Potato Progress

Research and Extension for Washington's Potato Industry
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Beet Leafhopper Trapping Update

Many of you may be wondering about the beet leafhopper situation this year, and how much to worry about purple top. The potato commission is conducting a trapping network again this year, the fourth year in a row. The end of May is typically when beet leafhopper catches start to climb. This year we have seen our first real up-swing in leafhopper catches during the past two weeks ending yesterday, but so far populations are much lower than in 2005, which had by far the largest beet leafhopper populations we have seen in the 4 years of trapping. We have established new graphical displays of annual leafhopper catch trends on our website: www.potatoes.com/research.cfm. These graphs allow you to compare 2007 regional populations to 2004, 2005, and 2006.

To monitor for beet leafhoppers, we strongly suggest deploying yellow sticky traps near your potato fields. These should be placed near the ground among weeds (sparse weeds are better), and away from dusty roads. Traps should be checked **and changed** at least weekly.

Current late blight forecast and management recommendations

Updated 10 May, 2007

Late blight has not been reported so far this growing season in the Columbia Basin. The Columbia Basin Late Blight Forecasting Model is predicting that late blight will occur this season in the Columbia Basin. Probability that late blight will occur is near 75%. This probability is less than that those experienced during the last 5 years.

Sprinkler irrigated fields should be treated with a protectant fungicide for late blight at row closure and then 7 days later. If the application 7 days after row closure coincides with full bloom of primary flower clusters, a fungicide effective against both late blight and Sclerotinia stem rot, such as Omega, would provide protection against both diseases. Rill irrigated fields do not need to be chemically treated for late blight at this time.

Volunteer potatoes in fields that had late blight in them last year or the year before have a high potential as sources of late blight inoculum. All volunteers need to be managed, and especially those in fields that had late blight in them last year or the year before.

Contact Dennis Johnson at 509 335 3753 to confirm or to make late blight diagnosis.

Growth & Development of Newly Released Cultivars in the Columbia Basin

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GemStar Russet, Defender, Premier Russet (A93157-6LS), and Alturas are among the newest frozen-processing cultivars released from the Pacific Northwest Variety Development Program since Ranger (1991) and Umatilla Russet (1997). A major goal of our research is to provide comparative data on growth & development and storage of these cultivars to the WA potato industry, to enhance the ability of growers to optimize production under Columbia Basin growing conditions. Specific questions include:

- In relation to our growing season, how do foliar & tuber growth compare among the cultivars over the 5 stages of development (emergence and plant establishment, vegetative growth, tuber initiation, tuber bulking, maturation)?
- How do seasonal patterns of carbohydrate accumulation in tubers relate to specific gravity, the attainment of physiological maturity, and the development of sugar-end disorders?
- How resistant or sensitive are these cultivars to variation in end-of-season tuber maturity for subsequent storability and processing quality (e.g. the onset of sweetening in storage, development of sugar ends, etc.)?

Analyses of foliar and tuber growth through several growing seasons is defining the onsets and durations of the five growth stages for each cultivar. This information can ultimately be used as an aid to schedule irrigation, fertilizer, and pesticide applications more effectively, according to the stage of crop development. Susceptibility to sugar-end development, in relation to tuber maturity and environmental stresses (e.g. heat, drought, fertility) inherent in the Columbia Basin are being monitored for each cultivar. The attainment of physiological maturity at the end of the season, where tubers have reached maximum dry matter content (specific gravity) with minimum concentrations of sucrose and reducing sugars, is being compared among cultivars. Processing quality and storability are optimal at physiological maturity. Changes in processing quality during storage in response to conventional and non-conventional temperature regimes are also being characterized. These studies will reveal the best storage management practices for WA-grown tubers of each cultivar. Here we present the 2006 foliar and tuber growth results from Othello, WA. Details of the studies are provided in the figure and table captions.

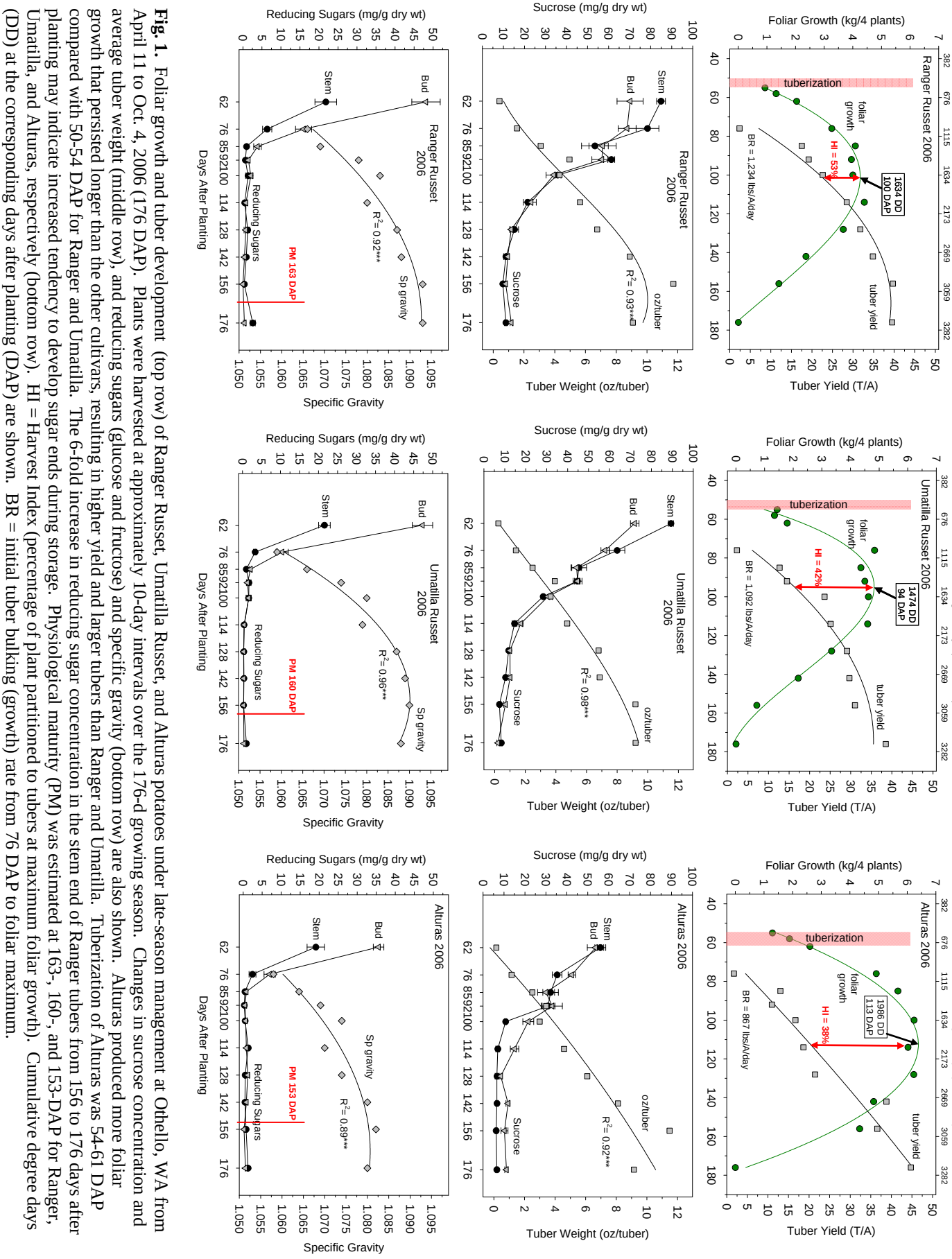

Fig. 1. Foliar growth and tuber development (top row) of Ranger Russet, Umatilla Russet, and Alturas potatoes under late-season management at Othello, WA from April 11 to Oct. 4, 2006 (176 DAP). Plants were harvested at approximately 10-day intervals over the 176-d growing season. Changes in sucrose concentration and average tuber weight (middle row), and reducing sugars (glucose and fructose) and specific gravity (bottom row) are also shown. Alturas produced more foliar growth that persisted longer than the other cultivars, resulting in higher yield and larger tubers than Ranger and Umatilla. Tuberization of Alturas was 54-61 DAP compared with 50-54 DAP for Ranger and Umatilla. The 6-fold increase in reducing sugar concentration in the stem end of Ranger tubers from 156 to 176 days after planting may indicate increased tendency to develop sugar ends during storage. Physiological maturity (PM) was estimated at 163-, 160-, and 153-DAP for Ranger, Umatilla, and Alturas, respectively (bottom row). HI = Harvest Index (percentage of plant partitioned to tubers at maximum foliar growth). Cumulative degree days (DD) at the corresponding days after planting (DAP) are shown. BR = initial tuber bulking (growth) rate from 76 DAP to foliar maximum.

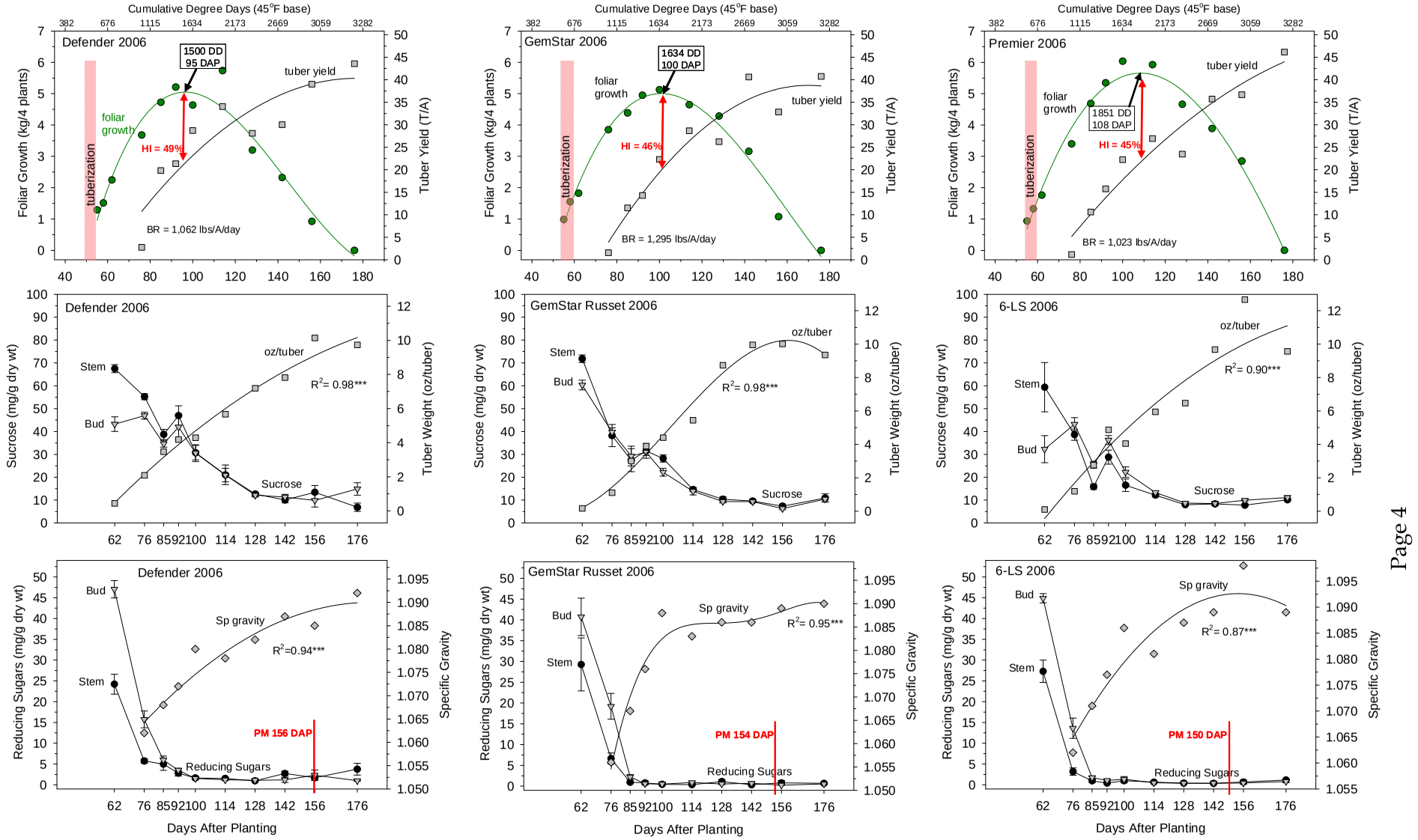

Fig. 2. Foliar growth and tuber development (top row) of Defender, GemStar Russet, and Premier Russet potatoes under late-season management at Othello, WA from April 11 to Oct. 4, 2006 (176 DAP). Plants were harvested at approximately 10-day intervals over the 176-d growing season. Changes in sucrose concentration and average tuber weight (middle row), and reducing sugars (glucose and fructose) and specific gravity (bottom row) are also shown. Premier Russet produced more foliar growth that persisted longer than the other cultivars, resulting in higher yield (46 T/A) and larger tubers than GemStar (41 T/A) and Defender (43 T/A). Tuberization of Premier and GemStar occurred 53-58 DAP compared with 49-53 DAP for Defender. Defender tubers had a 3-fold higher concentration of reducing sugars at 176 DAP compared with GemStar and Premier, indicating increased tendency to lose processing quality faster during storage. Physiological maturity (PM) was estimated at 156-, 154-, and 150-DAP for Defender, GemStar, and Premier, respectively. HI = Harvest Index (percentage of plant partitioned to tubers at maximum foliar growth). Cumulative degree days (DD) at the corresponding days after planting (DAP) are shown. BR = initial tuber bulking (growth) rate from 76 DAP to foliar maximum.

Tuberization & Initial Bulking Rates

Table 1. Timing of tuberization and initial bulking rates for cultivars grown at the Irrigated Agriculture Extension and Research Center (IAERC), Othello, WA. Planting dates were April 13 and 11 in 2005 and 2006, respectively. The days after planting (DAP) to 20-50% tuberization of stolons were calculated from polynomial regressions of percentage stolons tuberized versus DAP. Tuberization was earlier in 2005 than 2006 due to 20% higher cumulative degree days from March to June in 2005. GemStar, Premier, and Alturas tuberized later than the other cultivars.

	Tuberization		Initial Bulking Rate*		
Cultivar	**2005**	**2006**	**2005**	**2006**	**Avg**
	Days After Planting		*Lbs/acre/day*		
R. Burb.	40–45	47–52	NA	1048	-
Defender	41–47	49–53	1037	1062	1050
Umatilla	44–51	50–54	929	1092	1011
Ranger	40–45	50–54	1114	1234	1174
GemStar	47–52	53–58	1223	1295	1259
Premier	47–53	54–58	1027	1023	1025
Alturas	49–57	54–61	822	867	845

*Bulking rate calculated from 76 DAP to maximum foliar fresh wt

Physiological Maturity (PM), Yield, and Crop Value

Table 2. Changes in crop values and marketable yields from 128- to 176 DAP at Othello, WA during 2006. Values are based solely on tuber size clauses in processing contracts and thus reflect changes in yield and tuber size distribution only. No premiums or penalties were applied for bruise, internal defects, gravity, sugar content, or fry color. Physiological maturity (PM) was reached at the indicated days after planting (DAP). There is little advantage to managing Ranger beyond physiological maturity (163 DAP in 2006). In fact, we found that processing quality degrades sooner in storage when Ranger is grown over a prolonged season. The increases in $/Acre for GemStar and Premier from 149-176 DAP were limited by the production of oversize (>14 oz) tubers. Depending on the process contract, the value of these cultivars may increase substantially with closer (than 10-inch) in-row spacing and/or by planting seed that produces optimum stem numbers at 10-inch spacing to take advantage of their tremendous yield potentials over a prolonged growing season.

		Days After Planting		
Cultivar	**PM***	**128**	**149**	**176**
	DAP	*$/Acre (T/A)*		
R. Burbank	158	1,854 (24.7)	2,517 (31.1)	3,397 (40.4)
Defender	156	2,218 (27.7)	2,781 (34.5)	3,424 (41.9)
Umatilla	160	2,151 (29.1)	2,348 (30.6)	3,034 (37.6)
Ranger	163	2,664 (31.8)	3,085 (36.9)	3,189 (38.4)
GemStar	154	2,230 (26.3)	2,931 (36.7)	3,148 (40.1)
Premier	150	1,929 (23.5)	3,008 (36.2)	3,657 (45.2)
Alturas	153	1,682 (21.5)	3,182 (31.1)	3,622 (40.4)

*PM, physiological maturity. Vine kill = 156 DAP

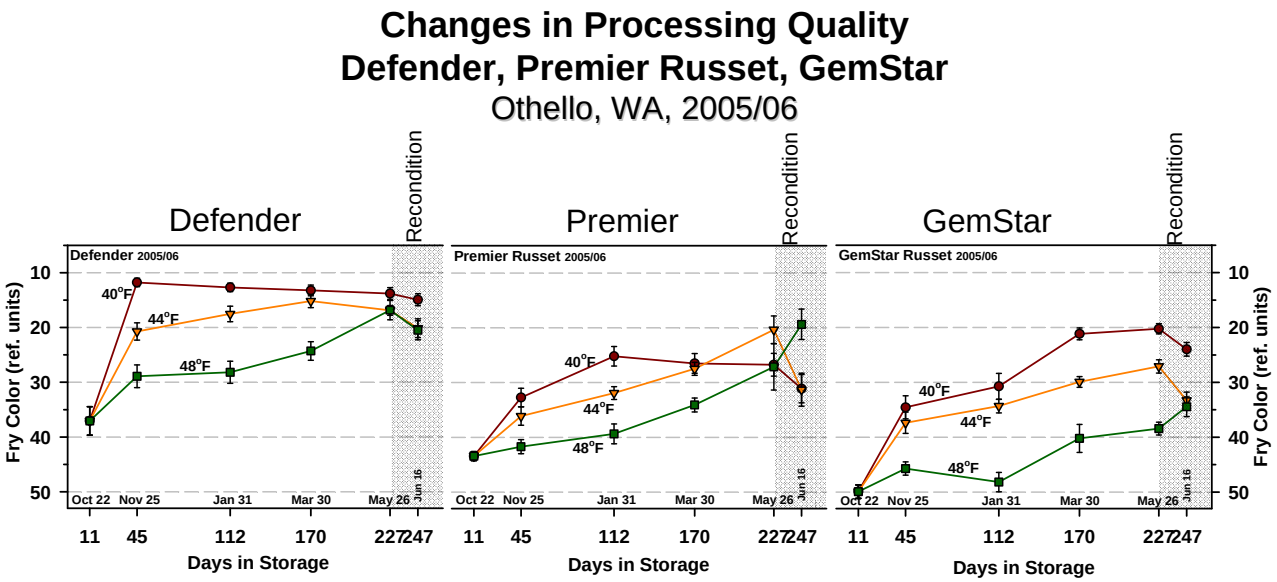

Fig. 3. Changes in the processing quality of French fries (photovolt reflectance units of the stem ends) from Defender, Premier Russet, and GemStar Russet during storage for 247 days. The tubers were grown at Othello, WA from April 13 to Oct. 11, 2005 (181 days) and 8- to 12-oz tubers were selected for storage. The tubers were wound-healed at 54°F for 11 days following harvest and stored at 40, 44, and 48°F for an additional 216 days (until May 26). The tubers were then reconditioned for 21 days at 60°F (May 26-Jun 16, shaded). Note the inverted scale on the French fry color axis. Low photovolt reflectance values indicate darker fries. A photovolt reflectance ≤19 is a USDA 3 or greater French fry, which is unacceptable by industry standards. Photovolt readings ≥31 = USDA 0, 25-30 = USDA 1, 20-24 = USDA 2, 15-19 = USDA 3, ≤14 = USDA 4. Each point is the average of 12 tubers ±SE.

Summary & Recommendations from 2005/06 Trials

- These studies are confirming our previous work that Ranger be harvested close to physiological maturity to minimize the maturation period under dead vines for maximum longevity and retention of processing quality in storage.
- Defender has higher reducing sugars than GemStar & Premier Russet at physiological maturity and, similar to Ranger Russet, reducing sugars tend to increase in the stem end of Defender during maturation. Therefore, Defender should be harvested at physiological maturity (~156 DAP) for maximum storage life.
- Defender sweetens rapidly and loses processing quality progressively in storage at all temperatures. Tubers should be stored at 48°F for no longer than 150-170 days for processing.
- The reducing sugar content of Premier and GemStar Russet tubers decreases to very low levels during maturation. These cultivars are therefore more "forgiving" than Ranger & Defender for deleterious effects of delayed harvest (beyond physiological maturity) on storability.
- Premier and GemStar can produce very high yields (>40 T/A) when grown for more than 150 days; however, these cultivars tend to produce a high percentage of oversize (>14 oz) tubers late in the season, which limits crop value (Table 2). This tendency can likely be mitigated by closer in-row spacing (<10 inches) and/or planting seed that will produce more stems (physiologically older). We are currently modeling stem number and tuber size distribution relationships for these cultivars. This work will lead to recommendations for production and storage of seed to optimize stem numbers and tuber size distribution for Columbia Basin growers.
- Premier and GemStar Russet are resistant to cold-induced sweetening. GemStar had the lightest fry color at harvest and maintained the lowest sugars and lightest colored fries when stored at 48°F for 227 days (Fig. 3). Fry colors were also acceptable when stored at 44 and 40°F.
- Premier absorbs more oil and can develop irreversible mottling, particularly when conditioned at higher temperatures (e.g. 48°F) and stored for 220 days or more. In contrast, GemStar maintains very uniform fry color with little oil absorption for more than 220 days in storage.