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Final Report

# **RYEGRASS CULTIVAR TRIAL 2005-2007**

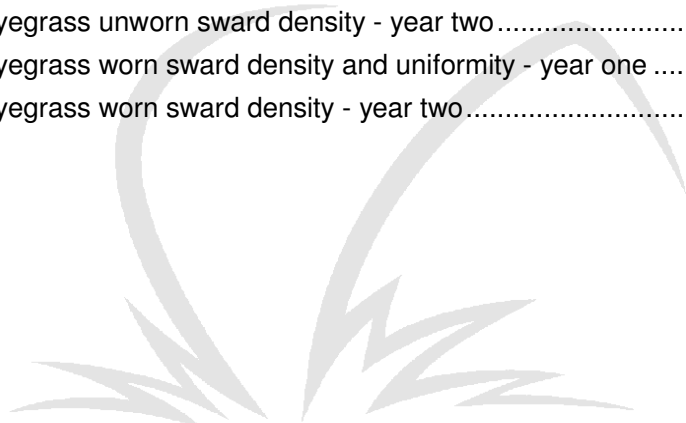
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# CONTENTS

TRIAL OBJECTIVE .....	1
MATERIALS AND METHODS .....	1
Site details.....	1
Variety details.....	1
Species.....	1
Cultivars.....	2
Trial maintenance.....	2
Assessments.....	3
Industry standard.....	3
Data collection, processing and statistical analysis.....	4
RESULTS .....	5
Early seedling establishment vigour.....	5
Early seedling establishment density.....	5
Disease incidence .....	6
Colour .....	7
Unworn sward density and uniformity (year one) and density (year two) .....	9
Worn sward density and uniformity (year one) and density (year two) .....	12
TABLES .....	5
Table 1: Ryegrass early seedling establishment vigour and density .....	5
Table 2: Ryegrass early seedling establishment vigour and density .....	6
Table 3: Red Thread severity.....	7
Table 4a: Spring 2005 colour description .....	8
Table 4b: Autumn 2006 colour description.....	8
Table 4c: Spring 2006 colour description.....	9
Table 4d: Summer 2007 colour description.....	9
Table 5a: Ryegrass unworn sward density and uniformity - year one .....	10
Table 5b: Ryegrass unworn sward density - year two.....	11
Table 6a: Ryegrass worn sward density and uniformity - year one .....	12
Table 6b: Ryegrass worn sward density - year two.....	13



## TRIAL OBJECTIVE

A total of 23 perennial ryegrasses cultivars were sown in April 2005 in a comparative trial at NZSTI, Auckland.

The objectives of the trial were:

1. To evaluate a range of ryegrass cultivars under wear, and no wear conditions.
2. To provide participating seed companies with comparative information about the performance of their turfgrass varieties. The trial was intended to be maintained under normal council sports field conditions. The low fertility of the site meant that the trial was effectively conducted under low maintenance fertility.

## MATERIALS AND METHODS

### Site details

Location:	NZSTI, Auckland
Soil type:	Clay loam, pipe drained
Mean annual rainfall:	1162 mm
Mean relative humidity:	89% (Mar-May), 94.2% (Jun-Aug), 84.9% (Sep-Nov), 86.1% (Dec-Feb)
Mean monthly temperature:	16.2°C (Mar-May), 11.6°C (Jun-Aug), 14.6°C (Sep-Nov), 19.2°C (Dec-Feb),
Trial design:	Completely randomised
Plot size:	1.75 m by 1.75 m
Replication:	Three per cultivar

### Variety details

*Species:* Perennial ryegrass (*Lolium perenne*)



*Cultivars*

<b>Participant</b>	<b>Cultivar</b>
Cropmark Seeds	Green magic
DLF Seeds Ltd	All*Star 2 Keystone Gator 3 Essence Tophat II Ponderosa Elfkin Greenway Margarita
Evans Turf Supplies Ltd	Reliant Inspire
PGG Wrightson Seeds Ltd	Colosseum Centurion Excalibur Tambour Joust prima Camelot PI6562 PI6563
Prebble Seeds Ltd	SR4200 SR4500 PreRye3

**Trial maintenance**

Seeding date: 8 April 2005

Seeding rate: 35 g/m<sup>2</sup>

Mowing: Weekly, clippings returned, height of cut 35 mm.

Irrigation: No regular irrigation applied.

Fertiliser: Four times per annum with ammonium sulphate at 120 kg/N/ha per year.

Weed control: Broadleaf weeds were controlled with two applications of broad-spectrum selective herbicide per year in July and November 2005 and,

April and December 2006. *Poa annua* hand weeded as required. Weed control treatments were ineffectual in 2006 resulting in patchy invasion of weeds such as white clover and *Oxalis corniculata*. Weed invasion could have affected scoring. The nitrogen fixing effect of white clover could have benefited some cultivars.

Pest control: None.

Wear: Year one wear was applied fortnightly from 25 July to 25 September 2005, 4 to 8 passes of a standard wear machine.

Year two wear was applied fortnightly 3 May to 31 May, 4 passes of a standard wear machine. Further wear was applied 17 and 21 August 2006, 8 and 2 passes respectively.

Disease: No fungicides were used to control disease. The only significant disease has been red thread and rust.

### Assessments

*Early seedling establishment vigour:* Plots were scored for early seedling vigour using a 1-9 scale to give a visual assessment of how quickly the plants were growing and establishing with 1 being low vigour (bare ground) and 9 being high vigour (very dense, rapid ground coverage).

*Early seedling establishment density:* Plots were scored for early seedling density using a 1-9 scale to give a visual assessment of how quickly the plants were to establish with 1 being bare ground and 9 being very dense ground cover.

*Density and uniformity:* Year one; plots were scored using a 1-9 scale to give a visual assessment of the number and uniformity of plants per unit area, with 1 being bare ground and 9 being very dense/uniform.

Density: Year two; plots were scored for sward density using a 1-9 scale to give a visual assessment of the density of plants per unit area, with 1 being bare ground and 9 being very dense. **Invasion of the sward by weeds due to low maintenance, low management inputs made scoring for uniformity no longer relevant. Density was scored only on areas not affected by weeds.**

*Disease incidence:* Scored for red thread on unworn plots only using a 0-5 scale, with 0 being no red thread, 5 being severe outbreak.

*Colour:* Scored on unworn plots using a three-colour scale of light green, medium green, and dark green as an indication of overall unworn plot colour on the date of the assessment, under low management inputs of the trial. Colour assessments do not necessarily reflect the inherent colour of the genotype.

*Worn density and uniformity (damage/recovery):* As for unworn density and uniformity scoring above.

### Industry standard

No "industry standard" was used in this trial.

## Data collection, processing and statistical analysis

Results were grouped into appropriate time periods (e.g. density/uniformity for each year), as follows:

### *Unworn plots*

Early seedling establishment vigour:	Measurement on 29/04/05
Early seedling establishment density:	Measurement on 8/06/05
Density and uniformity:	For year one, measurements pooled from 25/08/05, 28/11/05, 21/12/05, 4/04/06
Density:	For year two, measurements pooled from 29/05/06, 20/06/06, 11/07/06, 21/07/06, 3/08/06, 8/09/06, 27/11/06, 22/02/07, 4/05/07
Disease incidence:	Measurements pooled from 14/09/05, 28/11/05, 20/12/05, 12/01/06, 26/04/06
Colour:	Measurement made on 28/11/05, 4/04/06, 27/11/06, 22/02/07

### *Worn plots*

Density and uniformity:	For year one, measurements pooled from 25/08/05, 28/11/05
Density:	For year two, measurements pooled from 29/05/06, 20/06/06, 11/07/06, 21/07/06, 3/08/06, 8/09/06

Results were statistically analysed using multiple sample comparison function of Statgraphics Centurion XV version 15.0.10 with the least significant difference (LSD) used to determine cultivar differences at the 5% probability level. Means were grouped using Duncan's Multiple Range Test. Means with the same letter in each column are not significantly different. Note: ns = Not Significant; \* =  $p < 0.05$ ; \*\* =  $p < 0.01$ ; \*\*\* =  $p < 0.001$ .



## RESULTS

### Early seedling establishment vigour

The results for early establishment vigour are shown in Table 1. At 21 days Green Magic had a significantly lower early establishment vigour compared to the other cultivars. All other cultivars recorded similar early establishment vigour (range 7.3 to 4.0).

**Table 1: Ryegrass early seedling establishment vigour**

Cultivar name	Vigour
	29/04/05
	21 Days after seeding
Tambour	7.3a
Centurion	7.0ab
All*Star 2	7.0ab
Tophat II	7.0ab
Elfkin	7.0ab
Essence	7.0ab
Camelot	6.7abc
Greenway	6.7abc
SR4200	6.7abc
SR4500	6.7abc
Gator 3	6.3bcd
Keystone	6.3bcd
Inspire	6.3bcd
Margarita	6.3bcd
Colosseum	6.0cd
Excalibur	6.0cd
Ponderosa	6.0cd
PreRye3	6.0cd
PI6562	6.0cd
PI6563	6.0cd
Reliant	6.0cd
Joust Prima	5.7d
Green Magic	4.0e
Significance	***
CV%	12.03
LSD 5% level	0.7

### Early seedling establishment density

By 61 days after sowing early establishment density scores were all in the range 9 to 6.7 (Table 2). There were significant differences between the highest scoring cultivars with scores in the range 9.0 to 8.7 compared to the more slowly establishing cultivars (range 6.7 to 7.3).

**Table 2: Ryegrass early seedling establishment density**

Cultivar name	Density
	08/06/05
	61 Days after seeding
Centurion	9.0 a
All*Star 2	8.7a
Gator 3	8.7a
Keystone	8.7a
SR4200	8.7a
Tophat II	8.7a
Elfkin	8.3ab
Essence	8.3ab
Greenway	8.3ab
Inspire	8.3ab
Ponderosa	8.3ab
PreRye3	8.3ab
Reliant	8.3ab
Excalibur	8.0abc
Margarita	8.0abc
SR4500	8.0abc
Camelot	7.3bcd
Colosseum	7.3bcd
Joust Prima	7.3bcd
Tambour	7.3bcd
PI6562	7.0cd
PI6563	7.0cd
Green Magic	6.7d
Significance	***
CV%	10.24
LSD 5% level	1.0

**Disease incidence (red thread)**

Red thread was noted in a number of cultivars in the spring of 2005 and the outbreak continued through the summer and into autumn 2006. Plots were scored for red thread severity on five occasions during this period (Table 3). All cultivars suffered from red thread infection at various stages during this spring to autumn period. None of the differences between cultivars were significant.



**Table 3: Red thread severity scores**

Cultivar name	Red thread					Mean
	Measurement date					
	14/09/05	28/11/05	20/12/05	12/01/06	26/04/06	
	Days after sowing					
	159	234	256	277	383	
SR4200	0.3	0.3	1.3	3.7	1.0	1.3
Green Magic	0.7	1.0	2.3	4.3	1.3	1.9
Keystone	0.0	2.0	2.0	4.3	1.3	1.9
Tambour	0.3	1.7	2.0	3.7	2.0	1.9
Camelot	0.0	2.7	2.7	4.7	1.3	2.3
Tophat II	0.0	2.0	3.3	4.7	1.3	2.3
Excalibur	1.3	2.7	1.7	3.7	2.3	2.3
Essence	0.0	2.0	3.7	4.7	1.3	2.3
PreRye3	1.0	3.0	2.0	3.7	1.7	2.3
SR4500	0.3	2.0	2.7	4.3	2.7	2.4
Colosseum	0.0	3.3	3.3	4.0	2.0	2.5
PI6562	0.7	2.7	4.0	4.0	1.0	2.5
Centurion	0.0	2.7	3.0	4.7	2.0	2.5
All*Star 2	0.0	3.0	3.3	4.3	2.0	2.5
Ponderosa	0.3	3.3	3.0	4.3	2.0	2.6
Elfkin	0.0	2.3	3.7	4.3	2.7	2.6
PI6563	0.0	2.7	4.7	4.7	1.7	2.7
Inspire	0.0	3.0	4.3	4.7	1.3	2.7
Joust Prima	1.0	4.0	3.3	4.7	1.7	2.9
Margarita	0.3	4.0	4.3	4.3	1.3	2.9
Reliant	0.0	4.0	4.7	4.7	1.7	3.0
Greenway	3.3	3.3	4.3	3.3	1.3	3.1
Gator 3	0.0	3.3	4.3	4.7	3.0	3.1

No significant difference between cultivars

### Colour

Tables 4a to 4d classifies the different cultivars according to three shades of green (light, medium, dark green) as scored once in each of the following seasons; spring 2005, autumn 2006 spring 2006 and summer 2007.



**Table 4a: Ryegrass colour description - spring 2005**  
(as scored on 28 November 2005)

<b>Light green</b>	<b>Medium green</b>	<b>Dark green</b>
Tambour	Colosseum	Inspire
PI6562	Camelot	Tophat II
Margarita	Ponderosa	All*Star 2
	Elfkin	Gator 3
	Green Magic	
	SR4200	
	Greenway	
	Centurion	
	SR4500	
	Excalibur	
	PreRye3	
	Essence	
	Keystone	
	PI6563	
	Reliant	
	Joust Prima	

**Table 4b: Ryegrass colour description - autumn 2006**  
(as scored on 4 April 2006)

<b>Light green</b>	<b>Medium green</b>	<b>Dark green</b>
Tambour	Elfkin	Inspire
PI6562	SR4200	Tophat II
Margarita	Centurion	All*Star 2
PI6563	SR4500	Gator 3
Reliant	PreRye3	Green Magic
Joust Prima	Essence	
Colosseum	Keystone	
Camelot		
Ponderosa		
Greenway		
Excalibur		



**Table 4c: Ryegrass colour description -spring 2006**  
(as scored on 27 November 2006)

Light green	Medium green	Dark green
Colosseum	Ponderosa	Green Magic
Camelot	Elfkin	Tophat II
Tambour	SR4200	All*Star 2
Excalibur	Greenway	Gator 3
Margarita	Inspire	
Joust Prima	PI6562	
PI6563	Centurion	
	SR4500	
	PreRye3	
	Essence	
	Keystone	
	Reliant	

**Table 4d: Ryegrass colour description - summer 2007**  
(as scored on 22 February 2007)

Light green	Medium green	Dark green
PI6562	Colosseum	Camelot
	Ponderosa	All*Star 2
	Elfkin	
	Green Magic	
	SR4200	
	Greenway	
	Tambour	
	Inspire	
	Centurion	
	SR4500	
	Excalibur	
	PreRye3	
	Essence	
	Tophat II	
	Keystone	
	Margarita	
	Gator 3	
	Reliant	
	Joust Prima	
	PI6563	

**Unworn sward density and uniformity (year one) and density (year two)**

Scores for unworn sward density and uniformity in year one and density in year two are presented in Tables 5a and 5b respectively.

Some significant differences were recorded in the first year of measurements (Table 5a) between the higher scoring cultivars (Tophat II, Centurion, SR4500) and the lowest scoring cultivars (Ponderosa, PI6563, Joust Prima).

In the second year of measurements (Table 5b) significant differences between cultivars were only measured on three dates and as in year one the differences were only significant between the highest scoring cultivars and the lowest scoring cultivars.

**Table 5a: Ryegrass unworn sward density and uniformity - year one**

Cultivar name	Sward density and uniformity				Mean
	Measurement date				
	25/08/05	28/11/05	20/12/05	4/04/06	
	Days after sowing				
139	234	255	361		
Tophat II	8.3ab	7.0a	7.0	6.7a	7.3a
Centurion	8.0abc	7.0a	7.0	6.3ab	7.1ab
SR4500	7.7abc	7.0a	7.3	6.3ab	7.1ab
Inspire	8.7a	6.0bc	6.7	6.0abc	6.8abc
Gator 3	8.0abc	6.3abc	6.7	6.3ab	6.8abc
SR4200	8.3ab	5.7c	7.0	6.3ab	6.8abc
Essence	7.7abc	6.7ab	6.3	6.7a	6.8abc
Excalibur	8.3ab	6.3abc	6.3	6.0abc	6.8abcd
All*Star 2	7.7abc	6.7ab	7.0	5.3abcde	6.7abcd
Greenway	7.7abc	7.0a	6.0	6.0abc	6.7abcd
Elfkin	8.0abc	5.7c	6.7	6.0abc	6.6abcde
Camelot	7.7abc	6.3abc	6.3	5.7abcd	6.5bcdef
Margarita	7.3bc	6.3abc	7.0	5.3abcde	6.5bcdef
Keystone	8.0abc	5.7c	6.7	5.3abcde	6.4bcdefg
Green Magic	7.3bc	6.0bc	6.3	6.0abc	6.4bcdefg
PreRye3	8.0abc	6.0bc	6.0	5.7abcd	6.4bcdefg
Reliant	7.7abc	6.3abc	6.3	5.0abcde	6.3cdefg
PI6562	7.7abc	6.0bc	6.3	4.7bcde	6.2cdefg
Colosseum	7.3bc	5.7c	6.3	5.3abcde	6.2cdefg
Tambour	7.3bc	6.0bc	6.3	4.7bcde	6.1defg
Ponderosa	8.0abc	6.3abc	5.7	3.7e	5.9efg
PI6563	7.0c	6.3abc	6.0	4.0de	5.8fg
Joust Prima	7.0c	6.0bc	5.7	4.3cde	5.8g
Significance	*	**	ns	**	***
CV%	7.69	9.42		19.67	7.59
LSD 5% level	0.8	0.8		1.4	0.6

**Table 5b: Ryegrass unworn sward density - year two**

Cultivar name	Sward density									Mean
	Measurement date									
	29/05/06	20/06/06	11/07/06	21/07/06	3/08/06	8/09/06	27/11/06	22/02/07	4/05/07	
	Days after sowing									
	416	438	459	469	481	517	597	684	755	
Tophat II	6.3	7.3	7.0ab	7.7a	7.7	8.3a	7.3	5.0	5.0	6.9
Centurion	5.7	7.3	7.3a	7.3ab	7.0	8.0ab	7.0	6.3	5.7	6.9
SR4200	6.0	7.3	7.3a	7.3ab	7.0	7.7abc	7.0	6.0	4.7	6.7
Excalibur	6.0	6.7	7.3a	7.0abc	8.0	7.3abc	7.0	6.0	5.0	6.7
Green Magic	5.7	6.7	7.3a	6.7abcd	7.0	7.7abc	6.7	6.3	6.0	6.7
SR4500	5.7	7.0	7.3a	7.3ab	7.0	8.0ab	7.0	5.7	4.7	6.6
All*Star 2	6.0	7.0	6.7ab	7.0abc	7.0	7.3abc	6.7	6.3	5.0	6.6
PreRye3	6.0	7.0	7.0ab	7.3ab	7.7	7.3abc	6.7	5.3	4.3	6.5
Camelot	5.7	6.3	7.0ab	6.3abcd	6.7	7.0bc	7.3	6.7	4.7	6.4
Greenway	5.3	6.7	7.0ab	6.7abcd	7.0	7.7abc	6.3	5.3	4.7	6.3
Inspire	6.7	6.7	6.7ab	6.3abcd	7.0	6.7cd	6.3	5.3	4.3	6.2
Elfkin	5.7	6.7	6.3ab	6.3abcd	7.0	7.3abc	6.3	5.3	4.7	6.2
Margarita	6.0	6.7	7.0ab	6.7abcd	7.0	7.0bc	6.7	4.7	3.7	6.1
Gator 3	5.7	6.0	6.0b	6.3abcd	7.0	7.0bc	6.7	5.3	4.7	6.1
Essence	5.7	6.0	7.0ab	7.0abc	6.7	7.3abc	6.7	5.0	3.0	6.0
Keystone	6.3	6.7	6.7ab	6.0bcd	6.3	7.0bc	6.3	4.7	3.7	6.0
PI6562	5.0	6.0	6.3ab	5.7cd	6.0	7.0bc	6.3	5.7	5.0	5.9
Reliant	4.7	6.3	6.0b	6.0bcd	6.0	7.7abc	6.7	5.7	4.0	5.9
Tambour	5.3	6.0	6.3ab	5.3d	6.3	6.7cd	6.0	5.7	5.0	5.9
Colosseum	5.3	6.0	6.7ab	5.7cd	7.0	6.7cd	6.7	4.7	3.7	5.8
Joust Prima	5.0	6.0	6.0b	5.7cd	6.0	7.0bc	6.0	5.7	4.7	5.8
PI6563	4.7	6.3	6.3ab	6.0bcd	6.0	6.7cd	6.3	5.0	4.3	5.7
Ponderosa	4.7	6.0	6.0b	5.3d	6.3	5.7d	5.3	4.3	3.3	5.2
Significance	ns	ns	*	*	ns	**	ns	ns	ns	ns
CV%			10.16	14.88		10.86				
LSD 5% level			1.0	1.4		1.1				

**Worn sward density and uniformity (year one) and density (year two)**

Worn sward density and uniformity for year one and density for year two are presented in Tables 6a and 6b, (w) indicates measurements recorded during a period when wear was being applied.

No significant differences were found between cultivar worn density and uniformity or density scores for any measurement date for either year.

**Table 6a: Ryegrass worn sward density and uniformity – year one**

Cultivar name	Sward density and uniformity			Mean
	Measurement date			
	25/08/05	28/11/05	20/12/05	
	Days after sowing			
	139(w)	234	255	
Centurion	8.0	6.3	6.3	6.9
Gator 3	8.0	5.7	4.7	6.1
Inspire	7.7	5.3	5.0	6.0
Tophat II	7.7	5.3	5.0	6.0
SR4500	7.3	5.0	5.3	5.9
Margarita	7.7	5.0	5.0	5.9
All*Star 2	8.0	4.3	5.3	5.9
Essence	7.7	5.0	4.7	5.8
SR4200	7.3	4.7	5.0	5.7
Greenway	7.3	5.3	4.3	5.7
Excalibur	8.0	4.0	5.0	5.7
Keystone	8.0	4.3	4.0	5.4
Camelot	7.0	4.7	4.7	5.4
PreRye3	7.7	4.0	4.7	5.4
Elfkin	7.3	4.7	4.0	5.3
Joust Prima	7.3	4.3	4.0	5.2
Reliant	7.3	4.3	4.0	5.2
Ponderosa	7.0	4.7	3.7	5.1
Green Magic	7.3	5.0	3.0	5.1
PI6562	6.7	4.7	4.0	5.1
Tambour	6.3	4.0	4.7	5.0
PI6563	7.7	4.3	3.0	5.0
Colosseum	6.7	3.7	4.0	4.8

No significant differences between cultivars



**Table 6b: Ryegrass worn sward density for year two**

Cultivar name	Sward density									Mean
	Measurement date									
	29/05/06	20/06/06	11/07/06	21/07/06	3/08/06	8/09/06	27/11/06	22/02/07	4/05/07	
	Days after sowing									
	416(w)	438	459	469	481	517	597	684	755	
Centurion	4.3	4.3	5.7	5.7	6.0	5.0	4.7	5.7	5.3	5.6
Tophat II	4.3	4.7	5.0	5.3	5.3	5.3	4.7	5.0	4.3	5.2
All*Star 2	4.3	4.3	5.0	4.7	5.0	5.3	5.0	5.7	4.7	5.1
PreRye3	4.3	5.0	5.0	5.7	6.0	4.7	4.0	6.0	3.7	5.1
SR4200	4.7	4.3	5.3	5.7	5.3	4.7	4.3	5.0	4.0	5.0
Excalibur	4.3	3.7	5.3	5.3	5.7	4.3	5.0	5.7	4.0	5.0
SR4500	4.3	4.0	5.3	5.0	5.3	4.7	5.0	4.3	4.3	5.0
Camelot	4.0	3.7	5.0	4.3	5.0	5.7	5.3	6.0	4.3	5.0
Greenway	4.3	4.0	5.0	5.0	5.3	5.7	4.7	4.3	4.3	5.0
Inspire	4.3	5.0	5.0	5.0	5.0	4.7	4.3	4.7	3.7	5.0
Margarita	4.3	4.3	5.0	4.7	5.0	6.0	4.7	4.3	3.3	4.9
Gator 3	3.7	4.0	5.0	4.3	4.7	5.3	4.3	4.7	4.3	4.9
Green Magic	4.0	4.3	5.0	4.7	5.0	5.3	4.7	5.7	4.0	4.8
Keystone	4.3	4.7	5.0	4.3	5.0	5.0	4.3	5.0	4.0	4.8
Elfkin	4.0	4.0	4.7	4.7	5.0	5.3	4.7	5.0	4.3	4.8
Essence	4.3	3.7	4.7	4.7	4.7	4.7	3.7	4.3	3.3	4.6
Colosseum	3.7	3.7	4.7	4.7	5.0	5.0	4.7	5.0	4.0	4.6
Joust Prima	3.7	4.0	4.7	3.7	4.0	5.3	4.0	5.3	4.3	4.6
PI6562	3.7	4.0	5.0	4.0	4.7	4.3	4.0	5.0	4.7	4.6
Tambour	4.0	4.0	4.3	4.0	4.3	4.7	4.3	5.0	4.3	4.5
PI6563	3.3	4.0	4.7	4.0	4.3	5.3	4.0	5.0	4.0	4.5
Reliant	3.7	4.0	4.7	4.0	3.7	5.3	3.7	5.0	3.3	4.4
Ponderosa	3.7	3.7	4.3	4.0	4.0	4.7	4.0	4.7	3.3	4.3

No significant differences between cultivars