Pendleton-CBARC	2007	52.4	40.9	47.6	46.8	14.3	59.0	58.9	58.4	59.0	1.4
Hermiston	2007	158.5	128.4	136.6	152.5	17.5	60.3	61.8	60.6	60.7	0.9
Corvallis	2007	126.2	107.4	114.8	115.4	18.1	61.3	60.8	61.2	61.2	0.7
North Powder	2007	73.2	66.2	44.9	65.0	16.7	59.8	60.8	59.9	60.0	0.7
Ontario	2007	121.9	104.1	130.4	122.4	16.3	61.4	60.6	60.1	60.8	0.4
mean		100.5	91.9	94.7	97.8		60.6	60.6	60.1	60.0	

Table 6c. 2007 University of California Intermountain Winter Wheat Test

Location	Year	Yield (bu/a)				LSD @0.5	Test Weight (lbs/bu)				
		Xerpha	Madsen	Stephens	Tubbs		Xerpha	Madsen	Stephens	Tubbs	LSD @0.5
Tulelake	2007	136	100	128	123	12.3	57.7	56.4	56.4	55.8	1.8
Siskiyou	2007	121	106	108	121	18.2	55.0	54.7	55.1	54.5	2.1
mean		128	103	118	122	10.7	56.4	55.6	55.8	55.2	

**Table 7. Mean grain yield (bu/a) and test weight (lbs/bu) of Xerpha and check cultivars in WSU winter wheat breeding nurseries.**

Location	Year	Yield (bu/a)					Test Weight (lbs/bu)				
		Xerpha	Madsen	Eltan	Tubbs	LSD @.10	Xerpha	Madsen	Eltan	Tubbs	LSD @.10
Pullman	2002/03	<b>115.1</b>		84.4			<b>60.9</b>		61.8		
Pullman	2003/04	<b>128.1</b>	105.9	123.8		14.1	<b>60.8</b>	59.9	60.4		0.6
Lind	2003/04	Nursery lost due to soil crusting event.									
Pullman	2004/05	Data not used due to extreme CV (30.18%).									
Lind	2004/05	<b>56.0</b>	53.0	51.2			<b>60.8</b>	60.6	60.4		
Pullman	2005/06	<b>118.3</b>	93.9	79.2	98.4	11.2	<b>60.3</b>	60.1	60.4	59.6	0.7
Lind (late)	2005/06	<b>54.2</b>	51.6	52.4	60.1	8.2	<b>61.6</b>	61.0	61.7	61.8	0.7
Kahlotus	2006/07	<b>72.3</b>	52.0	58.7	54.0	11.0	<b>60.5</b>	59.7	61.0	59.9	0.8
Ritzville	2006/07	<b>71.5</b>	63.6	73.7	71.3	10.6	<b>62.2</b>	61.4	62.0	58.9	0.8
Lind	2006/07	<b>62.4</b>	48.2	57.8	56.3	6.8	<b>61.6</b>	60.3	62.6	60.4	0.6
Mansfield	2006/07	<b>51.4</b>	38.3	53.5	38.3	8.7	<b>56.6</b>	57.5	56.6	56.4	0.7
Waterville	2006/07	<b>79.6</b>	56.1	75.5	60.5	17.3	<b>61.0</b>	61.3	60.0	60.3	0.8
Colton	2006/07	<b>137.2</b>	122.7	131.1	135.4	17.2	<b>61.0</b>	60.8	61.6	61.1	0.9
Steptoe	2006/07	<b>139.2</b>	126.2	134.2	137.3	24.3	<b>60.0</b>	59.4	60.3	57.3	2.2
P18.11	2006/07	<b>98.8</b>	86.5	102.4	105.0	12.2	<b>60.2</b>	59.9	60.0	59.8	1.1
P23.6 (foot rot)	2006/07	<b>140.8</b>	138.2	96.7	138.5	20.0	<b>61.1</b>	60.8	59.4	60.9	1.4

Table 8. 2005-2006 Variety Testing FGIS Grade of Xerpha

Harvest						FGIS		
Yr	Originator	Location	Variety No.	Class	Grade	FGIS Comments		
2006	S. Jones	Almira	Xerpha	SWH	SWH			
2006	S. Jones	Anatone	Xerpha	SWH	SWH			
2006	S. Jones	Bickleton	Xerpha	SWH	SWH			
2006	S. Jones	Colton	Xerpha	SWH	SWH			
2006	S. Jones	Connell	Xerpha	SWH	SWH			
2006	S. Jones	Creston	Xerpha	SWH	SWH			
2006	S. Jones	Dayton	Xerpha	SWH	SWH			
2006	S. Jones	Dusty	Xerpha	SWH	SWH			
2006	S. Jones	Fairfield	Xerpha	SWH	SWH			
2006	S. Jones	Farmington	Xerpha	SWH	Conflict			
2006	S. Jones	Harrington	Xerpha	SWH	Conflict	HDWH-SWH		
2006	S. Jones	Lamont	Xerpha	SWH	SWH			
2006	S. Jones	Mayview	Xerpha	SWH	SWH			
2006	S. Jones	Moses Lake	Xerpha	SWH	SWH			
2006	S. Jones	Pullman	Xerpha	SWH	SWH			
2006	S. Jones	Reardan	Xerpha	SWH	SWH			
2006	S. Jones	Ritzville	Xerpha	SWH	SWH			
2006	S. Jones	St. Andrews	Xerpha	SWH	SWH			
2006	S. Jones	St. John	Xerpha	SWH	SWH			
2006	S. Jones	Walla Walla	Xerpha	SWH	SWH			
<hr/>								
2005	S. Jones	Almira	Xerpha	SWH	SWH			
2005	S. Jones	Anatone	Xerpha	SWH	SWH			
2005	S. Jones	Colton	Xerpha	SWH	HWH	Many SWH Traits		
2005	S. Jones	Coulee City	Xerpha	SWH	SWH			
2005	S. Jones	Creston	Xerpha	SWH	SWH			
2005	S. Jones	Dayton	Xerpha	SWH	Conflict			
2005	S. Jones	Dusty	Xerpha	SWH	SWH			
2005	S. Jones	Fairfield	Xerpha	SWH	SWH			
2005	S. Jones	Farmington	Xerpha	SWH	SWH			
2005	S. Jones	Lamont	Xerpha	SWH	SWH			
2005	S. Jones	Lind Fallow	Xerpha	SWH	SWH			
2005	S. Jones	Mayview	Xerpha	SWH	SWH			
2005	S. Jones	Moses Lake	Xerpha	SWH	SWH			
2005	S. Jones	Pullman	Xerpha	SWH	SWH	Some HDWH Traits		
2005	S. Jones	Reardan	Xerpha	SWH	SWH			
2005	S. Jones	Ritzville	Xerpha	SWH	SWH			
2005	S. Jones	St. John	Xerpha	SWH	SWH	Frosty back - sprouted		
2005	S. Jones	Walla Walla	Xerpha	SWH	SWH			

**Table 9. Evaluation of cold tolerance in wheat.**

Lower values indicate that the genotype is more cold tolerant.

Variety	2006			2007		
	Cold hardiness	95% Confidence Limits on the Mean		Cold hardiness	95% Confidence Limits on the Mean	
Xerpha	36	27	46	29.2	19	39
Madsen	41	36	47	45.7	41	51
Eltan	31	27	36	34.6	31	38
Tubbs	39	36	47	42.1	36	49

\*Mean Relative Area under the Death Progress Curve. K. Campbell: 2006, 2007

Varieties that differ by more or less than the confidence limit are significantly different from each other at the 5% probability level.

**Table 10. Coleoptile length (mm) and emergence.**

	2007	2006	2005	2004	2003
Xerpha	67.1	64.7	65.8	77.1	71.6
Madsen	65.1	52.1	63.2	73.2	80.4
Eltan	74.8	51.3	69.9	76.9	84.6
Tubbs	53.7		62.8		

**Emergence Study (Schillinger)**

Lind Research Station 9/6/2006

Days after planting:	10	21
Eltan	2	11.75
Xerpha	0	6
Masami	0	6

Seed place 7.0" below summer fallow surface, 5.5 " soil cover.

11.96 % moisture in top 9" of soil.

Table 11. Plant height (inches).

Precip. Zone: 7-14"	Year	Xerpha	Madsen	Ethan	Tubbs
Lind	2005	28.0	26.0	26.0	26.0
	2007	26.5	24.5	26.0	25.0
	Mean	27.3	25.3	26.0	25.5
Anatone	2005	35.0	35.0	37.0	36.0
	2006	35.0	36.0	36.0	37.0
	2007	31.5	30.0	32.0	31.8
Mean	33.8	33.7	35.0	34.9	
Bickleton	2006	26.0	26.0	30.0	28.0
	2007	26.8	28.0	28.0	29.5
	Mean	26.4	27.0	29.0	28.8
Connell	2006	30.0	28.0	29.5	28.0
Zone Mean		29.9	29.2	30.6	30.2
Precip. Zone: 11-15"					
Ritzville	2005	33.0	31.0	32.0	34.0
	2006	31.0	31.0	31.0	33.0
	2007	26.5	25.7	26.0	27.8
	Mean	30.2	29.2	29.7	31.6
Lamont	2005	37.0	40.0	40.0	41.0
	2006	38.0	37.0	41.0	38.0
	2007	35.3	34.3	38.3	37.5
	Mean	36.8	37.1	39.8	38.8
Harrington	2006	33.0	32.0	31.0	35.0
	2007	30.8	31.8	30.5	31.8
	Mean	31.9	31.9	30.8	33.4
Dusty	2005	39.0	35.0	39.0	37.0
	2006	32.0	30.0	34.0	31.0
	2007	29.3	28.0	31.8	30.5
	Mean	33.4	31.0	34.9	32.8
St. Andrews	2005	39.0	39.0	42.0	41.0
	2007	29.3	26.5	30.3	29.5
	Mean	34.2	32.8	36.2	35.3
Creston	2005	40.0	41.0	41.0	42.0
	2006	36.0	38.0	38.0	38.0
	2007	39.0	40.0	41.5	42.0
	Mean	38.3	39.7	40.2	40.7
Almira	2005	42.0	42.0	43.0	42.0
	2006	34.0	37.0	38.0	37.0
	2007	43.0	42.3	42.0	42.3
	Mean	39.7	40.4	41.0	40.4
Zone Mean		35.1	34.8	36.3	36.3

Precip. Zone: 16-18"	Year	Xerphn	Madsen	Ethan	Tubbs
Walla Walla Dayton	2005	42.0	40.0	43.0	43.0
	2005	43.0	43.0	40.0	44.0
	2006	39.0	39.0	41.0	41.0
	2007	34.0	33.3	36.3	35.5
Mean	39.5	38.8	40.1	40.9	
St. John	2005	46.0	45.0	44.0	49.0
	2006	42.0	41.0	44.0	44.0
	2007	41.8	38.3	42.5	42.0
	Mean	43.3	41.4	43.5	45.0
Reardan	2005	46.0	40.0	41.0	40.0
	2006	38.0	39.0	38.0	40.0
	2007	31.0	32.0	30.1	33.5
	Mean	36.3	37.0	36.4	37.8
Mayview	2005	38.0	38.0	41.0	40.0
	2006	34.0	34.0	35.0	34.0
	2007	38.3	35.3	40.0	39.3
	Mean	36.8	35.8	38.7	37.8
Zone Mean		39.0	38.3	39.7	40.4
Precip. Zone: 20-24"					
Pullman	2005	43.0	41.0	43.0	43.0
	2006	36.0	36.0	37.0	35.0
	2007	40.8	39.5	42.8	42.3
	Mean	39.9	38.8	40.9	40.1
Fairfield	2005	37.0	37.0	37.0	37.0
	2006	33.0	34.0	36.0	33.0
	2007	36.3	36.5	35.8	38.0
	Mean	35.4	35.8	36.3	36.0
Farmington	2005	39.0	39.0	37.0	39.0
	2006	39.0	42.0	40.0	42.0
	2007	41.3	40.5	41.5	43.5
	Mean	39.8	40.5	39.5	41.5
Colton	2005	42.0	40.0	42.0	41.0
	2006	40.0	39.0	41.0	40.0
	2007	38.5	37.3	40.5	38.8
	Mean	40.2	38.8	41.2	39.9
Zone Mean		38.8	38.5	39.5	39.4

Precip. Zone: Irrigated	Year	Xerpha	Madsen	Ethan	Tubbs
Moses Lake	2005	43.0	42.0	44.0	43.0
	2006	38.0	37.0	38.0	37.0
	2007	36.5	34.5	38.5	38.0
Zone Mean		39.2	37.8	40.2	39.3

Grand Mean	2005-07	36.1	35.6	37.0	37.0
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2005-2007 WSU Variety Testing data.

Table 12. Julian heading date.

Precip. Zone: 7-14"	Year	Xerpha	Madsen	Eltan	Tubbs
Lind	2005	133	132	133	131
	2007	141	140	141	137
	Mean	137	136	137	134
Anatone	2005	158	158	161	156
	2006	156	157	159	155
	2007	166	165	167	163
	Mean	160	160	162	158
Bickleton	2006	161	160	163	159
	2007	160	159	161	157
	Mean	160	160	162	158
Connell	2006	143	141	143	139
Zone Mean		152	152	154	150
<b>Precip. Zone: 11-15"</b>					
Ritzville	2005	148	146	147	144
	2006	153	154	156	152
	2007	148	147	150	145
	Mean	150	149	151	147
Lamont	2005	146	146	147	145
	2006	154	155	157	153
	2007	150	149	152	147
	Mean	150	150	152	148
Harrington	2006	146	145	154	143
	2007	145	146	145	146
	Mean	146	146	150	145
	Dusty	2005	143	143	144
2006		152	152	153	150
2007		151	146	153	148
Mean		149	147	150	146
St. Andrews	2005	153	154	154	152
	2007	151	150	151	148
	Mean	152	152	153	150
Creston	2005	162	163	164	161
	2006	158	158	161	154
	2007	163	162	163	160
	Mean	161	161	163	158
Almira	2006	158	159	161	157
	2007	153	152	155	150
	Mean	156	156	158	154
Zone Mean		152	152	154	150

Precip. Zone: 16-18"	Year	Xerpha	Madsen	Eltan	Tubbs
Walla Walla	2005	141	141	143	139
Dayton	2005	154	153	154	152
	2006	145	144	147	143
	2007	153	151	155	148
	Mean	151	149	152	148
St. John	2005	157	156	158	156
	2006	152	151	153	149
	2007	150	150	153	147
	Mean	153	152	155	151
Reardan	2005	164	165	166	163
	2006	163	164	166	162
	2007	166	165	167	163
	Mean	164	165	166	163
Mayview	2005	158	158	160	156
	2006	161	162	164	160
	2007	158	157	160	154
	Mean	159	159	161	157
Zone Mean		156	155	157	153
<b>Precip. Zone: 20-24"</b>					
Pullman	2005	161	162	161	162
	2006	160	160	162	159
	2007	158	159	161	155
	Mean	160	160	161	159
Fairfield	2005	165	165	166	164
	2006	159	159	162	158
	2007	165	164	166	162
	Mean	163	163	165	161
Farmington	2005	163	163	164	161
	2006	164	162	167	160
	2007	161	161	162	157
	Mean	163	162	164	159
Colton	2005	158	157	158	157
	2006	160	159	162	156
	2007	160	160	162	156
	Mean	159	159	161	156
Zone Mean		161	161	163	159

Precip. Zone: Irrigated	Year	Xerpha	Madsen	Eltan	Tubbs
Moses Lake	2005	144	146	147	144
	2006	147	147	148	143
	2007	150	150	149	148
Zone Mean		147	148	148	145

<b>Grand Mean</b>	<b>2005-07</b>	154	154	156	152
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2005-2007 WSU Variety Testing data.



**Table 13. Percent lodged.**

	Year	Xerpha	Madsen	Eltan	Tubbs
<b>11-15"</b>					
Lamont	2005	99	29	98	60
Harrington	2006	0	0	16	0
Creston	2005	3	0	11	0
	2006	0	0	40	0
Almira	2005	0	0	31	0
	2006	2.5	0	25	0
	2007	0	0	24	0
<b>16-18"</b>					
Walla Walla	2005	60	6	44	6
Dayton	2005	19	13	58	15
St. John	2005	82	36	97	80
	2006	0	0	49	0
Reardan	2006	0	0	24	0
<b>20-24"</b>					
Pullman	2005	50	5	70	28
	2006	0	0	76	0
Farmington	2005	78	43	98	60
	2006	0	0	25	0
	2007	0	0	6	0
Colton	2005	0	0	5	0
<b>Irrigated</b>					
Moses Lake	2005	33	31	99	65
	2006	0	0	80	0
	2007	0	0	25	0

2005-2007 WSU Variety Testing data.

Table 14. Stripe Rust Assessment by Dr. Chen.

2006

Infection types (IT) and severities (%) of Xerpha compared to PS 279 (susceptible check) and Eltan (HTAP resistant) in various nurseries.

0602\_WEDN

Entry	VARIETY	2006 PLOT	Stripe rust										
			LOC 1		LOC 3		LOC 4		LOC 5		LOC 6		LOC 7
			6/21 Flowering IT %	7/5 S. dough IT %	6/20 Flowering IT %	6/26 S. dough IT %	5/6 Early boot IT %	6/6 Flowering IT %	5/31 Flowering IT %	6/29 S. dough IT %	6/29 S. dough IT %	6/29 S. dough IT %	
15	ELTAN	15	2 5	2-3 15	2 5	5 10	-	-	2 20	2 20	5 10		
	(S Check)	21	8 90	8 100	8 100	8 90	8 50	8 100	8 100	8 80	8 80		
21	Xerpha	22	2 1	2-3 10	2 1	8 10	8 70	5 30	2 1	5 30	5 20		

0604\_WSJN

Entry #	Variety	2006 PLOT	STRIPE RUST		
			LOC 4	LOC 5	
			6/26 Soft dough IT %	5/6 Early boot IT %	6/6 Flowering IT %
2	Eltan	2	2 2	8 30	2 5
9	Xerpha	9	8 5	8 50	5 30
	PS 279	21	8 90	8 40	8 90

Infection types of WA7973 in greenhouse seedling and adult-plant tests compared to PS 279 (susceptible check) and Eltan (HTAP resistance)

Entry	VARIETY	VARIETY	2006 PLOT	0602 WEDN									Entry	2005 PLOT	0502 WEDN								
				Seedling Tests					Adult-Plant Tests						Seedling Tests					Adult-Plant Tests			
				PST-17	PST-37	PST-45	PST-100	PST-116	PST-37	PST-45	PST-116	PST-17			PST-37	PST-43	PST-45	PST-100	PST-116	PST-45	PST-100	PST-116	
15	PS 279	(S Check)	21	9	8	9	9	9	8	8	8	1	8	8	8	8	8	8	8	8	8	8	
	PI538994	ELTAN	15	8	8	8	8	6	2	2	3	16	17	8	8	8	8	8	8	8	2	2	2
21	Xerpha	Xerpha	22	7	8	8	8	8	3	2	3	23	25	7	8	7	8	8	8	8	3	5	3

2007

TABLE XMC0704. STRIPE RUST INFECTION TYPE (IT) AND SEVERITY (%) ON CULTIVARS AND LINES IN THE WINTER STEPHEN JONES NURSERY (EXP04) AT WHITLOW FARM (LOC04) NEAR PULLMAN, WA AND MT VERNON, WA (LOC05) WHEN RECORDED AT THE INDICATED DATES AND STAGES OF PLANT GROWTH, 2007 UNDER NATURAL INFECTION

Entry No.	Variety	2007 PLOT	STRIPE RUST			NOTES
			LOC 04	LOC 05		
			6/22/07 FS 10.54 IT %	4/18/07 FS 6 IT %	5/31/07 FS 10.1 IT %	
1	Madsen	1	2 2	2 5	2 2	
2	Eltan	2	2 10	2 5	2 5	
4	Tubbs06	4	2 2	8 30	3 15	
9	Xerpha	9	2 5	5 20	3 15	

**Table 15. Cephalosporium Stripe**

2005-06 Palouse Cons. Farm

Inoculated Field Trial - T. Murray

2006	Index Mean	Yield bu/a	Test wt. lbs/bu
Eltan	43.7	68.9	57.2
Bruehl	53.6	67.0	54.9
Xerpha	55.5	68.0	56.4
Madsen	67.8	50.0	51.6
Tubbs	74.7	38.7	48.9
LSD <sub>0.05</sub>	11.5	12.6	3.4

2006-07 Palouse Cons. Farm

Inoculated Field Trial - T. Murray

2007	Index Mean	Yield bu/a	Test wt. lbs/bu
Eltan	6.6	126.0	58.7
Xerpha	12.2	124.6	59.6
Bruehl	5.2	114.5	55.8
Madsen	10.1	106.8	58.9
Tubbs	12.9	100.3	57.5
LSD <sub>0.05</sub>	11.5	16.1	1.6

**Table 16. Eyespot foot rot**

2005-06 Palouse Cons. Farm

Inoculated Field Trial - T. Murray

2006	Index Mean	Yield bu/a	Test wt. lbs/bu
Xerpha	56.5	100.9	58.1
Bruehl	52.4	98.2	56.2
Eltan	49.4	90.1	56.6
Madsen	18.8	75.6	53.5
Tubbs	27.8	54.8	48.9
LSD <sub>0.05</sub>	12.7	16.2	2.7

2006-07 Palouse Cons. Farm

Inoculated Field Trial - T. Murray

2007	Index Mean	Yield bu/a	Test wt. lbs/bu
Tubbs	40.1	162.5	61.1
Xerpha	75.6	152.9	60.2
Madsen	26.3	147.6	61.3
Eltan	78.3	134.4	57.8
Bruehl	80.6	123.8	54.7
LSD <sub>0.05</sub>	17.1	14.6	1.5

**Table 17. Snow mold**

2005-06 Mansfield, WA - Dr. T. Murray

2006	S.mold rating*	Yield bu/a	Test wt. lbs/bu
Eltan	5.33	120.5	60.5
<b>Xerpha</b>	<b>2.33</b>	<b>68.7</b>	<b>60.5</b>
Tubbs	1.17	28.3	59.5
Madsen	0.67	0.0	0.0

\* 1-8, 8 best

2006-07 Mansfield, WA

2007	S.mold rating*	Yield bu/a	Test wt. lbs/bu
Eltan	7.3	53.5	56.6
<b>Xerpha</b>	<b>6.8</b>	<b>51.4</b>	<b>56.6</b>
Tubbs	5.3	38.3	57.5
Madsen	5.3	38.3	56.4

\* 1-8, 8 best

2006-07 Waterville, WA

2007	S.mold rating*	Yield bu/a	Test wt. lbs/bu
<b>Xerpha</b>	<b>4.3</b>	<b>79.6</b>	<b>61.0</b>
Eltan	6.5	75.5	60.0
Tubbs	4.5	60.5	60.3
Madsen	3.8	56.1	61.3

\* 1-8, 8 best

**Table 18. Dwarf Bunt**

2006-07 Dr. B. Goates

Enrty Name	Row Rep I	% bunt	Row Rep II	% bunt
Madsen	357	8	977	10
Eltan	358	0	978	2
Tubbs	360	tr	980	1
Cheyenne*	361	35	981	70
<b>Xerpha</b>	366	7	986	10

\* susceptible check

## Assessment of the End-Use Quality of 'Xerpha' Soft White Winter Wheat

C. F. Morris<sup>1\*</sup>, B. K. Baik<sup>2</sup>, and D. A. Engle<sup>1</sup>

<sup>1</sup>USDA-ARS Western Wheat Quality Laboratory, E-202 Food Sci. & Human Nutrition Facility  
East, P.O. Box 646394, Pullman, WA 99164-6394

<sup>2</sup>Wheat Quality Program, Dept. of Crop and Soil Sciences, Washington State Univ., Pullman, WA

\*Correspondence: [morrisc@wsu.edu](mailto:morrisc@wsu.edu); +1.509.335.4062. Prepared: January 2008

Line designation(s):	WA7973, PI 645605				
Market class/type:	Soft White Winter				
Requesting breeder:					
Release status request:	<input type="checkbox"/> Pre-Release	<input type="checkbox"/> Full Release	<input checked="" type="checkbox"/> Other		
Years of quality testing:	10 (Table 1)				
Check varieties:	Eltan	Finch	Madsen	Stephens	Tubbs06
Maximum paired check comparisons:	32	31	33	32	11

### INTRODUCTION

Following is an assessment of the quality of **Xerpha**. Assessment of wheat quality involves in-depth knowledge of industry needs, technical knowledge of testing methodologies and the traits that they measure, and an understanding of statistical analyses and their appropriate interpretation. Conclusions may therefore vary accordingly. Data are from the USDA ARS Western Wheat Quality Laboratory and the Washington State University Wheat Quality Program. These results represent standard cultivar development and nursery testing procedures and are presented here to facilitate deliberations and decisions as to the advancement or release of experimental germplasm. They may be freely used with permission from the authors.

Nurseries and the corresponding WAS (Wheat Analysis System) nursery numbers/codings are listed in Table 1. Experimental breeding lines are evaluated by comparison to check varieties grown in the same nursery (same location-year) to minimize environmental confounding. Check varieties and their occurrence in various nurseries are listed in Table 2. Due to practical limitations, a limited number of check varieties is used in this analysis. The inclusion of specific check varieties in nurseries is at the discretion of the breeder or Variety Testing coordinator; checks should reflect market class, current production, and be well-characterized for all aspects of end-use quality. Statistical analyses are conducted as essentially two-tailed paired *t*-tests using balanced designs. The number of paired comparisons, *n*, varies according to the check variety and trait. Table 3 presents the Analysis of Variance by check variety for each quality parameter. Statistical significance is assigned at  $P \leq 0.05$ ; LSDs assume an  $\alpha = 0.05$ . A list of trait abbreviations follows. Table 4 tabulates all of the data used for this analysis.

<u>Trait abbreviation</u>	<u>Trait name</u>	<u>Units</u>	<u>Comments</u>
TWT	Test weight	lbs/bu	limits set for U.S. grades
WPROT	Wheat Protein	%	--
SKHRD	Single Kernel Hardness	unitless	--
SKWT	Single Kernel Weight	mg	--
SKWTSD	Single Kernel Weight sd	unitless	--
FYELD	Flour Yield	%	--
BFYELD	Break Flour Yield	%	--
FASH	Flour Ash	%	lower values are preferred
MSCOR	Milling Score	unitless	--
FPROT	Flour Protein	%	--
FSV	Flour Swelling Volume		indicator of partial waxy
MABS	Mixograph Absorption	%	dough water absorption
CODI	Cookie Diameter	cm	--
CAVOL	Sponge Cake Volume	cc	--
LDOPA	L-DOPA	A <sub>475</sub>	polyphenol oxidase

### INTERPRETIVE SUMMARY FOR Xerpha

(As compared to Eltan, Finch, Madsen, Stephens and Tubbs06)

**Test weight** is similar to Eltan, Madsen, Stephens and Tubbs06; less than Finch (0.9 lbs/bu).

**Grain protein** is less than Madsen (0.5%) and Stephens (0.4%); similar to Eltan, Finch and Tubbs06.

**SKCS kernel hardness** is similar to Madsen and Tubbs06; somewhat greater than Eltan, Finch and Stephens.

**Kernel weight** is greater than Eltan, Finch and Madsen; less than Stephens and Tubbs06.

**Flour yield** is less than Finch (1.4%), Madsen (0.7%), Stephens (0.7%) and Tubbs06 (0.7%); similar to Eltan.

**Break flour yield** is less than Eltan, Finch and Madsen; similar to Stephens and Tubbs06.

**Flour ash** is less than Finch and Madsen; similar to Eltan, Stephens and Tubbs06.

**Milling Score** is similar to Eltan, Finch, Madsen and tubbs06; less than Stephens.

**Flour protein** is less than Madsen (0.7%) and Stephens (0.5%); similar to Eltan, Finch and Tubbs06.

**Flour Swelling Volume** indicates normal starch amylase.

**Dough water absorption** is similar to Eltan, Finch, Madsen and Tubbs06; greater than Stephens.

**Cookie diameter** is similar to slightly less than all checks.

**Sponge Cake Volume** is similar to Madsen and Stephens; less than Eltan and Finch.

**L-DOPA** indicates that PPO activity is higher than all the checks.

### CONCLUSION

**Xerpha** displays acceptable grain, milling and end-use quality, essentially equivalent to the quality of established varieties. Current release status is unknown but should be justified on non-quality considerations.

Overall, release of this variety is expected to:

- increase the overall quality of the wheat crop in Washington
- falls within the range of currently acceptable varieties and therefore should not have any particular effect on the overall quality of the wheat crop in Washington
- have both positive and negative effects on the overall quality of the wheat crop in Washington
- have both neutral and negative effects.
- decrease the overall quality of the wheat crop in Washington
- depend upon the variety that it will replace/supplant, meaning that its effect could be any one or a combination of the outcomes above
- require special handling, segregation, etc. for the following reason(s):

### ACKNOWLEDGMENTS

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Table 1. Nursery Sources For Xerpha Data Set

Year	Nursery	Nursery Name	Location	Breeder Name
1998	85	99 PRELIMINARY WHITE 2	LIND	S.S. JONES
1999	128	PRELIMINARY WHITE 2	PULLMAN	S.S. JONES
2000	68	ADVANCED WHITE YIELD 3	PULLMAN	S.S. JONES
2000	69	ADVANCED WHITE YIELD 3	LIND	S.S. JONES
2001	71	ADVANCED WHITE YIELD 3	LIND	S.S. JONES
2001	84	ADVANCED WHITE YIELD 3	PULLMAN	S.S. JONES
2002	103	ADVANCED WHITE YIELD 3	LIND	S.S. JONES
2002	104	ADVANCED WHITE YIELD 3	PULLMAN	S.S. JONES
2002	126	SSD2 ELTAN-ESTICA		S.S. JONES
2003	63	AWY1 WA NUR	JORGENSEN ORGANIC	S.S. JONES
2003	1071*	AWY1 WA NUR	WATERVILLE	S.S. JONES
2003	72	AWY1/WA NUR/AWY2/RESELECTS/CG/ACG1	LIND	S.S. JONES
2003	73	AWY1/WA NUR/AWY2/RESEL/CG PR/ACG1/FELT	PULLMAN	S.S. JONES
2003	119	ELTAN-ESTICA SSD	LIND	S.S. JONES
2003	123	AWY1 WA NUR	ST JOHN ORGAINIC	S.S. JONES
2003	124	AWY1 WA NUR	PULLMAN ORGANIC	S.S. JONES
2003	138	ELTAN/ESTICA PULLMAN	PULLMAN	S.S. JONES
2004	90	ELT-EST SSD	PULLMAN	S.S. JONES
2004	1084*	AWY1 PULLMAN	PULLMAN	S.S. JONES
2004	1085*	AWY1 LIND	LIND	S.S. JONES
2005	39	ADVANCED WHITE YIELD 1 NON-ORGANIC	PULLMAN	S.S. JONES
2005	40	ADVANCED WHITE YIELD 1 ORGANIC	PULLMAN	S.S. JONES
2005	41	ADVANCED WHITE YIELD 2	PULLMAN	S.S. JONES
2005	105	ADVANCED WHITE YIELD 2 LIND	LIND	S.S. JONES
2005	1012*	G&E SOFT WINTER	ALMIRA	C.F. MORRIS
2005	2012*	G&E SOFT WINTER	ANATONE	C.F. MORRIS
2005	3012*	G&E SOFT WINTER	COLTON	C.F. MORRIS
2005	4012*	G&E SOFT WINTER	REARDAN	C.F. MORRIS
2005	5012*	G&E SOFT WINTER	ST ANDREWS	C.F. MORRIS
2005	6012*	G&E SOFT WINTER	MOSES LAKE	C.F. MORRIS
2006	7012*	G&E SOFT WINTER	ST JOHN	C.F. MORRIS
2006	8012*	G&E SOFT WINTER	RITZVILLE	C.F. MORRIS
2006	9012*	G&E SOFT WINTER	MOSES LAKE	C.F. MORRIS
2006	10012*	G&E SOFT WINTER	LAMONT	C.F. MORRIS
2006	11012*	G&E SOFT WINTER	DAYTON	C.F. MORRIS
2006	12012*	G&E SOFT WINTER	ALMIRA	C.F. MORRIS
2006	1123*	ORGANIC AWY1	ST. ANDREWS	S.S. JONES
2006	1024*	SOFT WINTER RUSH	CONNELL	S.S. JONES
2006	1124*	ORGANIC AWY1	ST. JOHN	S.S. JONES
2006	2024*	SOFT WINTER RUSH	KAHLOTUS	S.S. JONES
2006	3024*	SOFT WINTER RUSH	LIND LATE	S.S. JONES
2006	4024*	SOFT WINTER RUSH	LIND	S.S. JONES
2006	5024*	SOFT WINTER RUSH	CENTRAL FERRY	S.S. JONES
2006	88	ADVANCED WHITE YIELD 1 NON-ORGANIC	PULLMAN	S.S. JONES
2007	13012*	G&E SOFT WINTER	DAYTON	C.F. MORRIS
2007	14012*	G&E SOFT WINTER	HARRINGTON	C.F. MORRIS
2007	15012*	G&E SOFT WINTER	LIND	C.F. MORRIS
2007	16012*	G&E SOFT WINTER	MAYVIEW	C.F. MORRIS
2007	17012*	G&E SOFT WINTER	PULLMAN	C.F. MORRIS

\* Nurseries 12, 23, 24, 71, 84, and 85 were assigned new nursery numbers by location to give each location a unique nursery identification for statistical purposes



Table 2. Data Pair by Nursery Number Detail

Variety	1998		1999		2000		2001		2002		2003		2004		2005															
	Nursery	85	128	68	69	71	84	103	104	126	63	72	73	119	123	124	138	90	1084	1085	89	40	41	105	1012	2012	3012	4012	5012	6012
ELTAN	0	0	0	0	1	1	0	0	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
FINCH	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MADSEN	0	1	1	1	0	0	1	1	0	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MASAMI	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
STEPHENS	0	0	1	1	0	0	1	1	0	1	1	1	0	1	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1
TUBBS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TUBBS06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
XERPHA	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Variety	2006																2007		
	Nursery	88	1024	1123	1124	2024	3024	4024	5024	7012	8012	9012	10012	11012	12012	13012	14012	15012	16012
ELTAN	1	1	1	1	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0
FINCH	1	0	1	1	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0
MADSEN	1	0	1	1	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0
MASAMI	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
STEPHENS	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
TUBBS	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TUBBS06	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
XERPHA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

\* 1 indicates data pair present in analysis  
 \* 0 indicates data pair not present in analysis

Table 3. Analysis of Variance  
Balanced Paired t Test Design

Variety	Test	p-Value	LSD	High Variety	Mean	Low Variety	Mean	Significance	Data Pairs
ELTAN	TWT	0.92	0.39	ELTAN	61.6	XERPHA	61.5	NON	32
FINCH	TWT	<0.01	0.3	FINCH	62.4	XERPHA	61.5	SIGNIFICANT	31
MADSEN	TWT	0.11	0.27	XERPHA	61.6	MADSEN	61.4	NON	33
STEPHENS	TWT	0.06	0.28	XERPHA	61.8	STEPHENS	61.5	NON	32
TUBBS06	TWT	0.34	0.32	XERPHA	61.7	TUBBS06	61.6	NON	11
ELTAN	WPROT	0.28	0.29	XERPHA	10.6	ELTAN	10.4	NON	32
FINCH	WPROT	0.13	0.22	XERPHA	10.4	FINCH	10.3	NON	31
MADSEN	WPROT	<0.01	0.29	MADSEN	10.8	XERPHA	10.3	SIGNIFICANT	33
STEPHENS	WPROT	0.01	0.26	STEPHENS	10.7	XERPHA	10.3	SIGNIFICANT	32
TUBBS06	WPROT	0.79	0.68	XERPHA	10.7	TUBBS06	10.6	NON	11
ELTAN	UWHRD	<0.01	3.11	XERPHA	35.2	ELTAN	29.3	SIGNIFICANT	14
FINCH	UWHRD	0.14	3.82	XERPHA	36.7	FINCH	33.9	NON	12
MADSEN	UWHRD	0.71	3.33	MADSEN	32.6	XERPHA	32.0	NON	17
STEPHENS	UWHRD	0.01	2.4	XERPHA	32.5	STEPHENS	29.3	SIGNIFICANT	16
ELTAN	SKHRD	<0.01	1.38	XERPHA	43.3	ELTAN	31.5	SIGNIFICANT	32
FINCH	SKHRD	<0.01	1.5	XERPHA	43.4	FINCH	34.5	SIGNIFICANT	30
MADSEN	SKHRD	0.33	1.87	XERPHA	42.4	MADSEN	41.5	NON	33
STEPHENS	SKHRD	<0.01	1.48	XERPHA	42.3	STEPHENS	30.7	SIGNIFICANT	32
TUBBS06	SKHRD	0.01	1.9	XERPHA	47.3	TUBBS06	44.6	SIGNIFICANT	11
ELTAN	SKWT	<0.01	1.1	XERPHA	38.0	ELTAN	35.6	SIGNIFICANT	32
FINCH	SKWT	<0.01	0.65	XERPHA	38.0	FINCH	35.0	SIGNIFICANT	30
MADSEN	SKWT	<0.01	0.82	XERPHA	37.9	MADSEN	35.3	SIGNIFICANT	33
STEPHENS	SKWT	<0.01	1.14	STEPHENS	45.2	XERPHA	38.5	SIGNIFICANT	32
TUBBS06	SKWT	0.01	1.41	TUBBS06	40.4	XERPHA	38.2	SIGNIFICANT	11
ELTAN	SKWTSD	0.01	0.4	XERPHA	9.0	ELTAN	8.4	SIGNIFICANT	32
FINCH	SKWTSD	<0.01	0.32	XERPHA	9.0	FINCH	7.9	SIGNIFICANT	30
MADSEN	SKWTSD	<0.01	0.35	XERPHA	8.9	MADSEN	8.1	SIGNIFICANT	33
STEPHENS	SKWTSD	<0.01	0.48	STEPHENS	9.8	XERPHA	8.9	SIGNIFICANT	32
TUBBS06	SKWTSD	<0.01	0.46	TUBBS06	9.1	XERPHA	8.3	SIGNIFICANT	11
ELTAN	FYELD	<0.01	0.38	XERPHA	68.9	ELTAN	68.3	SIGNIFICANT	32
FINCH	FYELD	<0.01	0.56	FINCH	70.4	XERPHA	69.0	SIGNIFICANT	31
MADSEN	FYELD	<0.01	0.41	MADSEN	69.4	XERPHA	68.7	SIGNIFICANT	33
STEPHENS	FYELD	<0.01	0.5	STEPHENS	69.5	XERPHA	68.8	SIGNIFICANT	32
TUBBS06	FYELD	<0.01	0.23	TUBBS06	71.8	XERPHA	70.9	SIGNIFICANT	11
ELTAN	BKFYELD	<0.01	0.52	ELTAN	50.1	XERPHA	48.5	SIGNIFICANT	32
FINCH	BKFYELD	<0.01	0.6	FINCH	52.6	XERPHA	48.8	SIGNIFICANT	31
MADSEN	BKFYELD	<0.01	0.49	MADSEN	50.5	XERPHA	48.7	SIGNIFICANT	33
STEPHENS	BKFYELD	0.76	1.06	STEPHENS	48.1	XERPHA	47.9	NON	32
TUBBS06	BKFYELD	0.18	2.73	TUBBS06	48.5	XERPHA	46.8	NON	11
ELTAN	FASH	0.01	0.01	XERPHA	0.38	ELTAN	0.37	SIGNIFICANT	32
FINCH	FASH	<0.01	0.01	FINCH	0.41	XERPHA	0.38	SIGNIFICANT	31
MADSEN	FASH	0.02	0.01	MADSEN	0.39	XERPHA	0.38	SIGNIFICANT	33
STEPHENS	FASH	0.6	0.01	XERPHA	0.38	STEPHENS	0.38	NON	32
TUBBS06	FASH	0.48	0.02	TUBBS06	0.41	XERPHA	0.40	NON	11

Table 3. Analysis of Variance  
Balanced Paired t Test Design

Variety	Test	p-Value	LSD	High Variety	Mean	Low Variety	Mean	Significance	Data Pairs
ELTAN	MSCOR	0.86	0.77	XERPHA	84.4	ELTAN	84.4	NON	32
FINCH	MSCOR	0.24	0.69	FINCH	84.9	XERPHA	84.5	NON	31
MADSEN	MSCOR	0.63	0.73	MADSEN	84.7	XERPHA	84.5	NON	33
STEPHENS	MSCOR	0.02	0.98	STEPHENS	85.6	XERPHA	84.4	SIGNIFICANT	32
TUBBS06	MSCOR	0.43	1.67	TUBBS06	86.7	XERPHA	86.1	NON	11
ELTAN	FPROT	0.19	0.29	ELTAN	9.0	XERPHA	8.8	NON	32
FINCH	FPROT	0.55	0.23	FINCH	8.8	XERPHA	8.8	NON	31
MADSEN	FPROT	<0.01	0.28	MADSEN	9.3	XERPHA	8.6	SIGNIFICANT	33
STEPHENS	FPROT	<0.01	0.22	STEPHENS	9.1	XERPHA	8.6	SIGNIFICANT	32
TUBBS06	FPROT	0.71	0.64	XERPHA	9.0	TUBBS06	8.9	NON	11
ELTAN	FSV	<0.01	0.45	ELTAN	20.0	XERPHA	18.9	SIGNIFICANT	21
FINCH	FSV	0.89	0.42	FINCH	18.9	XERPHA	18.9	NON	21
MADSEN	FSV	0.17	0.5	MADSEN	19.8	XERPHA	19.5	NON	26
STEPHENS	FSV	<0.01	0.51	STEPHENS	20.6	XERPHA	19.4	SIGNIFICANT	27
TUBBS06	FSV	0.08	0.65	TUBBS06	18.6	XERPHA	18.1	NON	11
ELTAN	MABS	0.58	0.99	XERPHA	55.9	ELTAN	55.7	NON	15
FINCH	MABS	0.07	1.11	XERPHA	55.9	FINCH	54.9	NON	15
MADSEN	MABS	0.28	1.01	XERPHA	55.7	MADSEN	55.2	NON	18
STEPHENS	MABS	0.05	1.01	XERPHA	55.8	STEPHENS	54.7	SIGNIFICANT	22
TUBBS06	MABS	0.08	1.56	XERPHA	56.0	TUBBS06	54.6	NON	11
ELTAN	CODI	<0.01	0.08	ELTAN	9.4	XERPHA	9.3	SIGNIFICANT	32
FINCH	CODI	<0.01	0.07	FINCH	9.5	XERPHA	9.3	SIGNIFICANT	31
MADSEN	CODI	0.7	0.07	MADSEN	9.3	XERPHA	9.3	NON	33
STEPHENS	CODI	<0.01	0.05	STEPHENS	9.4	XERPHA	9.4	SIGNIFICANT	31
TUBBS06	CODI	0.14	0.14	XERPHA	9.3	TUBBS06	9.2	NON	10
ELTAN	CAVOL	0.01	37.33	ELTAN	1281	XERPHA	1226	SIGNIFICANT	12
FINCH	CAVOL	0.03	38.98	FINCH	1279	XERPHA	1237	SIGNIFICANT	13
MADSEN	CAVOL	0.18	24.48	XERPHA	1242	MADSEN	1226	NON	13
STEPHENS	CAVOL	0.19	38.42	XERPHA	1230	STEPHENS	1206	NON	10

Table 4. Data set for XERPHA

Obs	YEAR	NURSCO	LABNUM	VAR	LOCATION	TWT	SKHRD	SKWT	SKWTS	WPROT	FYELD	MSCOR	FASH	FPROT	FSV	RVA	MABS	CAVOL	CODI
1	2000	68	680001	MADSEN	PULLMAN	62.4	36	39.8	8	9.5	69.1	88.1	0.33	7.8	22.3	118	55	1200	9.36
2	2000	68	680003	STEPHENS	PULLMAN	62.6	26.1	48.7	10.3	8.9	69.2	86.9	0.35	7.3	22.3	126	54.1	1295	9.4
3	2000	68	680047	XERPHA	PULLMAN	62.5	36.5	41.4	9	8.7	70.6	90	0.33	7.3	21.6	75	55.4	1205	9.2
4	2000	69	690001	MADSEN	LIND	62	40.1	37.2	8.8	11.6	69	84.8	0.38	10.1	21.3	127	57.2	1160	9.14
5	2000	69	690003	STEPHENS	LIND	62	31.2	49.5	12.4	10.8	67.8	83.9	0.37	9.3	21.6	132	54.3	1215	9.29
6	2000	69	690047	XERPHA	LIND	62.8	35.9	39.8	9.1	10.1	69.6	85.5	0.38	8.5	22.6	91	54.7	1288	9.25
7	2001	71	710001	ELTAN	LIND	63.3	29.7	43.9	9.1	15.3	67.8	80.7	0.42	12.6					8.84
8	2001	71	710039	XERPHA	LIND	62.7	33.6	41.8	10.3	15.3	67.6	80.4	0.42	12.8					9.07
9	2001	84	840001	ELTAN	PULLMAN	63.8	37.5	37.9	7.6	10.5	69	90.5	0.29	8.9					9.18
10	2001	84	840039	XERPHA	PULLMAN	62.7	41.3	39.4	7.2	11	68.5	91.1	0.27	9					9
11	2002	103	1030001	MADSEN	LIND	60.5	34.7	32.3	7.1	10.8	66.2	78.7	0.42	9.6	20.3				9.31
12	2002	103	1030002	STEPHENS	LIND	60	17.7	42.2	10.3	10.7	65.4	78.3	0.41	9.2	23.7				9.59
13	2002	103	1030012	XERPHA	LIND	62	33.3	37.9	8.5	10	65.8	79.4	0.4	8.6	21.6				9.59
14	2002	104	1040001	MADSEN	PULLMAN	61.3	35.3	37.2	7.4	10.5	66.9	84	0.35	8.5	20.6			1255	9.45
15	2002	104	1040002	STEPHENS	PULLMAN	61.2	26	45.1	6.6	10.5	67	84.8	0.34	9	20.3			1245	9.61
16	2002	104	1040012	XERPHA	PULLMAN	62.4	33.2	39.7	9	10.7	65.9	82.1	0.36	8.2	21.3			1275	9.55
17	2002	126	1260048	ELTAN		61.3	20.5	32.9	8.1	11.7	65.5	80.3	0.38	10			55.4		9.29
18	2003	63	630001	MADSEN	JORGENSEN ORGANIC	59.4	32.7	34	8.5	6.2	67.8	82.6	0.39	5.5	22.2		52.2		9.77
19	2003	63	630002	ELTAN	JORGENSEN ORGANIC	59.7	15.6	34.3	6.4	5.8	65.9	82.1	0.36	4.9	23.1		53.6	1350	9.6
20	2003	63	630003	STEPHENS	JORGENSEN ORGANIC	59.7	21.5	43.2	7.4	6.1	69.6	86.2	0.37	5.2	23.7		53.2		9.69
21	2003	63	630004	FINCH	JORGENSEN ORGANIC	59.6	11.9	36	7.1	5.5	69.7	83.1	0.42	4.8	23.1		52.6	1390	9.74
22	2003	63	630009	XERPHA	JORGENSEN ORGANIC	59.8	28.7	36.6	8.2	6	66.4	80.2	0.4	5.1	22.5		53.6		9.68
23	2003	63	630010	MASAMI	JORGENSEN ORGANIC	58.7	21.6	35.1	6.9	5.3	69.1	84.9	0.38	4.6	23.4		51.4	1340	9.73
24	2003	72	720001	MADSEN	LIND	62.1	46.2	36.2	8.1	12.5	67.3	80.7	0.41	11	17.9			1205	8.98
25	2003	72	720002	ELTAN	LIND	63.4	34.2	38.6	8.7	12.2	64.8	81.3	0.35	10.5	18.2			1260	9.23
26	2003	72	720003	STEPHENS	LIND	61.8	37.4	49.3	10.4	13.7	65.2	80.6	0.37	11.5	19.5			1170	9.23
27	2003	72	720004	FINCH	LIND	63.5	41.8	37.5	9.1	12.4	67.3	80.1	0.42	10.1	18.6			1265	9.26
28	2003	72	720009	XERPHA	LIND	62.4	45.5	37.6	10.1	12.7	64.5	77.1	0.41	10.6	19.5			1205	9.1
29	2003	72	720010	MASAMI	LIND	62	42	34.9	9.2	12.7	65.5	79	0.4	10.4	18.6			1265	9
30	2003	73	730001	MADSEN	PULLMAN	61.3	38.5	34	7.4	9.4	67.9	87.2	0.32	7.6	20.1			1220	9.4
31	2003	73	730002	ELTAN	PULLMAN	61.1	24.8	33.9	8.3	9.1	66.4	87.2	0.29	7.7	21.3			1300	9.27
32	2003	73	730003	STEPHENS	PULLMAN	60	21.9	42.3	7.8	10	68.2	86.9	0.33	7.9	21.6			1195	9.4
33	2003	73	730004	FINCH	PULLMAN	62.8	32.1	34.1	6.6	9.5	70.2	87.6	0.36	7.8	20.7			1300	9.43
34	2003	73	730009	XERPHA	PULLMAN	61.6	38.4	36.1	7.7	10	67.2	87.6	0.3	8.1	20.1			1200	9.38
35	2003	73	730010	MASAMI	PULLMAN	62	50.6	34.9	7.1	9.2	69.8	90.9	0.3	7	20.1			1215	9.35
36	2003	119	1190010	XERPHA	LIND	62.6	45.8	38.5	8.5	12	66.8	81.3	0.39	10.7					9.07
37	2003	123	1230001	MADSEN	ST JOHN ORGANIC	60.8	37.3	41.6	8.2	9.8	67.6	79.2	0.44	8	21.9			1245	9.25
38	2003	123	1230002	ELTAN	ST JOHN ORGANIC	61.6	27.3	42.1	8.4	9.3	66.6	79.2	0.42	7.8	22.5			1305	9.51
39	2003	123	1230003	STEPHENS	ST JOHN ORGANIC	60.6	24	54	9.6	9.8	69.4	84	0.4	7.9	23.1			1245	9.45
40	2003	123	1230004	FINCH	ST JOHN ORGANIC	62	28.4	40.5	8.7	9.6	70.4	80.8	0.47	7.8	20.7			1320	9.68
41	2003	123	1230009	XERPHA	ST JOHN ORGANIC	61.2	37	44.8	10.4	9.5	67.4	78.9	0.44	7.6	20.1			1275	9.46
42	2003	123	1230010	MASAMI	ST JOHN ORGANIC	60.4	34.4	42.9	9.7	9.7	67.7	79.3	0.44	7.7	18.9			1315	9.49
43	2003	124	1240001	MADSEN	PULLMAN ORGANIC	60.2	32.3	35.7	6.9	10.2	67	84.8	0.34	8.3	19.8				9.27
44	2003	124	1240002	ELTAN	PULLMAN ORGANIC	61.2	28.5	33.6	8	9.5	65.9	83.4	0.34	7.9	20.4			1245	9.48
45	2003	124	1240003	STEPHENS	PULLMAN ORGANIC	60.6	21.3	45.5	7.7	9.7	66.4	85.3	0.32	7.9	22.5				9.56
46	2003	124	1240004	FINCH	PULLMAN ORGANIC	61.8	25	33.6	8.2	9.8	68.4	83.4	0.39	7.7	20.1			1315	9.54
47	2003	124	1240009	XERPHA	PULLMAN ORGANIC	60.6	38.6	35.7	7.5	9.4	67.1	84.3	0.35	7.8	18.6				9.21
48	2003	124	1240010	MASAMI	PULLMAN ORGANIC	59.9	25.7	34.9	8.2	9.5	66.7	84.4	0.34	7.8	19.5			1315	9.38
49	2003	138	1380010	XERPHA	PULLMAN	61.3	39.3	38.5	7.8	10.9	67.7	86.9	0.32	9.1					9.2
50	2003	1071	710001	MADSEN	WATERVILLE	63.1	42.6	41.3	10.3	10	65.9	83.4	0.34	8.3	21.3				9.38
51	2003	1071	710002	ELTAN	WATERVILLE	63.3	33.6	39.5	9.6	9.3	65.4	82.7	0.34	7.8	23.1			1215	9.64
52	2003	1071	710003	STEPHENS	WATERVILLE	62.8	34.9	55.7	12.4	12	65.8	80.7	0.38	9.7	20.7				9.46
53	2003	1071	710004	FINCH	WATERVILLE	64	40.1	40.4	8.9	9.8	69.1	84.3	0.39	8.2	21.3			1255	9.44

Table 4. Data set for XERPHA

Obs	YEAR	NURSCO	LABNUM	VAR	LOCATION	TWT	SKHRD	SKWT	SKWTS	WPROT	FYELD	MSCOR	FASH	FPROT	FSV	RVA	MABS	CAVOL	CODI
54	2003	1071	710009	XERPHA	WATERVILLE	63.3	46.3	42.2	10.2	11.1	67.1	84.9	0.34		8.8	21.3			
55	2003	1071	710010	MASAMI	WATERVILLE	62.2	42.5	40	9.2	8.9	66.2	89.5	0.29		7.2	22.2		1335	9.14
56	2004	90	900001	MADSEN	PULLMAN	60	35.3	34.1	6.8	11.2	69.9	89.1	0.33		9.2				9.34
57	2004	90	900002	ELTAN	PULLMAN	61	22.3	36.1	7.8	10	68.3	88.3	0.31		8.3				9.24
58	2004	90	900003	STEPHENS	PULLMAN	60.3	23.4	44.3	8.8	10.5	69.4	89.1	0.32		8.6				9.61
59	2004	90	900004	FINCH	PULLMAN	62.1	26.1	34.5	7.6	10.3	71.4	90.4	0.34		8.2				9.45
60	2004	90	900006	XERPHA	PULLMAN	61	35	39	7.4	10.4	69.5	89.9	0.31		8.2				9.63
61	2004	1084	840001	MADSEN	PULLMAN	61	46.1	34.2	7.4	11.2	66.9	85.9	0.32		9.7		56.2	1135	9.49
62	2004	1084	840002	ELTAN	PULLMAN	62	34.7	34	8.2	10	64.6	84.3	0.3		8.6		56.1	1230	9.26
63	2004	1084	840003	STEPHENS	PULLMAN	62	37.7	42.9	10.1	11	66.7	86.3	0.31		9.7		56.9	1100	9.43
64	2004	1084	840004	FINCH	PULLMAN	63	33.9	32.5	8	10.7	68.9	87.2	0.34		8.7		55.8	1240	9.55
65	2004	1084	840009	XERPHA	PULLMAN	61.7	44.6	35.7	8.6	11.3	66.1	86.2	0.3		9.5		56.6	1125	9.73
66	2004	1085	850001	MADSEN		62.9	48.5	38.3	10	13.3	65.9	80.8	0.38		11.6		57.1	1190	9.26
67	2004	1085	850002	ELTAN		63.2	35	36.1	9.8	11.5	64	81	0.34		10.4		56	1300	9.49
68	2004	1085	850003	STEPHENS		62.6	38.5	47.3	11	12.1	65.5	82.2	0.35		10.7		55.9	1235	9.27
69	2004	1085	850004	FINCH		63.1	35.6	36.8	8.8	12	68.3	82.6	0.4		10.7		55.6	1305	9.38
70	2004	1085	850009	XERPHA	LIND	62.4	47.3	38.5	10.6	12.7	64.3	79.4	0.37		10.9		57.4	1210	9.07
71	2005	39	390001	MADSEN	PULLMAN	61.7	50.2	33.8	8.5	11	68.4	85.3	0.36		9.5			1195	9.36
72	2005	39	390002	ELTAN	PULLMAN	59.9	40	29.1	9.2	10.2	66.6	83.6	0.35		9.4			1260	9.61
73	2005	39	390003	FINCH	PULLMAN	63.3	42.8	34.1	7.8	10.1	69	84.8	0.38		8.8			1280	9.66
74	2005	39	390004	STEPHENS	PULLMAN	60.4	41.2	40.3	10.8	10.2	68	84.8	0.36		8.9			1125	9.48
75	2005	39	390005	MASAMI	PULLMAN	61.9	47.4	33.1	8.1	10	69.2	86.9	0.35		8.3			1275	9.34
76	2005	39	390010	XERPHA	PULLMAN	61.9	48.8	34	9.1	10.5	68.8	86.4	0.35		9.1			1230	9.45
77	2005	40	400001	MADSEN	PULLMAN	61.7	47.5	34	7.7	9.4	68.8	83.2	0.4		8.2			1280	9.46
78	2005	40	400002	ELTAN	PULLMAN	61.5	40.4	31.8	8.6	9.3	67.3	82	0.39		8.1			1355	9.73
79	2005	40	400003	FINCH	PULLMAN	63.1	40.6	33.7	8.1	9.5	69.3	82.6	0.42		8.2			1300	9.63
80	2005	40	400004	STEPHENS	PULLMAN	62.3	38.6	46.4	9.4	9.5	69.8	85.2	0.39		8.1			1230	9.55
81	2005	40	400005	MASAMI	PULLMAN	62	46	34.5	9	8.9	69.1	85.5	0.37		7.6			1285	9.6
82	2005	40	400010	XERPHA	PULLMAN	62.2	45.2	35.7	8.9	9.6	69.5	85.4	0.38		7			1305	9.43
83	2005	41	410001	MADSEN	PULLMAN	62.3	55.5	33.5	7.9	10.6	69.9	89.7	0.32		9.3				9.52
84	2005	41	410002	ELTAN	PULLMAN	61	45.6	31.4	3.3	9.8	66.9	87.2	0.3		8.2				9.65
85	2005	41	410003	FINCH	PULLMAN	64	41.9	33.5	3.1	9.7	69.7	89.5	0.32		7.8				9.8
86	2005	41	410006	XERPHA	PULLMAN	61.9	56.3	35.7	8.5	10.4	68.7	88.2	0.32		8.2				9.35
87	2005	105	1050001	MADSEN	LIND	60.8	31.2	31.6	7.8	13.2	71.9	85.9	0.42		12.3				9.16
88	2005	105	1050002	ELTAN	LIND	60.5	23.7	30.8	8.6	12.9	68.5	83.5	0.39		11.7				8.96
89	2005	105	1050003	FINCH	LIND	61.1	25.6	31.3	7.8	12.8	72	82.2	0.48		11.6				9.24
90	2005	105	1050006	XERPHA	LIND	60.8	34.1	34.6	7.4	13.2	68.3	82	0.41		11.1				9.02
91	2005	1012	120003	ELTAN	ALMIRA	61.1	30.2	28.9	7.8	11.4	67	79.7	0.42		9.9	20.1	53.1		9.46
92	2005	1012	120004	FINCH	ALMIRA	64	36.7	33.3	7.4	10.1	71	84.8	0.42		8.8	19.8	50.7		9.74
93	2005	1012	120006	MADSEN	ALMIRA	61.9	43.1	31.9	8.1	11.8	69.6	81.7	0.44		10.8	19.8	54.6		9.4
94	2005	1012	120008	STEPHENS	ALMIRA	62.5	31.1	44	10.4	11.2	68.5	84.1	0.38		10.2	21.3	52.8		9.61
95	2005	1012	120027	XERPHA	ALMIRA	62.4	45.4	37.9	9.1	10.5	68.7	83.1	0.4		9	20.4	57.1		9.43
96	2005	2012	120032	ELTAN	ANATONE	61.5	11.6	39.5	7.3	7.4	65.5	79	0.4		6.5	23.1	54.3		9.77
97	2005	2012	120033	FINCH	ANATONE	62.6	18.8	38.8	7.4	7.6	67.9	80.2	0.43		6.2	22.8	53.4		9.79
98	2005	2012	120035	MADSEN	ANATONE	61.3	34.9	37.7	7.7	7.4	67.5	81.6	0.4		6.5	25.2	53		9.85
99	2005	2012	120037	STEPHENS	ANATONE	61.1	21.1	42	8.4	7.5	66	79	0.41		6.5	23.1	53.1		9.63
100	2005	2012	120056	XERPHA	ANATONE	60.4	24.9	43.3	10.3	6.9	65.9	79.6	0.4		5.4	22.2	57.4		9.44
101	2005	3012	120061	ELTAN	COLTON	62.8	36.6	33.2	8.3	12.2	69.4	85.3	0.38		10.4	19.2	57.7		9.45
102	2005	3012	120062	FINCH	COLTON	63.6	43.9	32.6	7.6	11.6	71.3	85.8	0.41		10.2	17.3	57.7		9.52
103	2005	3012	120064	MADSEN	COLTON	61.8	45.8	34	7.7	13.4	70.5	85.4	0.4		11.9	17.6	57.5		9.27
104	2005	3012	120066	STEPHENS	COLTON	62.7	36.2	45.3	9.8	12.2	71.2	86.9	0.39		10.8	19.2	57.6		9.3
105	2005	3012	120085	XERPHA	COLTON	62.9	50.9	34.6	9.3	11.7	69.5	83.5	0.41		9.9	17.3	56.2		9.55
106	2005	4012	120090	ELTAN	REARDAN	61.6	19.8	34.5	8.3	8.8	67.5	82.2	0.39		7.3	21.6	54.1		9.63

Table 4. Data set for XERPHA

Obs	YEAR	NURSCO	LABNUM	VAR	LOCATION	TWT	SKHRD	SKWT	SKWTS	WPROT	FYELD	MSCOR	FASH	FPROT	FSV	RVA	MABS	CAVOL	CODI
107	2005	4012	120091	FINCH	REARDAN	63	22.9	35.9	8.3	9	70.6	83.6	0.43	7.4	20.1		53.8		9.65
108	2005	4012	120093	MADSEN	REARDAN	61.8	36	35.1	8.5	10	70.2	84.4	0.41	8.7	21.3		54.5		9.35
109	2005	4012	120095	STEPHENS	REARDAN	61.2	18.2	43.5	13.3	10.8	70.1	86.2	0.38	9.3	21.3		55.5		9.38
110	2005	4012	120114	XERPHA	REARDAN	61.8	35.8	39.5	9.7	9.7	70.1	88.7	0.34	8.3	20.4		53.7		9.36
111	2005	5012	120119	ELTAN	ST ANDREWS	62.9	27.3	36.6	8.3	9.9	68.4	85.9	0.35	8.8	21.9		55.8		9.65
112	2005	5012	120120	FINCH	ST ANDREWS	64.1	32.8	36.7	8.5	9.7	70.6	85.5	0.4	8.2	19.2		53.5		9.63
113	2005	5012	120122	MADSEN	ST ANDREWS	63.1	44	35.5	8.7	10.8	69.6	86.8	0.36	9.5	21.6		54.6		9.55
114	2005	5012	120124	STEPHENS	ST ANDREWS	62.6	26.1	46.1	12.8	9.9	68.3	89.6	0.29	8.3	22.5		54.1		9.61
115	2005	5012	120143	XERPHA	ST ANDREWS	61.6	36.7	39.2	9.9	8.2	69	84.1	0.39	7	20.1		52.5		9.52
116	2005	6012	120148	ELTAN	MOSES LAKE	59.4	27.2	37.7	10.4	12.7	67.6	78.5	0.45	11.4	17		56.1		9.21
117	2005	6012	120149	FINCH	MOSES LAKE	61.9	32.3	34.7	9.6	12.4	68.7	76.8	0.5	10.5	16.1		55.3		9.51
118	2005	6012	120151	MADSEN	MOSES LAKE	60.1	35.4	33.6	9.9	13.2	68.2	74.2	0.53	11.8	16.4		56.3		9.56
119	2005	6012	120153	STEPHENS	MOSES LAKE	61.6	29.9	46.9	13.1	13.1	68.8	77.5	0.49	11	17		57.1		9.57
120	2005	6012	120172	XERPHA	MOSES LAKE	61.6	45.8	41.3	12	12.3	67.5	78.4	0.45	10.3	16.4		56.2		9.66
121	2006	88	880001	MADSEN	PULLMAN	61.7	37.2	40.6	8.7	11	72.6	91.3	0.35	9.4	17.3			1175	9.65
122	2006	88	880002	ELTAN	PULLMAN	61.7	42.3	31.9	8	10.7	72.9	92.3	0.34	9.4	18.2			1240	9.48
123	2006	88	880003	FINCH	PULLMAN	61.7	47.2	32.2	8.4	10.6	72	91.8	0.33	9.5	17.9			1235	9.81
124	2006	88	880004	MASAMI	PULLMAN	60.9	47.8	31.6	7.9	10.1	73.2	90.8	0.37	9.1	16.1			1280	9.56
125	2006	88	880006	XERPHA	PULLMAN	61.1	51.6	35.3	8	11.4	72.3	90.3	0.36	9.7	16.1			1230	9.32
126	2006	1024	240001	XERPHA	CONNELL	60.6	47.9	37.3	9.1	13.4	72.7	86.3	0.43	12.4				1095	9.2
127	2006	1024	240002	MASAMI	CONNELL	61.8	40.2	38.9	8.6	13.4	73.4	85.9	0.45	12.1				1170	9.44
128	2006	1024	240003	ELTAN	CONNELL	62.3	31.5	39.4	9.2	13.6	72.9	87.8	0.41	12.8				1230	9.02
129	2006	1123	1230001	MADSEN	ST. ANDREWS	59.2	20.7	31.9	5.2	6.7	66.2	82.5	0.36	5.4	19.2			1345	9.99
130	2006	1123	1230002	ELTAN	ST. ANDREWS	59.7	21.8	40.5	8.4	6.5	69.9	85.3	0.39	5.2	18.9			1275	9.89
131	2006	1123	1230003	FINCH	ST. ANDREWS	59.8	31.6	31.4	5.9	6.7	66.5	81.6	0.38	5.7	18.6			1265	9.85
132	2006	1123	1230004	TUBBS	ST. ANDREWS	59	29.8	38.1	7.5	6.4	69.9	85.3	0.39	5	18.9			1295	9.56
133	2006	1123	1230005	MASAMI	ST. ANDREWS	58.7	23.3	33.7	7.3	6.2	69.7	84.4	0.4	4.8	17.6			1335	9.81
134	2006	1123	1230009	XERPHA	ST. ANDREWS	58.7	30.7	36.8	6.8	6.5	68.2	83.1	0.39	5.2	18.6			1350	9.5
135	2006	1124	1240001	MADSEN	ST. JOHN	62.7	34.7	36.9	8.8	10.3	71.4	84.6	0.43	8.9	17			1330	9.54
136	2006	1124	1240002	ELTAN	ST. JOHN	61.7	35.3	45.6	11.3	9.3	72.1	86.2	0.42	7.6	17.3			1275	9.41
137	2006	1124	1240003	FINCH	ST. JOHN	62.1	37.7	38	8.8	9.2	69.7	83.8	0.41	7.7	16.7			1330	9.43
138	2006	1124	1240004	TUBBS	ST. JOHN	61.8	50.3	41.3	10.4	9	71.8	85.2	0.43	7.5	16.1			1280	9.35
139	2006	1124	1240005	MASAMI	ST. JOHN	61.5	42.9	38.4	9.2	8.1	71.7	85.7	0.42	6.7	15.5			1295	9.59
140	2006	1124	1240009	XERPHA	ST. JOHN	62.2	46.2	40.1	10.1	9.2	71.3	85.2	0.42	7.8	16.7			1265	9.32
141	2006	2024	240004	XERPHA	KAHLOTUS	58.1	47.2	31.7	8.4	12.1	70.1	80.4	0.47	10.6				1150	9.22
142	2006	2024	240005	MASAMI	KAHLOTUS	57.3	40	30.2	8.5	13.7	70.5	82.2	0.45	12				1210	9.08
143	2006	3024	240008	XERPHA	LIND LATE	61.4	42.9	40.6	8.7	13	72	88	0.39	11.9				1220	9.2
144	2006	3024	240009	MASAMI	LIND LATE	61.3	39.3	38.7	8.6	12.7	73	89.2	0.39	11.2				1256	9.36
145	2006	3024	240010	FINCH	LIND LATE	61.9	33.9	39.5	7.6	12.6	70.9	87.2	0.38	11.6				1195	9.06
146	2006	4024	240011	XERPHA	LIND	60.7	42.4	40.3	9.2	12.4	71.4	87.2	0.39	11.5				1235	9.05
147	2006	4024	240012	MASAMI	LIND	61.3	46	38	9.1	12.2	72.2	88.2	0.39	10.6				1235	9.13
148	2006	4024	240013	FINCH	LIND	60.6	35.7	37.8	9.9	13	71.5	87.3	0.39	12.1				1225	9.07
149	2006	5024	240015	XERPHA	CENTRAL FERRY	60.8	43.3	43.7	9.4	7.8	72.5	85.4	0.44	6.5				1225	9.29
150	2006	5024	240016	MASAMI	CENTRAL FERRY	60.6	41.4	38.4	7.4	8.9	73.9	86.6	0.45	7.5				1335	9.71
151	2006	5024	240017	FINCH	CENTRAL FERRY	60.7	38.9	37.8	7.8	8.8	71.5	85.4	0.42	8.1				1370	9.68
152	2006	5024	240018	ELTAN	CENTRAL FERRY	61.3	35.3	34.6	7.4	9.3	71.9	87.8	0.39	8.4				1340	9.61
153	2006	7012	120011	MADSEN	ST JOHN	62.6	51.2	34.4	8.1	10.2	73.3	85.8	0.45	8.9	18.9		52.5		9.1
154	2006	7012	120012	ELTAN	ST JOHN	60.8	40	33.6	8.5	9.6	70.9	85.3	0.41	8.7	18.9		53.8		9.4
155	2006	7012	120013	FINCH	ST JOHN	63.1	38.1	34.7	7.7	9.3	73.4	86.6	0.44	8.4	18.6		53.5		9.26
156	2006	7012	120016	XERPHA	ST JOHN	61.8	51.9	39.2	8.9	9.4	71.1	83.6	0.44	8.7	17		55		9.01
157	2006	7012	120025	STEPHENS	ST JOHN	61.5	36.1	40.5	9.6	10.4	73.3	90.3	0.38	8.8	19.5		53.1		9.21
158	2006	7012	120027	TUBBS06	ST JOHN	62.4	51.1	38.1	8.7	9.1	72.4	89.1	0.38	7.5	17.3		51.7		8.8
159	2006	8012	120047	MADSEN	RITZVILLE	62.1	50.3	34.6	8.7	14.5	72.2	85.7	0.43	12.7	16.4		56.5		8.96

Table 4. Data set for XERPFA

Obs	YEAR	NURSCO	LABNUM	VAR	LOCATION	TWT	SKHRD	SKWT	SKWTS	WPROT	FYELD	MSCOR	FASH	FPROT	FSV	RVA	MABS	CAVOL	CODI
160	2006	8012	120048	ELTAN	RITZVILLE	62.9	32.7	37.7	8.5	14.1	71.8	86.4	0.41	12.4	17.6		61		9.31
161	2006	8012	120049	FINCH	RITZVILLE	63.4	29.8	46.6	10	13.5	72.9	87.8	0.41	11.7	16.1		60.9		9.16
162	2006	8012	120052	XERPFA	RITZVILLE	61.2	45.1	37.9	7.5	13.2	70.7	86.3	0.39	11	16.1		59.7		9.09
163	2006	8012	120061	STEPHENS	RITZVILLE	61.5	34.8	43.9	9.7	13.2	74.8	86.4	0.47	11.6	18.6		52.8		8.9
164	2006	8012	120063	TUBBS06	RITZVILLE	61.2	46.1	40.6	9	13.5	71.7	85	0.43	11.5	16.7		54		8.77
165	2006	9012	120083	MADSEN	MOSES LAKE	59.5	45.5	32.3	7.9	12.9	72.9	82.7	0.49	11.5	15.8		55.1		8.89
166	2006	9012	120084	ELTAN	MOSES LAKE	57.6	35	32	8.8	13.7	70.3	81.3	0.46	12.1	16.4		58.1		8.77
167	2006	9012	120085	FINCH	MOSES LAKE	59	38.2	29.8	7.8	13.2	71	81	0.48	11.8	14.6		58.3		8.63
168	2006	9012	120088	XERPFA	MOSES LAKE	60.4	49.1	35.5	10.3	12.9	71	82.2	0.46	10.9	15.8		59		9.04
169	2006	9012	120097	STEPHENS	MOSES LAKE	61.4	38.5	44.5	11.9	12.7	72.8	83.9	0.47	11	17		56.3		9.11
170	2006	9012	120099	TUBBS06	MOSES LAKE	59.9	44.3	39	10.4	13.2	71.7	78	0.54	11.1	15.2		54.8		8.89
171	2006	10012	120119	MADSEN	LAMONT	60.4	50	33.2	7.1	7.9	70	82.2	0.44	6.8	20.1		53.6	1305	8.66
172	2006	10012	120120	ELTAN	LAMONT	61.6	32.3	32.9	6.7	8.2	67.5	84.1	0.36	7	20.1		54.3		9.24
173	2006	10012	120121	FINCH	LAMONT	62.5	36.7	32.7	6.3	8.4	71.1	84.9	0.42	7.2	17		53.1		9.21
174	2006	10012	120124	XERPFA	LAMONT	61.6	51.8	35.1	8.5	9.5	69.6	84.3	0.4	8	17.3		53.5		9.01
175	2006	10012	120133	STEPHENS	LAMONT	62.2	41.5	38.8	8.9	10.9	72.3	88.3	0.39	9.6	19.2		54.3		9.1
176	2006	10012	120135	TUBBS06	LAMONT	61.5	48.9	39.1	8.3	7.8	70.4	85.9	0.39	6.7	19.5		53.3		8.8
177	2006	11012	120155	MADSEN	DAYTON	61.9	54.7	34	7.3	10.8	72.4	88.5	0.39	9.3	18.9		55.2		9.2
178	2006	11012	120156	ELTAN	DAYTON	61.6	35.6	32.5	6.6	9.8	71.3	87.7	0.38	8.5	20.1		55		9.56
179	2006	11012	120157	FINCH	DAYTON	62.6	42.7	31	6.5	10.5	73.7	88.9	0.41	9.4	17.9		54.3		9.65
180	2006	11012	120160	XERPFA	DAYTON	61.7	52.7	35.7	8.1	11.1	71.5	87.3	0.39	9.4	19.8		55		9.22
181	2006	11012	120169	STEPHENS	DAYTON	61.3	39.2	41.1	9.1	10.5	72.1	87.5	0.4	8.7	18.6		55.7		9.5
182	2006	11012	120171	TUBBS06	DAYTON	62	52.1	38	9.2	10.1	72	89.9	0.36	8.6	21		55.6		9.32
183	2006	12012	120191	MADSEN	ALMIRA	62.2	57.6	34.3	7.9	11.8	73.3	91.5	0.36	10.1	20.7		56.6		9.38
184	2006	12012	120192	ELTAN	ALMIRA	62.5	39.2	36	8	11	71.1	87.5	0.38	9.3	20.4		55.8		9.59
185	2006	12012	120193	FINCH	ALMIRA	63.5	43.7	35.4	7.3	10.5	73.4	89.7	0.39	8.9	19.8		55		9.65
186	2006	12012	120196	XERPFA	ALMIRA	61.9	54.4	36.6	8.1	11.2	72.1	88.1	0.39	9.2	20.1		55.8		9.31
187	2006	12012	120205	STEPHENS	ALMIRA	62	38.8	43.6	9.5	9.9	73.7	89.5	0.4	8.5	21		53.3		9.46
188	2006	12012	120207	TUBBS06	ALMIRA	62	48.7	40.4	8.7	9.6	72.8	87.7	0.41	7.8	20.4		53		9.38
189	2007	13012	120004	STEPHENS	DAYTON	62.6	30.3	45.8	8.1	9.8	72.7	92	0.34	8.7	19.5		55.5		9.51
190	2007	13012	120006	TUBBS06	DAYTON	62.4	43.7	40.8	8.7	10.6	71.4	89.1	0.36	8.6	17.6		54.5		9.23
191	2007	13012	120007	XERPFA	DAYTON	62.4	43.8	39.7	7.3	10.5	70.7	88.9	0.35	8.8	17.3		55.6		9.41
192	2007	14012	120030	STEPHENS	HARRINGTON	61.8	24.2	50	10.8	9.1	72	87.3	0.4	8.1	18.9		51.5		9.74
193	2007	14012	120032	TUBBS06	HARRINGTON	60.9	36.2	43	9	9.3	71.4	85.3	0.42	7.9	18.2		54.6		9.61
194	2007	14012	120033	XERPFA	HARRINGTON	60.7	41	38.9	8.5	9.2	70.3	84.5	0.41	7.5	17		54.8		9.41
195	2007	15012	120056	STEPHENS	LIND	61	24	47	8.8	12.3	71.1	86.2	0.4	10.5	21.6		55.8		9.43
196	2007	15012	120058	TUBBS06	LIND	62.1	31	45.4	10.6	12.7	72.6	86.8	0.42	10.9	20.1		56.8		9.1
197	2007	15012	120059	XERPFA	LIND	62.5	36.8	40.5	8.7	11.7	71.3	86.4	0.4	10	19.5		57.4		9.44
198	2007	16012	120082	STEPHENS	MAYVIEW	61.8	36.2	43.2	7.3	10.6	71.7	90.8	0.34	8.5	19.8		54.7		9.49
199	2007	16012	120084	TUBBS06	MAYVIEW	62	43.4	40.7	8.3	9.8	71.9	89.7	0.36	8.4	20.7		55.6		9.21
200	2007	16012	120085	XERPFA	MAYVIEW	63	42.3	40.9	7.5	9.5	71.5	90.5	0.34	8.1	19.2		55.2		9.39
201	2007	17012	120108	STEPHENS	PULLMAN	61	33.3	44	7.6	11.3	72	88	0.39	9.5	19.5		56.4		9.34
202	2007	17012	120110	TUBBS06	PULLMAN	60.8	45.2	39.4	8.6	11.1	71.7	86.9	0.4	9.2	18.2		56.5		9.5
203	2007	17012	120111	XERPFA	PULLMAN	61.6	51	40	7.9	9.5	70.3	84.5	0.41	7.8	19.5		54.6		9.41
204	1998	85	850070	XERPFA	LIND	62.2	24.3	40	11.2	10.5	71.3	87.7	0.38	8.6	22		53.5		9.34
205	1999	128	1280001	MADSEN	PULLMAN	60.3	37.8	37.3	9.7	12.2	72.5	91.1	0.35	10.5	20.6		55		9.19
206	1999	128	1280053	XERPFA	PULLMAN	61.5	41.2	38.9	7.9	10.8	71	92.4	0.3	9.4	22.1		53.6		9.23

**Xerpha** (WA007973) is a selection from a cross of Eltan and Estica made in 1999. A greenhouse breeding technique called single-seed descent was used to rapidly advance this line in the greenhouse to its fifth generation in just two years. Subsequent field selection was based on yield, test weight, disease resistance and general agronomics.

Xerpha is unique in that it has a very broad range of adaptation. It has been the top yielding variety in every precipitation zone for 2006 and 2007 in the WSU Extension Cereal Variety Testing Program where it was compared with 50 other varieties, breeding lines, and varietal blends from 10 other programs at 19 locations. It also has performed extremely well in 2007 N. California, S. Idaho, and Oregon Variety Testing Programs.

Xerpha is named in honor of Xerpha Gaines, WSU botanist.



#### Seed Availability

The Washington State Crop Improvement Association will have foundation seed available for commercial application beginning in the fall of 2008.

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Application for U.S. Plant Variety Protection for Xerpha will be submitted. All seed requests should be sent to the breeder during the period of Protection by the Plant Variety Protection Certificate. Seed of this release is deposited in the National Plant Germplasm system where it will be available after the expiry of the Plant Variety Protection for research purposes, including development and commercialization of new cultivars. It is requested that appropriate recognition be made if this germplasm contributes to the development of new germplasm or cultivars.

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#### WSU Contacts:

##### Winter Wheat Breeding:

Stephen Jones, Breeder.....335-6198  
Steve Lyon, Sr. Scientific Asst.....335-4877  
Genetics lab, Rm.236 VPBS.....335-5462

##### Mailing addresses:

Stephen S. Jones/Steven R. Lyon  
Dept. of Crop and Soil Sciences  
Washington State University  
PO Box 646420  
Pullman, WA 99164-6420  
E-mail: [joness@wsu.edu](mailto:joness@wsu.edu)  
[slyon@wsu.edu](mailto:slyon@wsu.edu)



Xerpha Gaines, WSU campus plots 1911.

**THE WASHINGTON**

**AGRICULTURAL RESEARCH**

**CENTER**

**WASHINGTON STATE UNIVERSITY**

**PULLMAN, WASHINGTON**

**IS PROUD TO ANNOUNCE THE**

**RELEASE OF**

**XERPHERA**

**Soft White Winter Wheat**



## Xerpha

Xerpha is a soft white winter wheat highly adapted to a broad range of production zones in the Pacific Northwest.

Outstanding characteristics of Xerpha are high grain yield, excellent test weight, cold tolerance and disease resistance.

### Description

Xerpha is a semi dwarf, soft white winter wheat with mid-season maturity, common head type, awned, with white straw and white chaff.

### Grain Yield

2006-2007 Yield as a % of Madsen

Precip.	Xerpha	Madsen	Eltan	Tubbs
<16"	112	100	99	111
16-20"	106	100	95	106
>20"	107	100	95	107
Irrigated	100	100	78	100

WSU Variety Testing

### Test Weight

2006-2007 Test wt. in lbs/bu

Precip.	Xerpha	Madsen	Eltan	Tubbs
<16"	59.0	59.3	59.2	58.8
16-20"	59.7	59.9	59.7	58.6
>20"	58.9	58.9	58.8	57.9
Irrigated	58.8	58.6	57.2	57.9

WSU Variety Testing

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## Physical Features

### Heading Date

2006-2007 Julian days to heading

Precip.	Xerpha	Madsen	Eltan	Tubbs
<16"	152	152	154	149
16-20"	156	155	157	153
>20"	161	161	163	159
Irrigated	147	148	148	145

WSU Variety Testing

### Plant Height

2006-2007 Plant height in inches

Precip.	Xerpha	Madsen	Eltan	Tubbs
<16"	32.5	32.0	33.5	33.3
16-20"	39.0	38.3	39.7	40.4
>20"	38.8	38.5	39.5	39.4
Irrigated	36.1	35.6	37.0	37.0

WSU Variety Testing

### Coleoptile length

millimeters

Xerpha	Madsen	Eltan	Tubbs
69.4	66.8	71.5	58.3

WSU Winter Wheat Program

### Winter Survival index

1 = poor, 5 = medium, 10 = excellent

Xerpha	Madsen	Eltan	Tubbs
8	5	8	4

USDA-ARS Wheat Genetics, Quality, Physiology and Disease Research Unit, Pullman, WA

## Disease Reactions

Disease	Xerpha	Madsen	Eltan	Tubbs
Common Bunt	--	R	MR	R
Dwarf Bunt	MR	MR	MR	S
Flag Smut	--	MS	MS	--
Leaf Rust	--	MR	S	MS
Stripe Rust	MR	R	MR	MS
Stem Rust	--	R	S	--
Ceph. Stripe tolerance	5	5	6	1
Straw-breaker Foot rot	T	R	S	R
Snow mold	MR	S	MR	MR

\*VS = Very Susceptible; MS = Moderately susceptible; MR = Moderately Resistant; R = Resistant, T = Tolerant; 1 = poor, 5 = medium, 10 = excellent  
 USDA-ARS Wheat Genetics, Quality, Physiology and Disease Research Unit, Pullman, WA  
 WSU Plant Pathology, Pullman, WA

### Quality

Xerpha displays good grain milling and end-use quality, essentially equivalent to established varieties.

USDA-ARS Wheat Genetics, Quality, Physiology and Disease Research Unit, Pullman, WA

To Whom It May Concern:

Variance Statement for Xerpha Soft White Winter Wheat

Xerpha Soft White Winter Wheat may contain up to a total of 10 in one pound of seed of the following naturally occurring variant:

**Red Seed**

In addition to the above variant the following variants have been observed in Xerpha:

Height variation (2" – 8" taller) may occur at a rate of 1/10,000. Height variation will be more noticeable under higher yield environments.

Awnless heads; and club type heads may occur at a rate of 1/ 80,000 for heads combined, that are otherwise typical for this variety

These variants described are distinct within the variety and are stable and predictable with a degree of reliability comparable to other varieties of the same kind, and within recognized tolerances, when the variety is reproduced or reconstructed and was originally part of the variety when released.

  
Steven R. Lyon  
Breeder