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Tulelake Farm Advisor Update

March 2012

Zebra Chip Found in the Klamath Basin

By Rob Wilson, Tulelake Farm Advisor

Zebra Chip, a new disease in the United States, was found in stored potatoes that were grown in Siskiyou County in 2011. The identification and presence of the bacterium was confirmed with molecular testing (PCR). The incidence of potatoes exhibiting Zebra Chip symptoms was very low. Why and how the disease arrived in the Klamath Basin is unknown. Whether or not this disease will return in 2012 is also unknown given the biology of the vector (Potato Psyllid) and the bacterium that causes the disease (*Candidatus Liberibacter*).

The following information is provided to help with understanding, identification, and control of this new disease. Several website links with more detailed articles about Zebra Chip and Potato psyllids are also listed. Given potato psyllids are the known vector of Zebra Chip, monitoring psyllid populations and the percentage of potato psyllids carrying the bacterium is extremely important. Unfortunately, potato psyllids are not easy to trap and current trapping methods have provided inconsistent results. Oregon State University operated a network of insect traps throughout the Klamath Basin during the past several years. However, potato psyllids have never been trapped to date. Growers interested in trapping for psyllids in 2012 should contact Brian Charlton to coordinate trapping efforts.

General Information about Zebra Chip

- Zebra chip has been reported in many states including California, Colorado, Kansas, Nebraska, New Mexico, Wyoming, Oregon, Idaho and Washington.
- In 2011, several positive samples were reported in the Columbia Basin.
- The disease reduces potato yield and tuber quality.
- Zebra chip is especially problematic for chip producers because the disease causes a dark striped pattern of necrosis in tubers that is enhanced when tubers are sliced and fried.
- To date, all potato varieties are affected to some extent by the disease.
- The bacterium is vectored by the potato psyllid. This small insect lays eggs on the potato plant, which hatch into nymphs, and mature into adults. Eggs laid by an adult with the bacterium pass the bacterium to future nymphs and adults.
- Potato psyllids are frequent movers and can spread over long distances. Psyllids have been shown to migrate from the south and arrive in the lower Columbia Basin around early July.

In-Season Zebra Chip Identification and Potato Psyllid Monitoring

- Plants affected by Zebra Chip at an early stage have symptoms that can be confused with Beet Leafhopper Virulence Agent, Potato Leafroll Virus, or Psyllid Yellows. Infected plants have stunting, chlorosis, leaf scorching, leaf curling, are bushy, and may have aerial tubers.
- Infected plants in the field can die early. Often times a small circular patch of plants killed by the bacterium can be seen among green plants.
- Yellow sticky cards can be used to detect first occurrence of psyllid adults. Place yellow sticky cards **in the field**, **near field edges**. Psyllids are difficult to trap, and trap counts do not correlate to psyllid numbers in the field. Sweep net sampling around field perimeters has been used to sample for adults in Texas.

Zebra Chip Found in Klamath Basin (cont.)

- In California, 70% of the potato psyllids can be found on the field edges early season. Leaf sampling can be used to monitor for psyllid eggs and nymphs. Psyllid nymphs are most commonly found on the tops and middle of the plants on the undersides of the leaves. Eggs are most commonly present on the leaf edge.

Control Measures

- The incidence of potatoes exhibiting Zebra Chip symptoms in 2011 was **extremely low**. Whether or not this disease will return is unknown. The chance for a high incidence of Zebra Chip within the Klamath Basin in 2012 is low unless psyllid populations increase above historic levels.
- Psyllid monitoring and psyllid control to prevent psyllids from vectoring the bacterium are the core of current control recommendations.
- No action threshold exists for psyllids in potato in the Pacific Northwest. PNW researchers suggest controlling potato psyllids at any level in any life stage until more is learned about the disease. UC IPM guidelines recommend treating potato fields in areas where the psyllid is known to occur with imidacloprid at planting. During the growing season, if monitoring indicates that psyllids are present, additional treatment may be warranted.
- Several insecticides are labeled in potatoes that control potato psyllid adult and nymphs.
- Timing of insecticide application and insecticide choice are important. Several research studies are underway to determine the best IPM strategy for managing potato psyllids and preventing Zebra Chip. Rotation of insecticide mode of action and resistance management should be a part of all insecticide programs.
- A current recommended control strategy for potato psyllids is to apply a neonicotinoid insecticide such as imidacloprid in furrow at planting and then initiate a foliar insecticide program if needed prior the effective decline of the insecticide applied at planting. Abamectin (Agri-Mek) is a foliar insecticide treatment which has been shown to control potato psyllid in multiple lifestages. It also has a different mode of action (group 6) than neonicotinoid insecticides (group 4a).

Links to More Information

Essential Information about Zebra Chip in the Columbia Basin: Identification, Late Season Control, and Storage
http://oregonstate.edu/dept/hermiston/sites/default/files/090911_fyi_zc.pdf

Biology and Management of Potato Psyllid in the Pacific Northwest Potatoes
http://zebrachipscri.tamu.edu/files/2012/03/Biology_and_Management_of_Psyllids_in_Pacific_Northwest.pdf

Effects of Insecticides on Behavior of Adult *Bactericera cockerelli* (Hemiptera: Triozidae) and Transmission of *Candidatus* Liberibacter psyllaurous
http://faculty.ucr.edu/~john/2011/Butler_et_al._2011.pdf

Spatial dispersion and binomial sequential sampling for the potato psyllid (Hemiptera:Triozidae) on potato
http://faculty.ucr.edu/~john/2012/Butler&Trumble_SOCI_2012.pdf

Alfalfa Variety Selection

By Steve Orloff, Siskiyou County Farm Advisor

Selecting the best alfalfa variety for your farm is not an easy decision. There are an incredible number of varieties from which to choose. In fact, for just the fall dormancy classes we produce there are 135 alfalfa varieties according to the National Alfalfa and Forage Alliance (Winter Survival, Fall Dormancy & Pest Resistance Ratings for Alfalfa Varieties 2012 Edition).
http://www.alfalfa.org/pdf/2012%20NAFA%20Variety%20Leaflet.pdf. There are actually 18 alfalfa varieties in the fall dormancy 3 class, 94 fall dormancy 4 varieties and 23 fall dormancy 5 varieties. And, these are just the certified varieties and do not include non-certified varieties or blends. I personally would not plant non certified varieties or blends so it does make the decision a little bit easier.

Variety choice is an important decision and one you must live with for a minimum of five to seven years (could actually be less if you select the wrong variety). Varieties differ in their yield potential, resistance to insects, diseases and nematodes, forage quality, and stand persistence. These factors should be the primary consideration when selecting a variety rather than the price of the seed. The resistance ratings for certified varieties can be found in the website listed above. Whether or not a variety is resistant to Roundup (RR alfalfa) is now another factor to consider. This decision depends to a large degree on the weed pressure in your field and your ability to control them with your current weed control program and lastly where you market your alfalfa.

To help growers know which varieties are likely to perform best on their farm, University of California Cooperative Extension regularly conducts alfalfa variety trials. These are led by UC Davis Alfalfa Specialist Dan Putnam. There were two variety trials conducted at the Intermountain Research and Extension Center (IREC) in Tulelake. One trial was established in 2007 and harvested for 4 full years (2008, 2009, 2010 and 2011). Not surprisingly, Vernal was the lowest yielding variety in the trial. Other varieties yielded an average of up to a full 30 percent more, which equates to 2 tons per acre higher yield per year. With alfalfa prices last year between $200 and $250 or more per ton, that is a huge difference in potential profits. Another trial was just planted in 2010 and harvested for the first year this past year (2011). The following pages show the results for both trials. I caution growers not to use a single year's worth of data to choose a variety. The ranking can change significantly and first year results alone can be misleading, especially if a variety does not persist.

Yield is only one factor (albeit likely the most important factor) when selecting a variety. Growers commonly inquire about the forage quality of different alfalfa varieties. However, analyzing all the varieties in a trial is costly and is therefore rarely done. We had the opportunity this last year to analyze the forage quality of varieties in the new trial on first and third cutting. The results are presented in the table for the new trial. There was a significant difference in TDN between varieties for both cuttings. TDN on first cutting varied from 53.1 to 55.6. These results together with the yield data can help growers make a more informed variety decision.

2008-2011 YIELDS, TULELAKE ALFALFA CULTIVAR TRIAL. TRIAL PLANTED 07/27/07													
		2008 Yield		2009 Yield		2010 Yield		2011 Yield		Average			% of VERNAL
	FD	Dry t/a											%
Released Varieties													
Archer III	5	8.6	(1)	8.3	(2)	7.5	(3)	9.8	(1)	8.5	(1)	A	131.0
PGI 459	4	8.5	(2)	8.3	(4)	7.8	(1)	9.3	(9)	8.5	(2)	A B	129.6
DKA50-18	5	8.3	(11)	8.5	(1)	7.6	(2)	9.3	(10)	8.4	(3)	A B C	129.0
WL 357HQ	5	8.3	(12)	8.1	(6)	7.2	(8)	9.2	(12)	8.2	(4)	B C D	125.8
GrandStand	4	8.2	(20)	8.0	(10)	7.3	(6)	9.3	(5)	8.2	(5)	B C D E	125.7
Integra 8400	4	8.0	(34)	8.3	(3)	7.5	(4)	8.9	(22)	8.2	(6)	B C D E F	125.3
Integra 8300	3	8.3	(15)	8.1	(7)	7.2	(9)	9.1	(14)	8.2	(7)	B C D E F	125.2
AmeriStand407TQ	4	8.1	(30)	8.0	(9)	7.2	(12)	9.3	(8)	8.2	(8)	B C D E F G	125.1
AmeriStand444NT	4	8.4	(4)	7.7	(31)	7.2	(14)	9.2	(11)	8.1	(9)	B C D E F G H	124.7
Genoa	4	8.4	(6)	7.7	(27)	7.3	(5)	9.1	(16)	8.1	(11)	B C D E F G H	124.6
Legendairy	3	8.0	(33)	8.1	(5)	7.2	(11)	9.1	(13)	8.1	(13)	C D E F G H I	124.4
MilkMaker ML	5	8.4	(3)	7.6	(37)	6.9	(31)	9.4	(4)	8.1	(15)	C D E F G H I J	123.8
PGI 424	4	8.3	(10)	7.9	(13)	7.0	(24)	8.9	(20)	8.0	(17)	D E F G H I J K	123.0
CW 500	5	8.2	(18)	7.9	(14)	6.8	(38)	9.1	(15)	8.0	(20)	D E F G H I J K L	122.8
FSG 528SF	5	8.4	(7)	7.7	(26)	6.9	(35)	8.9	(21)	8.0	(21)	D E F G H I J K L M	122.3
Rebound 5	4	7.9	(38)	8.0	(8)	7.2	(13)	8.6	(33)	7.9	(24)	D E F G H I J K L M N O	121.7
FSG 505	5	7.8	(46)	7.7	(25)	7.2	(7)	8.7	(29)	7.9	(28)	E F G H I J K L M N O P Q	120.5
Xtra-3	4	8.4	(5)	7.5	(45)	6.8	(41)	8.6	(31)	7.8	(31)	G H I J K L M N O P Q R	120.0
Magnum VI	4	7.8	(47)	7.8	(18)	6.8	(44)	8.7	(30)	7.8	(36)	J K L M N O P Q R S T U	118.9
WL 343HQ	4	7.6	(52)	7.7	(34)	6.9	(29)	8.6	(34)	7.7	(38)	K L M N O P Q R S T U	118.3
Dura 512	5	8.1	(24)	7.8	(21)	6.6	(48)	8.2	(49)	7.7	(40)	L M N O P Q R S T U	117.7
54V09	4	8.1	(29)	7.6	(39)	6.7	(46)	8.2	(45)	7.6	(43)	M N O P Q R S T U	117.3
WL 325 HQ	4	7.8	(48)	7.7	(32)	6.8	(42)	8.1	(52)	7.6	(47)	P Q R S T U	116.4
Mountaineer 2	5	7.9	(39)	7.3	(50)	6.6	(51)	8.3	(44)	7.5	(49)	Q R S T U	115.6
Everlast II	4	7.7	(51)	7.5	(43)	6.8	(43)	8.2	(50)	7.5	(50)	Q R S T U	115.5
MasterPiece	4	8.0	(37)	7.4	(49)	6.7	(45)	7.9	(55)	7.5	(51)	R S T U	115.0
Whitney	4	7.9	(41)	6.9	(54)	6.3	(53)	8.8	(26)	7.5	(52)	S T U	114.5
Prosementi	ND	8.1	(28)	7.2	(53)	6.3	(54)	8.2	(48)	7.4	(53)	T U	114.0
FSG 408DP	4	7.6	(53)	7.3	(52)	6.8	(40)	8.0	(53)	7.4	(54)	U	113.7
Vernal	2	6.7	(56)	6.5	(56)	5.6	(56)	7.3	(56)	6.5	(56)		100.0
Experimental Varieties													
R46Bx164	6	8.1	(26)	8.0	(11)	7.0	(23)	9.4	(3)	8.1	(10)	B C D E F G H	124.6
R56Bx214	4	8.3	(9)	7.6	(38)	7.1	(19)	9.5	(2)	8.1	(12)	C D E F G H	124.4
R56BD191	ND	8.3	(13)	7.8	(16)	7.1	(17)	9.1	(17)	8.1	(14)	C D E F G H I J	123.8
R46Bx197	8	8.3	(8)	7.8	(17)	7.2	(16)	8.9	(24)	8.1	(16)	D E F G H I J K	123.5
R46Bx218	6	8.1	(31)	7.8	(15)	6.8	(39)	9.3	(6)	8.0	(18)	D E F G H I J K	123.0
R56BD190	ND	8.2	(19)	7.8	(24)	7.2	(15)	8.9	(23)	8.0	(19)	D E F G H I J K L	122.8
R56BD188	ND	8.2	(22)	8.0	(12)	7.2	(10)	8.5	(36)	8.0	(22)	D E F G H I J K L M	122.3
R46Bx160	5	7.9	(40)	7.8	(22)	7.1	(20)	9.0	(18)	8.0	(23)	D E F G H I J K L M N	122.0
R46Bx165	8.5	8.0	(36)	7.8	(20)	6.9	(32)	9.0	(19)	7.9	(25)	D E F G H I J K L M N O P	121.4
R46BD201	ND	8.2	(17)	7.8	(19)	7.0	(22)	8.5	(38)	7.9	(26)	D E F G H I J K L M N O P	121.1
R46Bx211	4.1	7.9	(44)	7.3	(51)	7.0	(25)	9.3	(7)	7.9	(27)	D E F G H I J K L M N O P Q	120.6
R46Bx167	4	8.2	(23)	7.7	(29)	7.0	(27)	8.5	(37)	7.8	(29)	F G H I J K L M N O P Q	120.3
R46Bx162	8	8.2	(16)	7.7	(28)	7.0	(28)	8.4	(40)	7.8	(30)	F G H I J K L M N O P Q	120.3
R46Bx777	ND	8.1	(32)	7.8	(23)	7.1	(18)	8.4	(42)	7.8	(32)	G H I J K L M N O P Q R	119.9
R46Bx163	4	8.1	(25)	7.4	(48)	6.9	(30)	8.8	(25)	7.8	(33)	G H I J K L M N O P Q R	119.9
R46BD203	ND	8.3	(14)	7.4	(47)	6.9	(33)	8.6	(32)	7.8	(34)	H I J K L M N O P Q R S	119.6
R46Bx778	ND	8.2	(21)	7.5	(41)	6.6	(50)	8.7	(27)	7.8	(35)	I J K L M N O P Q R S T	119.2
R46Bx775	ND	8.1	(27)	7.7	(30)	7.0	(21)	8.1	(51)	7.7	(37)	J K L M N O P Q R S T U	118.8
R56Bx212	6	7.9	(42)	7.5	(42)	6.8	(37)	8.6	(35)	7.7	(39)	K L M N O P Q R S T U	118.3
R56BD202	ND	7.8	(45)	7.6	(35)	6.5	(52)	8.7	(28)	7.7	(41)	L M N O P Q R S T U	117.7
TS 4028	4	7.9	(43)	7.5	(40)	7.0	(26)	8.2	(47)	7.7	(42)	M N O P Q R S T U	117.4
R46Bx173	5	7.7	(50)	7.5	(44)	6.9	(36)	8.5	(39)	7.6	(44)	M N O P Q R S T U	117.1
R46Bx161	6	7.5	(55)	7.7	(33)	6.9	(34)	8.4	(41)	7.6	(45)	N O P Q R S T U	117.0
R46Bx217	8	8.0	(35)	7.4	(46)	6.6	(47)	8.3	(43)	7.6	(46)	O P Q R S T U	116.6
R46Bx776	ND	7.7	(49)	7.6	(36)	6.6	(49)	8.2	(46)	7.5	(48)	Q R S T U	115.8
R66BD108	ND	7.6	(54)	6.8	(55)	5.9	(55)	7.9	(54)	7.0	(55)	V	108.1
MEAN		8.05		7.69		6.93		8.71		7.84			
CV		5.8		4.5		4.5		8.7		4.1			
LSD (0.1)		0.49		0.37		0.33		0.81		0.34			

Trial seeded at 25 lb/acre viable seed at Intermountain Research and Extension Center, Tulelake, CA.
Entries followed by the same letter are not significantly different at the 10% probability level according to Fisher's (protected) LSD.
FD = Fall Dormancy reported by seed companies.

2011 YIELDS, TULELAKE ALFALFA CULTIVAR TRIAL. TRIAL PLANTED 8/17/10

Note: Single year data should not be used to evaluate alfalfa varieties or choose alfalfa cultivars

	FD	YEAR TOTAL			% of VERNAL	Cut 1 CP	Cut 3 CP	Cut 1 ADF	Cut 3 ADF	Cut 1 TDN*	Cut 3 TDN*
					%						
MS Sunstra 803	4	8.8	(1)	A	114.5	22.3	23.4	29.4	23.2	54.3	58.5
R57M129 FG	5	8.3	(2)	B	108.7	21.8	22.1	28.0	23.0	55.2	58.6
HybriForce 2400	4	8.3	(3)	B C	108.6	21.7	21.1	27.9	25.1	55.3	57.2
R57M130 FG	5	8.3	(4)	B C	108.1	21.8	22.4	28.7	22.2	54.7	59.1
DG4210	4	8.2	(5)	B C D	108.0	23.6	22.4	27.8	21.7	55.3	59.5
GrandStand	4	8.2	(6)	B C D	107.9	20.7	22.0	29.8	23.1	54.0	58.5
WL 357 HQ	4	8.2	(7)	B C D E	107.8	22.6	22.6	29.1	22.9	54.5	58.6
Integra 8400	4	8.2	(8)	B C D E	107.5	21.7	21.8	29.4	24.3	54.2	57.7
PGI 459	4	8.2	(9)	B C D E	107.4	20.7	22.2	30.9	23.9	53.3	58.0
WL 363 HQ	5	8.2	(10)	B C D E F	106.7	21.7	23.0	29.2	22.4	54.4	59.0
Dura 512	5	8.1	(11)	B C D E F G	106.1	22.0	21.5	30.7	24.3	53.4	57.7
AmeriStand407TQ	4	8.1	(12)	B C D E F G H	105.7	22.0	22.4	28.8	23.1	54.7	58.5
R46Bx162	4	8.0	(13)	B C D E F G H	105.1	22.7	23.4	28.0	21.5	55.2	59.6
Archer III	5	8.0	(14)	B C D E F G H I	104.7	23.1	22.9	28.1	22.6	55.2	58.8
R47M312 FG	4	8.0	(15)	B C D E F G H I	104.6	21.9	22.1	29.8	23.3	54.0	58.4
Mountaneer II	5	8.0	(16)	B C D E F G H I J	104.3	23.1	21.9	29.4	23.8	54.3	58.1
Syngenta 6422Q	4	8.0	(17)	C D E F G H I J	104.2	23.8	22.5	27.5	21.7	55.6	59.5
R56Bx212	5	7.9	(18)	D E F G H I J K	103.5	22.9	21.6	28.1	23.5	55.1	58.2
Rebound 6.0	4	7.9	(19)	E F G H I J K	103.4	22.5	21.8	28.7	22.5	54.7	58.9
R46Bx163	4	7.9	(20)	E F G H I J K	103.4	21.5	22.6	29.8	22.2	54.0	59.2
MasterPiece II	4	7.9	(21)	E F G H I J K	103.3	22.6	20.6	28.4	24.1	54.9	57.8
Integra 8300	3	7.8	(22)	F G H I J K	102.5	23.0	22.2	28.0	21.9	55.2	59.3
Syngenta 6422Q-EMD	4	7.8	(23)	F G H I J K	102.2	23.3	21.9	27.5	21.8	55.6	59.4
R47M120 FG	4	7.8	(24)	G H I J K	102.0	22.4	20.5	29.9	24.5	53.9	57.6
Lightening IV	4	7.7	(25)	H I J K L	101.3	22.1	22.4	28.8	23.0	54.7	58.6
Xtra-3	4	7.7	(26)	H I J K L	101.3	23.2	22.5	28.4	23.3	55.0	58.4
R48W224 FG	4	7.7	(27)	I J K L M	100.6	22.5	22.5	28.2	22.2	55.1	59.1
Vernal	2	7.6	(28)	J K L M	100.0	21.2	23.7	29.3	21.4	54.3	59.7
R48M153 FG	4	7.6	(29)	K L M	99.3	20.6	22.5	28.7	20.9	54.8	60.0
R65BD278	6	7.4	(30)	L M	96.9	23.5	21.5	30.7	27.1	53.4	55.8
Minerva	5	7.4	(31)	M	96.5	21.0	21.6	31.2	24.6	53.1	57.5
Rugged	3	7.4	(32)	M	96.4	23.0	23.4	28.7	22.6	54.7	58.9
MEAN		7.96				22.3	22.2	29.0	23.1	54.6	58.6
LSD (0.1)		0.34									
LSD (0.05)						NS	NS	0.7	0.9	0.5	0.6
P value						0.059	0.0616	0.011	0.001	0.011	0.001

Trial seeded at 25 lb/acre viable seed at Intermountain Research and Extension Center, Tulelake, CA.

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FD = Fall Dormancy reported by seed companies.

*TDN calculated from ADF using the California Equation

Keep up to date with the research we're doing at the Intermountain Research and Extension Center at:
http://ucanr.org/sites/Intermountain_REC/Research_Progress_Reports978/.
Recent publications include:

Alfalfa Variety Evaluation
Cereal Variety Evaluation
Maggot Control in Processing Onions
Onion Weed Control in Tulelake
2011 IREC Potato Variety Report
Classic Russet and Russet Norkotah Nitrogen Fertilization
Biological Control of Potato Diseases
Potato Fumigant Comparison Trials
Potato Irrigation Scheduling
Potato Seed Spacing Trials

UC SPRING WHEAT AND BARLEY VARIETY TRIAL RESULTS

By Rob Wilson, Tulelake Farm Advisor

University of California Cooperative Extension cereal evaluation tests are conducted in the intermountain valleys of northern California each year. Entries in the tests included standard cultivars, new and soon-to-be released cultivars, and advanced breeding lines from both public and private breeding programs. Tests were conducted at the Intermountain Research and Extension Center in Tulelake and in fields of cooperating growers in Shasta Valley (Siskiyou site) or Lassen County. Intermountain tests were irrigated and sown at seeding rates of 1.2 million seeds per acre which is equivalent to 88 to 139lbs/acre for common wheat, 113 to 180 lbs/acre for durum wheat, and 69 to 126 lbs/acre for barley. Complete trial results and cultivar descriptions along with information on small grain pest management and production practices can be found on the UC small grain workgroup website: http://agric.ucdavis.edu/crops/cereals/cereal.htm

Tables 1 through 4 summarize yield results for intermountain locations. Spring barley results are presented in Tables 1 and 2. Spring wheat results are presented in Table 3. Table 4 details results for varieties grown in 2 acre unreplicated blocks at IREC in 2011. You will notice that some varieties performed better at one location compared to the other sites and visa versa. Differences in soil, weather, fertilization, and irrigation are likely the causes for the variation. The Tulelake site has an organic clay loam soil with optimal irrigation. The Shasta Valley and Lassen sites are normally located on sandy loam or loam soils with optimal to slightly below adequate irrigation. With this variation in mind, some varieties performed well at multiple locations as shown by the average yield across locations. Along with the yield data presented in the tables, variety characteristics such as grain quality, time of maturity, and pest resistance should be considered. Hard red wheat varieties grown in the Tulelake trials consistently have low protein content. The cause of the low protein is likely related to the site's low soil nitrate levels and the high yield potential. Read the article written by Steve Orloff on nitrogen fertilization and its' influence on grain protein for strategies to maximize hard red wheat protein content.

Table 1. 2009-11 INTERMOUNTAIN SPRING BARLEY YIELD SUMMARY

Entry	Name	2011 (3 Loc)		2010-11 (6 Loc/Yr)		2009-11 (8 Loc/Yr)	
CULTIVARS							
204	STEPTOE	5930	(6)	5620	(6)	5400	(5)
900	BARONESSE	5090	(17)	5160	(11)	4790	(8)
960	UC 960	5660	(9)	5410	(10)	5470	(3)
1010	MILLENNIUM	6290	(2)	6000	(2)	5910	(2)
1016	STATEHOOD	6060	(4)	5560	(8)	5420	(4)
1082	CONRAD	4410	(23)	4830	(12)	4550	(9)
1084	LEGACY	4740	(20)	4610	(16)	4420	(11)
1217	AC METCALFE	4360	(24)	4380	(17)	4140	(13)
ADVANCED LINES							
1099	UCD-TL20	6030	(5)	5570	(7)	5260	(6)
1135	UCD YP03-8/2	5010	(18)	4790	(13)	4970	(7)
1171	T/S//E 11-18	4330	(25)	4690	(15)	4430	(10)
1201	TLB 148	6450	(1)	6070	(1)	5980	(1)
1219	BZ502-265	4690	(22)	4740	(14)	4360	(12)
1268	UCD 1A	6230	(3)	5970	(3)	-	
1274	UCD 4B	5720	(8)	5770	(4)	-	
1277	UCD 9B	5430	(13)	5460	(9)	-	
1278	UCD 10B	5870	(7)	5730	(5)	-	
1289	UCD 1289	5520	(12)	-		-	
1290	UCD 1290	5370	(14)	-		-	
1291	UCD 1291	5540	(11)	-		-	
1292	UCD 1292	4830	(19)	-		-	
1293	UCD 1293	5300	(15)	-		-	
1294	UCD 1294	5270	(16)	-		-	
1295	UCD 1295	5610	(10)	-		-	
1296	UCD 1296	4730	(21)	-		-	
	MEAN	5370		5310		4990	
	CV	12.7		11.8		14.1	
	LSD (.05)	630		410		400	

Numbers in parentheses indicate relative rank in column.

Tabel 2. 2011 TULELAKE SPRING BARLEY TEST

Entry #	Name	Type	Source	Yield (lbs/acre)		Test Wt (lbs/bu)	Plant Ht (in)	Lodging Harvest	Heading (From 3/1
CULTIVARS									
204	STEPTOE	6RSF	WSU	7350	(9)	50.5	39	2.0	128
688	ROBUST	6RSM	MN	4820	(50)	53.9	48	2.0	130
821	HARRINGTON	2RSM	USASK	5650	(41)	54.5	39	4.3	132
900	BARONESSE	2RSF	WB	5920	(37)	54.2	35	7.0	132
960	UC 960	6RSF	UCD	6800	(19)	51.2	32	1.0	127
977	MERIT	2RSM	BARI	5900	(38)	54.1	39	5.3	133
1010	MILLENNIUM	6RSF	USU	8050	(4)	53.0	40	1.0	126
1016	STATEHOOD	6RSF	USU	8130	(3)	52.3	39	1.0	127
1075	LACEY	6RSM	MN	7210	(13)	54.9	41	5.0	127
1082	CONRAD	2RSM	BARI	5600	(43)	54.4	37	4.0	130
1083	TRADITION	6RSM	BARI	5950	(36)	51.7	42	5.7	130
1084	LEGACY	6RSM	BARI	6210	(32)	51.8	42	7.3	129
1197	HOCKETT	2RSF/M	MT	6430	(26)	49.8	32	1.0	129
1217	AC METCALFE	2RSM	AG Canad	5520	(46)	55.8	40	5.0	131
1297	CDC COPELAND	2RSM	ID	5690	(40)	51.3	41	5.7	132
1298	CONLON	2RSM	NDSU	5640	(42)	55.6	36	6.7	121
1299	MERIT 57	2RSM	BARI	5590	(44)	52.7	39	5.7	131

Tabel 2. 2011 TULELAKE SPRING BARLEY TEST (cont.)

Entry #	Name	Type	Source	Yield (lbs/acre)	Test Wt (lbs/bu)	Plant Ht (in)	Lodging Harvest	Heading (From 3/1)
1299	MERIT 57	2RSM	BARI	5590 (44)	52.7	39	5.7	131
1300	PINNACLE	2RSM	NDSU	6590 (23)	55.2	37	6.0	130
1301	CELEBRATION	6RSM	BARI	6100 (33)	52.5	40	7.3	129
1302	STELLAR-ND	6RSM	NDSU	6450 (25)	53.5	42	4.3	128
1315	CDC KINDERSLE	2RSM	USASK	6220 (30)	54.1	38	4.3	130
<u>ADVANCED LINES</u>								
1099	UCD-TL20	6RSF	UCD	8140 (2)	50.7	38	1.0	129
1135	UCD YP03-8/2	6RS(N)	UCD/OSU	6090 (34)	51.5	37	3.7	135
1171	T/S//E 11-18	6RSM	OSU	5480 (48)	51.8	39	7.0	129
1201	TLB 148	6RSF	UCD	7670 (7)	50.4	38	1.0	132
1219	BZ502-265	2RSF	WB	6710 (21)	55.3	38	4.7	130
1268	UCD 1A	6RSF	UCD	7760 (5)	49.4	32	2.0	129
1274	UCD 4B	6RSF	UCD	6690 (22)	48.6	37	3.3	134
1277	UCD 9B	6RSF	UCD	6430 (27)	50.7	36	5.7	130
1278	UCD 10B	6RSF	UCD	7250 (12)	52.0	40	4.0	128
1289	UCD 1289	6RSF	UCD	7080 (15)	51.3	35	1.7	129
1290	UCD 1290	6RSF	UCD	7690 (6)	53.0	40	1.7	128
1291	UCD 1291	6RSF	UCD	7320 (10)	51.2	36	1.0	130
1292	UCD 1292	6RSF	UCD	7140 (14)	52.7	36	1.0	130
1293	UCD 1293	6RSF	UCD	7280 (11)	50.5	36	1.0	131
1294	UCD 1294	6RSF	UCD	7590 (8)	50.5	36	1.0	131
1295	UCD 1295	6RSF	UCD	6930 (17)	49.7	38	1.0	131
1296	UCD 1296	6RSF	UCD	6360 (29)	49.0	39	1.0	133
1303	2B04-0175	2RSM	BARI	7000 (16)	56.0	39	4.7	129
1304	2B05-0811	2RSM	BARI	5520 (47)	53.8	37	5.3	130
1305	2B06-0929	2RSM	BARI	6750 (20)	54.1	35	4.0	129
1306	2B06-0933	2RSM	BARI	6040 (35)	54.9	37	2.7	130
1307	2B07-1516	2RSM	BARI	5730 (39)	54.4	39	5.3	133
1308	2B07-1590	2RSM	BARI	6550 (24)	53.9	36	4.3	131
1309	UT04B2041-42	6RSF	USU	8180 (1)	55.3	39	1.3	129
1310	UT6R2120-14	6RSF	USU	6910 (18)	53.5	38	3.7	127
1311	05WA-316.K	6RSF	WSU	4970 (49)	54.1	35	6.7	129
1312	05WA-316.99	6RSF	WSU	6220 (31)	53.6	38	5.3	132
1313	06WA-412.4	6RSF	WSU	5580 (45)	54.4	37	6.0	133
1314	WAS 2	6RSW	WSU	6390 (28)	54.7	34	4.7	129
	MEAN			6530	52.8	38	3.8	130
	CV			10.6	1.6	5.1	31.6	0.6
	LSD (.05)			1120	1.7	3	1.9	1.0

Rating scale for lodging: 1 = 0-3%, 2 = 4-14%, 3 = 15-29%,
4 = 30-49%, 5 = 50-69%, 6 = 70-84%, 7 = 85-95%, 8 = 96-100%.
Numbers in parentheses indicate relative rank in column.
TYPE: 6RSF = 6-row spring feed; 6RSM = 6-row spring malt; 2RSF = 2-row spring feed; 2RSM = 2-
SOURCE: AG Canada = Agricultural and Agri-foods, Canada; BARI = Busch Agricultural Resources, I
ID = University of Idaho, USDA/ARS, Aberdeen, ID; MN = University of Minnesota; MT = University
NDSU = North Dakota State University; OSU = Oregon State University; UCD = University of Califor
USASK = University of Saskatchewan; USU = Utah State University;
WB = WESTBRED, LLC; WSU = Washington State University

Table 3. 2011 INTERMOUNTAIN SPRING WHEAT YIELD SUMMARY (LBS/ACRE)
(2011 Oregon Spring Elite Yield Trial - OSEYT)

Entry	Name	Type	Source	Yield Mean (3 Loc)	Lassen Yield lbs/A	Tulelake Yield lbs/A	Siskiyou Yield lbs/A	Tulelake Test Wt (lb/bu)	Tulelake 1000 Kernal Wt (g)	Tulelake Plant Ht (in)	Days To Heading (From 3/1)	Tulelake Lodging Rating	Tulelake Protein %	Siskiyou Protein %
1	Kelse	HRS	WSU	6120 (18)	4320	7610	6450	62.2	43.3	40	134	1.3	13.59	15.39
2	WA 8074	HRS	WSU	5540 (37)	3840	6940	5840	61.4	40.7	39	132	5.5	13.1	14.64
3	Bullseye	HRS	AgriPro	5760 (29)	4360	6790	6130	62.9	35.7	36	133	6.5	13.18	14.93
4	Cabernet	HRS	AgriPro	5910 (24)	3680	7190	6880	60.7	33.8	34	132	1	13.66	14.39
5	Malbec	HRS	AgriPro	5630 (36)	3230	7150	6500	61.5	40.5	35	132	1	13.66	14.56
6	Jefferson	HRS	UI	5960 (23)	3990	7570	6340	61.8	39.4	40	133	1.3	13.26	14.93
7	Winchester	HRS	UI	6100 (21)	4110	7860	6330	61.6	40.9	38	132	4.3	13.08	14.33
8	IDO 702	HRS	UI	6420 (14)	4560	7740	6960	61.3	36.6	41	133	3.5	13.31	14.09
9	Cerere	HRS	Cooley	5800 (27)	3650	7760	6000	60.7	36.7	37	139	1	12.56	13.46
10	Buck Pronto	HRS	Limagrain	6110 (20)	3770	7790	6770	63.5	32.6	41	134	1.3	14.26	15.88
11	10 Fx Inc1	HRS	Limagrain	5780 (28)	4430	6840	6060	62.4	37.4	40	132	3	13.42	15.19
12	Lassik	HRS	UC Davis	6020 (22)	4330	7130	6600	60.1	32.5	35	134	1.3	12.92	14.12
13	UC 1617	HRS	UC Davis	5660 (35)	3620	7110	6250	59.3	35.6	28	133	1	14.67	14.88
14	UC 1618	HRS	UC Davis	6130 (17)	5000	6860	6520	60.8	32.9	33	134	1	12.64	14.21
15	YS-11	HRS	Wagner Se	6320 (16)	3780	7770	7410	64	43.1	39	133	1.3	12.59	13.41
16	Patwin	HWS	UC Davis	5720 (32)	3640	7200	6330	58.6	30.1	33	136	1	13.93	14.62
17	Capstone	HWS	AgriPro	6540 (9)	4570	8040	7010	62.4	39.7	35	130	1.3	13.03	13.93
18	OR4051328	HWS	OSU	6520 (12)	4720	8450	6380	59.6	35.2	35	140	1.8	12.22	14.17
19	OR4041268	SWS	OSU	6110 (19)	3900	7570	6870	60.6	30.5	38	135	6.8	11.82	13.04
20	Alturas	SWS	UI	6600 (8)	3980	8300	7510	61.6	35.8	42	133	2.3	11.45	11.81
21	Cataldo	SWS	UI	6730 (6)	4020	8590	7580	61.4	41.1	40	131	1	11.88	12.47
22	IDO671	SWS	UI	6890 (5)	3840	8930	7900	61.9	36.7	40	133	1.8	11.18	11.81
23	IDO644	SWS	UI	6650 (7)	4680	7470	7800	59	35	37	131	6.5	11.64	11.56
24	IDO 599	SWS	UI	7240 (2)	4870	9100	7750	61.8	37.4	39	131	3.8	11.01	11.78
25	IDO 686	SWS	UI	6430 (13)	5100	8260	5920	62.9	39.9	45	134	3.5	12.2	12.98
26	IDO 687	SWS	UI	7250 (1)	4350	9390	8030	63	36.6	43	134	2	10.95	12.00
27	Alpowa	SWS	WSU	6530 (10)	5160	8270	6170	62.2	37.4	40	136	5.8	11.78	14.40
28	Louise	SWS	WSU	5880 (25)	4740	7290	5600	59.4	43.8	39	133	5	11.89	14.41
29	JD	CLB	WSU	5350 (40)	3920	6930	5210	61.6	38.6	43	136	4.5	13.5	14.51
30	Diva	SWS	WSU	5660 (34)	4760	7160	5070	59.8	42.6	40	133	6.5	12	13.97
31	Whit	SWS	WSU	5860 (26)	4110	6510	6960	59.3	35.1	40	132	6.8	12.85	13.67
32	Babe	SWS	WSU	6910 (4)	4620	8690	7430	62.2	38.4	40	134	5.8	11.62	13.66
33	WA 8124	SWS	WSU	6530 (11)	4640	8720	6220	61.1	34.6	41	135	7.3	10.94	13.08
34	Merrill II	SWS	H. Lewis	6360 (15)	3860	8460	6750	58.7	36.7	38	140	2.5	11.99	13.24
35	HL 550	SWS	H. Lewis	7080 (3)	4880	8580	7780	60.3	43.7	43	134	1.5	10.93	11.85
36	Patwin 515	HWS	UC Davis	5460 (39)	3080	7020	6270	58.4	29.3	29	136	1	14.26	15.06
37	Clear White	HWS	UC Davis	5750 (30)	3230	7580	6440	62.1	39.2	33	130	1	12.66	14.27
38	Clear White 5	HWS	UC Davis	5730 (31)	3250	7930	6020	61.5	39.3	36	130	1	13.12	16.38
39	WB-FUZION	HRS	WestBred	5690 (33)	3280	7040	6750	61.3	37.5	40	130	2	14.12	16.00
40	WB-ROCKLANI	HRS	WestBred	5470 (38)	3280	7620	5510	62	36.6	31	133	1	14.05	16.20
	MEAN			6130	4130	7730	6590	61.1	37.4	38	133	2.9	12.69	13.98
	CV			10.2	17.1	7.9	7.8	1	4.1	3.4	0.5	41.5	nd	nd
	LSD (.05)			500	990	850	720	1.2	3.1	2	1	1.7	nd	nd

Numbers in parentheses indicate relative rank in column.
TYPE: HRS = Hard Red Spring; HWS = Hard White Spring; CL

SOURCE: CA = University of California; UI = University of Io
OSU = Oregon State University; WSU = Washington State Un

Rating scale for lodging: 1 = 0-3%, 2 = 4-14%, 3 = 15-29%, 4 = 30-49%,
5 = 50-69%, 6 = 70-84%, 7 = 85-95%, 8 = 96-100%.

Numbers in parentheses indicate relative rank in column.
Protein is expressed at 12% moisture

Table 4. 2011 IREC Small Grain Demo Plot Yield Summary

Each variety was grown in an unreplicated 1.8 to 2.2 acre block under normal manage

Variety Name	Type	Yield (lbs/acre)	Test Wt (lbs/bu)	Protein %
Expresso	spring hard red wheat	6540	63	11.4
Rockland	spring hard red wheat	5955	63	12.2
Hank	spring hard red wheat	6682	62	10.6
Fuzion	spring hard red wheat	6455	63	11
Yecora Rojo	spring hard red wheat	5995	62	10.9
Alpowa	spring soft white wheat	4923	59	n/a
Nick	spring soft white wheat	5986	56	n/a
Baronesse	2-row spring feed barley	5514	51	n/a
Champion	2-row spring feed barley	4281	50	n/a

Take advantage of our Crop Water Use Table and Local Weather Data at:
http://ucanr.org/sites/Intermountain_REC/Crop_Water_Usage/
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Effect of Nitrogen Fertilization Practices on Spring Wheat Protein Content
By Steve Orloff, Siskiyou County Farm Advisor

Grain protein content is a significant issue for wheat producers—nearly as important as yield. The price that a producer receives for hard red spring wheat is determined by the grain protein content with a discount for wheat with less than 14% for grain marketed in the Pacific Northwest. This has significant economic consequences for wheat producers. Unfortunately, yield and protein content are often inversely related and is difficult to achieve both. The primary production factors that affect protein content are variety selection and nitrogen fertility management.

With the high cost of fertilizers and their application, growers need to maximize N use-efficiency while at the same time minimize the number of fertilizer applications. Research was needed to evaluate the effect of different varieties and nitrogen fertilization program on yield, protein and bushel weight. Trials were conducted in Scott Valley and in Tulelake at the Intermountain Research and Extension Center (IREC). Four varieties were evaluated—Yecora Rojo, Hank, Fusion and Malbec. Seven nitrogen treatments/strategies were evaluated (Table 1). Urea was the nitrogen fertilizer source used for all applications.

Table 1. Nitrogen treatments evaluated in Scott Valley and IREC.

1. Control – **(unfertilized)**
2. 120 Pre-plant **(Total N 120 lbs)**
3. 120 Pre-plant + 30 lbs Flowering **(Total N 150 lbs)**
4. 120 Pre-plant + 50 lbs Tillering **(Total N 170 lbs)**
5. 120 Pre-plant + 50 lbs Tillering + 30 lbs Boot **(Total N 200 lbs)**
6. 120 Pre-plant + 50 lbs Tillering + 30 lbs Flowering **(Total N 200 lbs)**
7. 120 Pre-plant + 50 lbs Tillering + 30 lbs Boot + 30 lbs Flowering **(Total N 230 lbs)**

Grain yields were higher at the IREC site (Tulelake) than at the Scott Valley site. This is commonly observed due to more favorable environmental conditions (cooler summer temperatures and better soil) in Tulelake compared with Scott Valley. In addition, 2011 was a fairly wet spring and it was difficult to find a planting window. The soil was prepared in spring and the wheat planted into moisture. Some of the seeds emerged with soil moisture and others did not emerge until there was subsequent rain. This resulted in staggered emergence which lowered the yield potential of the Scott Valley site. Nitrogen fertilization had a significant impact on grain yield at both sites. In Scott Valley, maximum yield increased from 0.6 to 1.1 tons per acre over the untreated check depending on the variety and fertilizer treatment (Table 2).

Effect of Nitrogen Fertilization . . . (cont.)

The yield increase over the unfertilized plots was far greater at the IREC site where yields were nearly doubled (almost 2 tons higher) for many of the varieties (Table 3). Additional applications after the preplant application also increased yield in most cases. At the Scott Valley site the 230 pounds N per acre application did not increase yield over the other fertilization strategies that included a topdress application. However, at IREC maximum yield for all varieties occurred at the 230 pounds per acre application rate where N was applied preplant and top dressed at tillering, boot and flowering growth stages. This is probably due to the higher yield potential at this site and this site had a slightly lower preplant soil nitrate nitrogen level (6 ppm at IREC compared with 8 ppm in Scott Valley).

Wheat variety and the nitrogen fertilizer program had a significant effect on wheat protein content. Hank had the lowest protein content of the four varieties at both sites. Protein content was much higher at the Scott Valley site than at IREC most likely due to the much higher yield at IREC and the slightly lower initial soil nitrate level. Many of the fertilizer treatments resulted in a protein content above 14 percent (the benchmark value in Pacific Northwest markets) in Scott Valley. In contrast, protein contents below 12 percent were common at IREC for the plots that received the lower N rates, and none of the treatments ever reached 14 percent average for the four replications. A preplant application alone, common grower practice, was never sufficient to reach acceptable protein levels to avoid a discount at either site. At IREC the highest fertilizer rate (230 pounds N per acre over four applications) always resulted in the numerically highest protein content. In Scott Valley, the numerically highest protein content was also achieved with this highest rate. However, differences in protein content between this rate and lower rates were small and acceptable protein levels were achieved with some of the lower rates. In Scott Valley, any treatments that had 170 pounds of N or more over the season had a protein content over 14, except for the cultivar Hank. These results emphasize the need for split applications of N, rather than relying solely on a preplant application, to achieve acceptable yield and protein content.

Table 2. Effect of nitrogen strategy on yield, protein and bushel weight of four hard red spring wheat varieties grown in the Scott Valley (Siskiyou County).

Treatments	Total N lbs/A	Yield tons/A	Protein (%)	Test Wt. (bu/A)
Yecora Rojo				
Untreated	0	1.80	12.5	63.2
Pre-plant	120	2.47	13.2	62.0
Pre-plant + Flowering	150	2.59	14.9	62.1
Pre-plant + Tillering	170	2.71	15.6	62.1
Pre-plant + Tillering + Boot	200	2.84	14.7	62.2
Pre-plant + Tillering + Flowering	200	2.93	15.3	62.2
Pre-plant + Tillering + Boot + Flowering	230	2.90	15.4	62.0
Hank				
Untreated	0	2.27	12.0	62.7
Pre-plant	120	2.82	12.7	61.2
Pre-plant + Flowering	150	2.96	13.2	61.5
Pre-plant + Tillering	170	2.91	13.2	62.2
Pre-plant + Tillering + Boot	200	2.71	13.5	60.7
Pre-plant + Tillering + Flowering	200	3.16	13.8	61.0
Pre-plant + Tillering + Boot + Flowering	230	2.88	13.9	61.2
Fuzion				
Untreated	0	2.58	12.3	63.7
Pre-plant	120	2.79	13.4	63.2
Pre-plant + Flowering	150	3.09	14.0	62.8
Pre-plant + Tillering	170	3.12	14.9	62.5
Pre-plant + Tillering + Boot	200	3.05	14.6	62.6
Pre-plant + Tillering + Flowering	200	3.09	15.0	62.5
Pre-plant + Tillering + Boot + Flowering	230	3.16	14.1	62.8
Malbek				
Untreated	0	2.66	12.7	63.3
Pre-plant	120	3.26	13.1	63.1
Pre-plant + Flowering	150	3.19	13.2	62.9
Pre-plant + Tillering	170	2.72	14.1	62.4
Pre-plant + Tillering + Boot	200	3.54	13.7	62.6
Pre-plant + Tillering + Flowering	200	3.06	14.0	62.5
Pre-plant + Tillering + Boot + Flowering	230	3.22	14.3	62.4
LSD 0.05		0.38	1.1	1.0

Table 3. Effect of nitrogen strategy on yield, protein and bushel weight of four hard red spring wheat varieties grown at the Intermountain Research and Extension Center (Siskiyou County).

Treatments	Total N (lbs/A)	Yield (tons/A)	Protein (%)	Test Wt. (lbs/bu)
Yecora Rojo				
Untreated	0	2.78	9.2	63.6
Pre-plant	120	3.99	10.0	63.2
Pre-plant + Flowering	150	4.35	10.9	63.1
Pre-plant + Tillering	170	4.19	11.4	62.8
Pre-plant + Tillering + Boot	200	4.32	12.8	62.0
Pre-plant + Tillering + Flowering	200	4.25	12.1	62.8
Pre-plant + Tillering + Boot + Flowering	230	4.47	13.1	62.8
Hank				
Untreated	0	2.50	8.5	62.5
Pre-plant	120	4.34	10.4	62.6
Pre-plant + Flowering	150	4.45	11.0	62.1
Pre-plant + Tillering	170	4.34	11.1	62.6
Pre-plant + Tillering + Boot	200	4.67	11.6	62.5
Pre-plant + Tillering + Flowering	200	4.62	12.0	62.3
Pre-plant + Tillering + Boot + Flowering	230	4.81	12.9	62.3
Fuzion				
Untreated	0	2.31	9.2	63.5
Pre-plant	120	3.96	10.6	63.1
Pre-plant + Flowering	150	4.20	11.3	63.0
Pre-plant + Tillering	170	4.25	12.4	63.3
Pre-plant + Tillering + Boot	200	4.36	12.7	62.9
Pre-plant + Tillering + Flowering	200	4.41	12.3	63.4
Pre-plant + Tillering + Boot + Flowering	230	4.47	13.5	63.1
Malbek				
Untreated	0	2.61	9.3	63.3
Pre-plant	120	4.03	10.7	63.3
Pre-plant + Flowering	150	4.31	11.7	63.3
Pre-plant + Tillering	170	4.23	12.4	63.3
Pre-plant + Tillering + Boot	200	4.33	12.6	62.8
Pre-plant + Tillering + Flowering	200	4.34	12.6	63.0
Pre-plant + Tillering + Boot + Flowering	230	4.43	13.3	63.1
LSD 0.05		0.27	0.5	0.5

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