

# **Dry Pea, Lentil, Chickpea and Winter Legume Breeding**

## **2004 Progress Report**



**Prepared by  
Grain Legume Genetics and Physiology Research Unit**

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## Spring Pea Yield Testing

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Advanced breeding lines of green, yellow and marrowfat peas were compared in yield trials at Pullman, Fairfield and Walla Walla, WA, and at Genesee, ID (Tables 1, 5 and 9). Trials in 2004 produced above average yields compared to previous years due to favorable conditions throughout the season (Tables 3, 7 and 11). The trial at Walla Walla produced the greatest yield overall followed by Pullman, Genesee and Fairfield. In addition to advanced and preliminary trials in the Palouse, a small trial of twenty early generation breeding lines was evaluated at four North Dakota environments, Minot, Carrington, Williston and Hettinger. This was the third year of this trial and with the encouraging results we hope to continue the trial and have expanded testing and selection efforts in North Dakota to include early generation populations.

### Green Pea Trial Results

The advanced green pea yield trial contained 15 experimental lines from the USDA breeding program and 5 checks from the USDA and other breeding programs. 'Stirling' the most recent release from the USDA program, was slightly above the trial mean (3642 kg/ha vs. 3598 kg/ha). Stirling the first semi-leafless, upright cultivar with green cotyledons and resistance to seed bleach was released from the USDA legume breeding program in 2003. It continues to show a yield advantage compared to 'Columbian' and other cultivars. Foundation seed of Stirling was produced in Washington, Idaho and North Dakota and was available to growers in the 2004 season. Due to the success seen in 2004, expanded production of Stirling is expected in 2005.

The top yielding lines in the 2004 trials were PS0010804 and PS0110460. Both of these lines have great agronomic characteristics including consistent yield, upright growth habit, excellent seed quality and disease resistance (Tables 1 and 2).

Physical appearance and cooking quality are priorities in the breeding program. Overall quality was good in 2004 with seed bleach at a low level. It has been an objective of the breeding program to develop upright plant types. All the green pea breeding lines have been selected to have the semi-leafless (afila) leaf type which contributes to upright growth. Plant height index for the breeding lines in the 2004 trial ranged from 0.26 to 0.73. The lower values compared to previous years can be explained by the additional biomass production and greater seed yield afforded by the near ideal growing conditions. Further selection for improved stem properties will continue to improve overall plant stature.

The preliminary yield trial for green pea selections containing 17 experimental lines and 3 checks was planted at Pullman, WA (Table 4). Only three breeding lines out-yielded Stirling, and 'Lifter'. and five breeding lines exceeded the mean yield of all checks. All selections had excellent agronomic characteristics and seed quality. PS02100093 was the highest yielding breeding line (3929 kg/ha) and maintained a plant height of index of 0.89.

### Disease Screening

All pea selections in the advanced and preliminary yield trials were screened at Corvallis, OR for resistance to pea enation mosaic virus (PEMV). Unfortunately, nearly all selections are susceptible to PEMV; therefore, introduction and selection for resistance will be a major focus of the program in the future. Resistance to Fusarium wilt race 1 was evaluated at the Spillman Research Farm. Individual selections with resistance identified in these trials are being used to transfer their respective resistances to new varieties.

### Variety Releases

Stirling, was released in 2003 and has been under test for the past eight years. It has been among the highest yielding lines in Pacific Northwest field trials and has excellent seed quality and is resistant to seed bleaching. It maintains an upright growth habit through harvest due to the combination of improved stem strength and the semi-leafless trait. The upright growth habit provides greater ease of harvest and improved crop quality through reduced foreign matter being harvested with the seed. Foundation seed was produced in 2003 and 2004 and it is expected that a significant number of acres will be sown to Stirling in the 2005 season.



Table 1. Location Yield Summary (kg/ha) for the Advanced Green Dry Pea Yield Trial, 2004 (0401)

Cultivar	Origin	Leaf Type	Plant Type	Fairfield	Genesee	Pullman	Walla Walla	Mean Seed Yield
PS0010804	BX94P64-11	-	-	3977	3786	3658	4511	3983
PS0110460	BX97P9-6	-	-	3449	3869	3906	4372	3899
PS810162	X94P058	-	-	3538	3842	3583	4470	3858
PS0110767	X98P022	-	-	3719	3704	3641	4259	3831
PS0110745	X98P020	-	-	3658	3550	3526	4364	3774
PS0010792	BX94P26-12	+	-	3216	3826	4099	3910	3763
PS0110756	X98P021	-	-	3501	3527	3385	4545	3739
PS0110060	BX97P16	-	-	2820	4021	3516	4478	3709
STIRLING	X93P022	-	-	3415	3522	3716	3913	3642
PS0110827	X98P026	-	-	3475	3286	3474	4215	3613
PS0110762	X98P021	-	-	2963	3349	3741	4248	3575
PS0110805	X98P025	-	-	3266	3562	3366	4075	3567
PS01101386	X98P112	-	-	2371	3796	3584	4279	3508
JOEL	X84F172	+	+	3347	3588	3187	3895	3504
PS9910592	X95P122	-	-	3085	3271	3471	4072	3474
TOLEDO	.....	-	-	2942	3567	3497	3656	3415
PS0110815	X98P025	-	-	2954	3348	3326	3656	3321
LIFTER	X93P045	+	-	3425	3121	2709	3968	3306
*COLUMBIAN(LOT-I)	.....	+	+	2812	3634	2903	3642	3248
PS0110795	X98P024	-	-	2885	3127	3413	3489	3229
Grand Mean				3241	3565	3485	4101	3598
C.V. (%)				21	4	5	11	12
LSD ( $\alpha=0.05$ )				938	209	229	600	379
Planting Date				4/12/04	3/24/04	4/5/04	3/31/04	
Harvest Date				8/12/04	7/27/04	7/23/04	7/26/04	

Leaf type; + = normal leaf, - = *afila* or semileafless type. Plant type; + = tall plant type, - = short plant type.

Yield data are means of three replications at each of the four locations.

\*Check variety.

Table 2. Agronomic Data for the Advanced Green Dry Pea Yield Trial, 2004 (0401)

Cultivar	Origin	FW	Aphano- myces	PEMV	Days to Flower	Days to Maturity	Nodes to First Flower	Pods/ Peduncle	Mean† Pod Ht (green) ..cm..	Mean Pod Ht (mature) ..cm..	Mean Pod Ht Index	Mean† Plant Ht (green) ..cm..	Mean PlantHt (mature) ..cm..	Mean Plant Ht Index	Rep Nodes	Weight 100 Seed ..g..
PS0010804	BX94P64-11	+	3.8	-	70	105	17	2	47	18	0.39	75	42	0.58	4	24.9
PS0110460	BX97P9-6	+	3.3	-	70	105	15	2	39	17	0.44	67	38	0.57	5	24.7
PS810162	X94P058	+	3.2	-	60	105	14	2	34	14	0.43	65	44	0.73	5	22.8
PS0110767	X98P022	+	3.2	-	68	105	18	2	46	18	0.38	80	44	0.56	5	23.8
PS0110745	X98P020	+	4.3	-	68	105	15	2	42	21	0.49	75	44	0.59	4	22.5
PS0010792	BX94P26-12	+	3.5	-	69	105	16	2	48	18	0.38	84	44	0.54	4	25.5
PS0110756	X98P021	-	3.3	-	74	105	19	2	47	19	0.39	76	42	0.54	4	21.4
PS0110060	BX97P16	+	3.3	-	71	105	16	2	44	16	0.38	74	39	0.55	5	24.8
STIRLING	X93P022	+	3.2	-	65	105	14	2	33	14	0.42	71	39	0.58	5	21.6
PS0110827	X98P026	+	2.7	-	71	105	17	2	54	24	0.43	87	60	0.71	5	25.5
PS0110762	X98P021	-	4.0	-	69	105	16	2	53	14	0.27	89	41	0.46	4	22.4
PS0110805	X98P025	+	3.5	-	74	105	18	2	53	18	0.31	97	51	0.52	5	22.2
PS01101386	X98P112	+	4.3	-	71	105	15	2	45	15	0.32	73	34	0.47	4	26.2
JOEL	X84F172	+	3.5	-	62	105	15	2	70	12	0.17	133	40	0.32	5	23.8
PS9910592	X95P122	+	4.3	-	70	105	14	2	33	4	0.12	65	19	0.29	4	20.0
TOLEDO	.....	+	3.7	-	68	105	17	2	49	39	0.82	80	76	0.97	4	26.3
PS0110815	X98P025	+	4.5	-	71	105	17	2	46	18	0.38	80	48	0.60	5	21.8
LIFTER	X93P045	+	2.2	+	73	106	16	2	50	10	0.19	85	31	0.37	5	21.9
*COLUMBIAN(LOT-I)	.....	+	3.1	-	55	105	12	1	40	7	0.20	124	29	0.25	7	21.9
PS0110795	X98P024	+	4.5	-	66	105	17	2	54	26	0.46	94	65	0.68	5	22.1
Grand Mean			3.6		68	105	16	2	46	17	0.37	84	43	0.54	5	23.3
C.V. (%)			17		1	0	7	7	14	23	32	10	12	19	21	
LSD ( $\alpha=0.05$ )			0.9		1	1	1	0	7	8	0.19	10	12	0.20	1	

FW = Fusarium wilt race 1; + = resistant, - = susceptible.

Aphanomyces = Aphanomyces root rot; 1 = no symptoms, 2 = 20% of lower leaves symptomatic, 3 = 50% of leaves symptomatic and plant stunted, 4 = 80% of leaves symptomatic and plant stunted, 5 = all plants dead.

PEMV = Pea enation mosaic virus, + = resistant, - = susceptible.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Rep Nodes = average number of reproducing nodes on a plant.

Agronomic data are means of three replications at Pullman, WA. Means data are means of three replication over 3 locations; Genesee, Pullman and Walla Walla. Means† data are means of three replications over 4 locations; Fairfield, Genesee, Pullman and Walla Walla.

\*Check variety.

Table 3. Mean Yields of the Advanced Green Dry Pea Yield Trial, 2000 - 2004

Cultivar	Origin	Leaf Type	Plant Type	2000		2001		2002		2003		2004	
				kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check
PS0010804	BX94P64-11	-	-	....	...	....	...	....	...	1709	119	3983	123
PS0110460	BX97P9-6	-	-	....	...	....	...	....	...	....	...	3899	120
PS810162	X94P058	-	-	....	...	2521	...	1993	115	1691	118	3858	119
PS0110767	X98P022	-	-	....	...	....	...	....	...	....	...	3831	118
PS0110745	X98P020	-	-	....	...	....	...	....	...	....	...	3774	116
PS0010792	BX94P26-12	+	-	....	...	....	...	....	...	1563	109	3763	116
PS0110756	X98P021	-	-	....	...	....	...	....	...	....	...	3739	115
PS0110060	BX97P16	-	-	....	...	....	...	....	...	....	...	3709	114
STIRLING	X93P022	-	-	1792	...	2625	...	2025	117	1657	115	3642	112
PS0110827	X98P026	-	-	....	...	....	...	....	...	....	...	3613	111
PS0110762	X98P021	-	-	....	...	....	...	....	...	....	...	3575	110
PS0110805	X98P025	-	-	....	...	....	...	....	...	....	...	3567	110
PS01101386	X98P112	-	-	....	...	....	...	....	...	....	...	3508	108
JOEL	X84F172	+	+	1650	...	2375	...	1908	110	1626	113	3504	108
PS9910592	X95P122	-	-	....	...	....	...	1928	112	1797	125	3474	107
TOLEDO	.....	-	-	1623	...	2559	...	1644	95	1548	108	3415	105
PS0110815	X98P025	-	-	....	...	....	...	....	...	....	...	3321	102
LIFTER	X93P045	+	-	1983	...	2381	...	1938	112	1616	113	3306	102
*COLUMBIAN(LOT-I)	.....	+	+	....	...	....	...	1728	100	1436	100	3248	100
PS0110795	X98P024	-	-	....	...	....	...	....	...	....	...	3229	99
Grand Mean				1646		2477		1850		1587		3598	
LSD ( $\alpha=0.05$ )				152		152		159		128		379	

Leaf type; + = normal leaf, - = *afila* or semileafless type. Plant type; + = tall plant type, - = short plant type.

Yield data are means of three replications at each location, over four locations in each year.

\*Check variety

Table 4. Agronomic and Yield Data for the Preliminary Green Dry Pea Yield Trial, 2004 (0403)

Cultivar	Origin	Leaf Type	Plant Type	FW	PM	Aphano- myces	PEMV	Days to Flower	Days to Maturity	Nodes to First Flower	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Rep Nodes	Weight 100 Seed ..g..	Seed Yield ..kg/ha..
PS02100093	X98P020	-	-	+		3.2	-	71	105	19	2	56	30	0.53	65	57	0.89	3	24.0	3929
PS02100015	X98P005	-	-	+		3.5	-	70	105	15	2	49	11	0.23	67	35	0.52	4	22.0	3618
PS02100026	X98P006	-	-	+		4.5	-	71	105	18	2	55	10	0.18	69	28	0.41	3	23.5	3518
STIRLING	X93P022	-	-	+	-	3.8	-	64	105	14	2	39	16	0.43	60	35	0.59	5	21.0	3512
LIFTER	X93P045	+	-	+	-	2.0	+	73	109	14	2	57	8	0.14	83	25	0.30	5	22.0	3493
PS02100107	X98P022	-	-	+		3.5	-	69	105	16	2	43	30	0.71	58	54	0.93	4	22.5	3481
PS02100151	X98P025	-	-	+		3.8	+	75	105	18	2	60	23	0.38	72	45	0.64	4	21.5	3397
PS02100022	X98P006	-	-	-		3.2	-	69	105	15	2	46	19	0.41	60	40	0.67	3	24.0	3368
PS02100084	X98P017	-	-	+		3.8	-	68	105	16	2	60	16	0.28	77	48	0.64	3	23.5	3340
PS02100111	X98P023	-	-	-		4.3	-	75	105	16	2	50	25	0.49	60	53	0.88	3	20.5	3194
PS02100195	X98P197	-	-	-		3.2	-	71	105	16	2	46	26	0.56	66	55	0.83	4	22.0	3170
JOEL	X84F172	+	+	+	-	3.5	-	62	106	15	1	65	11	0.17	111	34	0.32	6	23.5	3162
PS02100040	X98P010	-	-	+		4.0	-	69	105	15	2	49	10	0.21	73	28	0.39	5	20.0	3150
PS02100025	X98P006	-	-	+		4.3	-	71	105	15	2	49	13	0.26	58	23	0.42	3	22.0	3113
PS02100148	X98P025	-	-	-		4.0	-	70	105	15	2	47	14	0.31	65	33	0.53	3	20.5	3086
PS02100219	X99P231	-	-	-	+	4.0	-	74	105	18	2	60	7	0.12	77	28	0.37	4	25.5	3059
PS02100128	X98P024	-	-	+		4.0	-	74	105	18	2	50	33	0.67	61	64	1.00	3	20.5	3024
PS02100120	X98P024	-	-	+	+	3.7	-	67	105	16	2	44	18	0.40	65	44	0.66	5	19.0	2988
PS02100155	X98P025	-	-	+	+	3.8	-	64	105	16	2	56	15	0.27	86	39	0.46	6	23.0	2984
PS02100119	X98P024	-	-	+	+	3.8	-	70	105	17	2	46	25	0.57	72	56	0.79	5	22.0	2873
Grand Mean						3.7		70	105	16	2	51	18	0.37	70	41	0.61	4	22.1	3273
C.V. (%)						23		1	0	7	11	11	36	38	13	21	25	18		8
LSD ( $\alpha=0.05$ )						1.2		1	1	2	0	8	9	0.19	13	12	0.21	1		356

Planting date 4/5/04. Harvest date 7/28/04.

FW = Fusarium wilt race 1; + = resistant, - = susceptible. PM = Powdery mildew; + = susceptible, - = resistant.

Aphanomyces = Aphanomyces root rot; 1 = no symptoms, 2 = 20% of lower leaves symptomatic, 3 = 50% of leaves symptomatic and plant stunted, 4 = 80% of leaves symptomatic and plant stunted, 5 = all plants dead.

PEMV = Pea enation mosaic virus, + = resistant, - = susceptible.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Rep Nodes = average number of reproducing nodes on a plant.

Agronomic and yield data are means of three replications at Pullman, WA.

## Marrowfat Pea Trial Results

Marrowfat peas are a specialty type of pea typically consumed as dried and seasoned snacks or as a thick soup preparation referred to as 'mushy peas'. Agronomic characteristics of this class of pea include relatively late maturity, short plant stature, conventional leaf morphology and a tendency to lodge at maturity. Quality characteristics of the marrowfat type peas related to flavor and texture are unique and poorly defined. Visual quality characteristics of the seed include extremely large seed size (exceeding 400 g/1000 seed) and dark green cotyledon coloration.

Goals of the USDA-ARS marrowfat pea breeding program include improving plant architecture, improving resistance to seed bleach and introgressing resistance to powdery mildew. Improved plant architecture has been accomplished through introduction of the semi-leafless (afila) leaf morphology and selection for stiff stem characters. Stem stiffness is a complex character and has been difficult to recover in segregating populations. Improved resistance to seed bleach has been accomplished through selection under simulated conditions in the greenhouse. Selection for powdery mildew resistance has been successful and nearly all breeding lines are resistant.

Advanced marrowfat pea yield trials were grown at four locations in the Palouse region, Pullman, Fairfield and Walla Walla, WA and at Genesee, ID (Table 5). The trials comprised ten breeding lines and two named cultivars, 'Guido' and 'Supra', as checks. Yield at the four locations were greatest at Walla Walla followed by Pullman, Genesee and Fairfield. Guido and Supra topped the trial in 2004 followed by four new entries which were not statistically different in yield. These breeding lines flowered three to eight days earlier than either Guido or Supra. One of the four lines, PS01102929, possesses resistance to Pea Enation Mosaic Virus as determined by field evaluations in Corvallis, OR.

All breeding lines in the advanced yield trial maintain the semi-dwarf plant stature and conventional leaf type; however, many of the breeding lines in the earlier stages of the breeding pipeline have been selected to include the semi-leafless leaf morphology to improve plant stature. Three breeding lines in the preliminary yield trial (Table 8) and eight of the breeding lines in the preliminary observation trial (Table 12) possess the semi-leafless character for improved plant stature. The preliminary marrowfat yield trial comprised five breeding lines and three check cultivars, Guido, Supra and 'Big Daddy'. One breeding line identified as PS02100740 outyielded the checks by 558 kg/ha which was statistically significant. Additional improved breeding lines from the preliminary observation trial will be advanced into the preliminary yield trial in 2005.

Table 5. Location Yield Summary (kg/ha) for the Advanced Marrowfat Dry Pea Yield Trial, 2004 (0433)

Cultivar	Origin	Leaf Type	Plant Type	Fairfield	Genesee	Pullman	Walla Walla	Mean Seed Yield
*GUIDO	.....	+	-	2799	2876	3221	5025	3480
SUPRA	.....	-	-	2903	3197	3124	4376	3400
PS01101063	X95P055	+	-	2340	2838	3558	4369	3276
PS01101287	X95P555	+	-	2995	3079	3379	3272	3181
PS01101328	X95P590	+	-	1992	2951	2850	4155	2987
PS01102929	X95P014	+	-	2487	2687	2706	3815	2924
PS9101380	X95P554	+	-	2788	2694	2440	3265	2797
PS99101364	X95P554	+	-	2393	2719	2417	3601	2782
PS710909	X95P017	+	-	2448	2614	2483	3273	2705
PS9101365	X95P554	+	-	2625	2640	2110	2989	2591
PS99101381	X95P554	+	-	2599	2354	2282	2869	2526
PS0010408	X95P272	+	-	2625	2152	2298	2992	2517
Grand Mean				2583	2733	2739	3667	2930
C.V. (%)				10	6	6	8	8
LSD ( $\alpha=0.05$ )				375	245	233	436	527
Planting Date				4/12/04	3/25/04	4/5/04	3/31/04	
Harvest Date				8/12/04	7/27/04	7/28/04	7/26/04	

Leaf type; + = normal leaf, - = *afila* or semileafless type. Plant type; + = tall plant type, - = short plant type.

Yield data are means of three replications at each of the four locations.

\*Check variety.

Table 6. Agronomic Data for the Advanced Marrowfat Dry Pea Yield Trial, 2004 (0433)

Cultivar	Origin	FW	PM	Aphano- myces	PEMV	Days to Flower	Days to Maturity	Nodes to First Flower	Pods/ Peduncle	Mean† Pod Ht (green) ..cm..	Mean Pod Ht (mature) ..cm..	Mean Pod Ht Index	Mean† Plant Ht (green) ..cm..	Mean Plant Ht (mature) ..cm..	Mean Plant Ht Index	Rep Nodes	Weight 100 Seed ..g..
*GUIDO	.....	+	+	3.7	-	72	107	14	2	43	11	0.27	70	33	0.47	4	35.0
SUPRA	.....	+	+	3.5	-	71	106	15	2	47	13	0.27	75	35	0.49	4	34.5
PS01101063	X95P055	+	+	4.0	-	68	107	14	2	45	9	0.21	70	27	0.38	4	33.0
PS01101287	X95P555	+		4.3	-	68	105	15	2	43	11	0.25	65	26	0.41	4	31.5
PS01101328	X95P590	+		4.2	-	64	106	15	2	48	10	0.20	86	33	0.39	5	33.5
PS01102929	X95P014	+		3.5	+	63	105	15	2	45	9	0.22	73	32	0.43	5	33.5
PS9101380	X95P554	+		3.8	-	66	109	15	2	48	11	0.24	81	37	0.48	4	30.0
PS99101364	X95P554	+		4.2	-	65	109	15	2	49	10	0.20	76	33	0.44	3	32.0
PS710909	X95P017	+		4.0	-	69	107	15	2	40	8	0.22	69	25	0.37	3	30.5
PS9101365	X95P554	+		3.8	-	66	110	15	2	46	14	0.30	80	37	0.50	5	32.0
PS99101381	X95P554	+		4.0	-	64	109	15	2	46	11	0.24	81	34	0.44	4	32.5
PS0010408	X95P272	+		4.0	-	64	109	14	2	49	11	0.23	72	33	0.47	4	32.5
Grand Mean				3.9		67	107	15	2	46	11	0.24	75	32	0.44	4	32.5
C.V. (%)				11		2	1	9		14	27	31	10	16	19	21	
LSD ( $\alpha=0.05$ )				0.6		2	1	2		4	2	0.06	7	4	0.06	1	

FW = Fusarium wilt race 1; + = resistant, - = susceptible. PM = Powdery mildew; + = susceptible, - = resistant.

Aphanomyces = Aphanomyces root rot; 1 = no symptoms, 2 = 20% of lower leaves symptomatic, 3 = 50% of leave symptomatic and plant stunted, 4 = 80% of leaves symptomatic and plant stunted, 5 = all plants dead.

PEMV = Pea enation mosaic virus, + = resistant, - = susceptible.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Rep Nodes = average number of reproducing nodes on a plant.

Agronomic data are means of three replications at Pullman, WA. Means data are means of three replication over 3 locations; Genesee, Pullman and Walla Walla. Means† data are means of three replications over 4 locations; Fairfield, Genesee, Pullman and Walla Walla.

\*Check variety.

Table 7. Mean Yields of the Advanced Marrowfat Dry Pea Yield Trial, 2000 - 2004

Cultivar	Origin	Leaf Plant		2000		2001		2002		2003		2004	
		Type	Type	kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check
*GUIDO	.....	+	-	1358	100	2192	100	1638	100	980	100	3480	100
SUPRA	.....	-	-	1326	98	2074	95	1712	105	1084	111	3400	98
PS01101063	X95P055	+	-	....	...	....	...	....	...	....	...	3276	94
PS01101287	X95P555	+	-	....	...	....	...	....	...	....	...	3181	91
PS01101328	X95P590	+	-	....	...	....	...	....	...	....	...	2987	86
PS01102929	X95P014	+	-	....	...	....	...	....	...	....	...	2924	84
PS9101380	X95P554	+	-	....	...	1742	79	1460	89	831	85	2797	80
PS99101364	X95P554	+	-	....	...	....	...	1386	85	624	64	2782	80
PS710909	X95P017	+	-	1396	103	1614	74	1513	92	999	102	2705	78
PS9101365	X95P554	+	-	....	...	1611	73	1459	89	570	58	2591	74
PS99101381	X95P554	+	-	....	...	....	...	1459	89	650	66	2526	73
PS0010408	X95P272	+	-	....	...	....	...	....	...	627	64	2517	72
Grand Mean				1376		1864		1365		771		2930	
LSD ( $\alpha=0.05$ )				111		109		109		90		527	

Leaf type; + = normal leaf, - = *afila* or semileafless type. Plant type; + = tall plant type, - = short plant type.

Yield data are means of three replications at each location, over four locations in each year.

\*Check variety



Table 8. Agronomic and Yield Data for the Preliminary Yellow and Marrowfat Dry Pea Yield Trial, 2004 (0404)

Cultivar	Origin	Leaf Type	Plant Type	FW	PM	Aphano- myces	PEMV	Days to Flower	Days to Maturity	Nodes to First Flower	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Rep Nodes	Weight 100 Seed ..g..	Seed Yield ..kg/ha..
<b>Yellow Peas</b>																				
PS02101229	X98P067	-	-	+	-	4.3	+	74	105	16	2	58	9	0.16	75	22	0.30	4	24.5	4090
DELTA	.....	-	-	+	+	4.0	-	71	105	16	2	55	49	0.88	72	79	1.00	4	23.5	4079
PS02101119	X96P122	-	-	+		3.8	-	70	105	15	2	58	9	0.16	71	28	0.39	3	27.0	3996
PS02101178	X96P133	-	-	+/-		4.3	-	69	105	15	2	47	13	0.28	70	31	0.45	4	23.0	3924
PS02101224	X98P062	-	-	+	-	4.7	-	72	105	16	2	42	12	0.29	63	24	0.38	5	24.5	3880
PS02101137	X96P127	-	-	+		4.0	-	71	105	17	2	63	21	0.34	76	44	0.57	4	25.5	3778
PS02101168	X96P131	-	-	+		4.5	-	74	105	16	2	57	14	0.25	76	28	0.37	4	25.0	3776
PS01101501	X98P088	-	-	+		4.3	-	75	105	16	2	53	27	0.51	69	50	0.72	4	23.0	3752
PS02101150	X96P130	-	-	+		4.5	-	64	105	16	2	53	15	0.29	77	30	0.39	5	27.5	3662
PS02101174	X96P133	-	-	+		3.5	-	74	105	17	2	64	12	0.19	80	28	0.35	5	29.0	3615
PS02101159	X96P130	-	-	+		4.2	-	69	105	14	2	49	17	0.34	73	36	0.51	5	25.5	3606
MIDAS	.....	-	-	+		4.3	-	75	105	16	2	52	38	0.74	67	74	1.00	4	21.0	3593
PS02101160	X96P130	-	-	+		4.5	-	68	105	15	2	43	9	0.21	71	26	0.37	5	26.0	3578
PS02101239	X98P072	-	-	+	-	3.7	-	71	105	16	2	57	6	0.11	85	24	0.29	6	26.5	3514
<i>Sub-mean Yellow Peas</i>						4.2		71	105	16	2	54	18	0.34	73	37	0.52	4	25.1	3775
<b>Marrowfats</b>																				
PS02100740	X98P049	-	-	+		4.3	-	74	105	17	2	58	12	0.21	71	33	0.47	4	34.5	4003
GUIDO	.....	+	-	+	+	3.8	-	73	106	15	2	44	8	0.19	66	26	0.39	4	34.0	3445
BIG-DADDY	.....	-	-	+	+	4.2		69	105	15	2	53	17	0.31	79	35	0.45	6	36.5	3433
SUPRA	.....	-	-	+	+	3.7	-	73	106	15	2	47	10	0.22	69	27	0.40	5	33.5	3422
PS02100756	X00P193	+	-	+		5.0	-	69	106	14	2	53	11	0.22	72	27	0.38	4	29.5	3373
PS02100738	X98P049	-	-	+	-	4.0	-	76	106	16	2	57	6	0.11	69	19	0.28	4	31.0	3348
PS02100739	X98P049	-	-	+		4.0	-	75	107	17	2	53	11	0.22	73	27	0.37	5	34.5	3209
PS02100266	X95P014	+	-	+		4.0	-	66	107	15	2	49	15	0.31	82	32	0.40	5	30.5	2540
<i>Sub-mean Marrowfats</i>						4.1		72	106	16	2	52	11	0.22	73	28	0.39	5	33.0	3347

Table 8. Agronomic Data for the Preliminary Yellow and Marrowfat Dry Pea Yield Trial, 2004 (0404)

Cultivar	Origin	Leaf Type	Plant Type	FW	PM	Aphano- myces	PEMV	Days to Flower	Days to Maturity	Nodes to First Flower	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Rep Nodes	Weight 100 Seed ..g..	Seed Yield ..kg/ha..
Grand Mean						4		71	105	16	2	53	16	0.30	73	34	0.47	5	28.0	3619
C.V. (%)						14		1	1	8	6	8	32	33	8	17	17	25		7
LSD ( $\alpha=0.05$ )						0.8		1	1	2	0	6	7	0.13	8	8	0.11	2		353

Planting date 4/5/04. Harvest date 7/28/04.

FW = Fusarium wilt race 1; + = resistant, - = susceptible. PM = Powdery mildew; + = susceptible, - = resistant.

Aphanomyces = Aphanomyces root rot; 1 = no symptoms, 2 = 20% of lower leaves symptomatic, 3 = 50% of leave symptomatic and plant stunted, 4 = 80% of leaves symptomatic and plant stunted, 5 = all plants dead.

PEMV = Pea enation mosaic virus, + = resistant, - = susceptible.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Rep Nodes = average number of reproducing nodes on a plant.

Agronomic and yield data are means of three replications at Pullman, WA.

## Yellow Pea Trial Results

The advanced yellow pea yield trial was grown at Pullman, Fairfield and Walla Walla, WA, and at Genesee, ID (Table 9) and comprised five breeding lines and three check cultivars, 'Delta', 'Eiffel' and 'Rex'. Overall seed yield was greatest at Walla Walla followed by Genesee, Pullman and Fairfield. Two breeding lines, PS9910140 and PS0010836, yielded approximately equal to Delta and Eiffel and ranked 2 and 3 in the trial for seed yield. Despite excellent plant height in previous years, PS9910140 lodged in 2004 with a height index (canopy height/vine length) of 0.27 while PS0010836 along with PS01102958 both had height indices greater than 0.50. The overall trial mean yield was 3799 kg/ha and the mean of the checks was 3965 kg/ha. Several breeding lines in the preliminary yield and observation trials produced outstanding yields and will be advanced into the advanced yield trial for wide testing across environments.

Significant advances have been made in the yellow peas for plant stature and yield while maintaining seed quality. The breeding line, PS01102958, has performed well in both PNW and midwest trials and will be proposed for preliminary increase of breeder seed in anticipation of its continued superior performance. It has seed color and quality characteristics similar to those of Rex and maintains a superior canopy height at maturity to Rex resulting in greater harvest ease. It also has resistance to race 1 of fusarium wilt and powdery mildew both of which Rex lacks. PS01102958 has only been tested for two years in replicated trials and a decision on full release will not be made until an additional year of data can be compiled.

Table 9. Location Yield Summary (kg/ha) for the Advanced Yellow Dry Pea Yield Trial, 2004 (0402)

Cultivar	Origin	Leaf Type	Plant Type	Fairfield	Genesee	Pullman	Walla Walla	Mean Seed Yield
*DELTA	.....	-	-	3766	3951	3719	4894	4083
PS9910140	X92P303	-	-	3447	3903	3976	4884	4052
PS0010836	SH95-6-1	-	-	4126	3774	3464	4837	4050
EIFFEL	.....	-	-	3529	4291	3958	4408	4046
REX	.....	+	-	3299	3875	3491	4401	3767
PS01102958	X96P124	-	-	2985	3327	3540	4371	3555
PS0010806	X94P81-2	-	-	3096	3585	2911	4149	3435
PS01103430	X96P138	-	-	2968	2673	3000	4982	3406
Grand Mean				3402	3672	3507	4615	3799
C.V. (%)				9	5	6	7	7
LSD ( $\alpha=0.05$ )				454	268	287	459	471
Planting Date				4/12/04	3/25/04	4/5/04	3/31/04	
Harvest Date				8/12/04	7/27/04	7/23/04	7/26/04	

Leaf type; + = normal leaf, - = *afila* or semileafless type. Plant type; + = tall plant type, - = short plant type.

Yield data are means of three replications at each of the four locations.

\*Check variety.

Table 10. Agronomic Data for the Advanced Yellow Dry Pea Yield Trial, 2004 (0402)

Cultivar	Origin	FW	Aphano- myces	PEMV	Days to Flower	Days to Maturity	Nodes to First Flower	Pods/ Peduncle	Mean† Pod Ht (green) ..cm..	Mean Pod Ht (mature) ..cm..	Mean Pod Ht Index	Mean† Plant Ht (green) ..cm..	Mean Plant Ht (mature) ..cm..	Mean Plant Ht Index	Rep Nodes	Weight 100 Seed ..g..
*DELTA	.....	+	3.3	-	70	105	16	2	48	39	0.82	78	71	0.94	4	24.0
PS9910140	X92P303	+	2.0	-	71	105	15	2	41	9	0.21	82	22	0.28	5	22.5
PS0010836	SH95-6-1	+	3.0	-	72	105	13	2	42	17	0.40	71	36	0.53	3	26.0
EIFFEL	.....	-	3.2	-	68	105	16	2	51	34	0.67	82	69	0.85	4	26.5
REX	.....	-	2.0	-	68	105	16	2	48	13	0.27	83	35	0.43	4	24.0
PS01102958	X96P124	+	2.2	-	73	105	15	2	46	16	0.33	76	38	0.50	3	25.5
PS0010806	X94P81-2	+	3.5	-	70	105	14	2	37	8	0.21	77	22	0.30	5	26.5
PS01103430	X96P138	+	2.7	-	76	106	18	2	56	7	0.13	87	24	0.26	4	25.5
Grand Mean			2.7		71	105	15	2	46	18	0.38	79	40	0.51	4	25.1
C.V. (%)			29		2	1	9		11	32	35	8	19	21	27	
LSD ( $\alpha=0.05$ )			1.1		2	1	2		5	7	0.16	9	8	0.14	2	

FW = Fusarium wilt race 1; + = resistant, - = susceptible. PM = Powdery mildew; + = susceptible, - = resistant.

Aphanomyces = Aphanomyces root rot; 1 = no symptoms, 2 = 20% of lower leaves symptomatic, 3 = 50% of leave symptomatic and plant stunted, 4 = 80% of leaves symptomatic and plant stunted, 5 = all plants dead.

PEMV = Pea enation mosaic virus, + = resistant, - = susceptible.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Rep Nodes = average number of reproducing nodes on a plant.

Agronomic data are means of three replications at Pullman, WA. Means data are means of three replication over 3 locations; Genesee, Pullman and Pullman. Means† data are means of three replications over 4 locations; Fairfield, Genesee, Pullman and Walla Walla.

\*Check variety.

Table 11. Mean Yields of the Advanced Yellow Dry Pea Yield Trial, 2000 - 2004

Cultivar	Origin	Leaf Type	Plant Type	2000		2001		2002		2003		2004	
				kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check
*DELTA	.....	-	-	1322	100	2870	100	2272	100	1639	100	4083	100
PS9910140	X92P303	-	-	....	...	....	...	2218	98	1779	109	4052	99
PS0010836	SH95-6-1	-	-	....	...	....	...	....	...	1804	110	4050	99
EIFFEL	.....	-	-	....	...	....	...	2248	99	1586	97	4046	99
REX	.....	+	-	1487	112	2740	95	2020	89	1654	101	3767	92
PS01102958	X96P124	-	-	....	...	....	...	....	...	....	...	3555	87
PS0010806	X94P81-2	-	-	....	...	....	...	....	...	1568	96	3435	84
PS01103430	X96P138	-	-	....	...	....	...	....	...	....	...	3406	83
Grand Mean				1605		2754		2048		1651		3799	
LSD ( $\alpha=0.05$ )				159		179		112		91		471	

Leaf type; + = normal leaf, - = *afila* or semileafless type. Plant type; + = tall plant type, - = short plant type.

Yield data are means of three replications at each location, over four locations in each year.

\*Check variety

Table 12. Agronomic and Yield Data for the Preliminary Green, Yellow and Marrowfat Dry Pea Observation Trial, 2004 (0405)

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Cultivar	Origin	Leaf Type	Plant Type	Days to Flower	Days to Maturity	Nodes to First Flower	Pod/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Rep Nodes	Weight 100 Seed ..g..	Seed Yield ..kg/ha..
<b>Green Cots</b>																
PS03690197	X97P11	-	-	68	103	18	2	56	32	0.57	66	57	0.86	2	23.0	3995
PS03100116	X94P106	-	-	74	103	16	2	71	14	0.20	83	37	0.45	3	22.6	3894
PS03100546	BX98P10-7	-	-	68	103	16	2	55	27	0.49	70	55	0.79	4	24.3	3888
PS03100471	BX98P10-7	-	-	68	103	17	2	53	40	0.75	71	55	0.77	3	24.8	3846
PS02100224	X99P235	-	-	60	103	17	2	69	12	0.17	85	36	0.42	3	25.2	3776
PS03101445	X98P024	-	-	69	103	17	2	59	23	0.39	71	50	0.70	4	22.5	3675
PS03690293	X96P143	-	-	68	103	14	2	47	11	0.23	68	49	0.72	3	23.2	3613
PS03101459	X98P025	-	-	68	103	17	2	57	25	0.44	78	52	0.67	5	23.0	3482
PS03101347	X00P111	-	-	69	103	18	2	70	20	0.29	89	39	0.44	3	22.5	3352
PS03690011	X97P143	-	-	69	103	17	2	57	16	0.28	79	37	0.47	4	22.0	3249
PS03101349	X00P111	-	-	66	103	19	2	75	22	0.29	86	46	0.53	3	25.0	3170
PS03101340	X00P111	-	-	64	103	16	2	60	13	0.22	91	42	0.46	5	25.2	3104
PS03690009	X97P131	-	-	72	103	14	2	38	19	0.50	46	45	0.98	2	22.0	2595
<i>Sub-mean Green Cots</i>				68	103	17	2	59	21	0.37	76	46	0.64	3	23.5	3511
<b>Marrowfats</b>																
PS02100725	X98P042	-	-	69	103	14	2	62	15	0.24	85	40	0.47	4	36.0	3313
PS03101328	X00P098	-	-	74	106	17	2	67	23	0.34	78	39	0.50	3	34.2	3162
PS02100735	X98P049	-	-	68	103	13	2	50	20	0.40	63	36	0.57	3	34.0	3118
PS02100726	X98P042	-	-	69	103	13	2	63	24	0.38	84	45	0.54	4	35.0	2856
PS03101671	X95P272	+	-	65	103	16	2	44	8	0.18	69	34	0.49	5	34.4	2283
PS03101611	X95P048	+	-	72	103	15	2	38	10	0.26	52	26	0.50	4	32.6	2200
PS03101789	X98P046	-	-	67	103	15	2	41	24	0.59	77	53	0.69	8	35.4	2095
<i>Sub-mean Marrowfats</i>				69	103	15	2	52	18	0.34	73	39	0.54	4	34.5	2718
<b>Yellow Cots</b>																
PS03101822	X96P126	-	-	66	103	13	2	47	15	0.32	64	32	0.50	3	25.2	4214
PS03100278	BXM95P10-111	-	-	65	103	18	2	60	31	0.52	77	70	0.91	3	25.3	3834
PS03100411	SH95-54-5	-	-	73	103	18	2	62	46	0.74	71	71	1.00	3	25.0	3832
PS03101815	X96P126	-	-	67	103	14	2	45	15	0.33	64	32	0.50	4	26.5	3722
PS03101867	X96P133	-	-	73	103	16	2	55	16	0.29	66	30	0.45	3	22.1	3426
PS03100280	BXM95P10-111	-	-	67	103	17	2	59	55	0.93	81	66	0.81	5	24.7	3182
PS03101847	X96P130	-	-	67	103	15	2	53	15	0.28	68	31	0.46	4	27.3	3174
<i>Sub-mean Yellow Cots</i>				68	103	16	2	54	28	0.49	70	47	0.66	4	25.2	3626

Table 12. Agronomic and Yield Data for the Preliminary Green, Yellow and Marrowfat Dry Pea Observation Trial, 2004 (0405)

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Cultivar	Origin	Leaf Type	Plant Type	Days to Flower	Days to Maturity	Nodes to First Flower	Pod/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Rep Nodes	Weight 100 Seed ..g..	Seed Yield ..kg/ha..
<b>Red Cots</b>																
PS03690134	X98P161	-	-	67	103	15	2	44	12	0.27	54	28	0.52	2	22.9	3912
PS03690129	X98P144	+	-	73	103	18	2	59	31	0.53	78	50	0.64	4	20.5	3420
PS03690125	X98P092	-	-	66	103	16	2	46	20	0.43	68	41	0.60	5	27.3	3265
<i>Sub-mean Red Cots</i>				69	103	16	2	50	21	0.41	67	40	0.59	4	23.6	3533
<b>Parentals</b>																
POSLESSKII	VIR-K 8799	-	+	69	103	16	2	95	11	0.12	107	31	0.29	3	...	3575
REZONATOR	VIR-K 8752	+	+	74	106	17	2	98	15	0.15	112	38	0.34	4	...	3253
ADMIRALTEIISKII	VIR-K 8746	+	+	69	103	14	2	71	15	0.21	90	30	0.33	3	...	3191
8712-CIZ-10	VIR-EK 98	+	-	68	103	15	2	71	6	0.08	99	24	0.24	4	...	1652
<i>Sub-mean Parentals</i>				70	104	16	2	84	12	0.14	102	31	0.30	4	...	2918
<b>Grand Mean</b>				69	103	16	2	59	19	0.33	76	39	0.52	4	26.4	3054

Planting date 4/7/04. Harvest date 7/26/04.

Leaf type; + = normal leaf, - = *afila* or semileafless type. Plant type; + = tall plant type, - = short plant type.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Rep Nodes = average number of reproducing nodes on a plant.

Agronomic and yield data are one replication at Pullman, WA



Table 13. Agronomic and Yield Data for the Canadian and Australian Pea Observation Nursery, 2004 (0407P)

Page 1 of 2

Cultivar	Leaf Type	Plant Type	FW	Aphano- myces	PEMV	Days to Flower	Days to Maturity	Nodes to First Flower	Pods/ Peduncle	Pod Height (green) ..cm..	Pod Height (mature) ..cm..	Pod Height Index	Plant Height (green) ..cm..	Plant Height (mature) ..cm..	Plant Height Index	Rep Nodes	Weight 100 Seed ..g..	Mean Seed Yield ..kg/ha..
92-218*9*6	-	-	+/-	3.8	-	72	103	21	2	83	30	0.36	93	58	0.62	4	24	4231
92-208-*12	-	-	+	3.7	-	69	106	19	2	69	36	0.52	98	72	0.73	7	22	4183
CDC-0107	-	-	+	3.7	-	73	103	18	2	62	14	0.23	81	34	0.42	4	18	4103
CDC-715-4	-	-	+	3.8	-	74	103	16	2	57	43	0.75	63	65	1.03	2	23	4078
93-062*14	-	-	+	4.6	-	69	103	16	2	54	30	0.56	83	59	0.71	4	20	4059
92-026-*5-11	-	-	+	2.2	-	73	103	19	2	74	38	0.51	80	47	0.59	3	23	4045
CDC-651-2	-	-	+/-	3.8	-	73	103	18	2	63	20	0.32	75	32	0.43	4	20	4016
96-288-*1	+	-	+/-	4.3	-	68	103	14	1	53	16	0.30	96	39	0.41	7	20	3950
92-218-*8-5	+	-	+	3.7	-	72	103	19	2	75	18	0.24	88	34	0.39	4	24	3921
92-254-*7-6	-	-	+	4.3	-	69	103	17	2	59	13	0.22	84	42	0.50	5	21	3867
92-256-*1-3	-	-	-	3.8	-	71	103	17	2	55	23	0.42	91	54	0.59	5	22	3859
92-297-*10-1	-	-	+	3.8	-	72	103	16	2	69	12	0.17	83	29	0.35	4	22	3828
CDC-0105	-	-	+/-	3.8	+	69	103	14	2	55	18	0.33	73	39	0.53	4	22	3815
CDC-0108	-	-	+	3.7	-	74	103	16	2	62	31	0.50	81	45	0.56	4	23	3788
92-104P5*6	-	-	+	4.3	-	68	103	17	2	50	36	0.72	65	61	0.94	4	23	3782
CDC-VERDI	-	-	+	3.7	-	73	103	19	2	66	29	0.44	78	46	0.59	3	21	3778
89-036-*9-10	-	-	+	4.2	-	69	103	18	2	58	24	0.41	79	40	0.51	5	23	3770
CDC-0103	-	-	+	3.7	-	77	103	20	1	74	34	0.46	79	48	0.61	3	23	3743
CDC-647-1	-	-	+	3.2	-	74	103	18	2	75	12	0.16	91	37	0.41	6	20	3722
92-190-*5-6	-	-	+	...	-	69	103	19	2	61	25	0.41	74	64	0.86	4	22	3695
CDC-653-8	-	-	+	3.7	-	73	103	17	2	80	34	0.43	88	62	0.70	2	22	3691
95-072*3	-	+	+	...	-	73	106	18	2	86	21	0.24	123	37	0.30	5	20	3687
CDC-ACER	-	-	-	2.2	-	78	106	17	2	56	20	0.36	66	34	0.52	3	15	3679
90-166*30-5	-	-	+	3.7	-	74	103	19	2	97	30	0.31	114	56	0.49	4	25	3679
92-112-*1-3	-	-	+	4.2	-	68	103	16	2	65	21	0.32	82	40	0.49	3	20	3621
CDC-MINUET	-	-	-	2.5	-	75	103	15	2	52	18	0.35	66	41	0.62	4	17	3610
CDC-0007	-	-	-	3.3	-	73	103	16	2	66	39	0.59	77	76	0.99	3	22	3590
CDC-MONTERO	-	-	+/-	2.8	-	74	103	16	2	66	16	0.24	74	23	0.31	2	20	3464

Table 13. Agronomic and Yield Data for the Canadian and Australian Pea Observation Nursery, 2004 (0407P)

Cultivar	Leaf Type	Plant Type	FW	Aphano- myces	PEMV	Days to Flower	Days to Maturity	Nodes to First Flower	Pods/ Peduncle	Pod Height (green) ..cm..	Pod Height (mature) ..cm..	Pod Height Index	Plant Height (green) ..cm..	Plant Height (mature) ..cm..	Plant Height Index	Rep Nodes	Weight 100 Seed ..g..	Mean Seed Yield ..kg/ha..
90-131*27-7	+	+	-	4.2	-	72	103	20	1	94	12	0.13	118	26	0.22	4	20	3464
CDC-0106	-	-	+/-	3.8	-	71	103	15	2	63	30	0.48	88	54	0.61	5	17	3406
CDC-0101	-	-	-	3.0	-	74	103	16	2	55	37	0.67	64	64	1.00	3	22	3393
CDC-SONATA	+	-	-	4.2	-	73	106	16	2	67	9	0.13	73	18	0.25	3	26	3375
89-036-*9-2	-	-	+	4.0	-	69	103	22	2	79	29	0.37	101	54	0.53	6	22	3224
CDC-0102	-	-	+	3.7	-	72	103	16	2	45	27	0.60	56	33	0.59	3	21	3118
89-036-*9-8	-	-	+	4.0	-	72	103	14	2	56	16	0.29	68	51	0.75	5	22	3112
CDC-0009	-	-	-	3.8	-	74	103	15	2	51	38	0.75	65	61	0.94	4	21	3110
90-158*8-5	-	-	+	4.0	-	73	103	21	2	81	56	0.69	90	84	0.93	4	23	3110
92-133-*2-9	+	+	+		-	68	103	16	2	68	10	0.15	117	31	0.26	5	19	3098
96-286-*1	-	-	+	3.8	-	63	103	14	2	64	15	0.23	79	29	0.37	4	23	3091
92-038-*9-2	-	-	-	3.8	-	69	103	18	2	65	18	0.28	88	43	0.49	5	22	3067
SNOWPEAK	-	-	+	3.8	-	66	103	16	2	56	36	0.64	77	59	0.77	5	21	2932
CDC-672-1	-	-	-	3.2	-	73	103	13	2	60	60	1.00	73	78	1.00	3	21	2901
KASPA	-	-	+	4.7	-	79	106	24	2	83	46	0.55	91	65	0.71	4	22	2802
EXCELL	-	-	+	4.2	-	67	103	17	2	53	35	0.66	83	69	0.83	4	24	2790
Grand Mean				3.7		72	103	17	2	66	27	0.42	83	48	0.60	4	21	3574

Planting date was 4/7/04. Harvest date was 7/26/04.

Leaf type; + = normal leaf, - = *afila* or semileafless type. Plant type; + = tall plant type, - = short plant type.

FW = Fusarium wilt race 1; + = resistant, - = susceptible. PM = Powdery mildew; + = susceptible, - = resistant.

Aphanomyces = Aphanomyces root rot; 1 = no symptoms, 2 = 20% of lower leaves symptomatic, 3 = 50% of leave symptomatic and plant stunted, 4 = 80% of leaves symptomatic and plant stunted, 5 = all plants dead.

PEMV = Pea enation mosaic virus, + = resistant, - = susceptible.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Rep Nodes = average number of reproducing nodes on a plant.

Agronomic and yield data are one replication at Pullman, WA

## Winter Pea Trial Results

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The white-flowered, clear-seeded, winter pea yield trial included 8 breeding lines and was grown at three locations in 2004, WSU Spillman Farm, Russ Zenner's farm near Genesee and Joe Schmitz' farm near Rosalia, WA. Establishment of the 2004 trials at all three locations was successful despite dry soil conditions. Incidence of harsh conditions during the 2003/2004 winter resulted in excellent test conditions for winter hardiness, especially at the Spillman location. Two spring type yellow peas, Delta and 'Shawnee' were included in the trial to indicate the level of winter severity and at the Spillman site no survival was observed while at Rosalia approximately a 50% stand was maintained and at the Genesee site 100 % survival of the spring checks was recorded. This variation in survival demonstrates the range of conditions/environments crops on the Palouse may be exposed to depending on microclimate and location. Survival of the advanced breeding lines in the advanced yield trial at all three locations were rated either 9 or 10 on a 1-10 scale, where 1 indicates complete death and 10 complete survival, indicating that the level of winter hardiness in these lines was adequate.

The eight lines in the advanced yield trial comprised one green cotyledon type, PS9530726, and seven yellow cotyledon types. Five of the entries were long vine types and the remaining three were semi-dwarf types and only one entry possessed the conventional leaf morphology. Despite experiencing the most severe winter conditions seed yield was greatest at Spillman Farm followed by Genesee and Rosalia (Table 14). Overall average yield for each entry ranged from 2188 to 2866 kg/ha.

Breeding line PS9830F009, approved for preliminary increase of breeder seed in 2003, was proposed and received approval for full release in 2004 and has been named 'Specter'. Specter has performed well over five years of testing in trials across the Palouse as well as trials conducted in several midwest states. This variety is being released as a winter feed pea due to the presence of 'ghost' mottling on the seed coat and small seed size making it less desirable for traditional human food markets. Specter has yellow cotyledons and a long vine plant type with semi-leafless leaf morphology.

Breeder seed development for Specter was initiated by producing 500 single plants in the USDA greenhouse during the winter of 2003-2004. Following elimination of individuals which were not true-to-type, seed of each individual plant were sown in microplots at Spillman research farm during the summer 2004 season. Again, off-type plots were eliminated and those with uniform, true-to-type seed were bulked as pre-breeder seed (approx. 360 lb). Approximately 2 acres were planted in the fall of 2004 and the remaining seed will be sown in the spring 2005 to increase seed stocks and produce Foundation seed.

The winter pea preliminary observation trial comprised 52 breeding lines of both green and yellow cotyledon types. Winter hardiness scores ranged from 1 to 9 among these lines and thirteen were advanced for wide testing across multiple locations. Seed yield ranged from 445 to 4545 kg/ha with a mean seed yield of 3354 kg/ha (Table 16).

A second year of seeding rate trials were conducted in the 2004 crop year to complete the agronomic adaptation of winter pea and lentil to direct seeding systems project funded by the Cool Season Food Legume Research Program. Four treatments (0.5X, 1.0X, 1.5X and 2.0X) were included each year. The 1.0X seeding rate for pea and lentil was 120 and 35 lb/ac, respectively. Average results showed that the recommended 1.0X rate was optimum for both crops (Table 17).

Table 14. Location Yield Summary (kg/ha) for the Advanced Winter Dry Pea Yield Trial, 2004 (0422)

Cultivar	Origin	Leaf Type	Plant Type	Genesee	Pullman	Rosalia	Mean Seed Yield
PS9830F011	X92P056	-	-	2843	3767	1965	2866
PS9830S358	X93P060	-	-	3443	3564	2156	2860
PS9630448	X92P056	-	+	2874	3803	1712	2757
PS9530726	X91P241	-	-	3656	3603	1846	2724
PS9830F009	X92P056	-	+	2725	3467	1901	2684
PS9830F010	X92P056	-	+	2555	3385	1975	2680
PS9830S431	X95P679	+	+	3560	3115	1769	2442
PS9430706	X91P091	-	+	1655	2651	1725	2188
Grand Mean – Winter Types				2914	3419	1881	2650
SHAWNEE	X84F259	+	+	2085	0	807	404
DELTA		-	-	1774	0	630	315
Grand Mean – Spring Types				1929	0	718	359
Planting Date				9/24/03	9/22/03	9/24/03	
Harvest Date				8/5/04	7/29/04	8/2/04	

Leaf type; + = normal leaf, - = *afila* or semileafless type. Plant type; + = tall plant type, - = short plant type.  
Yield data are means of three replications at each of the three locations.

Table 15. Agronomic Data for the Advanced Winter Dry Pea Yield Trial, 2004 (0422)

Cultivar	Origin	Leaf Type	Plant Type	FW	PM	Aphano- myces	Nodes to First Flower	Mean Pods/ Peduncle	Mean Pod Ht (green) ..cm..	Mean Pod Ht (mature) ..cm..	Mean Pod Ht Index	Mean Plant Ht (green) ..cm..	Mean Plant Ht (mature) ..cm..	Mean Plant Ht Index	Mean Rep Nodes	Mean Weight 100 Seed ..g..	Winter Hardy Score
PS9830F011	X92P056	-	-	+	-	3.2	17	2	41	19	0.49	88	49	0.59	11	14.4	7
PS9830S358	X93P060	-	-	+	-	3.8	18	2	46	17	0.42	85	48	0.62	8	15.3	9
PS9630448	X92P056	-	+	+	-	3.3	15	2	83	17	0.21	157	55	0.39	8	13.6	9
PS9530726	X91P241	-	-	+	-	3.8	18	3	43	13	0.33	85	42	0.53	9	14.2	8
PS9830F009	X92P056	-	+	+	-	2.7	18	2	72	19	0.28	134	56	0.44	8	13.1	9
PS9830F010	X92P056	-	+	-	-	3.0	18	2	97	18	0.20	163	53	0.35	8	13.7	9
PS9830S431	X95P679	+	+	+	-	3.8	15	2	61	15	0.29	139	47	0.37	9	13.0	9
PS9430706	X91P091	-	+	+	-	3.3	16	2	84	19	0.26	157	48	0.32	9	12.7	7
Grand Mean – Winter Types						3.4	17	2	66	17	0.31	126	50	0.45	9	13.8	8
SHAWNEE	X84F259	+	+	+	-	2.8	0	1	28	8	0.14	66	24	0.25	5	18.4	0
DELTA		-	-	+	-	2.8	0	1	29	12	0.28	54	30	0.36	4	21.4	0
Grand Mean-Spring Types						2.8	0	1	29	10	0.21	60	27	0.31	4	19.9	0

Leaf type; + = normal leaf, - = *afila* or semileafless type. Plant type; + = tall plant type, - = short plant type.

FW = Fusarium wilt race 1; + = resistant, - = susceptible. PM = Powdery mildew; + = susceptible, - = resistant.

Aphanomyces = Aphanomyces root rot; 1 = no symptoms, 2 = 20% of lower leaves symptomatic, 3 = 50% of leave symptomatic and plant stunted, 4 = 80% of leaves symptomatic and plant stunted, 5 = all plants dead.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Rep Nodes = average number of reproducing nodes on a plant.

Winter hardy score – 10 = 100% survival; 0 = 0% survival

Agronomic data are means of three replications at Pullman, WA. Means data are means of three replications over three locations, Genesee, ID, Pullman, WA and Rosalia, WA.

Table 16. Agronomic and Yield Data for the Winter Dry Pea Observation Nursery, 2004 (0425)

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Cultivar	Origin	Nodes to First Flower	Pods/ Peduncle	Pod Height (green) ..cm..	Pod Height (mature) ..cm..	Pod Height Index	Plant Height (green) ..cm..	Plant Height (mature) ..cm..	Plant Height Index	Rep Nodes	Weight 100 Seed ..g..	Mean Seed Yield ..kg/ha..
PS0230F274	X97P051	20	2	94	18	0.19	152	41	0.27	6	17.0	4545
PS03100600	X92P028	16	2	73	23	0.32	141	69	0.49	11	14.6	4516
PS03100778	X97P107	18	2	69	10	0.14	128	37	0.29	11	12.6	4509
PS03100598	X92P028	19	2	79	20	0.25	142	77	0.54	11	15.0	4489
PS03100648	X92P056	17	2	75	16	0.21	161	73	0.45	12	14.0	4417
PS03100601	X92P028	21	2	84	31	0.37	175	63	0.36	11	15.0	4269
PS03100635	X92P056	15	2	72	21	0.29	142	68	0.48	10	12.7	4197
PS0230F075	X98P103	10	3	53	13	0.25	77	32	0.42	3	14.5	4184
PS03100848	X97P096	16	3	68	12	0.18	121	31	0.26	8	19.3	4184
PS0230F076	X98P103	17	2	42	14	0.33	83	42	0.51	9	14.9	4106
PS03100606	X92P056	20	2	101	19	0.19	169	51	0.30	10	14.3	4064
PS0230F100	X98P103	18	2	39	11	0.28	81	39	0.48	8	15.7	4042
PS0230F256	X95P672	19	2	93	15	0.16	159	33	0.21	7	16.1	3985
PS0230F352	X97P100	21	2	109	13	0.12	198	51	0.26	8	14.2	3974
PS03100569	X91P241	18	2	56	15	0.27	87	42	0.48	9	16.6	3947
PS0017018	X97P098	24	2	88	10	0.11	175	46	0.26	11	15.4	3921
PS03100675	X95P672	12	2	57	17	0.30	126	63	0.50	10	15.7	3903
PS03100660	X95P679	18	2	64	13	0.20	132	47	0.36	11	12.4	3763
PS0230F249	X95P672	21	2	107	12	0.11	186	56	0.30	7	14.5	3705
PS03100909	X98P103	19	..	65	10	0.15	84	32	0.38	9	15.3	3654
PS0230F210	X97P088	16	2	66	6	0.09	115	34	0.30	4	20.0	3651
PS0230F257	X95P672	21	2	100	11	0.11	193	58	0.30	5	15.5	3646
PS03100959	X98P105	21	2	51	15	0.29	79	43	0.54	7	15.2	3643
PS0230F063	X98P098	20	2	44	15	0.34	78	38	0.49	8	13.9	3611
PS03101146	X98P099	13	2	38	15	0.39	69	32	0.46	7	16.0	3609
PS03100578	X91P234	24	2	118	9	0.08	155	41	0.26	6	17.4	3555
PS0230F092	X98P100	21	2	43	12	0.28	71	33	0.46	7	15.1	3538
PS03101160	X98P100	12	2	25	9	0.36	60	34	0.57	7	16.9	3525
PS03100567	X91P241	19	2	47	12	0.26	85	36	0.42	9	15.9	3501
PS0230F113	X98P108	19	3	45	14	0.31	78	48	0.62	6	15.3	3431
PS03101120	X97P088	15	3	50	12	0.24	103	45	0.44	7	19.6	3429
PS03101150	X98P099	14	2	34	11	0.32	69	29	0.42	8	16.6	3429
PS03100879	X97P103	16	..	64	18	0.28	154	55	0.36	12	13.7	3347
PS0230F077	X98P103	16	2	39	15	0.38	76	42	0.55	11	14.1	3342
PS0230F061	X98P097	21	2	62	18	0.29	94	53	0.56	6	16.5	3281
PS03101133	X97P098	11	2	46	14	0.30	122	43	0.35	8	15.4	3263
PS0230F211	X97P096	21	3	94	15	0.16	168	34	0.20	8	16.5	3182
PS03101139	X98P097	17	3	36	10	0.28	74	38	0.51	10	14.9	3159
PS03101269	X98P096	16	2	75	23	0.31	140	41	0.29	10	17.1	3063
PS03101170	X98P104	14	2	35	13	0.37	72	35	0.49	8	16.0	3016
PS03101247	X98P098	16	2	30	16	0.53	71	49	0.69	11	11.6	3007

Table 16. Agronomic and Yield Data for the Winter Dry Pea Observation Nursery, 2004 (0425)

Page 2 of 2

Cultivar	Origin	Nodes to First Flower	Pods/ Peduncle	Pod Height (green) ..cm..	Pod Height (mature) ..cm..	Pod Height Index	Plant Height (green) ..cm..	Plant Height (mature) ..cm..	Plant Height Index	Rep Nodes	Weight 100 Seed ..g..	Mean Seed Yield ..kg/ha..
PS03101118	X97P088	16	2	53	10	0.19	117	36	0.31	7	19.4	2964
PS03100849	X97P096	15	2	88	10	0.11	157	47	0.30	9	21.0	2802
PS0230F058	X98P096	19	2	69	15	0.22	143	37	0.26	8	14.7	2750
PS03100979	X98P084	13	2	25	..	...	74	..	...	10	21.7	2478
PS03101166	X98P102	16	2	28	11	0.39	62	36	0.58	9	16.7	2356
PS03101205	X98P100	15	2	32	19	0.59	65	46	0.71	7	19.0	2083
PS0230F208	X97P088	14	2	50	10	0.20	123	44	0.36	11	21.1	1888
PS03100938	X98P102	11	2	28	14	0.50	73	40	0.55	9	17.0	1487
PS03101027	X98P089	13	2	27	24	0.89	49	..	...	6	20.2	980
PS0230F123	X98P084	18	2	39	17	0.44	56	44	0.79	5	25.7	586
PS03101045	X98P093	13	2	25	..	...	54	..	...	9	23.5	445
Grand Mean		17	2	60	14	0.27	112	42	0.40	8	16.4	3354

Planting date was 9/22/03. Harvest date was 7/28/04.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Rep Nodes = average number of reproducing nodes on a plant.

Agronomic and yield data are one replication at Pullman, WA



Table 17. Agronomic and Yield Data of Winter Pea – Population Study, 2004 (0448)

			<u>Fall Stand Count</u>		<u>Spring Stand Count</u>		<u>Mean Weight</u>	<u>Seed Yield</u>		
<u>Rates</u>			<u>Rosalia</u>	<u>Genesee</u>	<u>Rosalia</u>	<u>Mean</u>	<u>100 Seed</u>	<u>Genesee</u>	<u>Rosalia</u>	<u>Mean</u>
<u>..multiplier..</u>	<u>..seed/m²..</u>	<u>kg/ha</u>	<u>..plants/m²..</u>		<u>..plants/m²..</u>		<u>..g..</u>		<u>..kg/ha..</u>	
0.5x	40	54	11	9	8	9	15.2	4278	2036	3157
1.0x	80	108	14	16	12	14	15.1	4563	2207	3385
1.5x	120	162	19	21	15	18	15.1	4579	2356	3467
2.0 x	160	216	31	26	16	21	14.8	4474	2445	3459
Grand Mean			19	18	13	15	15.0	4473	2261	3367
C.V. (%)			24	14	36	24		6	10	4
LSD ( $\alpha=0.05$ )			6	3	7	8		351	372	305
Planting Date								9/24/03	9/24/03	
Harvest Date								8/5/04	8/2/04	

Agronomic and yield data are means of three replications at each location, over two locations. Weight of 100 seed are one replication at two locations; Genesee, ID and Rosalia, WA.

## Lentil Trial Results

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Thirty-five entries and five check varieties ('Pennell', 'Merrit', 'Richlea', 'Mason' and 'Brewer') were included in the advanced large-seeded yellow lentil yield trial in 2004. The nursery was planted at three locations (Pullman and Farmington, WA, and Genesee, ID) (Tables 18, 19 and 20). Yields were generally very good due to adequate soil moisture and good growing conditions. The Farmington site was affected by a hail and wind storm just prior to harvest. The ground was littered with seed from shattered pods. Yields from the Farmington location were so adversely affected that they are not reported here. Mean yield over the two remaining locations was 2226 kg/ha (about 2003 pounds per acre). Several lines (LC01600732R, LC01600698L, LC99600747L, LC01600686L and LC01600828R) were the highest for yield and very similar to each other when averaged over the two locations. Pennell and Merrit, the two recently released large seeded lentil varieties, were about equal in yield when compared to the Brewer check and indicated that these two varieties are well adapted to the Palouse environment. LC860616L has been in the trials for four years and has been proposed for preliminary release. LC860616L was tall, early maturing and had larger seed size when compared to Pennell and Merrit. Standing ability was also excellent. A final decision on the selection will be made early in 2005.

Overall, the entries in the trial have been selected for good plant height indices and have good standing ability. Data collected on the 35 selections in the trial indicate that progress has been made in improving seed weights and yields as well as standing ability. Future variety releases of large yellow cotyledon lentils are expected to stand more erect, ensuring greater ease of harvest, seeds will be larger and yields will be improved.

Advanced yield trials of Turkish red types were also planted at three locations (Pullman, Farmington, WA and Genesee, ID) (Tables 21, 22 and 23). A Turkish red selection, LC1602062T, was again the highest yielding red cotyledon type in the trial and also had good plant height and seed size; however, it is a new selection and we only have two years of data from replicated trials at more than one location. The check variety, 'Crimson', had a mean yield of 1858 kg/ha (about 1672 lbs/acre). The major objectives in selection of Turkish red types are increased plant height, improved standing ability and improved seed quality.

New 'Eston' type selections were compared to Eston at at three locations (Pullman, Farmington, WA and Genesee, ID) (Tables 24, 25 and 26). One selection, LC01602307E, was significantly higher yielding when compared to the Eston check. LC01602307E also was slightly taller and had a mean plant height index of 0.93 that indicated good resistance to lodging. Additional testing of this line is needed before we can propose it for release.

Six Spanish brown type selections were compared to 'Pardina' in yield trials at three locations (Pullman, Farmington, WA and Genesee, ID). All six Spanish brown type selections had yields statistically equal to Pardina (Tables 27, 28 and 29).

The preliminary yield trial for large yellow lentil selections contained 39 selections and five checks (Table 30). Ten of the selections were significantly higher yielding when compared to the Brewer check. The Laird type lines were selected for exceptionally large seeds prior to inclusion in this nursery, which was planted at Pullman, WA. Lines in this preliminary trial were also selected for increased biomass and residue production as well as standing ability.

Zero tannin type selections were evaluated in a yield trial at Pullman in 2004. Three of the selections, each with yellow cotyledons, were higher yielding when compared to the Brewer check.

The preliminary screening nursery contained 193 selections that were evaluated for the first time at Pullman, WA, of which 112 were harvested (Table 32). The nursery contained 49 large yellow lentil selections that were scored for large uniform seed size with no mottling and blunt seed edge. The preliminary screening nursery also contained 8 zero-tannin lines, 3 Richlea type lines, 15 Spanish brown type lines, 3 Eston type lines, 30 Turkish red type lines, and 1 Castilian type line. All were evaluated for days to flowering, standing ability, days to maturity, seed size, seed color and yield. Data from these lines was evaluated and promising selections were advanced to preliminary yield trials for the 2005 season.

As part of germplasm exchange with counterparts in Canada and Australia we conducted a trial, for the second year, to compare their varieties and selections with our material. The results of the trial are somewhat inconclusive because of there only being a single replication (Table 30). Several lines produced very good yields and are potential parents for incorporating into the breeding program.

#### POTENTIAL VARIETY RELEASES:

LC860616L has averaged 15, 4, 7 and 3%, higher yields over the past four years (2001-2004), respectively, when compared to the Brewer check. LC860616L also has large seeds (100 seeds weigh 7.9 grams compared to 6.1 for Brewer and 7.5 for Pennell). Standing ability is also good. The selection will be proposed for release in February 2005; however, there will be a delay in the availability of Breeder and Foundation seed. We expect that Breeder seed will be available after the 2005 field season and Foundation seed after the 2006 season.

Breeder seed for Turkish red selection, LC01602062T and Eston type selection, LC01602307E, will be developed in 2005 and be available in the event that one or both of these selections are proposed for release.

Table 18. Location Yield Summary (kg/ha) for the Advanced Large Yellow Lentil Yield Trial, 2004 (0452)

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Cultivar	Origin	Genesee	Pullman	Mean Seed Yield
LC01600732R	X98L011	2766	2432	2599
LC01600698L	X97L086	2668	2270	2469
LC99600747L	X95L078	2656	2282	2469
LC01600686L	X97L086	2617	2287	2452
LC01600828R	X97L093	2626	2249	2438
LC01600719L	X98L010	2624	2177	2400
RICHLEA	.....	2466	2324	2395
LC860359L	X93L035	2355	2435	2395
LC00600470L	X97L005	2379	2359	2369
LC01602300R	X98L047	2459	2261	2360
MERRIT	.....	2603	2090	2347
LC01600745L	X98L012	2645	2040	2343
LC860616L	X95L073	2460	2189	2325
LC01602252R	X98L039	2371	2224	2297
LC00600086L	X93L036	2310	2255	2283
PENNELL	.....	2412	2112	2262
*BREWER	.....	2485	2015	2250
LC99602075L	X96L092	2361	2138	2249
LC860443L	X93L011	2438	2042	2240
LC00600157L	X95L245	2427	1975	2201
LC99600345L	X93L027	2417	1962	2190
CDC_SOVEREIGN	.....	2305	2065	2185
LC01600749L	X98L012	2409	1924	2167
LC01601205L	X95L245	2320	2012	2166
LC01601051L	X93L035	2029	2302	2165
LC01601333L	X96L091	2060	2259	2160
MASON	.....	2280	2033	2157
LC01601394L	X96L110	2266	2038	2152
LC01600856R	X97L094	2295	1942	2119
CDC_950-8	.....	2088	2148	2118
LC01601591L	X97L051	2233	1994	2114
LC00600233L	X96L095	2278	1940	2109
LC01601461L	X97L009	2183	1969	2076
LC00600394L	X96L111	2224	1919	2072
LC00600560L	X97L028	2358	1782	2070
CDC_GRANDORA	.....	1961	2142	2051
LC00600295L	X96L100	2218	1864	2041
LC00600256L	X96L096	2217	1859	2038
CASTILLION	X89L007	2092	1921	2006
LC00600150C	X95L241	1988	1530	1759

Table 18. Location Yield Summary (kg/ha) for the Advanced Large Yellow Lentil Yield Trial, 2004 (0452)

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Cultivar	Origin	Genesee	Pullman	Mean Seed Yield
Grand Mean		2359	2094	1826
C.V. (%)		6	7	9
LSD ( $\alpha=0.05$ )		201	198	245
Planting Date		3/24/04	4/5/04	
Harvest Date		8/6/04	8/2/04	

Yield data are means of three replications at each location, over two locations.

Farmington location removed from experiment results because of damage to field due to storm just before harvest.

\*Check variety.

Table 19. Agronomic Data for the Advanced Large Yellow Lentil Yield Trial, 2004 (0452)

Page 1 of 2

Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..
LC01600732R	X98L011	74	109	3	24	16	0.67	35	33	0.96	5.4
LC01600698L	X97L086	73	111	2	24	17	0.74	42	37	0.90	7.8
LC99600747L	X95L078	71	111	2	21	16	0.75	35	34	0.98	7.6
LC01600686L	X97L086	73	109	2	26	14	0.55	40	32	0.81	7.5
LC01600828R	X97L093	77	109	2	24	16	0.67	34	32	0.94	5.6
LC01600719L	X98L010	73	107	3	20	17	1.00	37	30	0.81	6.9
RICHLEA	.....	73	112	2	20	16	0.89	35	35	0.99	5.7
LC860359L	X93L035	75	111	3	21	18	0.88	40	34	0.84	7.3
LC00600470L	X97L005	72	107	2	15	13	0.86	33	34	1.00	7.0
LC01602300R	X98L047	73	72	2	17	15	0.90	39	35	0.92	5.5
MERRIT	.....	71	107	2	19	14	0.74	33	31	0.95	6.9
LC01600745L	X98L012	71	112	2	25	22	0.97	41	37	0.90	8.0
LC860616L	X95L073	71	110	2	16	14	0.92	39	35	0.90	7.9
LC01602252R	X98L039	75	110	2	25	18	0.74	43	36	0.82	5.5
LC00600086L	X93L036	76	74	2	21	17	0.79	45	37	0.84	7.4
PENNELL	.....	73	111	2	18	17	1.00	33	36	1.00	7.5
*BREWER	.....	70	107	2	19	14	0.75	41	33	0.80	6.1
LC99602075L	X96L092	72	75	2	21	14	0.65	38	36	0.95	8.8
LC860443L	X93L011	73	111	2	19	13	0.73	25	36	0.93	8.4
LC00600157L	X95L245	70	72	2	15	14	0.97	37	31	0.83	9.4
LC99600345L	X93L027	71	109	3	21	14	0.74	42	36	0.85	6.8
CDC_SOVEREIGN	.....	75	113	2	31	15	0.48	46	38	0.83	6.8
LC01600749L	X98L012	74	109	2	24	18	0.77	36	33	0.92	7.4
LC01601205L	X95L245	70	109	2	18	13	0.78	36	34	0.97	8.9
LC01601051L	X93L035	75	111	2	26	17	0.68	42	32	0.79	7.5
LC01601333L	X96L091	72	110	2	18	11	0.61	39	35	0.91	8.3
MASON	.....	70	107	2	20	15	0.86	37	34	0.95	7.1
LC01601394L	X96L110	71	109	2	19	15	0.80	40	34	0.85	8.1
LC01600856R	X97L094	73	108	2	19	14	0.74	36	30	0.86	5.3
CDC_950-8	.....	72	113	2	22	15	0.70	43	35	0.82	7.9
LC01601591L	X97L051	70	110	3	18	12	0.72	38	33	0.88	7.7
LC00600233L	X96L095	72	74	2	22	17	0.76	39	35	0.92	8.6
LC01601461L	X97L009	73	113	2	19	25	1.00	36	30	0.85	7.9
LC00600394L	X96L111	71	108	2	17	15	0.93	36	32	0.87	8.2
LC00600560L	X97L028	70	109	2	19	13	0.69	37	29	0.80	7.5
CDC_GRANDORA	.....	76	112	2	20	19	1.00	44	39	0.89	7.2
LC00600295L	X96L100	71	108	2	15	9.3	0.64	30	27	0.88	9.8
LC00600256L	X96L096	71	112	2	18	10	0.62	37	28	0.79	8.1
CASTILLION	X89L007	70	108	2	17	14	0.86	37	36	0.99	7.5
LC00600150C	X95L241	74	75	2	23	15	0.65	40	34	0.84	9.6

Table 19. Agronomic Data for the Advanced Large Yellow Lentil Yield Trial, 2004 (0452)

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Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..
Grand Mean		72	104	2	20	15	0.79	38	34	0.89	7.5
C.V. (%)		1	23	17	20	30	44	13	11	16	
LSD ( $\alpha=0.05$ )		1	33	0	5	6	0.48	7	5	0.19	

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic data are means of three replications at Pullman, WA.

\*Check variety.

Table 20. Mean Yields of the Advanced Large Yellow Lentil Yield Trial, 2000 - 2004

Cultivar	Origin	2000		2001		2002		2003		2004	
		kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check
LC01600732R	X98L011	....	...	....	...	....	...	....	...	2599	115
LC01600698L	X97L086	....	...	....	...	....	...	....	...	2469	110
LC99600747L	X95L078	....	...	....	...	1245	101	1196	102	2469	110
LC01600686L	X97L086	....	...	....	...	....	...	....	...	2452	109
LC01600828R	X97L093	....	...	....	...	....	...	....	...	2438	108
LC01600719L	X98L010	....	...	....	...	....	...	....	...	2400	107
RICHLEA	.....	1407	111	1968	124	1459	118	1249	107	2395	106
LC860359L	X93L035	....	...	1764	111	1380	112	1239	106	2395	106
LC00600470L	X97L005	....	...	....	...	....	...	1202	103	2369	105
LC01602300R	X98L047	....	...	....	...	....	...	....	...	2360	105
MERRIT	.....	1125	89	1759	111	1387	112	1166	100	2347	104
LC01600745L	X98L012	....	...	....	...	....	...	....	...	2343	104
LC860616L	X95L073	....	...	1824	115	1282	104	1253	107	2325	103
LC01602252R	X98L039	....	...	....	...	....	...	....	...	2297	102
LC00600086L	X93L036	....	...	....	...	....	...	1098	94	2283	101
PENNELL	.....	1100	87	1767	111	1364	111	1114	95	2262	101
*BREWER	.....	1264	100	1585	100	1233	100	1170	100	2250	100
LC99602075L	X96L092	....	...	....	...	1382	112	1210	103	2249	100
LC860443L	X93L011	....	...	1667	105	1260	102	1168	100	2240	100
LC00600157L	X95L245	....	...	....	...	....	...	1065	91	2201	98
LC99600345L	X93L027	1185	94	1652	104	1278	104	1184	101	2190	97
CDC_SOVEREIGN	.....	....	...	....	...	....	...	1098	94	2185	97
LC01600749L	X98L012	....	...	....	...	....	...	....	...	2167	96
LC01601205L	X95L245	....	...	....	...	....	...	....	...	2166	96
LC01601051L	X93L035	....	...	....	...	....	...	....	...	2165	96
LC01601333L	X96L091	....	...	....	...	....	...	....	...	2160	96
MASON	.....	1368	108	1674	106	1304	106	1164	99	2157	96
LC01601394L	X96L110	....	...	....	...	....	...	....	...	2152	96
LC01600856R	X97L094	....	...	....	...	....	...	....	...	2119	94
CDC_950-8	.....	....	...	....	...	....	...	1226	105	2118	94
LC01601591L	X97L051	....	...	....	...	....	...	....	...	2114	94
LC00600233L	X96L095	....	...	....	...	....	...	1229	105	2109	94
LC01601461L	X97L009	....	...	....	...	....	...	....	...	2076	92
LC00600394L	X96L111	....	...	....	...	....	...	1013	87	2072	92
LC00600560L	X97L028	....	...	....	...	....	...	1173	100	2070	92
CDC_GRANDORA	.....	....	...	....	...	....	...	1193	102	2051	91
LC00600295L	X96L100	....	...	....	...	....	...	1003	86	2041	91
LC00600256L	X96L096	....	...	....	...	....	...	1141	98	2038	91
CASTILLION	X89L007	....	...	1720	109	1158	94	1161	99	2006	89
LC00600150C	X95L241	....	...	....	...	....	...	992	85	1759	78
Grand Mean		1181		1607		1203		1087		2226	
LSD ( $\alpha=0.05$ )		163		83		251		86		298	

Yield data are means of three replications at each location, over three locations in each year and two locations in 2004.

\*Check variety



Table 21. Location Yield Summary (kg/ha) for the Advanced Turkish Red Type Lentil Yield Trial, 2004 (0451T)

Cultivar	Origin	Farmington	Genesee	Pullman	Mean Seed Yield
LC01602062T	X96L057	1668	2648	1792	2036
LC01600405T	X96L063	1704	2458	1903	2022
LC02600449T	X97L084	1807	2543	1531	1960
LC01601751T	X95L049	1486	2406	1923	1938
LC99602724T	X95L041	1527	2702	1472	1900
*CRIMSON	.....	1289	2479	1808	1858
LC01601752T	X95L050	1479	2296	1787	1854
LC99602972T	X95L071	1302	2424	1539	1755
LC02601008T	X95L061	1184	2424	1591	1733
LC02601276T	X97L108	1406	2072	1615	1698
LC01601724T	X95L032	1726	1848	1480	1685
LC02601273T	X97L107	586	1694	709	996
Grand Mean		1430	2333	1596	1786
C.V. (%)		9	3	10	7
LSD ( $\alpha=0.05$ )		178	91	216	335
Planting Date		4/2/04	3/24/04	4/5/04	
Harvest Date		8/13/04	8/5/04	7/30/04	

Yield data are means of three replications at each location, over three locations.

\*Check variety

Table 22. Agronomic Data for the Advanced Turkish Red Type Lentil Yield Trial, 2004 (0451T)

Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..
LC01602062T	X96L057	70	108	2	9.7	8	0.90	27	25	0.92	5.1
LC01600405T	X96L063	70	107	2	12	7	0.58	25	25	1.00	3.8
LC02600449T	X97L084	77	110	3	15	8	0.59	29	25	0.89	4.6
LC01601751T	X95L049	76	109	3	17	18	1.00	32	32	1.00	3.8
LC99602724T	X95L041	70	109	2	11	9	0.82	26	27	1.00	4.2
*CRIMSON	.....	74	107	2	15	9	0.58	31	24	0.80	3.6
LC01601752T	X95L050	77	108	2	17	8	0.52	32	29	0.94	3.7
LC99602972T	X95L071	70	107	2	9.3	10	1.00	29	27	0.92	3.7
LC02601008T	X95L061	71	108	2	13	9	0.67	34	29	0.86	4.4
LC02601276T	X97L108	74	113	2	21	15	0.85	37	34	0.94	3.7
LC01601724T	X95L032	71	112	2	10	8	0.79	29	23	0.81	4.5
LC02601273T	X97L107	78	113	2	13	10	0.74	32	32	1.00	3.2
Grand Mean		73	109	2	14	10	0.78	30	28	0.93	4.0
C.V. (%)		1	1	14	25	51	48	14	11	20	
LSD ( $\alpha=0.05$ )		1	2	0	5	7	0.52	6	4	0.26	

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic data are means of three replications at Pullman, WA.

\*Check variety

Table 23. Mean Yields of the Advanced Turkish Red Type Lentil Yield Trial, 2001 - 2004

Cultivar	Origin	2001		2002		2003		2004	
		kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check
LC01602062T	X96L057	....	...	....	...	1518	115	2036	110
LC01600405T	X96L063	....	...	....	...	1367	103	2022	109
LC02600449T	X97L084	....	...	....	...	....	...	1960	105
LC01601751T	X95L049	....	...	....	...	1208	91	1938	104
LC99602724T	X95L041	1419	101	1399	114	1344	102	1900	102
*CRIMSON	.....	1400	100	1232	100	1324	100	1858	100
LC01601752T	X95L050	....	...	....	...	1208	91	1854	100
LC99602972T	X95L071	1480	106	1292	92	1348	102	1755	94
LC02601008T	X95L061	....	...	....	...	....	...	1733	93
LC02601276T	X97L108	....	...	....	...	....	...	1698	91
LC01601724T	X95L032	....	...	....	...	1214	92	1685	91
LC02601273T	X97L107	....	...	....	...	....	...	996	54
Grand Mean		1270		1212		1272		1786	
LSD ( $\alpha=0.05$ )		86		71		89		335	

Yield data are means of three replications at each location, over three locations in each year.

\*Check variety

Table 24. Location Yield Summary (kg/ha) for the Advanced Eston Type Lentil Yield Trial over Locations, 2004 (0451E)

Cultivar	Origin	Farmington	Genesee	Pullman	Mean Seed Yield
LC01602307E	X98L047	1349	2039	2281	1890
LC01600736E	X98L011	1018	2351	2085	1818
LC02600147E	X98L011	1064	2161	2227	1817
LC02600698E	X98L032	1175	2133	2015	1774
ATHENA	.....	841	2330	2029	1733
LC02601130E	X98L039	1206	1903	2072	1727
LC01600743E	X98L011	955	2239	1956	1717
LC01600858E	X97L094	1033	2062	1960	1685
LC01602273E	X98L041	1371	2008	1661	1680
LC01600830E	X98L017	1077	1951	1935	1654
LC02600261E	X98L018	1182	1726	2039	1649
LC02600565E	X98L017	920	2134	1820	1625
*ESTON	.....	869	2030	1720	1539
LC01600735E	X98L011	1090	2007	1518	1539
LC01602341E	X98L054	727	2003	1837	1523
LC01600728E	X98L011	766	2069	1467	1434
LC02601191E	X98L055	1042	1627	1431	1367
LC02601183E	X98L054	836	1636	1458	1310
Grand Mean		1029	2023	1862	1638
C.V. (%)		16	8	7	9
LSD ( $\alpha=0.05$ )		226	222	193	311
Planting Date		4/2/04	3/24/04	4/5/04	
Harvest Date		8/13/04	8/5/04	8/2/04	

Yield data are means of three replications at each location, over three locations.

\*Check variety

Table 25. Agronomic Data for the Advanced Eston Type Lentil Yield Trial, 2004 (0451E)

Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..
LC01602307E	X98L047	74	109	3	14	11	0.83	37	33	0.88	4.6
LC01600736E	X98L011	72	109	2	17	8	0.46	36	31	0.87	4.0
LC02600147E	X98L011	79	111	3	17	12	0.75	34	30	0.90	4.1
LC02600698E	X98L032	77	112	3	20	11	0.53	30	32	1.00	3.2
ATHENA	.....	73	111	2	16	12	0.77	29	31	1.00	4.8
LC02601130E	X98L039	75	109	2	13	11	0.83	30	30	0.99	3.9
LC01600743E	X98L011	77	111	3	17	12	0.75	31	29	0.93	3.9
LC01600858E	X97L094	76	110	2	14	12	0.87	32	28	0.87	3.9
LC01602273E	X98L041	73	108	2	12	10	0.83	34	26	0.79	3.6
LC01600830E	X98L017	77	112	3	16	9	0.59	29	28	1.00	3.8
LC02600261E	X98L018	78	110	3	18	7	0.35	31	26	0.83	4.3
LC02600565E	X98L017	75	107	2	14	7	0.48	28	28	1.00	3.5
*ESTON	.....	73	107	3	10	7	0.76	29	27	0.92	3.5
LC01600735E	X98L011	73	113	2	11	8	0.69	28	27	0.96	4.0
LC01602341E	X98L054	72	108	2	17	9	0.53	28	26	0.93	3.4
LC01600728E	X98L011	71	113	2	7	8	1.00	28	25	0.90	4.1
LC02601191E	X98L055	70	107	2	13	8	0.64	30	23	0.78	3.7
LC02601183E	X98L054	73	107	2	11	9	0.81	25	26	1.00	4.0
Grand Mean		74	110	2	14	10	0.74	31	28	0.93	3.9
C.V. (%)		1	1	20	19	27	61	11	13	14	
LSD ( $\alpha=0.05$ )		1	2	1	4	3	0.63	5	5	0.19	

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic data are means of three replications at Pullman, WA.

\*Check variety

Table 26. Mean Yields of the Advanced Eston Type Lentil Yield Trial, 2000 - 2004

Cultivar	Origin	2000		2001		2002		2003		2004	
		kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check
LC01602307E	X98L047	....	...	....	...	....	...	1283	126	1890	123
LC01600736E	X98L011	....	...	....	...	....	...	1234	122	1818	118
LC02600147E	X98L011	....	...	....	...	....	...	....	...	1817	118
LC02600698E	X98L032	....	...	....	...	....	...	....	...	1774	115
ATHENA	.....	....	...	1748	110	923	97	1149	113	1733	113
LC02601130E	X98L039	....	...	....	...	....	...	....	...	1727	112
LC01600743E	X98L011	....	...	....	...	....	...	1104	109	1717	112
LC01600858E	X97L094	....	...	....	...	....	...	....	...	1685	109
LC01602273E	X98L041	....	...	....	...	....	...	1220	120	1680	109
LC01600830E	X98L017	....	...	....	...	....	...	1061	105	1654	107
LC02600261E	X98L018	....	...	....	...	....	...	....	...	1649	107
LC02600565E	X98L017	....	...	....	...	....	...	....	...	1625	106
*ESTON	.....	1081	100	1583	100	955	100	1015	100	1539	100
LC01600735E	X98L011	....	...	....	...	....	...	....	...	1539	100
LC01602341E	X98L054	....	...	....	...	....	...	1061	105	1523	99
LC01600728E	X98L011	....	...	....	...	....	...	....	...	1434	93
LC02601191E	X98L055	....	...	....	...	....	...	....	...	1367	89
LC02601183E	X98L054	....	...	....	...	....	...	....	...	1310	85
Grand Mean		1090		1534		861		1128		1638	
LSD ( $\alpha=0.05$ )		134		86		72		95		311	

Yield data are means of three replications at each location, over three locations in each year.

\*Check variety

Table 27. Location Yield Summary (kg/ha) for the Advanced Pardina Type Lentil Yield Trial, 2004 (0451P)

Cultivar	Origin	Farmington	Genesee	Pullman	Mean Seed Yield
*PARDINA	.....	1998	2675	2018	2230
LC02600397P	X98L033	1889	2347	2198	2145
LC02600377P	X98L031	1640	2594	2113	2115
LC02600682P	X98L031	1923	2420	1990	2111
LC01602245P	X98L038	1815	2594	1875	2095
LC02601144P	X98L044	1942	2309	2020	2090
LC01601640P	X93L018	1732	2456	1905	2031
LC000010D	.....	1800	2258	1512	1857
Grand Mean		1842	2457	1954	2084
C.V. (%)		8	4	12	8
LSD ( $\alpha=0.05$ )		215	139	329	262
Planting Date		4/2/04	3/24/04	4/5/04	
Harvest Date		8/13/04	8/5/04	7/30/04	

Yield data are means of three replications at each location, over three locations.

\*Check variety

Table 28. Agronomic Data for the Advanced Pardina Type Lentil Yield Trial, 2004 (0451P)

Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..
*PARDINA	.....	70	108	2	12	8	0.67	29	23	0.78	3.6
LC02600397P	X98L033	76	112	2	15	10	0.69	29	31	1.00	4.0
LC02600377P	X98L031	72	108	2	13	10	0.76	28	28	0.99	4.4
LC02600682P	X98L031	73	110	2	13	10	0.77	31	29	0.94	3.9
LC01602245P	X98L038	70	108	2	11	7	0.81	30	27	0.89	4.2
LC02601144P	X98L044	70	108	2	17	9	0.56	32	31	0.97	4.2
LC01601640P	X93L018	70	108	2	12	8	0.68	28	25	0.89	3.8
LC000010D	.....	74	108	2	14	7	0.53	28	28	0.98	3.2
Grand Mean		72	109	2	13	9	0.68	30	28	0.94	3.9
C.V. (%)		1	1	14	19	28	50	9	9	10	
LSD ( $\alpha=0.05$ )		1	1	0	4	3	0.49	4	4	0.14	

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic data are means of three replications at Pullman, WA.

\*Check variety.

Table 29. Mean Yields of the Advanced Pardina Type Lentil Yield Trial, 2001 - 2004

Cultivar	Origin	2001		2002		2003		2004	
		kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check
*PARDINA	.....	1776	100	1409	100	1334	100	2230	100
LC02600397P	X98L033	....	...	....	...	....	...	2145	96
LC02600377P	X98L031	....	...	....	...	....	...	2115	95
LC02600682P	X98L031	....	...	....	...	....	...	2111	95
LC01602245P	X98L038	....	...	....	...	1340	100	2095	94
LC02601144P	X98L044	....	...	....	...	....	...	2090	94
LC01601640P	X93L018	....	...	....	...	1527	114	2031	91
LC000010D	.....	1636	92	1288	91	1073	80	1857	83
Grand Mean		1659		1203		1305		2084	
LSD ( $\alpha=0.05$ )		112		80		131		262	

Yield data are means of three replications at each location, over three locations in each year.

\*Check variety



Table 30. Agronomic and Yield Data for the Preliminary Large Yellow Lentil Yield Trial, 2004 (0454)

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Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..	Mean Seed Yield ..kg/ha..
<b>Laird Type</b>												
LC02600095L	X97L086	76	110	2	22	14	0.64	39	33	0.87	8.0	2508
LC01600691L	X97L086	73	111	2	21	24	1.00	43	34	0.81	7.3	2326
LC01600698L	X97L086	73	109	2	22	19	0.85	38	34	0.90	8.0	2212
LC02600104L	X97L086	72	108	2	19	7.7	0.39	34	29	0.88	7.0	2207
LC02600793L	X95L240	71	74	2	15	14	0.93	32	32	1.00	7.9	2171
LC01600758L	X97L109	73	109	2	18	9.7	0.58	30	25	0.83	7.4	2140
LC02600740L	X95L220	72	112	2	19	16	0.86	37	34	0.93	8.6	2102
LC02600487L	X97L086	74	111	2	20	11	0.53	34	32	0.96	8.8	2041
LC01600715L	X98L010	70	108	2	19	8.3	0.49	34	23	0.67	7.0	2027
LC02600531L	X98L012	71	109	2	20	15	0.81	35	32	0.93	7.0	2027
LC01600724L	X98L010	73	109	2	17	14	0.87	37	30	0.80	6.9	2007
LC02600934L	X97L008	72	109	2	19	10	0.57	40	32	0.81	7.9	1990
LC02600166L	X97L109	76	110	3	22	15	0.66	34	28	0.83	8.1	1947
LC01600719L	X98L010	73	108	2	21	15	0.75	34	29	0.84	6.9	1907
LC02600916L	X96L110	73	110	2	18	16	0.89	37	33	0.95	8.3	1893
MASON	.....	70	107	2	25	15	0.73	30	32	1.00	7.6	1870
LC02600225L	X98L016	73	109	2	22	8.7	0.40	30	27	0.89	7.3	1849
LC02600945L	X97L035	70	110	2	19	13	0.71	36	35	0.99	8.5	1834
LC01600761L	X97L109	71	107	2	19	11	0.62	36	31	0.86	6.8	1813
LC02600954L	X97L051	71	112	2	21	17	0.84	40	36	0.91	8.0	1772
LC01600808L	X98L015	73	112	2	25	15	0.63	38	30	0.80	6.5	1766
LC02600223L	X98L016	75	109	2	19	11	0.57	30	29	0.97	7.5	1746
LC02600716L	X95L089	71	112	2	18	17	0.99	34	36	1.00	8.0	1726
LC02600469L	X98L006	73	110	2	19	16	0.91	34	29	0.85	7.1	1723
MERRIT	.....	70	107	2	17	13	0.86	35	31	0.90	6.8	1702
LC02600747L	X95L221	71	109	2	17	10	0.66	33	28	0.85	8.4	1683
PENNELL	.....	73	113	2	19	16	0.82	32	28	0.92	7.2	1607
LC01600933L	X98L023	70	108	2	15	18	1.00	32	32	1.00	8.0	1591
LC02600801L	X95L241	71	115	2	21	20	0.95	38	40	1.00	8.9	1387
Sub Mean - Laird		72	109	2	20	14	0.75	35	31	0.92	7.6	1916
<b>Brewer Type</b>												
LC02600026B	X97L083	73	112	2	18	12	0.75	36	30	0.84	7.9	2024
BREWER	.....	70	107	2	18	13	0.67	30	31	1.00	6.4	1943
Sub Mean - Brewer		72	110	2	18	13	0.71	33	31	0.98	7.2	1984
<b>Castillian Type</b>												
LC02600320C	X98L023	74	113	2	27	22	0.83	38	35	0.91	8.1	2051

Table 30. Agronomic and Yield Data for the Preliminary Large Yellow Lentil Yield Trial, 2004 (0454)

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Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..	Mean Seed Yield ..kg/ha..
<b><i>Richlea Type</i></b>												
LC02600563R	X97L093	75	109	2	20	15	0.76	37	33	0.91	6.1	2289
LC02601112R	X98L037	72	107	2	16	13	0.86	33	31	0.95	4.3	2280
RICHLEA	.....	73	112	2	20	13	0.67	39	35	0.88	5.3	2209
LC02601124R	X98L039	73	110	2	17	9.7	0.56	31	29	1.00	6.0	2188
LC02601118R	X98L039	73	107	2	21	14	0.64	35	33	0.96	5.1	2177
LC02601125R	X98L039	74	108	2	17	11	0.64	32	26	0.88	5.2	1999
LC02600193R	X98L014	71	109	3	18	14	0.79	33	30	0.93	5.4	1934
LC02600667R	X98L034	73	111	2	17	15	0.89	37	34	0.94	3.6	1906
LC02600206R	X97L092	77	109	2	18	16	0.89	35	30	0.86	4.7	1885
LC02600372R	X98L030	76	114	2	20	17	0.87	39	36	0.94	5.3	1849
LC02601169R	X98L049	73	112	2	14	13	0.87	38	30	0.79	5.2	1804
LC02601132R	X98L041	75	108	2	17	25	1.00	35	33	0.93	5.1	1747
<i>Sub Mean - Richlea</i>		74	110	2	18	15	0.82	35	32	0.93	5.1	2022
Grand Mean		73	109	2	19	14	0.77	35	31	0.93	7.0	1951
C.V. (%)		1	9	15	20	37	40	16	13	32		7
LSD ( $\alpha=0.05$ )		1	13	0	5	7	0.42	8	6	0.40		189

Planting date 4/5/04. Harvest date 8/4/04.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic and yield data are means of three replications at Pullman, WA.

Table 31. Agronomic and Yield Data for the Zero Tannin Lentil Yield Trial, 2004 (0463)

Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..	Mean Seed Yield ..kg/ha..
<b>Yellow Cotyledon</b>												
LC02601251YZ	X00L031	71	110	2	16	15	0.95	34	33	0.98	6.4	2041
LC7601114YZ	X93L001	71	113	2	12	14	1.00	32	34	1.00	6.1	1817
LC02601249YZ	X00L031	71	112	2	15	13	0.90	35	33	0.96	5.8	1805
LC8601910YZ	X93L001	71	113	2	12	11	0.93	37	34	0.93	6.4	1534
<i>Sub Mean – Yellow Cots</i>		71	112	2	14	13	0.98	35	34	0.99	6.2	1799
<b>Red Cotyledon</b>												
LC02600977RZ	X95L004	71	110	2	11	10	0.95	23	27	1.00	4.9	1571
LC00600917RZ	X95L005	71	111	2	12	9.3	0.82	32	30	0.95	5.3	1366
LC99602585RZ	X95L004	72	110	2	11	10	0.95	29	26	0.92	4.5	1301
<i>Sub Mean – Red Cots</i>		71	110	2	11	10	0.91	28	28	1.00	4.9	1413
<b>Check Variety</b>												
BREWER		70	107	2	16	12	0.74	36	28	0.78	6.0	1783
Grand Mean		71	111	2	13	12	0.92	32	30	1.00	5.7	1652
C.V. (%)		0	1		20	17	23	14	7	28		11
LSD ( $\alpha=0.05$ )		0	2		4	3	0.30	6	3	0.40		258

Planting date 4/5/04. Harvest date 8/4/04.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic and yield data are means of three replications at Pullman, WA.

Table 32. Agronomic and YieldData for the Preliminary Lentil Screening Nursery, 2004 (0455)

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Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..	Mean Seed Yield ..kg..
<i>Laird Type</i>												
LC03600854L	X97L001	69	106	2	31	11	0.35	47	25	0.53	7.5	2674
LC03600592L	X95L245	69	107	2	33	9	0.27	40	19	0.48	7.4	2637
LC03600663L	X96L078	71	107	2	29	15	0.52	44	31	0.70	8.4	2502
LC03601115L	X00L001	69	107	2	24	17	0.71	45	33	0.73	7.7	2461
LC0369L001L	X97L001	69	107	2	25	10	0.40	44	28	0.64	8.0	2390
LC03600867L	X97L003	71	107	2	30	16	0.53	47	38	0.81	7.0	2341
LC03600511L	X95L093	71	107	2	23	15	0.65	42	34	0.81	8.4	2339
LC03600883L	X97L009	75	111	2	26	13	0.50	31	34	1.00	6.4	2322
LC03600586L	X95L244	69	106	2	25	6	0.24	32	19	0.59	9.3	2312
LC03600729L	X96L090	69	110	2	26	17	0.65	39	31	0.79	9.2	2308
LC03600667L	X96L078	71	106	2	32	11	0.34	39	23	0.59	8.1	2299
LC03600914L	X97L018	70	110	2	24	11	0.46	38	36	0.95	7.9	2260
LC03600982L	X97L035	69	107	2	23	15	0.65	35	32	0.91	6.9	2254
LC0369L040L	X89L002	69	107	2	23	16	0.70	40	33	0.83	6.8	2254
LC03600516L	X95L093	69	110	2	21	9	0.43	28	32	1.00	8.7	2233
LC03601009L	X97L039	71	111	2	25	21	0.84	33	41	1.00	8.0	2194
LC03601588L	X98L041	73	107	2	16	7	0.44	35	19	0.54	4.8	2173
LC03600897L	X97L009	69	107	2	25	12	0.48	40	38	0.95	6.9	2171
LC03600895L	X97L009	71	110	2	32	8	0.25	40	36	0.90	7.5	2126
LC03600951L	X97L026	71	110	2	27	16	0.59	40	34	0.85	8.7	2078
LC03600886L	X97L009	70	107	2	26	12	0.46	37	34	0.92	6.2	2064
LC03600956L	X97L026	71	113	2	28	18	0.64	32	36	1.00	8.7	2004
LC03600967L	X97L029	69	106	2	22	14	0.64	39	32	0.82	7.7	1977
LC03601067L	X97L050	71	111	2	33	16	0.48	44	33	0.75	8.3	1975
LC03600932L	X97L024	71	111	2	23	14	0.61	42	33	0.79	8.4	1967
LC03600942L	X97L024	71	110	2	19	20	1.00	30	36	1.00	8.9	1923
LC03601002L	X97L038	70	107	2	24	16	0.67	37	34	0.92	8.2	1911
LC03600864L	X97L002	69	113	2	34	13	0.38	44	35	0.80	7.8	1882
LC03601005L	X97L038	71	110	2	35	12	0.34	43	31	0.72	8.8	1878
LC03600892L	X97L009	71	111	2	22	17	0.77	37	39	1.00	8.3	1869
LC03600884L	X97L009	71	111	2	29	21	0.72	40	36	0.90	8.2	1849
LC03601029L	X97L042	71	111	2	23	17	0.74	45	36	0.80	7.9	1832
LC03600962L	X97L029	69	110	2	26	13	0.50	39	41	1.00	7.5	1799
LC03601018L	X97L039	71	111	2	29	10	0.34	45	38	0.84	7.9	1745
LC03600606L	X95L248	69	113	2	22	9	0.41	35	24	0.69	9.3	1718
LC0369L012L	X97L026	69	113	2	24	15	0.63	43	36	0.84	8.3	1681
LC0369L024L	X97L051	69	111	2	19	13	0.68	33	38	1.00	7.0	1669
LC03600891L	X97L009	72	110	2	29	17	0.59	42	35	0.83	7.9	1621
LC03601648L	X01L004	70	110	2	20	20	1.00	32	31	0.97	8.2	1582
LC03601671L	X01L016	69	107	2	17	18	1.00	41	43	1.00	6.4	1567
LC03601020L	X97L040	71	111	2	23	22	0.96	40	35	0.88	7.7	1565
LC03600507L	X95L093	70	110	2	17	12	0.71	31	35	1.00	8.7	1553
LC03600894L	X97L009	69	110	2	25	13	0.52	40	37	0.93	7.2	1547
LC0369L017L	X97L036	69	111	2	23	9	0.39	36	32	0.89	6.5	1530
LC03601104L	X00L002	73	107	2	24	14	0.58	34	33	0.97	7.3	1528

Table 32. Agronomic and Yield Data for the Preliminary Lentil Screening Nursery, 2004 (0455)

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Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..	Mean Seed Yield ..kg..
LC03601668L	X01L015	69	107	2	14	13	0.93	38	34	0.89	7.5	1520
LC03600503L	X95L091	69	107	2	11	11	1.00	33	34	1.00	8.2	1437
LC0369L007L	X97L009	69	111	1	21	12	0.57	39	32	0.82	6.4	1257
LC03600632L	X95L250	69	111	2	30	16	0.53	40	33	0.83	8.8	1185
<i>Sub Mean – Laird</i>		70	109	2	25	14	0.59	39	33	0.87	7.8	1958
<b>Castilian Type</b>												
LC03600857C	X97L001	71	110	2	27	11	0.41	40	28	0.70	8.2	2221
<b>Richlea Type</b>												
LC03601590R	X98L041	71	106	3	15	12	0.80	37	18	0.49	3.9	1973
LC03601608R	X98L047	73	107	2	24	10	0.42	36	34	0.94	4.8	1326
LC03601659R	X01L007	69	111	2	25	11	0.44	42	29	0.69	5.1	521
<i>Sub Mean - Richlea</i>		71	108	2	21	11	0.55	38	27	0.71	4.6	1273
<b>Pardina Type</b>												
LC03600384P	X97L102	79	113	2	37	18	0.49	50	28	0.56	3.2	2543
LC03600204P	X98L022	69	105	2	19	16	0.84	33	26	0.79	3.9	2527
LC03600200P	X98L022	69	105	2	31	10	0.32	31	28	0.90	3.8	2438
LC03600303P	X98L013	69	105	2	24	12	0.50	31	31	1.00	4.6	2430
LC03600201P	X98L022	69	105	2	18	11	0.61	35	21	0.60	3.9	2372
LC03600423P	X97L106	71	106	2	22	10	0.45	39	21	0.54	3.4	2260
LC03601629P	X98L062	69	107	2	15	8	0.53	32	32	1.00	4.4	2101
LC03600177P	X98L018	72	111	2	25	13	0.52	36	22	0.61	3.7	2068
LC03601628P	X98L062	69	106	2	10	7	0.70	27	27	1.00	4.3	1785
LC03600223P	X98L031	72	107	2	27	7	0.26	46	22	0.48	3.1	1778
LC03600245P	X97L108	80	110	2	32	24	0.75	40	42	1.05	3.4	1663
LC03600386P	X97L102	76	107	2	21	5	0.24	42	15	0.36	3.4	1654
LC03600417P	X98L033	76	107	3	20	6	0.30	40	18	0.45	3.4	1648
LC03601127P	X93L010	69	110	2	16	5	0.31	35	27	0.77	4.2	1462
LC03601531P	X96L071	69	107	2	18	4	0.22	33	25	0.76	4.7	1212
<i>Sub Mean - Pardina</i>		72	107	2	22	10	0.47	37	26	0.72	3.8	1996
<b>Eston Type</b>												
LC03601178E	X93L039	72	107	3	19	9	0.47	38	37	0.97	3.7	2122
LC0369L034E	X97L033	71	106	2	19	12	0.63	30	29	0.97	4.1	1197
LC03601194E	X94L033	77	110	3	20	16	0.80	42	32	0.76	3.3	1090
<i>Sub Mean - Eston</i>		73	108	3	19	12	0.63	37	33	0.90	3.7	1470
<b>Zero Tannin Type – Yellow Cot</b>												
LC03601211YZ	X93L001	69	110	2	29	13	0.45	44	39	0.89	6.2	2661
LC03601214YZ	X93L001	69	110	2	27	20	0.74	44	36	0.82	6.4	2606
LC03601300YZ	X00L038	69	107	2	26	22	0.85	40	41	1.00	6.5	2380
LC03601207YZ	X93L001	69	113	2	31	19	0.61	44	43	0.98	7.0	2374
LC03601309YZ	X00L038	69	111	2	17	11	0.65	38	30	0.79	7.4	2287

Table 32. Agronomic and Yield Data for the Preliminary Lentil Screening Nursery, 2004 (0455)

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Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..	Mean Seed Yield ..kg..
LC03601242YZ	X93L006	69	110	2	23	11	0.48	35	31	0.89	6.3	2091
LC03601257YZ	X93L033	69	113	2	29	9	0.31	43	33	0.77	5.4	1776
<i>Sub Mean – Zero Tannin, Y</i>		69	111	2	26	15	0.58	41	36	0.88	6.5	2311

**Zero Tannin Type – Red Cot**

LC03601334RZ	X95L005	69	106	2	15	9	0.60	29	33	1.00	5.0	1830
LC03601311RZ	X95L004	69	107	2	18	10	0.56	37	32	0.86	4.4	153
<i>Sub Mean – Zero Tannin, R</i>		69	107	2	17	10	0.58	33	33	1.00	4.7	992

**Turkish Red Type**

LC03600482T	X97L116	71	105	2	15	13	0.87	29	32	1.00	3.4	2333
LC03600428T	X97L107	79	111	2	21	12	0.57	21	22	1.00	3.1	2304
LC03600403T	X97L104	72	110	3	24	14	0.58	42	32	0.76	3.7	2262
LC03600483T	X97L116	71	110	2	21	16	0.76	38	34	0.89	3.8	2084
LC03600232T	X97L104	77	110	2	32	14	0.44	51	32	0.63	3.7	2072
LC03600429T	X97L107	77	110	2	27	10	0.37	42	36	0.86	2.9	2047
LC03600474T	X97L116	69	105	2	12	16	1.00	33	35	1.00	2.9	2039
LC03600475T	X97L116	69	107	3	16	13	0.81	30	39	1.00	3.3	2008
LC03600349T	X97L096	71	110	3	25	22	0.88	41	37	0.90	3.8	1962
LC03601426T	X95L069	69	107	2	9	15	1.00	28	28	1.00	4.9	1896
LC03600462T	X97L115	69	107	2	28	9	0.32	36	27	0.75	3.3	1890
LC03600430T	X97L107	77	110	2	26	11	0.42	37	25	0.68	2.8	1884
LC03600437T	X97L108	72	111	2	25	17	0.68	38	39	1.00	3.7	1869
LC03600412T	X98L033	75	106	2	23	11	0.48	33	32	0.97	3.1	1828
LC03600427T	X97L107	75	107	2	30	8	0.27	39	23	0.59	2.8	1822
LC03600114T	X98L003	68	105	2	16	10	0.63	27	18	0.67	3.2	1772
LC03600452T	X97L114	77	110	2	23	14	0.61	47	36	0.77	3.0	1727
LC03600231T	X97L104	74	110	2	31	14	0.45	41	26	0.63	3.6	1696
LC03600292T	X98L012	69	107	2	26	14	0.54	40	35	0.88	3.9	1677
LC03600267T	X97L085	71	110	2	22	11	0.50	45	34	0.76	4.8	1638
LC02600655T	X97L100	69	107	3	20	22	1.00	31	39	1.00	3.9	1625
LC03601458T	X95L281	71	107	3	18	10	0.56	35	27	0.77	4.3	1588
LC03600257T	X97L084	71	107	2	21	13	0.62	38	31	0.82	4.5	1572
LC03600451T	X97L114	71	111	2	37	13	0.35	47	41	0.87	3.2	1224
LC03600401T	X97L104	77	110	2	28	21	0.75	36	37	1.00	3.4	1148
LC03600399T	X97L104	79	113	2	23	16	0.70	47	33	0.70	3.3	1146
LC03601407T	X95L049	71	107	2	19	12	0.63	32	36	1.00	4.1	1075
LC03600124T	X97L084	73	110	2	16	8	0.50	40	25	0.63	4.9	1065
LC03600126T	X97L085	70	107	2	20	14	0.70	34	29	0.85	4.8	883
LC03600194T	X97L096	70	107	2	24	22	0.92	39	33	0.85	4.2	641
<i>Sub Mean – Turkish Red</i>		72	108	2	23	14	0.67	37	32	0.87	3.7	1693

Table 32. Agronomic and Yield Data for the Preliminary Lentil Screening Nursery, 2004 (0455)

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Cultivar	Origin	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..	Mean Seed Yield ..kg..
<b>Red Chief Type</b>												
LC01601936r	X95L267	69	105	2	18	15	0.83	31	38	1.00	5.7	1615
Grand Mean		71	109	2	23	13	0.59	38	32	0.85	5.8	1864

Planting date 4/5/04. Harvest date 8/10/04.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic and yield data are one replication at Pullman, WA.

Table 33. Agronomic Data for the Canadian and Australian Lentil Observation Nursery, 2004 (0407L)

Cultivar	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (Green) ..cm..	Pod Ht (Mature) ..cm..	Pod Ht Index	Plant Ht (Green) ..cm..	Plant Ht (Mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..	Seed Yield ..kg/ha...
1207D-13	72	105	3	20	9	0.45	40	16	0.40	4.2	3044
1211-41	75	110	3	21	18	0.86	44	42	0.95	4.9	2665
1208D-35	72	106	2	23	11	0.48	40	30	0.75	4.5	2661
1162-27	73	106	3	19	11	0.58	37	19	0.51	5.3	2543
1038L-18	75	110	2	24	16	0.67	45	34	0.76	5.3	2504
1145-3-6	76	107	3	17	8	0.47	38	34	0.89	3.8	2314
1211M-16	73	106	2	21	12	0.57	31	31	1.00	4.6	2229
1076-13	69	105	2	15	9	0.60	34	31	0.91	4.2	2221
1254S-1	75	107	3	14	13	0.93	40	34	0.85	4.0	2194
1193-2-21	71	105	2	35	19	0.54	16	34	1.00	3.3	2157
1194-3	75	105	2	16	10	0.63	29	32	1.00	2.8	2153
1119-2-7	72	107	3	18	5	0.28	40	32	0.80	3.7	2146
1119-2-3	71	105	3	26	8	0.31	34	30	0.88	3.6	2062
1125-1-5	75	107	3	23	11	0.48	34	34	1.00	3.2	2055
1218D-13	76	105	3	21	13	0.62	41	34	0.83	3.0	2022
1190S-101	71	105	3	25	16	0.64	33	35	1.00	3.1	2000
95-003L*96G6-98H007	72	107	2	17	16	0.94	28	32	1.00	3.7	1954
95-013L*96G1-98H007	69	106	2	11	14	1.00	33	31	0.94	3.7	1917
1218D-18	75	107	3	16	8	0.50	30	32	1.00	3.4	1913
94-004L*97H11	69	105	1	18	8	0.44	28	26	0.93	6.7	1892
95-002L*96G3-98H002	69	105	2	13	12	0.92	21	28	1.00	3.6	1795
94-004L*97H10	69	111	2	11	8	0.73	24	26	1.00	5.9	1768
95-003L*96G1-97H7	69	105	2	15	10	0.67	40	29	0.73	3.0	1756
1153-11	75	110	3	35	19	0.54	37	31	0.84	3.6	1754
901-1-28RS	75	105	2	17	11	0.65	27	30	1.00	2.6	1749
NUGGET	69	107	2	12	11	0.92	12	28	1.00	5.1	1741
94-003L*97H26	69	105	2	16	8	0.50	30	26	0.87	4.8	1652
94-002L*97H29	69	105	1	15	10	0.67	30	27	0.90	3.0	1470
COBBER	69	105	2	11	13	1.00	19	26	1.00	4.7	1468
DIGGER	69	105	2	9	5	0.56	22	23	1.00	5.4	1381
94-009L*98H069	69	105	2	8	7	0.88	30	24	0.80	4.3	1319
1110-13RY-5	71	105	3	14	12	0.86	42	32	0.76	3.4	1315
I94S160L*97H10	69	105	2	10	4	0.40	29	18	0.62	5.0	1266
94-009L*97H5	69	107	2	5	7	1.00	19	24	1.00	4.7	1210
ILL7220	69	105	2	11	11	1.00	21	21	1.00	3.4	1117
NORTHFIELD	69	106	2	11	10	0.91	21	23	1.00	3.8	1106
CASSAB	69	105	2	10	3	0.30	28	16	0.57	5.3	1046
MATILDA	69	112	2	10	9	0.90	27	23	0.85	6.2	1013
ALDINGA	69	110	1	15	7	0.47	26	21	0.81	5.7	771
CUMRA	69	111	2	7	9	1.00	26	20	0.77	5.2	544
Grand Mean	71	107	2	16	11	0.70	31	28	0.98	4.2	1797

Planting date 5/2/03. Harvest date 8/8/03.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green pod stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic and yield data are one replication at Pullman, WA



## Winter Lentil Trial Results

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Sixteen selections were included in the red cotyledon winter lentil nursery in 2003-2004 and were grown at three locations, the WSU Spillman farm, the Russ Zenner farm near Genesee and on the Joe Schmitz farm near Rosalia (Table 34 and 34). Winter hardy lentil lines are being targeted for direct seeding in standing wheat or barley stubble in order to aid in control of soil erosion. It is also expected that seed yield will be increased up to 50% over traditional spring types. Average seed yield at the Genesee site was 1886 kg/ha (1697 lb/a) while at the Rosalia site yields averaged 903 kg/ha (813 lb/a) and 1404 kg/ha (1264 lb/a) at Pullman. Morton, the recently released winter lentil, had an average yield of 2074 kg/ha (1867 lb/a) across the three locations. Morton is relatively small seeded and has red cotyledons and is expected to fit well into markets in South Asia.

A preliminary screening nursery for Turkish red type lentil selections contained 148 selections and one check (Table 36) which were evaluated for the first time at Pullman, WA. Seventy-eight lines survived the winter and were harvested. Twenty-one of these lines were selected to remain in the program and were planted in trials in September of 2004.

LC9976079T was included with the winter pea selection described previously in a study to determine adaptation to direct seeding systems (Table 37). Results indicate that winter pea and lentil have potential to provide producers with a viable alternative cropping system to spring sown legume crops. Direct sowing into standing stubble offers many advantages including control of soil erosion, snow capture and greater protection of small seedlings from harsh winter conditions.

Table 34. Location Yield Summary (kg/ha) for the Advanced Red Cotyledon Winter Lentil Yield Trial, 2004 (0441F)

Cultivar	Origin	Genesee	Pullman	Rosalia	Mean Seed Yield
MORTON	X92L043	2041	2941	1239	2074
LC9979065T	X92L043	2026	2706	963	1898
LC9978057T	X92L040	2266	2108	1015	1796
LC9979062T	X92L043	1771	2447	920	1713
LC9979120T	X92L043	1871	2112	1118	1700
LC9976079T	X92L035	2026	1892	822	1580
WA8649041	-----	1512	2202	878	1531
LC9440070r	X92L001	1998	1815	634	1482
LC9978094T	X92L040	1994	1626	699	1439
LC0160957T	X98L025	1872	852	877	1200
LC0160869c	X98L018	1973	281	1015	1090
LC0160873c	X98L018	2121	227	895	1081
LC0160641T	X97L084	1424	628	822	958
LC0160887T	X97L095	1835	432	601	956
LC0160872c	X98L018	1603	300	904	936
LC0160879c	X98L018	1846	0	1044	928
Grand Mean		1886	1404	903	1398
C.V. (%)		22	17	14	20
LSD ( $\alpha=0.05$ )		569	326	170	958
Planting Date		9/24/03	9/19/03	9/24/03	
Harvest Date		8/5/04	7/29/04	8/2/04	

Yield data are means of three replications at each location, over three locations.

Table 35. Agronomic Data for the Advanced Red Cotyledon Winter Lentil Yield Trial, 2004 (0441F)

Cultivar	Origin	Mean Pods/ Peduncle	Mean Pod Ht (green) ..cm..	Mean Pod Ht (mature) ..cm..	Mean Pod Ht Index	Mean Plant Ht (green) ..cm..	Mean Plant Ht (mature) ..cm..	Mean Plant Ht Index	Mean Weight 100 Seed ..g..
MORTON	X92L043	3	22	11	0.58	50	31	0.62	3.1
LC9979065T	X92L043	2	24	13	0.58	48	32	0.69	2.7
LC9978057T	X92L040	3	19	10	0.53	46	26	0.51	2.3
LC9979062T	X92L043	3	21	12	0.60	52	35	0.66	2.7
LC9979120T	X92L043	3	19	9	0.60	47	31	0.72	3.0
LC9976079T	X92L035	2	20	12	0.69	52	35	0.70	3.2
WA8649041		3	23	10	0.50	51	28	0.52	2.8
LC9440070r	X92L001	2	18	11	0.63	54	28	0.49	4.2
LC9978094T	X92L040	2	21	11	0.51	53	30	0.50	3.1
LC0160957T	X98L025	2	14	8	0.80	47	27	0.60	2.6
LC0160869c	X98L018	3	18	9	0.73	49	28	0.62	2.8
LC0160873c	X98L018	3	14	8	0.59	45	27	0.67	2.8
LC0160641T	X97L084	3	14	9	0.74	49	28	0.58	3.0
LC0160887T	X97L095	3	18	8	0.53	47	26	0.61	3.3
LC0160872c	X98L018	3	13	6	0.64	47	24	0.53	3.2
LC0160879c	X98L018	2	13	8	0.65	46	29	0.69	3.0
Grand Mean		2	18	10	0.62	49	29	0.61	3.0
C.V. (%)		18	27	31	39	10	16	17	21
LSD ( $\alpha=0.05$ )		1	8	3	0.30	9	6	0.19	1

Pod height was measured at the green pod stage and at harvest maturity.

Pod height index was determined by dividing the pod height at harvest maturity by the green pod height.

Plant height was measured at the green pod stage and at harvest maturity.

Plant height index was determined by dividing the canopy height at harvest maturity by the total plant height.

Means data are means of three replications over two locations, Genesee, ID and Pullman, WA; means data for Pod Ht (mature) and Plant Ht (mature) are means of three replications over three locations, Genesee, ID, Pullman, WA and Rosalia, WA.

Table 36. Agronomic Data for the Preliminary Turkish Red Lentil Screening Nursery, 2004 (0445F)

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Cultivar	Origin	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index
LC02600117T	X97L088	3	10	8	0.80	34	21	0.62
LC02600310T	X98L022	2	9	8	0.89	35	24	0.69
LC02600397T	X98L033	3	17	13	0.76	49	36	0.73
LC02600449T	X97L084	3	12	8	0.67	43	31	0.72
LC02601271T	X97L107	3	18	14	0.78	44	40	0.91
LC02601273T	X97L107	2	13	14	1.08	47	44	0.94
LC02601276T	X97L108	3	12	16	1.33	40	43	1.08
LC03600117R	X98L003	3	8	9	1.13	35	33	0.94
LC03600120T	X97L084	2	13	12	0.92	45	34	0.76
LC03600121T	X97L084	2	10	9	0.90	40	28	0.70
LC03600133T	X97L088	2	13	3	0.23	33	17	0.52
LC03600139T	X98L014	2	11	11	1.00	32	26	0.81
LC03600158T	X97L091	3	15	21	1.40	34	22	0.65
LC03600175T	X98L018	3	24	8	0.33	47	22	0.47
LC03600190T	X97L096	2	12	7	0.58	35	22	0.63
LC03600194T	X97L096	2	11	6	0.55	42	35	0.83
LC03600215T	X98L027	2	15	10	0.67	44	35	0.80
LC03600218T	X98L028	2	10	4	0.40	37	17	0.46
LC03600221T	X98L030	2	16	22	1.38	40	21	0.53
LC03600226T	X97L102	3	18	8	0.44	44	24	0.55
LC03600227T	X97L103	2	19	17	0.89	45	40	0.89
LC03600230T	X97L104	3	12	15	1.25	36	33	0.92
LC03600231T	X97L104	2	17	20	1.18	48	45	0.94
LC03600232T	X97L104	2	15	12	0.80	39	37	0.95
LC03600233T	X97L104	3	21	16	0.76	43	42	0.98
LC03600237T	X98L033	3	19	12	0.63	46	24	0.52
LC03600238P	X98L033	3	19	11	0.58	47	32	0.68
LC03600244T	X97L108	3	25	18	0.72	49	41	0.84
LC03600245T	X97L108	2	20	9	0.45	49	26	0.53
LC03600249T	X92L041	3	17	14	0.82	43	38	0.88
LC03600256T	X97L084	2	13	4	0.31	40	14	0.35
LC03600264T	X97L084	3	10	8	0.80	45	18	0.40
LC03600265T	X97L084	3	11	8	0.73	48	25	0.52
LC03600269T	X97L085	3	13	14	1.08	41	35	0.85
LC03600278T	X97L087	3	9	7	0.78	40	13	0.33
LC03600282T	X97L087	3	16	8	0.50	44	27	0.61
LC03600292T	X98L012	2	18	8	0.44	40	33	0.83
LC03600331T	X97L095	2	13	10	0.77	40	39	0.98
LC03600332T	X97L095	2	12	11	0.92	35	33	0.94
LC03600334T	X97L095	3	12	5	0.42	39	37	0.95
LC03600335T	X97L095	2	11	8	0.73	37	37	1.00
LC03600337T	X97L095	3	9	11	1.22	37	34	0.92
LC03600338T	X97L095	3	12	10	0.83	35	23	0.66
LC03600339T	X97L095	3	11	10	0.91	39	29	0.74

Table 36. Agronomic Data for the Preliminary Turkish Red Lentil Screening Nursery, 2004 (0445F)

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Cultivar	Origin	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index
LC03600341T	X97L096	3	12	16	1.33	37	36	0.97
LC03600347T	X97L096	3	16	13	0.81	41	33	0.80
LC03600349T	X97L096	2	12	12	1.00	37	36	0.97
LC03600359T	X97L098	3	12	11	0.92	39	34	0.87
LC03600362T	X97L098	3	12	11	0.92	35	35	1.00
LC03600366T	X98L026	3	9	12	1.33	36	31	0.86
LC03600379T	X98L030	3	21	22	1.05	48	41	0.85
LC03600385T	X97L102	3	24	15	0.63	44	28	0.64
LC03600386T	X97L102	2	20	16	0.80	45	30	0.67
LC03600394T	X97L103	2	16	13	0.81	32	30	0.94
LC03600395T	X97L103	3	18	11	0.61	31	25	0.81
LC03600396T	X97L103	3	14	12	0.86	31	30	0.97
LC03600399T	X97L104	2	19	21	1.11	45	41	0.91
LC03600401T	X97L104	3	21	17	0.81	42	39	0.93
LC03600412T	X98L033	3	20	13	0.65	34	29	0.85
LC03600417T	X98L033	2	18	14	0.78	41	30	0.73
LC03600418T	X98L033	3	16	12	0.75	35	25	0.71
LC03600421P	X98L033	3	21	13	0.62	41	33	0.80
LC03600427T	X97L107	3	15	12	0.80	40	36	0.90
LC03600428T	X97L107	3	17	18	1.06	42	38	0.90
LC03600429T	X97L107	3	16	16	1.00	38	31	0.82
LC03600430T	X97L107	3	19	15	0.79	40	35	0.88
LC03600432T	X97L107	3	17	15	0.88	35	35	1.00
LC03600434T	X97L108	3	18	13	0.72	41	33	0.80
LC03600437T	X97L108	3	17	17	1.00	41	39	0.95
LC03600438T	X97L108	3	19	12	0.63	46	35	0.76
LC03600443T	X97L113	3	19	16	0.84	46	39	0.85
LC03600455T	X97L114	3	20	14	0.70	45	35	0.78
LC03600471T	X97L116	2	6	6	1.00	30	31	1.03
LC03600475T	X97L116	3	10	10	1.00	31	34	1.10
LC03600479T	X97L116	2	10	11	1.10	26	23	0.88
LC03600482T	X97L116	2	9	12	1.33	27	29	1.07
LC03600483T	X97L116	3	15	11	0.73	32	30	0.94
MORTON	X92L043	3	17	11	0.65	30	36	1.20
MORTON	X92L043	3	14	12	0.86	32	31	0.97
Grand Mean		3	15	12	0.83	40	31	0.81

Pod height was measured at the green pod stage and at harvest maturity.

Pod height index was determined by dividing the pod height at harvest maturity by the green pod height.

Plant height was measured at the green pod stage and at harvest maturity.

Plant height index was determined by dividing the canopy height at harvest maturity by the total plant height.

Agronomic data are one replication at Pullman, WA.

Table 37. Agronomic and Yield Data of Winter Lentil – Population Study, 2004 (0449)

	Rates		Fall Stand Count		Spring Stand Count		Weight 100 Seed	Seed Yield		
			Rosalia	Genesee	Rosalia	Mean		Genesee	Rosalia	Mean
..multiplier..	..seed/m <sup>2</sup> ..	kg/ha	..plants/m <sup>2</sup> ..		..plants/m <sup>2</sup> ..		..g..		..kg/ha..	
0.5x	60	21	15	12	6	9	3.1	2594	964	1779
1.0x	120	41	26	20	15	18	2.9	2762	948	1855
1.5x	180	62	29	20	17	19	2.5	2755	886	1821
2.0 x	240	82	40	25	17	21	2.7	2573	780	1676
Grand Mean			27	19	14	16	2.8	2671	895	1783
C.V. (%)			33	50	39	47		5	16	8
LSD ( $\alpha=0.05$ )			12	12	7	4		190	190	232
Planting Date								9/24/03	9/24/03	
Harvest Date								8/5/04	8/2/04	

Agronomic and yield data are means of three replications at each location, over two locations. Weight of 100 seed are one replication at Rosalia, WA.

## Field Evaluation of Lentil Cultivars for Resistance to *Sclerotinia sclerotiorum*

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The relative susceptibility of 12 lentil cultivars to *Sclerotinia* white mold was evaluated at Corvallis, OR. The twelve treatments were arranged in a randomized complete block design with four replications. Each plot row was 20 ft long with 15 in. row spacing. Plants were planted on 23 June. Natural inoculum was abundant and no artificial inoculations were applied. Disease severity was rated on 4 November according to the following 1-to-9 scale: 1 = no infection, 2 = 1-3% infection, 3 = 4-10%, 4 = 10-25%, 5 = 25-50%, 6 = 50-75%, 7 = 75-90%, 8 = 90-97%, and 9 = 97-100%. ANOVA with a GLM (SAS) was used to determine the significance of treatments and protected LSD at  $P = 0.05$  was used to separate treatment means.

All of the cultivars are susceptible to infection by white mold, but differences among the 12 test entries in response to white mold were observed. Cultivars Mason and Pardina were clearly among the most susceptible cultivars, and should be avoided in fields where white mold is suspected to be a problem. Cultivar CDC Sovereign and Pennel were among the cultivars showing tolerance to white mold. A general observation was that the more upright, thicker stemmed cultivars seemed more tolerant, which suggests that there was an architectural influence in white mold development in lentil. The results are in general agreement with previous greenhouse and field evaluations.

Table 38. Field Evaluation of Lentil Cultivars for Tolerance to *Sclerotinia sclerotiorum*, 2004 (0496)

Cultivar	Disease severity*
Mason	9.0A
Pardina	7.25AB
Brewer	7.0BC
Castillion	6.5BCD
Merit	6.25BCD
Crimson	5.75BCDE
CDC Grandora	5.25CDE
Athena	4.75DEF
Richlea	4.75DEF
Eston	4.25EFG
Pennel	3.25FG
CDC Sovereign	2.75G

\*Means with the same letter were not significantly different at  $p = 0.05$ .



## Chickpea Trial Results

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Seventeen selections and three check varieties were included in the advanced large Kabuli chickpea yield trials conducted at Genesee, ID, Pullman, WA and Walla Walla, WA in 2004 (Tables 39, 40 and 41). Mean yields of the trials were very good and a reflection of the adequate soil moisture available during the 2004 growing season. Check varieties included the recently released 'Sierra' as well as 'Dwelley' and 'Xena' from Canada. The results from the Genesee, ID location are not reported here due to extremely variable results due to residual herbicide in the plant area. Yields at Pullman and Walla Walla were very good. Selections that had been promising in the past three seasons (CA9990I604C and CA9990I875W) performed as well or better than Sierra or Dwelley. These two selections have the fern leaf structure and, as expected, demonstrated their yield potential under adequate soil moisture. Of these two selections, CA9990I604C was the highest yielding in 2002, performed well in 2003, a dry year and was fourth overall in 2004. It has excellent seed size and quality. CA9990I875W is a large seeded Spanish White type selection with excellent size and quality. Both selections have good resistance to ascochyta blight. We will make a decision in early 2005 on a possible variety release of these two lines. Several of the higher yielding selections in the trial were somewhat small seeded. They were included based on their very good resistance to ascochyta blight.

The 2004 preliminary yield trial conducted at Pullman, WA for large Kabuli chickpeas had 26 entries and 2 check lines (Table 41). The check lines were Dwelley and Sierra. The Café type selections in the Preliminary trial were chosen for good resistance to ascochyta blight. Although nearly all were small seeded this season, only two lines (CA0290B670C and CA0290B854C) had acceptable blight scores, the remaining lines will be discarded. However, the two resistant selections had significantly smaller seed size.

The preliminary screening nursery had 90 entries of which 39 lines were harvested. About half were Café types and half Spanish white types that were being evaluated for the first time (Table 43). The 39 lines were evaluated for plant type, habit, leaf type, and earliness to flower and resistance to ascochyta blight. The most promising selections will be advanced to the preliminary yield trial in spring of 2005.

An observation trial of breeding lines from Canada and Australia was conducted at Pullman (Table 44). The lines were evaluated in an unreplicated trial to observe the characteristics and disease resistance of material from other programs. Based on performance, agronomic characteristics and blight resistance scores, several of the lines will be used as parental material.

### Disease screening:

Recent results of disease screening in the greenhouse has indicated that the newly released variety Sierra has resistance to pathotypes 1 and 2 of the blight pathogen while Dwelley, Sanford and Evans only have resistance to pathotype 1. This finding

explains what appears to be a breakdown of disease resistance of these earlier released varieties and the apparent improved performance of Sierra that appears to have resistance to both pathotypes. Newly introduced germplasm from ICARDA is expected to have resistance to pathotypes 1, 2 and 3 and the incorporation of that germplasm into the breeding program will be important to improved resistance in future selections.

The ascochyta blight nursery established annually at Spillman Farm continues to be an excellent method of screening for resistance. More than 600 lines and selections from the breeding program and other sources were screened for blight resistance in 2004. Infected chickpea debris from infected plants was gathered for use in 2005 to inoculate the nursery. The infected debris is spread among the newly emerging plants in the nursery each spring. Irrigation water is applied to the nursery at regular intervals, usually at night, to ensure good spread of the disease and to promote the pod infection phase. Scores for infection were made bi-weekly for seven weeks and selections were made based on the blight scores and also on plant habit and pod setting. Chickpea lines with low scores, indicating resistance, were retained for further evaluations while the plant rows with scores exceeding the checks were discarded.

To introduce additional sources of disease resistance, yield traits and quality into the breeding program we evaluated germplasm from several wide ranging sources. These introductions included material from ICARDA in Syria, ICRISAT in India, Turkey and Mexico as well as from collaborators in Bulgaria, Canada and Australia. Germplasm receiving low blight scores indicating good resistance or with improved yield or quality traits were chosen for use as parents in the crossing program.

#### Selection criteria:

Crosses were made in the field and in the greenhouse to transfer ascochyta blight resistance to large seeded Spanish White types and to the large seeded Café types. The resulting hybrids are currently being increased in the greenhouse and selected for size, shape and color of the seeds. Advanced single plant selections in the  $F_4$ ,  $F_5$ , and  $F_6$  were grown in the greenhouse and harvested. Seed of these plants will be planted in single plant rows in the blight nursery in 2005 and evaluated for resistance to blight and other traits. The primary criteria in the selection process are large seeds of each type as well as earliness to flower and mature. In addition to the crossing and selection program, Spanish White and Café types were selected from existing breeding populations. Those selections were screened in the blight nursery and evaluated in the preliminary screening nursery.

### Early flowering and early maturity:

In addition to the work on resistance to blight, we have identified earlier flowering and earlier maturing germplasm lines. These lines have been crossed and intercrossed to our blight resistant material. The delayed maturity of most of the chickpea varieties appears to be related to late flowering and a high degree of abortion of the first flowers on the plants. This seems related to cold temperature sensitivity in varieties where pod setting is observed to begin only when the mean daily temperature is above a critical point. It also appears that pod setting ceases when mean daily temperatures rise above a critical high temperature point. To alleviate this problem, we are in the process of widening this temperature range of adaptation. Progeny lines are selected for earlier onset of flowering, non-abortion of flowers after the onset of flowering, an extended flowering period, and tolerance to high temperatures during the pod set and seed set stages of development. It is expected as a result of this approach that flower set, pod set and seed development will begin at lower temperatures and continue at higher temperatures. The adaptation allowing widening of the temperature range for flowering, podding, and seed set will advance maturity, improve seed quality and increase yield potential.

### Potential Variety Releases:

We will propose CA9990I604C and CA9990I875W, two large seeded Kabuli type selections for variety release this winter. These lines are fern leafed types that have performed well in yield testing and have excellent seed quality traits. CA9990I604C has larger seed size when compared to Sierra and the seeds are lighter. Seeds of CA9990I875W are exceptionally large and white. Blight resistant scores have not been as low as previously experienced, but the scores in 2004 were comparable to Sierra. Breeder seed of both lines is available for increase to Foundation seed.

Table 39. Location Yield Summary (kg/ha) for the Advanced Large Kabuli Chickpea Yield Trial, 2004 (0481)

Cultivar	Origin	Leaf Type	Seed Type	Pullman	Walla Walla	Mean Seed Yield
CA0090B347C	X96C004	S	C	1816	3148	2482
CA0090B383C	X96C019	S	C	1861	3044	2453
CA9783163C	X92C017	C	C	2113	2772	2443
CA0190B110C	X96C004	C	C	1673	3118	2395
CA9990I604C	X94C080	C	W	1915	2865	2390
CA0190B777C	X96C020	C	C	1868	2858	2363
CA0190B775C	X96C020	C	C	1800	2878	2339
CDC_XENA	.....	S	C	1866	2760	2313
CA9990B1579C	X92C016	S	C	1654	2957	2306
CA9990I875W	X94C005	C	W	2011	2536	2273
*DWELLEY	.....	S	C	1817	2698	2258
CA0090B015W	X94C005	C	W	1850	2565	2207
CA0190B723C	X96C011	S	C	1622	2737	2180
SIERRA	.....	S	C	1558	2767	2163
CA0190B839C	X96C031	S	C	1708	2544	2126
CA0190B539W	X96C144	C	C	1492	2731	2112
CA9890233W	X94C005	C	W	1900	2153	2027
CA0190B052C	X96C003	C	C	1598	2295	1947
CA0090B659D	X96C026	S	C	1420	2470	1945
CA0190B474C	X96C036	C	C	1205	1168	1187
Grand Mean				1737	2653	2195
C.V. (%)				9	8	8
LSD ( $\alpha=0.05$ )				212	277	550
Planting Date				4/5/04	3/31/04	
Harvest Date				8/31/04	8/19/04	

Leaf type; C = compound leaf, S = simple leaf type. Seed type; W = white seed type, C = café seed type, D = desi

Yield data are means of three replications at each location, over two locations.

Genesee location removed from experiment results due to inconsistencies because of residual herbicide.

\*Check variety.

Table 40. Agronomic Data for the Advanced Large Kabuli Chickpea Yield Trial, 2004 (0481)

Cultivar	Origin	Ascochyta Blight	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (green) ..cm..	Pod Ht (mature) ..cm..	Pod Ht Index	Plant Ht (green) ..cm..	Plant Ht (mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..
CA0090B347C	X96C004	5	74	115	1	24	23	0.98	43	40	0.92	45.0
CA0090B383C	X96C019	6	74	112	1	34	31	0.93	49	48	0.99	40.0
CA9783163C	X92C017	8	75	121	1	29	27	0.96	49	47	0.95	59.0
CA0190B110C	X96C004	4	73	113	1	23	21	0.97	40	40	1.00	30.9
CA9990I604C	X94C080	8	71	117	1	27	23	0.86	43	42	0.96	57.2
CA0190B777C	X96C020	7	73	125	1	31	25	0.83	49	44	0.91	45.1
CA0190B775C	X96C020	5	73	124	1	28	22	0.80	49	40	0.82	43.6
CDC_XENA	.....	8	73	113	1	32	29	0.91	50	45	0.91	49.6
CA9990B1579C	X92C016	8	74	120	1	26	23	0.89	49	42	0.85	54.8
CA9990I875W	X94C005	7	73	121	1	25	29	1.00	46	45	0.99	61.9
*DWELLEY	.....	8	77	120	1	31	23	0.75	52	47	0.91	54.7
CA0090B015W	X94C005	7	73	115	1	28	23	0.84	43	42	0.98	53.3
CA0190B723C	X96C011	7	76	116	1	38	32	0.85	62	57	0.92	42.6
SIERRA	.....	8	75	119	1	29	22	0.79	51	45	0.87	57.2
CA0190B839C	X96C031	8	73	122	1	38	27	0.70	54	51	0.94	59.1
CA0190B539W	X96C144	8	78	124	1	42	37	0.88	62	59	0.94	43.1
CA9890233W	X94C005	8	73	118	1	31	25	0.80	45	44	0.98	56.8
CA0190B052C	X96C003	6	73	113	1	26	24	0.91	49	40	0.83	40.0
CA0090B659D	X96C026	7	77	118	1	36	31	0.87	61	52	0.85	31.3
CA0190B474C	X96C036	6	76	125	1	32	33	1.00	54	49	0.90	33.8
Grand Mean		7	74	119	1	30	27	0.89	50	46	0.92	48.0
C.V. (%)		11	1	2		14	11	19	6	6	8	
LSD ( $\alpha=0.05$ )		1	1	4		6	4	0.23	4	4	0.10	

Leaf type; C = compound leaf, S = simple leaf type. Seed type; W = white seed type, C = café seed type.

Ascochyta Blight Resistance Scores: 1 = Highly Resistant, 3 = Resistant, 5 = Tolerant, 7 = Susceptible and 9 = Highly Susceptible

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green plant stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic data are means of three replications at Pullman, WA.

\*Check variety.

Table 41. Mean Yields of the Advanced Large Kabuli Chickpea Yield Trial, 2000 - 2004

Cultivar	Origin	Leaf Seed		2000		2001		2002		2003		2004	
		Type	Type	kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check	kg/ha	% check
CA0090B347C	X96C004	S	C	....	...	....	...	....	...	1080	116	2482	110
CA0090B383C	X96C019	S	C	....	...	....	...	....	...	1084	116	2453	109
CA9783163C	X92C017	C	C	1875	110	1855	116	1331	98	980	105	2443	108
CA0190B110C	X96C004	C	C	....	...	....	...	....	...	....	...	2395	106
CA9990I604C	X94C080	C	W	....	...	....	...	1559	115	950	102	2390	106
CA0190B777C	X96C020	C	C	....	...	....	...	....	...	....	...	2363	105
CA0190B775C	X96C020	C	C	....	...	....	...	....	...	....	...	2339	104
CDC_XENA	.....	S	C	....	...	....	...	....	...	833	89	2313	102
CA9990B1579C	X92C016	S	C	....	...	....	...	1517	112	1053	113	2306	102
CA9990I875W	X94C005	C	W	....	...	....	...	1300	96	779	83	2273	101
*DWELLEY	.....	S	C	1701	100	1595	100	1360	100	935	100	2258	100
CA0090B015W	X94C005	C	W	....	...	....	...	....	...	933	100	2207	98
CA0190B723C	X96C011	S	C	....	...	....	...	....	...	....	...	2180	97
SIERRA	.....	S	C	1761	104	1731	109	1383	102	990	106	2163	96
CA0190B839C	X96C031	S	C	....	...	....	...	....	...	....	...	2126	94
CA0190B539W	X96C144	C	C	....	...	....	...	....	...	....	...	2112	94
CA9890233W	X94C005	C	W	....	...	1788	112	1236	91	864	92	2027	90
CA0190B052C	X96C003	C	C	....	...	....	...	....	...	....	...	1947	86
CA0090B659D	X96C026	S	C	....	...	....	...	....	...	949	101	1945	86
CA0190B474C	X96C036	C	C	....	...	....	...	....	...	....	...		
Grand Mean				1555		1784		1307		948		2195	
LSD ( $\alpha=0.05$ )				176		140		336		112		550	

Yield data are means of three replications at each location, over three locations in each year and two locations in 2004.

\*Check variety

Table 42. Agronomic and Yield Data for the Preliminary Large Kabuli Chickpea Yield Trial, 2004 (0483)

Cultivar	Origin	Leaf Type	Seed Type	Ascochyta Blight	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (Green) ..cm..	Pod Ht (Mature) ..cm..	Pod Ht Index	Plant Ht (Green) ..cm..	Plant Ht (Mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..	Seed Yield ..kg/ha..
DWELLEY	.....	S	C	8	75	120	1	33	27	0.83	54	45	0.85	54.8	1938
CA0290B938C	X94C003	C	C	6	73	114	1	26	28	1.00	51	33	0.65	42.3	1928
CA0290B815C	X98C010	C	C	7	76	124	1	24	19	0.84	42	39	0.93	40.0	1927
CA0290B799C	X96C026	C	C	8	72	116	1	27	30	1.00	55	52	0.95	49.2	1904
CA0290B663C	X96C003	C	C	5	73	114	1	23	22	1.00	49	40	0.82	40.0	1878
CA0290B720C	X96C081	C	C	7	74	127	1	27	21	0.75	49	45	0.93	55.1	1868
CA0290B698C	X96C019	S	C	7	75	112	1	28	21	0.76	48	44	0.91	41.6	1850
CA0290B005C	X98C010	C	C	5	73	118	1	18	24	1.00	42	45	1.00	31.8	1842
CA0290B805C	X96C084	C	C	8	73	124	1	27	21	0.82	50	42	0.84	45.6	1828
CA0290B670C	X96C004	C	C	4	72	112	1	26	26	1.00	50	42	0.85	38.6	1828
CA0290B932C	X94C003	C	C	6	73	114	1	30	31	1.00	56	52	0.93	42.0	1812
SIERRA	.....	S	C	7	74	121	1	22	27	1.00	50	43	0.85	54.0	1764
CA0290B737C	X96C128	S	C	7	77	126	1	33	28	0.87	56	52	0.93	52.0	1758
CA0290B902C	X96C008	C	C	7	75	119	1	16	21	1.00	41	39	0.95	41.9	1701
CA0290B662C	X96C003	C	C	6	72	113	1	23	20	0.94	49	45	0.93	42.2	1699
CA0290B790C	X96C024	C/S	C	7	74	116	1	27	24	0.92	54	43	0.81	44.3	1698
CA0290B854C	X98C020	C	C	5	77	124	1	25	24	0.98	47	45	0.96	43.0	1647
CA0290B822C	X98C010	C	C	6	76	113	1	27	25	0.94	42	43	1.00	36.4	1494
CA0290B734C	X96C081	S	C	6	73	116	1	20	14	0.80	42	35	0.83	47.2	1462
CA0290B767C	X96C006	C	C	5	73	119	1	20	20	1.00	41	38	0.93	45.5	1427
CA0290B820C	X98C010	S	C	7	75	120	1	30	34	1.00	54	48	0.88	42.1	1417
CA0290B860C	X98C020	S	C	6	76	113	1	27	25	0.96	54	49	0.91	42.4	1406
CA0290B708C	X96C019	S	C	7	76	119	1	25	25	1.00	52	44	0.85	44.8	1400
CA0290B730C	X96C081	S	C	6	74	120	1	25	19	0.78	49	41	0.83	52.7	1369
CA0290B862C	X98C021	C	C	7	77	130	1	24	21	0.89	50	44	0.89	45.3	1367
CA0290B748C	X96C128	S	C	7	77	125	1	34	31	0.91	61	53	0.88	46.6	1092
CA0290B054C	X96C036	C	C	7	74	125	1	20	25	1.00	43	40	0.92	40.0	1083
CA0290B798D	X96C026	C	D	7	73	117	1	26	27	1.00	55	54	0.98	26.7	1010
Grand Mean				6	74	119	1	25	24	1.00	50	44	0.90	43.9	1621
C.V. (%)				13	1	2	11	18	15	26	7	14	16		7
LSD ( $\alpha=0.05$ )				1	1	4	0	6	5	0.35	5	8	0.20		164

Pullman planting date was 4/5/04. Pullman harvest date was 8/31/04.

Leaf type; C = compound leaf, S = simple leaf type. Seed type; W = white seed type, C = café seed type.

Ascochyta Blight Resistance Scores: 1 = Highly Resistant, 3 = Resistant, 5 = Tolerant, 7 = Susceptible and 9 = Highly Susceptible

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green pod stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic and yield data are means of three replications at Pullman, WA.

Table 43. Agronomic and Yield Data for the Preliminary Large White Kabuli Chickpea Screening Nursery, 2004 (0485)

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Cultivar	Origin	Leaf Type	Seed Type	Ascochyta Blight	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (Green) ..cm..	Pod Ht (Mature) ..cm..	Pod Ht Index	Plant Ht (Green) ..cm..	Plant Ht (Mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..	Seed Yield ..kg/ha..
CA0390B223C	X96C005	C	C	6	73	113	1	43	36	0.84	59	58	0.98	42.9	2240
CA0390B007C	X94C003	C	C	5	73	117	1	35	31	0.89	47	44	0.94	50.6	2204
CA0390B172C	X96C023	C	C	5	73	118	1	32	30	0.94	57	47	0.82	43.2	2111
CA0390B483C	X96C006	C	C	5	72	114	1	33	33	1.00	56	54	0.96	43.1	2111
CA0390B097C	X96C004	C	C	5	70	113	1	30	36	1.00	58	49	0.84	40.8	2099
CA0390B482C	X96C006	C	C	5	72	113	1	38	25	0.66	64	53	0.83	41.7	2006
CA0390B463W	X98C024	W	S	8	72	118	1	40	40	1.00	56	60	1.00	44.9	1985
CA0390B212C	X96C128	C	C	4	71	110	1	32	29	0.91	54	49	0.91	46.9	1933
CA0390B374W	X98C011	W	S	8	73	112	1	40	36	0.90	60	58	0.97	45.7	1925
CA0390B367W	X98C011	W	S	8	73	113	1	44	42	0.95	58	59	1.00	49.2	1913
CA0390B038C	X94C004	C	C	7	72	113	1	26	22	0.85	48	40	0.83	46.6	1882
CA0390B369W	X98C011	W	S	7	73	112	1	46	43	0.93	59	59	1.00	48.2	1878
CA0390B047C	X94C004	C	C	7	76	127	1	31	28	0.90	59	47	0.80	50.4	1760
CA0390B440W	X98C020	W	C	6	73	113	1	22	21	0.95	40	36	0.90	41.2	1745
CA0390B119C	X96C011	C	C	5	70	111	1	32	27	0.84	51	49	0.96	40.6	1710
CA0390B122C	X96C011	C	C	5	70	111	1	34	30	0.88	58	53	0.91	41.3	1692
CA0390B349W	X98C010	W	S	6	75	118	1	30	24	0.80	50	43	0.86	44.6	1692
CA0390B500C	X96C023	C	S	7	73	114	1	32	30	0.94	55	52	0.95	45.3	1677
CA0390B095C	X96C004	C	S	7	75	124	1	33	35	1.00	60	52	0.87	47.9	1673
CA0390B467W	X98C024	W	S/C	8	73	124	1	32	37	1.00	53	54	1.00	36.0	1642
CA0390B487C	X96C011	C	S	8	75	124	1	47	30	0.64	56	51	0.91	49.3	1627
CA0390B448W	X98C021	W	S	8	77	118	1	45	45	1.00	56	58	1.00	49.7	1625
CA0390B105C	X96C011	C	C	6	70	117	1	31	24	0.77	52	45	0.87	42.9	1621
CA0390B464W	X98C024	W	C	7	73	117	1	48	34	0.71	55	53	0.96	41.3	1596
CA0390B233C	X96C006	C	C	3	71	117	1	26	31	1.00	54	46	0.85	46.4	1582
CA0390B232C	X96C006	C	C	3	71	122	1	41	32	0.78	57	60	1.00	43.8	1479
CA0390B418W	X98C016	W	C	6	77	131	1	46	38	0.83	69	60	0.87	41.5	1443
CA0390B214C	X96C128	C	S	7	75	112	1	41	41	1.00	56	61	1.00	44.5	1431



Table 43. Agronomic and Yield Data for the Preliminary Large White Kabuli Chickpea Screening Nursery, 2004 (0485)

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Cultivar	Origin	Leaf Type	Seed Type	Ascochyta Blight	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (Green) ..cm..	Pod Ht (Mature) ..cm..	Pod Ht Index	Plant Ht (Green) ..cm..	Plant Ht (Mature) ..cm..	Plant Ht Index	Weight 100 Seed ..g..	Seed Yield ..kg/ha..
CA0390B470W	X98C024	W	S/L	7	73	121	1	45	25	0.56	52	53	1.00	40.5	1414
CA0390B344W	X98C010	W	C	7	76	117	1	26	24	0.92	26	42	1.00	42.9	1404
CA0390B419W	X98C016	W	C	7	76	128	1	33	31	0.94	58	57	0.98	47.7	1361
CA0390B474C	X96C005	C	C	8	72	128	1	33	37	1.00	54	52	0.96	40.6	1350
CA0390B362W	X98C010	W	S	8	77	122	1	53	48	0.91	60	63	1.00	42.2	1288
CA0390B288C	X96C026	C	S	6	73	114	1	36	35	0.97	58	59	1.00	45.0	1241
CA0390B213C	X96C128	C	S	6	75	114	1	40	44	1.00	58	58	1.00	42.6	1208
CA0390B283C	X96C026	C	S	6	75	117	1	43	36	0.84	52	55	1.00	43.4	1088
CA0390B393W	X98C012	W	C	6	72	128	1	28	18	0.64	45	49	1.00	50.6	986
CA0390B489C	X96C011	C	S	8	73	124	1	37	32	0.86	62	60	0.97	47.2	829
CA0390B422W	X98C016	W	C	5	73	128	1	41	32	0.78	54	47	0.87	48.9	163
Grand Mean				6	73	118	1	37	33	0.90	55	52	0.97	44.7	1605

Pullman planting date was 4/5/04. Pullman harvest date was 8/31/04.

Leaf type; C = compound leaf, S = simple leaf type. Seed type; W = white seed type, C = café seed type, D = desi

Ascochyta Blight Resistance Scores: 1 = Highly Resistant, 3 = Resistant, 5 = Tolerant, 7 = Susceptible and 9 = Highly Susceptible

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height. Plant height was measured at the green pod stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic and yield data are one replication at Pullman, WA.

Table 44. Agronomic and Yield Data for the Canadian and Australian Chickpea Observation Nursery, 2004 (0407C)

Cultivar	Ascochyta Blight	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (Green)	Pod Ht (Mature)	Pod Ht Index	Plant Ht (Green)	Plant Ht (Mature)	Plant Ht Index	Weight 100 Seed	Seed Yield
					..cm..	..cm..		..cm..	..cm..		..g..	..kg/ha..
CDC-DIVA	8	71	111	1	32	26	0.81	54	42	0.78	46.9	2285
CDC-CHICHI	8	71	113	1	28	24	0.86	50	43	0.86	41.9	2275
FLIP94-90C	3	69	107	1	22	24	1.00	43	38	0.88	32.4	2175
CDC-XENA	8	71	110	1	30	36	1.00	48	46	0.96	47.1	2126
CDC-FRONTIER	5	71	111	1	26	29	1.00	50	41	0.82	36.7	2058
FLIP94-92C	4	69	111	1	21	20	0.95	29	38	1.00	37.0	1718
S95342	4	70	110	1	24	20	0.83	50	43	0.86	36.2	1648
CDC-CHICO	6	69	110	1	35	27	0.77	55	47	0.85	25.9	1638
CDC-NIKA	6	69	110	1	27	21	0.78	47	40	0.85	32.0	1636
304-22	4	70	107	1	27	25	0.93	45	42	0.93	22.1	1549
CDC-ANNA	7	70	111	1	24	16	0.67	42	38	0.90	19.5	1485
CDC-YUMA	6	71	113	1	49	24	0.49	54	49	0.91	46.1	1443
304-40	5	72	110	1	28	22	0.79	42	36	0.86	20.7	1421
92073-40	5	69	106	1	11	16	1.00	48	36	0.75	29.2	1412
BS1-43	5	72	107	1	22	25	1.00	40	39	0.98	25.2	1406
95NN-12	3	69	110	1	21	10	0.48	40	36	0.90	31.6	1402
ICCV96836	5	69	106	1	25	26	1.00	42	43	1.00	18.1	1398
304-31	4	70	107	1	12	21	1.00	43	33	0.77	21.2	1299
SONA-4028	6	69	106	1	35	23	0.66	52	46	0.88	20.6	1214
FLIP-94508C	3	69	105	1	19	24	1.00	41	37	0.90	17.6	1193
CDC-DESIRAY	5	69	106	1	20	19	0.95	48	39	0.81	18.9	1173
242-1	6	72	111	1	24	12	0.50	47	37	0.79	37.5	1115
S95362	3	70	107	1	22	19	0.86	49	39	0.80	30.7	1104
SONA*98PBC4019	6	69	106	1	16	27	1.00	52	43	0.83	20.9	1053
97-INDIAN2-11	6	69	111	1	23	15	0.65	37	30	0.81	39.6	840
BARWON-MR	5	72	110	1	16	18	1.00	34	29	0.85	13.5	788
SONA*98CZH4009	6	69	107	1	11	12	1.00	44	31	0.70	22.4	755
SB2000-2	6	70	110	1	10	10	1.00	37	20	0.54	16.0	219
Grand Mean	5	70	109	1	24	21	0.96	45	39	0.86	28.8	1422

Planting date 4/7/04. Harvest date 8/21/04.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green pod stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic and yield data are one replication at Pullman, WA

## Chickpea Disease Experimental Results

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Field evaluation of seed treatment fungicides for control of root rot and damping-off on chickpea, 2004.

Chickpea seeds, particularly the large kabuli-seed type, are always treated before planting to control damping-off and root rot. The traditional seed treatment includes Apron for controlling *Oomycete* pathogens and Mertect for controlling *Fusarium* spp. and *Rhizoctonia solani* that cause damping-off and root rot. Since 2002 we have observed elevated levels of root rot of chickpea showing symptoms resembling *Rhizoctonia* root rot in cultivar 'Spanish White'. *R. solani* was isolated from diseased plants. In 2004, we evaluated five fungicide treatments for their effectiveness in controlling damping-off and root rot caused *Fusarium* spp. and *R. solani*. The treatments included an untreated control, a standard treatment (Apron XL LS, 0.16 fl oz and Mertect LSP, 6 fl oz per 100 lb); Maxim (standard treatment plus Maxim, 0.04 fl oz per 100 lb); Protégé (standard treatment plus Protégé, 0.375 fl oz per 100 lb); Blocker (standard treatment plus Blocker 10G, 18 lb per A), and Kodiak (Captan 400, 2.5 fl oz, Allegiance, 0.75 fl oz, and Kodiak, 0.125 oz per 100 lb). In the Kodiak treatment, Captan and Allegiance replaced Apron and Mertect in the standard treatment. All the treatments except Blocker 10G were coated onto the seeds less than one week before planting. The Blocker 10G in pellet form was mixed with standard-treated seeds at planting. Exactly 200 seeds of cultivar 'Spanish White' were planted in each plot (5 ft by 12 ft) on 31 March on a farm near Walla Walla, WA, and on 25 March on a farm near Genesee, ID using a completely randomized block design with four replications. Plant stands were counted on 14 May on both locations. Plots were harvested for grain yields on 18 Aug at the Walla Walla location and on 30 Aug at the Genesee location. Nearest Neighbors Analysis was performed using the AgroBase generation II program, and protected LSDs were used to separate treatment means.

All treatments including the standard treatment increased stand counts over the untreated control at both locations, and no difference among the treatments were found. However, the treatments did not significantly increase yield over the untreated control at either location.

Table 45. Chickpea Seed Treatment Study, 2004 (0493)

Treatment (per 100 lb seed)	Genesee		Walla Walla	
	Stand*	Yield**	Stand*	Yield**
Standard (Apron XL LS, 16 fl oz and Mertect LSP, 6 fl oz)	188	1019	171	2807
Kodiak (Captan 400 2.5 fl oz, Allegiance 0.75 fl oz and Kodiak 0.125 oz)	191	1060	184	2597
Blocker 10 G (Standard plus Blocker 10 G, 18 lb/A)	195	1025	179	2582
Maxim (Standard plus Maxim 0.04 fl oz)	190	859	181	2572
Protege (Standard plus Protege 0.375 fl oz)	191	936	181	2445
Untreated Control	146	718	164	2597
LSD <sub>0.05</sub>	11	388	9	269

\*Mean number of plant stands out of 200 seeds per plot.

\*\*Mean Yield expressed in lb per acre.

## Field evaluation of fungicides for control of *Ascochyta* blight of chickpea, 2004

Five fungicides were evaluated for the control of *Ascochyta* blight at two locations. The five fungicides were Bravo Weather Stik (1.4 pt/A), Headline (10.4 fl oz/A), JAU 6476 (5.7 fl oz/A), Quadris SC (9.2 fl oz/A), and Tanos (8 oz/A). Water was sprayed as a control. The split plots were arranged with a randomized complete block design with chemicals as the main plots (8 ft wide by 12 ft long) and two cultivars Dwelley (resistant) and Spanish White (susceptible) as the split plots. There were four blocks. The same experimental design was used at the Spillman Experimental Farm of Washington State University in Pullman, WA and on a farm near Genesee, ID. Natural inoculum of *Ascochyta rabiei* was abundant, and no artificial inoculations were used. The plots were sprayed with fungicides on 3 Jun, 17 Jun, 1 Jul for the Pullman location, and 4 Jun, 18 Jun, and 2 Jul for the Genesee location. Disease severity was recorded on the dates indicated below based on a 1-to-9 scale: 1 = no lesions visible, no signs of disease, healthy plants; 2 = lesions visible but inconspicuous; 3 = A few lesions visible, <10% of plant tissue diseased; 4 = 10-20% plant tissue diseased, but lesions have not caused irreparable damage to the plants; 5 = 21-30% plant tissue diseased, some stem girding; 6 = 41-60% plant tissue diseased, moderate stem girding and breakage; 7 = 61-80 % plant tissue diseased, stem girding and breakage common; 8 = 81-90% of plant tissue diseased; 9 = >90 % plants died. Plots were harvested using a plot combine on 30 Aug.

Disease pressure was higher at the Pullman location than at the Genesee location. Under high disease pressure, all fungicides reduced disease severity and increased yield on cv. Dwelley. Bravo and JAU 6476 also increased yield of cv. Spanish White. Under low disease pressure, fungicide spraying reduced disease severity on both cultivars, but did not increase yield of resistant cv. Dwelley. JAU 6476 and Bravo increased yield of cv. Spanish White over the control. All tested fungicides reduced disease severity. BRAVO, Headline, JAU 6476 and Quadris all performed well except Quadris on Spanish White at the Pullman location.

Table 46. Chickpea Fungicide Trial, 2004 (0495)

Pullman location

Fungicide	Dwelley (Resistant)					Spanish White (Susceptible)				
	Disease Severity*				Yield**	Disease Severity*				Yield**
	17 Jun	1 Jul	16 Jul	2 Aug		17 Jun	1 Jul	16 Jul	2 Aug	
Control	2.5a	2.75a	3.75a	5a	396c	5.25ab	7.75a	9a	9a	24b
Tanos	2.25a	2.75a	2.75b	4b	1273b	5ab	6.75b	8ab	8.5ab	41ab
Bravo	2.5a	3a	2.5b	2.75c	2359a	5.5a	6.25bc	5.5c	6de	507a
Headline	2.25a	2a	2b	2.75c	2511a	4.75ab	5.75c	5.25c	5.5e	516a
Quadris	2a	2.5a	2.5b	3c	2579a	4.5b	6.25bc	7b	7.75bc	76ab
JAU 6476	2.5a	2.5a	2.25b	3c	2791a	5.25ab	6.75b	7.25b	7cd	344ab

Genesee location

Fungicide	<u>Dwelley (Resistant)</u>				Yield**	<u>Spanish White (Susceptible)</u>			
	Disease Severity*			Disease Severity*			Yield**		
	18 Jun	2 Jul	22 Jul	18 Jun		2 Jul		22 Jul	
Control	1a	2.5a	3.5a	2072a	2.5a	4.25a	5.5a	1243b	
Tanos	1a	2a	2b	2214a	2.75a	3.75a	3.75b	1799ab	
Bravo	1.25a	2.5a	2.25b	2170a	2.5a	3.25a	3.25b	1866a	
Headline	1.25a	2.5a	2.5b	2450a	2.5a	3.25a	3.25b	1609ab	
Quadris	1a	2a	2.25b	2360a	2.5a	3.5a	3.5b	1789ab	
JAU 6476	1.25a	2.75a	2.5b	2225a	2.25a	3.5a	3.5b	1863a	

\*Means (of 4 replication) followed by the same letter in the same column are not significantly different at  $P = 0.05$  following a Fisher's protected least significant difference test.

\*\*Yields are expressed as pounds per acre.

## Legume Associations with Symbiotic Microbes for Sustainable Agriculture

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Symbiotic nitrogen fixation by legume crops such as pea, lentil and chickpea improves soil fertility status contributing to their advantageous role in rotation with cereals. Legume roots form symbiotic relationships with the soil borne bacteria, *Rhizobium leguminosarum* (pea and lentil) and *Mesorhizobium ciceri* (chickpea) which form nodules on the roots where the bacteria receive nutrients from the plant and in turn fix atmospheric nitrogen (N<sub>2</sub>) into a plant available form. In addition to *Rhizobium* spp. roots of certain plant species also establish symbiotic interactions with vesicular arbuscular mycorrhizae (VAM). VAM are soil fungi which are able to efficiently acquire soil nutrients, especially phosphorus, making them more available to the plant.

A collaborative project between the All-Russia Institute for Agricultural Microbiology in St. Petersburg, Russia and the USDA-ARS Grain Legume Genetics and Physiology Research Unit in Pullman, WA was established as part of a joint NATO-US funded proposal to investigate the response of pea to inoculation. Two experiments were established during the 2004 field season to study the effect of Rhizobium and Mycorrhizae inoculation on plant development and yield. The first experiment included twelve cultivars or breeding lines, seven from the USDA program and five from Russia, tested in all combinations with four inoculation treatments; no inoculant, Rhizobium only, Mycorrhizae only and Rhizobium with Mycorrhizae. The five cultivars from Russia had been previously tested and shown to have a positive response to inoculation. The experiment was designed as a split plot with six replications where inoculation was the main plot and cultivar as the sub plots. Yield data from these plots are summarized in Table 47. Results showed that Mycorrhizae alone produced the greatest yield followed by Rhizobium alone, uninoculated control and the combined treatment of Rhizobium with Mycorrhizae produced the least yield overall; however, yield differences were only significant between the Mycorrhizae alone and the Rhizobium with Mycorrhizae treatments. PS9910140, a yellow pea, produced the greatest yield overall in the trial and showed a significant yield response to inoculation with Mycorrhizae while the combination of inoculants reduced overall seed yield. PS9910188, another yellow pea, showed a yield response to all three inoculation treatments compared to the uninoculated control. The trial will be repeated in 2005 to confirm any yield response to inoculation.

The second experiment included two breeding lines of pea and chickpea and one breeding line of lentil, tested in the presence of a commercial Rhizobium inoculant compared to an uninoculated control (Tables 48, 49, 50). The trial was established as an unreplicated strip trial with each strip being 120 feet in length. Yield of the uninoculated control for both breeding lines of pea and chickpea was greater than the inoculated treatment. Average yield differences were 274 kg/ha for pea and 131 kg/ha for chickpea. The lentil breeding line showed a marginal yield response (42 kg/ha) to inoculation.

Table 47. Yield Data (kg/ha) for the Pea Rhizobium and Mycorrhizae Symbiosis Trial, 2004 (0475)

	Untreated Check	Rhizobium	Mycorriza	Rhizobium Plus Mycorriza	Yield
	..kg/ha..	..kg/ha..	..kg/ha..	..kg/ha..	..kg/ha..
PS9910140	2353	2825	2589	2340	2527
PS9910188	2105	2489	2720	2520	2458
PS810240	2252	2014	2530	2430	2307
PS810191	1936	2267	2188	2405	2199
Stirling	2203	2056	2338	2135	2183
Triumph	2138	2128	2336	1933	2134
VIR7128	1837	1974	1826	1730	1842
VIR8274	2273	1835	1760	1416	1821
Franklin	1862	1619	1791	1537	1702
PS710048	1679	1885	1361	1820	1686
VIR1693	1561	1724	1718	1432	1609
Scythian (Ckuop)	1594	1684	1627	1488	1598
Grand Means	1983	2042	2065	1932	
LSD=319 SP LSD=100 MP					



Table 48. Agronomic and Yield Data for the Pea Rhizobium Inoculation Trial, 2004 (0470P)

Cultivar	Origin	Treatment	Days to Flower	Days to Maturity	Nodes to First Flwr	Pods/ Peduncle	Pod Ht (Green)	Pod Ht (Mature)	Pod Ht Index	Plant Ht (Green)	Plant Ht (Mature)	Plant Ht Index	Rep Nodes	Seed Yield
							..cm..	..cm..		..cm..	..cm..		..g..	..kg/ha...
PS0010836	SH95-6-1	Without Rhizobium	62	93	14	2	39	22	0.56	51	43	0.84	3	2776
PS9910140	X92P303	Without Rhizobium	62	93	17	2	42	2	0.05	53	13	0.25	4	2709
PS0010836	SH95-6-1	With Rhizobium	62	93	13	2	45	22	0.49	55	50	0.91	3	2496
PS9910140	X92P303	With Rhizobium	62	93	14	2	42	1	0.02	54	12	0.22	4	2458
Grand Mean			62	93	15	2	42	12	0.28	53	30	0.56	4	2610

Planting date 4/20/04. Harvest date 7/29/04.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height. Plant height was measured at the green pod stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Rep Nodes = average number of reproducing nodes on a plant.

Agronomic and yield data are one replication at Pullman, WA

Table 49. Agronomic and Yield Data for the Lentil Rhizobium Inoculation Trial, 2004 (0470L)

Cultivar	Origin	Treatment	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (Green)	Pod Ht (Mature)	Pod Ht Index	Plant Ht (Green)	Plant Ht (Mature)	Plant Ht Index	Seed Yield
						..cm..	..cm..		..cm..	..cm..		..kg/ha...
LC860616L	X95L073	With Rhizobium	59	97	2	18	15	0.83	39	36	0.92	943
LC860616L	X95L073	Without Rhizobium	59	97	2	20	14	0.70	37	35	0.95	901
Grand Mean			59	97	2	19	15	0.77	38	36	0.94	922

Planting date 4/20/04. Harvest date 8/10/04.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green pod stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic and yield data are one replication at Pullman, WA

Table 50. Agronomic and Yield Data for the Chickpea Rhizobium Inoculation Trial , 2004 (0470C)

Cultivar	Treatment	Days to Flower	Days to Maturity	Pods/ Peduncle	Pod Ht (Green)	Pod Ht (Mature)	Pod Ht Index	Plant Ht (Green)	Plant Ht (Mature)	Plant Ht Index	Seed Yield
					..cm..	..cm..		..cm..	..cm..		..kg/ha...
CA9890233W	Without Rhizobium	64	114	1	33	26	0.79	43	42	0.98	1826
CA9890233W	With Rhizobium	64	114	1	31	26	0.84	42	42	1.00	1608
PI559363	Without Rhizobium	59	97	1	20	10	0.50	36	31	0.86	377
PI559363	With Rhizobium	59	97	1	16	10	0.63	36	29	0.81	334
Grand Mean		62	106	1	25	18	0.69	39	36	0.91	1036

Planting date 4/20/04. Harvest date 8/31/04.

Pod height was measured at the green pod stage and at harvest maturity. Pod height index was determined by dividing pod height at harvest maturity by the green pod height.

Plant height was measured at the green pod stage and at harvest maturity. Plant height index was determined by dividing plant height at harvest maturity by the green plant height.

Agronomic and yield data are one replication at Pullman, WA