UNIVERSITY OF SASKATCHEWAN

# VEGETABLE CULTIVAR AND CULTURAL TRIALS 2009

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Saskatchwan Agriculture and Food

# Agronomy of New Potato Lines

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The objective of these trials conducted from 2005-2009 is to evaluate the performance of a range of newly released potato cultivars under Saskatchewan growing conditions. Changes in yield and quality as a function of N-fertility, crop maturity, irrigation, and in-row spacing have been evaluated in trials conducted on the Plant Sciences Department Potato Research plots in Saskatoon. The site features a sandy loam, pH 7.8, EC < 1 dS, with 4% O.M. This site has only a limited history being cropped to potatoes - until 5 years ago it was in dryland alfalfa.

In all trials, each treatment plot consisted of a single, 8-m long section of row. Unless otherwise specified, the row spacing was 1 m between rows with 25 cm between plants within a row. Weed control was achieved by applying eptam + metribuzin prior to planting, followed by linuron applied at ground crack. The crop was hilled twice prior to ground crack. In the irrigated treatments, an overhead system was used whenever soil water potentials averaged over the effective root zone (0-30 cm) fell below -50 kPa. Unless otherwise specified, the trials were top-killed using diquat in mid-September (ca. 120 DAP) and machine harvested by early October using a Grimme harvester. Tubers were cured for 10 days at 15$^{o}$C, then cooled to 4$^{o}$C for longterm storage. The tubers were mechanically graded into size categories; small = < 44 mm diam., medium = 44 - 88 mm and oversize = > 88 mm diam. The boiling, baking, chipping and frying quality of the various lines were evaluated using standard methodologies.

Results from trial conducted from 2005 - 2008 trials are available at :
**www.usask.ca/agriculture/plantsci/vegetable/potato/pagronomy.htm**

**New cultivars tested in 2009 trials**

Milva (exclusive to a SSPGA member) - a yellow fleshed oval table potato
AC Peregrine Red (SSPGA exclusive) - red skinned, white fleshed table potato
Gem Star (SSPGA members as local agents) - a russet processing potato
O'Pearle (exclusive to a SSPGA member) - a yellow fleshed "Baby" type potato

The trials evaluated the new lines against established industry standard lines (Russet Norkotah, Russet Burbank, Shepody and Norland).

**2009 Growing Season -** temperatures in 2009 were well below normal from May through August but well above normal during the harvest period in September. While the cool temperatures would have delayed emergence and early growth, they should have been favorable during the crucial periods of tuber set and bulking. Unusually warm conditions in September facilitated top-kill and skin set but caused problems during storage. About 23 cm of rainfall was received from June 1 - Aug 31 of 2009 (normal = 17 cm). A total of 15 cm of supplemental irrigation was applied during the 2009 growing season. The 38 cm of total moisture received by the irrigated crop consistently maintained soil moisture levels above the -50 kPa stress threshold for potatoes. The combination of above normal rainfall and below normal temperatures reduced drought stress in the dryland trial. The dryland crop had adequate moisture through emergence and tuber set but experienced a moderate degree of stress through the early stages of tuber bulking.

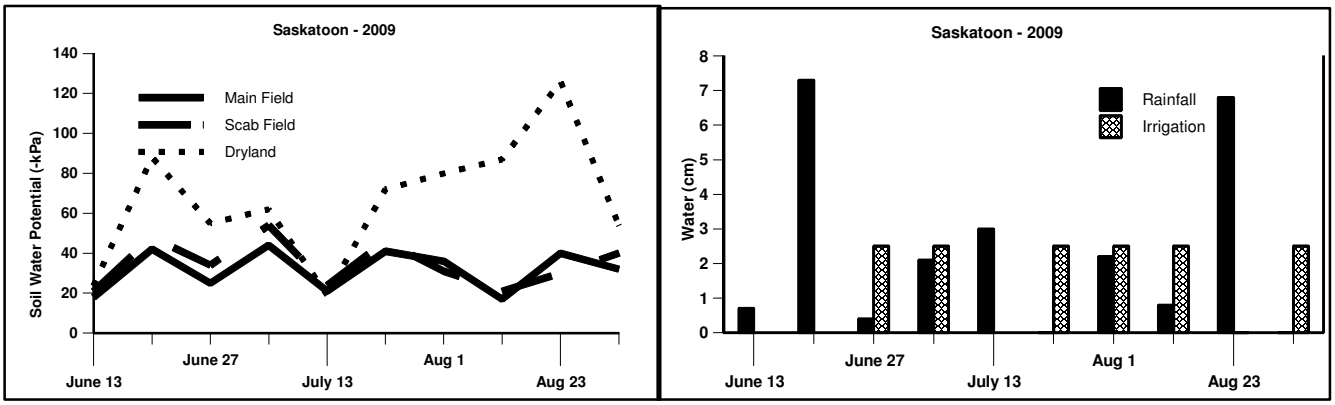


**Fig. 09-1. Soil water potentials, rainfall and irrigation events for the 2009 potato trials in Saskatoon.**

**Time of Planting and Harvest Trials**

This trial examined the impact on time of planting and harvest on yields and quality. Irrigated trials were planted in mid-May or early June and harvested in late August or mid-September. This combination of planting and harvest dates resulted in plots harvested at 80, 90, 105 and 120 days after planting. In the dryland trial only a single combination of planting and harvest dates was used - the crop was planted in mid-May and harvested at 120 days after planting. In both the dryland and irrigated trials each treatment was replicated four times.

The early harvested plots had the tops removed by hand a week prior to the harvest. For the 120 day harvest, the plots were sprayed twice with Reglone 10 days prior to the harvest. The crop was machine harvested and then sized and graded as previously described.

**Results**

Yields in 2009 were substantially lower than in 2008. This likely reflects unfavorably cool conditions early in 2009. **The cool growing season coupled with above average rainfall during the 2009 growing season allowed the production of unusually high yield s in the dryland trial (avg = 83% of irrigated).**

**Reds -** In the irrigated trials conducted in both 2008 and 2009, total yields for Norland and Peregrine were comparable at all four growth intervals (Fig 09-2a). In the 2009 trial there had been relatively little difference in the specific gravities of Norland versus Peregrine at any of the havrest dates. This ran contrary to findings in previous years and in 2009, where Peregrine consistently had higher specific gravities than Norland (Fig 09-2b). Peregrine and Norland produced equivalent yields under the mild drought stress experienced in 2009 (Table 09-1). In years with more severe moisture deficits, Norland had tended to out-perform Peregrine. Specific gravities of both the red cultivars in the dryland trial were significantly lower than when the crop was irrigated. This ran contrary to previous finding, where gravities of the dryand crop tend to be equivalent or higher than an irrigated crop.

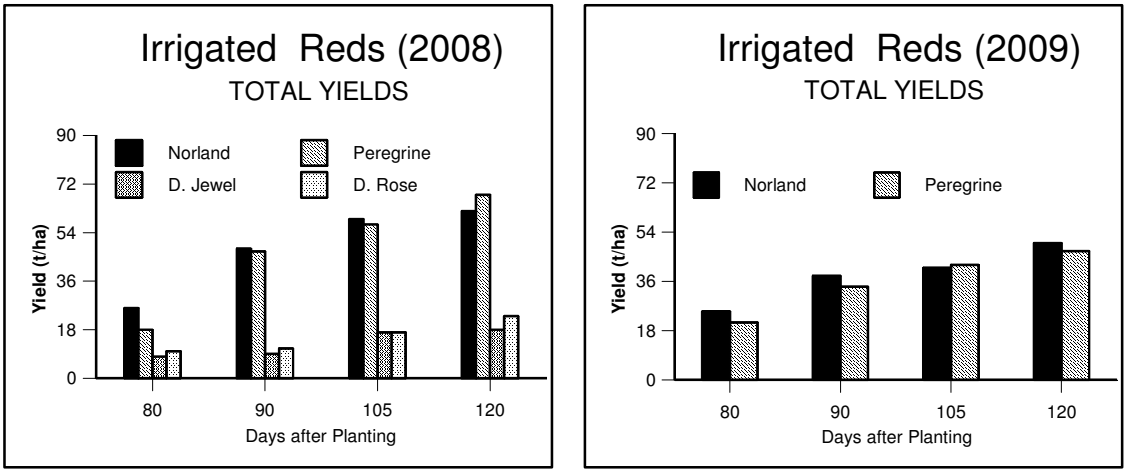


**Figure 09-2a. Yields for various red-skinned potatoes under irrigation in 2008 and 2009**.

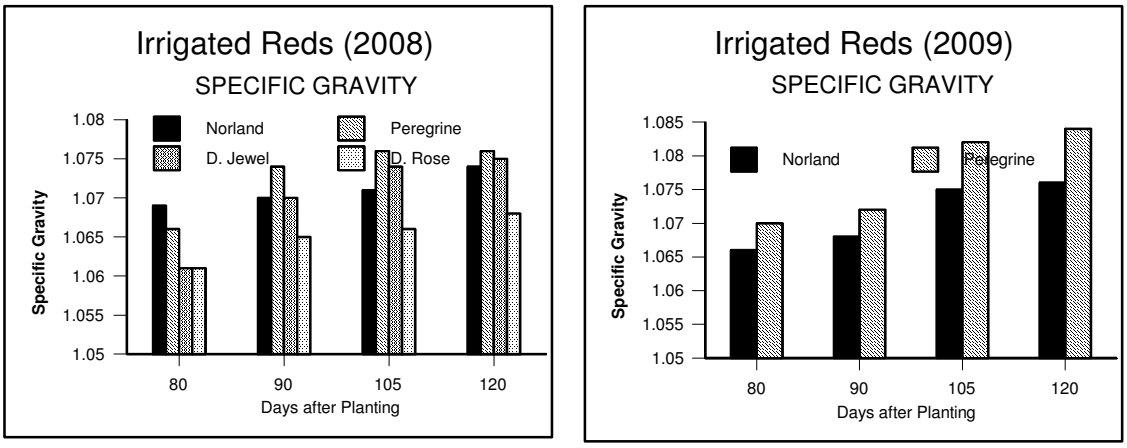


**Figure 09-2b. Specific gravities for various red-skinned potatoes under irrigation in 2008 and 2009**.

**Russets -** Yields of the four russet type lines were very comparable at all four sampling dates in 2008. This is in contrast with the results in previous years and in 2009 where yields of Russet Burbank and GemStar tended to lag behind the other cultivars (Fig 09-3a). In warmer years, yields of these slow developing cultivars tend to catch up late in the season, but this did not occur in 2009 - again a reflection of the cool growing season. O'Pearle had the highest specific gravities at all harvest dates - this is typical of varieties with a European background. Milva appears to mature early , as indicated by both its yield profile and also the limited change in its specific gravities as the season progressed. Specific gravities for the late maturing processing varieties (Gemstar and Russet Burbank) were higher than expected given the relative lack of favorable growing conditions in 2009. In the dryland trial, Milva produced outstanding yields. The lowest yielding russet lines under irrigated conditions (Gemstar and Russet Norkotah) showed the smallest relative yield decline when grown without irrigation. Specific gravities for the Russet cultivars under dryland were generally comparable to the gravities under irrigation.

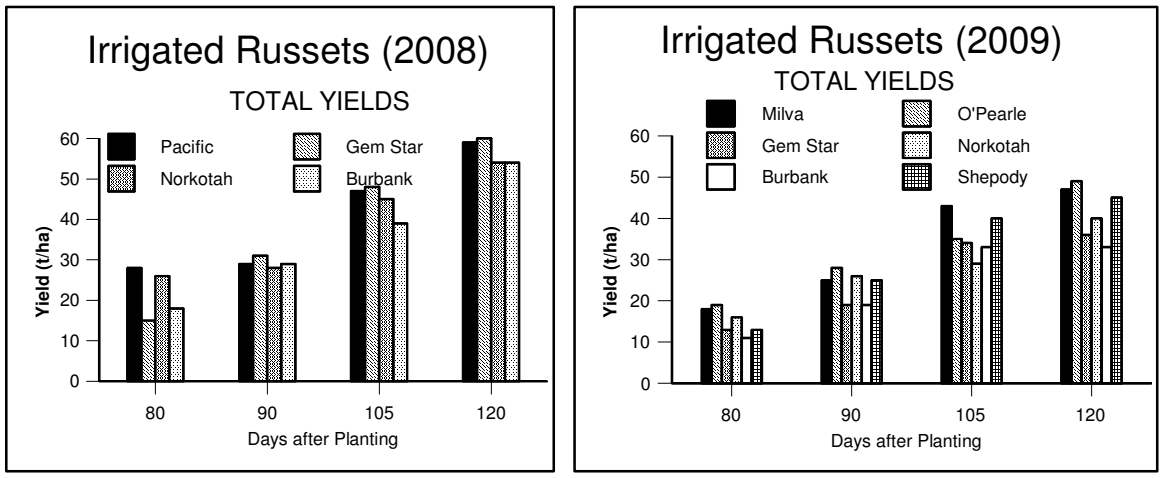


**Figure 09-3a. Yields of russet-type potato cultivars under irrigation in 2008 and 2009**.

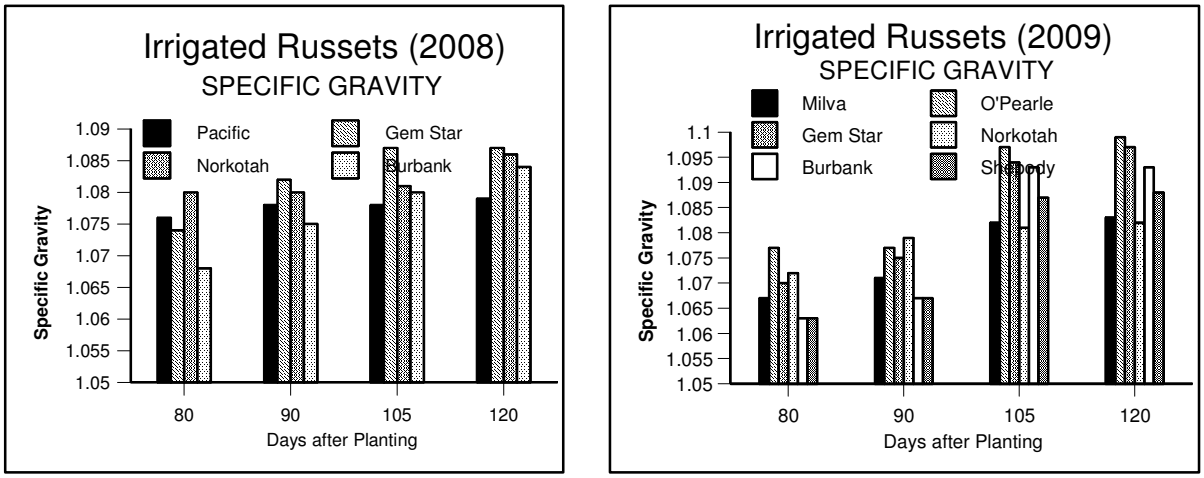


**Figure 09-3b. Specific gravities of russet-type potato cultivars under irrigation in 2008 and 2009**.

**Summary of Time of Planting and Harvest Trial**

The results of the 2009 study, as well as previous similar studies reported previously, clearly indicate the importance of maximizing the duration of the effective growing season for growers in Saskatchewan wishing to maximize their yields. Yields of all of the new cultivars tested increased progressively with duration in the field through to 120 days. A 120 day season represents the effective maximum available to potato growers in Saskatchewan - as earlier planting or later harvest run into excessive risk of frost damage. By contrast, some growers opt for a very short duration growing season - in the seed industry this is used to minimize the risk of virus infection, whereas in the table sector, growers may opt for an early harvest to catch a high value market opportunity or to keep the size of their tubers within the optimum range desired in the marketplace. The results form this trial clearly illustrate the magnitude of yield sacrifice associated with an early harvest. The rate of yield gain was greatest for the earlier harvests but was still significant up to 120 days in the field. The relative amount of yield loss associated with an early harvest was greater for late maturing cultivars like Gem Star and Russet Burbank than for earlier cultivars like Milva or Norland. This suggests that growers should use caution when growing cultivars like Gem Star or Russet Burbank as a slow start to the season, an unusually cool summer or an early fall could severely depress yields. In all cases the increase in yields with time in the field was strictly a function on an increase in average tuber size, rather than any increase in tubers produced. Even at the latest harvest date (120 days) only small proportion of the tubers had exceeded optimum size for marketability (data not shown). It should however be noted that these trials were based on a relatively close (25 cm or 10") in-row spacing. Growers opting for wider in-row spacings may find a relatively large proportion of the crop grading out as oversize after 120 days - especially for cultivars like Norland, Milva, Shepody and Gem Star which have a larger than average tuber size profile. As expected, the dry matter content (specific gravities) increased with duration in the field - reflecting increased physiological maturity. The increase in specific gravity with maturity is of only limited importance to the seed and table growers of Saskatchewan - but this information will be of use to growers in other areas wishing to use these newly developed cultivars for processing,

Review of the new cultivars tested in 2009;

- the new "baby" potato cultivar **O'Pearle** actually produced the highest yields of any of the Russet types - suggesting that this cultivar has excellent potential for use in Saskatchewan - especially as the other "baby" type cultivars tend to be both late maturing and low yielding. The small but uniform tuber size profile of O'Pearle make it well suited to the baby potato market. The fact that this cultivar has an unusually high specific gravity also suggest that it may have superior storage potential. **One concern may be the apparent sensitivity of O'Pearle to drought stress. We also noted a heightened degree of sensitivity to drought stress in a grower's field in 2009.**

**- Milva** is hoped to represent an alternative to Yukon Gold or Shepody as a smooth skinned light russet table potato. Milva appeared to have excellent yield potential especially in early harvests. Its tuber size distribution was also far more uniform than Shepody and it shows far less tendency to oversize than either Shepody or Yukon Gold.

**Table 09-1. Yield and quality components for Red and Russet potatoes under dryland conditions in 2009.**

| Line | Yield (t/ha) | Yield - % of irrigated | Specific gravity |
|---|---|---|---|
| **Reds** | | | |
| **Norland** | 42.1 a | 84 a | 1.068 b |
| **AC Peregrine** | 42.9 a | 91 a | 1.077 a |
| | | | |
| **Russets** | | | |
| **R. Norkotah** | 35.6 ab | 90 a | 1.079 d |
| **R. Burbank** | 27.8 c | 81 b | 1.090 b |
| **Shepody** | 33.6 bc | 76 b | 1.082 cd |
| **Gem Star** | 31.8 bc | 89 a | 1.095 a |
| **O'Pearle** | 31.4 bc | 63 c | 1.090 b |
| **Milva** | 41.5 a | 88a | 1.085 c |

For each type of potato, values within columns followed by the same letter are not significantly different ($p$=0.05)