



UNIVERSITY OF
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VEGETABLE CULTIVAR AND CULTURAL TRIALS 2006

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Saskatchewan
Agriculture
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Agronomy of New Potato Lines

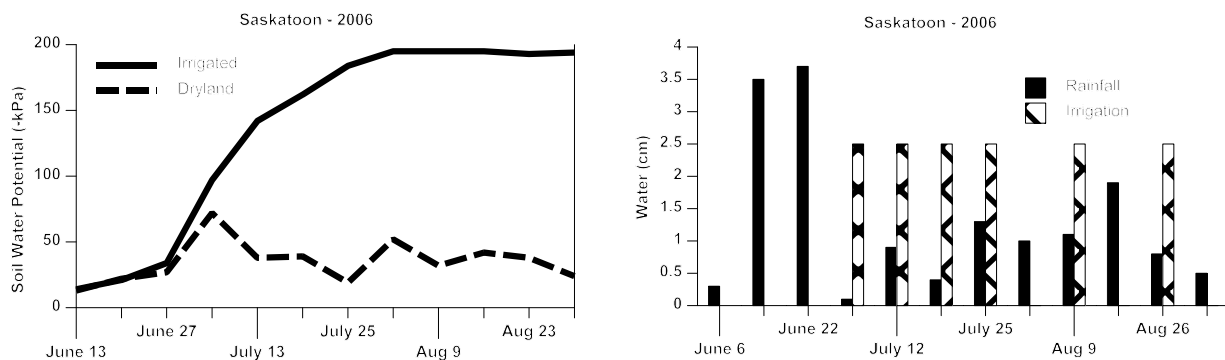
(Supported by the Agricultural Development Fund of Saskatchewan Agriculture and Food)

The objective of this trial was 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, in-row spacing and herbicide treatments were 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 1m between rows with 25cm between plants within a row. Weed control was achieved by applying 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 (0-30cm) fell below -50 kPa. Unless otherwise specified, the trials were top-killed using diquat in mid-September (ca. 120 DAP) and machine harvested in early October using a Grimme harvester. Tubers were cured for 10 days at 15°C, then cooled to 4°C for longterm storage. The tubers were mechanically graded into size categories; small = < 44 mm diam., medium = 44 - 88 mm diam. and oversize = > 88 mm diam. The boiling, baking, chipping and frying quality of the various lines were evaluated using standard methodologies..

The 2006 growing season was cool and wet during May and June but temperatures were well above normal in July, August and early September. 20cm cm of rainfall was received over the growing period of June 1 - Sept. 1 (normal = 17cm). A total of 15cm of supplemental irrigation was applied during the growing season (Fig. 06-1). Several heavy rain events occurred in mid-September after top kill - this precipitation had little impact on yields but delayed harvest operations. No problems with insects or diseases were observed in any of the trials conducted in 2006.

Fig. 06-1. Soil water potentials, rainfall and irrigation events for the 2006 potato trials in Saskatoon.



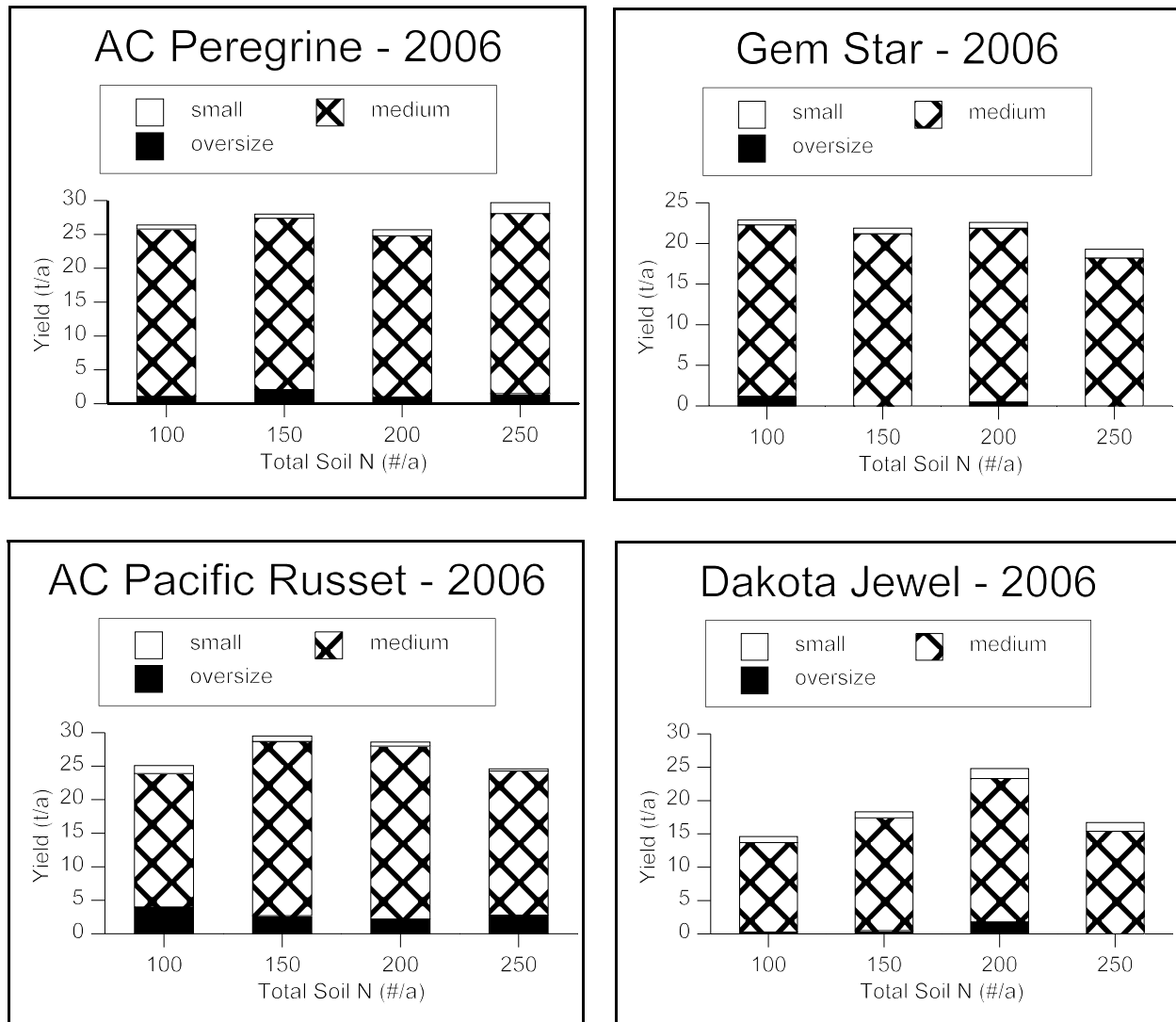
N-Fertility Trials

The objective of this trial was to determine optimum N-fertility recommendations under irrigation for a range of new cultivars. The soil-N treatments (total of 100, 150, 200 or 250 # N/a) were achieved by pre-plant broadcasting sufficient 46-0-0 to supplement the residual soil N (ca. 100 # N/a). The N-treatments were laid out in an incremental design. Each cultivar was planted in mid-May in two 8-m long rows within each N-level. The in-row spacing was 25cm, with 1m between rows. Each treatment was replicated twice.

Results

The yield responses of the AC Peregrine, Gem Star, Dakota Jewel and AC Pacific Russet to total soil-N levels ranging from 100-250 # N/a are presented in Fig 06-2. As in the 2005 trial, AC Peregrine again had the highest overall yields of the cultivars tested in 2006, followed by Pacific Russet, then Gem Star with Dakota Jewel producing the lowest yields.

Fig. 06-2. Yield responses of new potato cultivars to increasing levels of soil-N.



The N-response of AC Peregrine was quite flat in both 2005 and 2006, with the lowest level of soil-N tested (100 # N/a) resulting in total yields within 10% of the highest yield observed (150 # N/a). In 2005 yields of Gem Star increased through to the highest soil-N level tested (250# N/a). In 2006 Gem Star showed a much more limited yield response to increasing N - with the highest N application rate producing the lowest yields.

Yields of AC Pacific Russet were low in 2005 due to problems with seed quality and herbicide damage. In 2006 neither of these problems occurred and Pacific Russet produced excellent yields which peaked when 150 # N/a was used.

Specific gravities of the four cultivars were more erratic than seen in previous trials and there was no consistent relationship between N fertilizer rates and specific gravity. (Fig. 06-3)

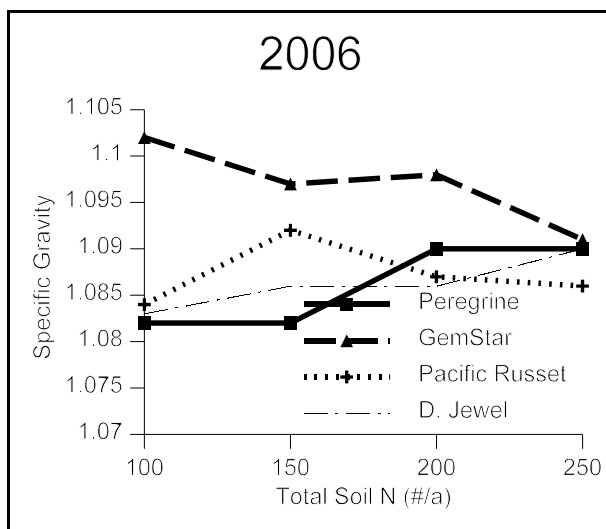


Fig. 06-3. Influence of soil-N levels on specific gravities of new potato cultivars.

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 on May 16 and June 7 and harvested August 21 or October 5. This resulted in plots harvested at 80, 90, 105 and 120 days after planting. Separate plots were grown for each planting and harvest date. In a 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 plot consisted of a single, 8-m long section of row. Each treatment was replicated three times in a split plot design (main plot = planting date and sub-plot = planting date). The rows were spaced 1m apart with 25cm between plants within a row. The irrigated trials were watered whenever soil moisture potentials in the hills dropped below -50 kPa. Weed control was achieved through application of herbicides and cultivation as previously described.

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

Reds - In the irrigated trial, total yields for Norland were higher than for the other red-skinned lines at the first harvest (80 days)(Fig. 06-4a), followed closely by AC Peregrine, with Dakota Jewel and CV89075-1 lagging well behind. By the second harvest, yields of AC Peregrine were equal to Norland and significantly greater than for Dakota Jewel and CV89075-1. This trend continued through the 105 and 120 day harvests. Tuber size was much larger for Norland than the other red lines tested (Fig. 06-4b). By the final harvest over 12% of the tubers of Norland were in the oversize category (Fig.06-4c). Few oversize tubers were produced by the other varieties, even after 120 days in the field. AC Peregrine had much higher tuber specific gravities than the other red varieties in this trial (Fig. 06-4d). Yields in the dryland trial were about 50% of the irrigated trial (Table 06-1). Relative yields of the four red-skinned varieties in the dryland trial were very comparable to the corresponding irrigated trial. Specific gravities in the dryland trial were higher than under irrigation.

Figure 06-4. a-d. Yields (a), average tuber weights (b), tuber size profile at the final harvest (c) and specific gravities (d) for various red-skinned potatoes under irrigation.

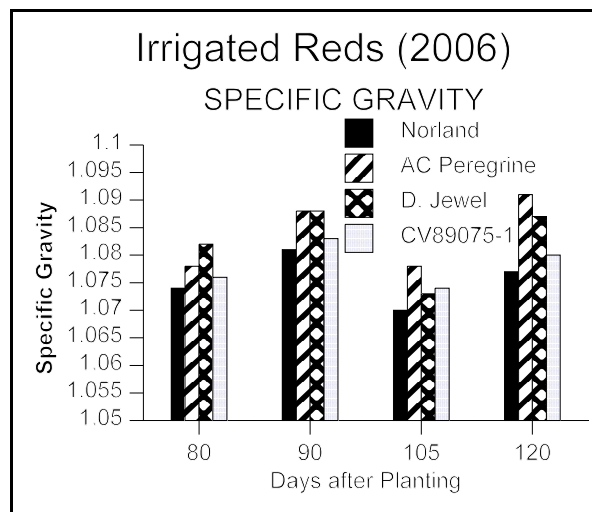
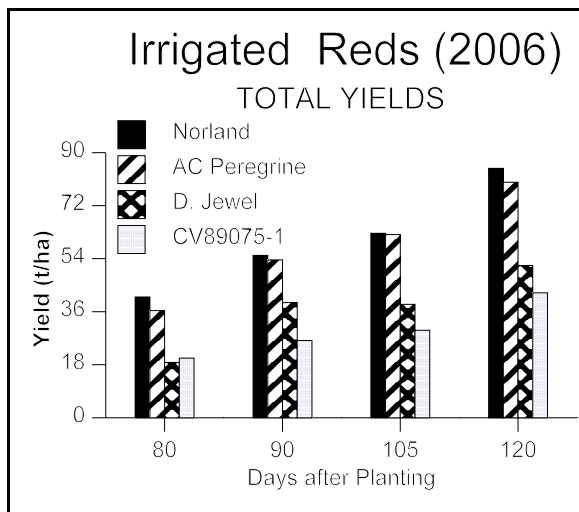
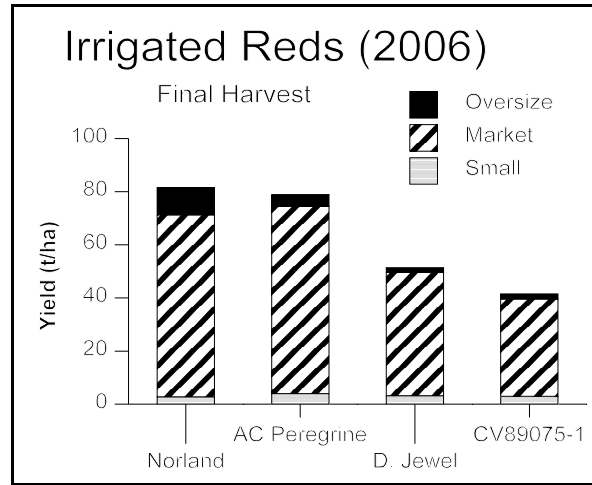
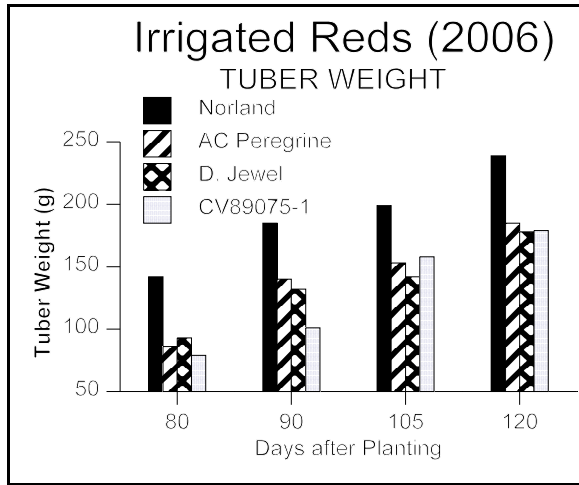


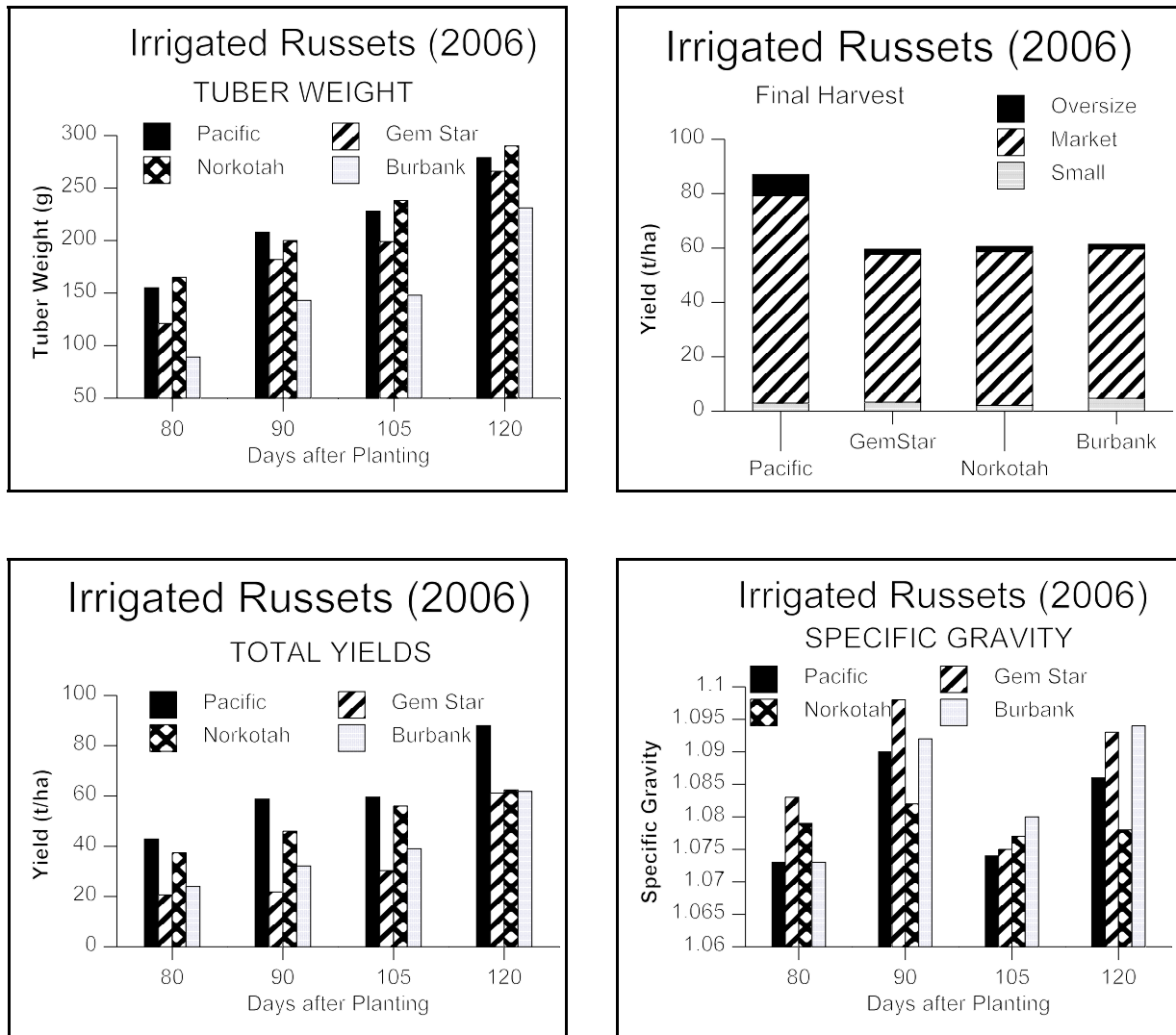
Table 06-1. Yield and quality components for Red and Russet potatoes under dryland conditions in 2006.

Line	Yield (t/ha)	Specific Gravity	Avg Tuber Wt. (g)
Reds			
Norland	46.2 a	1.087 b	179 a
AC Peregrine	44.8 a	1.104 a	113 c
CV 89075-1	24.5 c	1.092 b	119 bc
Dakota Jewel	33.2 b	1.092 b	137 b
Russets			
R. Norkotah	39.2 a	1.091 c	181 ab
R. Burbank	27.4 b	1.098 b	116 c
Pacific Russet	41.9 a	1.097 b	166 b
Gem Star	27.8 b	1.104 a	190 a

Values within columns followed by the same letter are not significantly different (p=0.05)

Russets - While yields of the red lines increased steadily with increasing time in the field, yields of the russet lines showed little increase between the 90 and 105 day harvests (Fig.06-5a). This was a period of exceptionally high temperatures which may have slowed tuber development. The new SSPGA line Pacific Russet and Russet Norkotah had comparable yields at the early harvests (80 and 90 days), but in the later harvests, yields of Pacific Russet were substantially greater than for Norkotah. Gem Star and Burbank yields lagged well behind Norkotah and Pacific Russet at the 80, 90 and 105 day harvests, but reached Norkotah yields by the 120 day harvest. Yields of Gem Star doubled between the 105 and 120 day harvests, suggesting that this cultivar is best suited to regions with a long/warm growing season. Yields and specific gravities of Gem Star were not as good as in previous years - and were never significantly better than the standard Russet Burbank. (Fig. 06-5 a and d). Russet Burbank tubers were smaller than the other cultivars at all harvest dates (Fig 06-5c). Specific gravities of Pacific Russet, GemStar and Burbank at the 120 harvest were dramatically higher than at earlier harvests (Fig. 06-5 d) - suggesting that these cultivars require a long season to reach physiological maturity. Yields from the dryland trial of the russets were about 50% of the irrigated trial. (Table 06-1). Relative yields of the russet varieties in the dryland trial were again comparable to the corresponding trial under irrigation - with yields of Gem Star and Burbank lagging well behind Norkotah and Pacific Russet 120 days after planting. This is in direct contrast with the results from the dryland trial conducted in 2005 (Table 05-1) - where Burbank and Gem Star out yielded Norkotah and Pacific Russet. Severity of the water deficit in the dryland trials was more extreme in 2006 than in 2005.

Figure 06-5. a-d Yields (a), average tuber weights (b), tuber size profile at the final harvest (c) and specific gravities (d) for various russet-skinned potatoes under irrigation.



Spacing Trial

This trial evaluated the impact of in-row spacing on yields and tuber size distribution of AC Peregrine, Pacific Russet, Gem Star and Dakota Jewel. The trial was planted on May 18 using 6, 10 or 14" (15, 23 or 35cm) in-row spacings. Each treatment row was 8m long with 1m between rows. Each treatment was replicated four times in a randomized complete block design. The trial was irrigated and weeds were managed as previously described. The crop was top killed in the 2nd week of September and harvested by the 2nd week of October (120 days after planting). The crop was graded as previously described.

Results

Yields of all cultivars increased as the in-row spacing decreased in both years (Fig. 06-6a). This yield response to spacing was more pronounced for Gem Star than for AC Peregrine or Pacific Russet - likely reflecting the low tuber set characteristic of Gem Star. Average tuber size increased as the distance between plants increased, with the greatest response observed as the spacing changed from 10 to 14"

between seed pieces (Fig. 06-6b). The average tuber size for Gem Star was much larger than for Pacific Russet, with AC Peregrine having the smallest average tuber size.

Fig 06-6a. Influence of in-row spacing on yields of Pacific Russet, Gem Star and AC Peregrine.

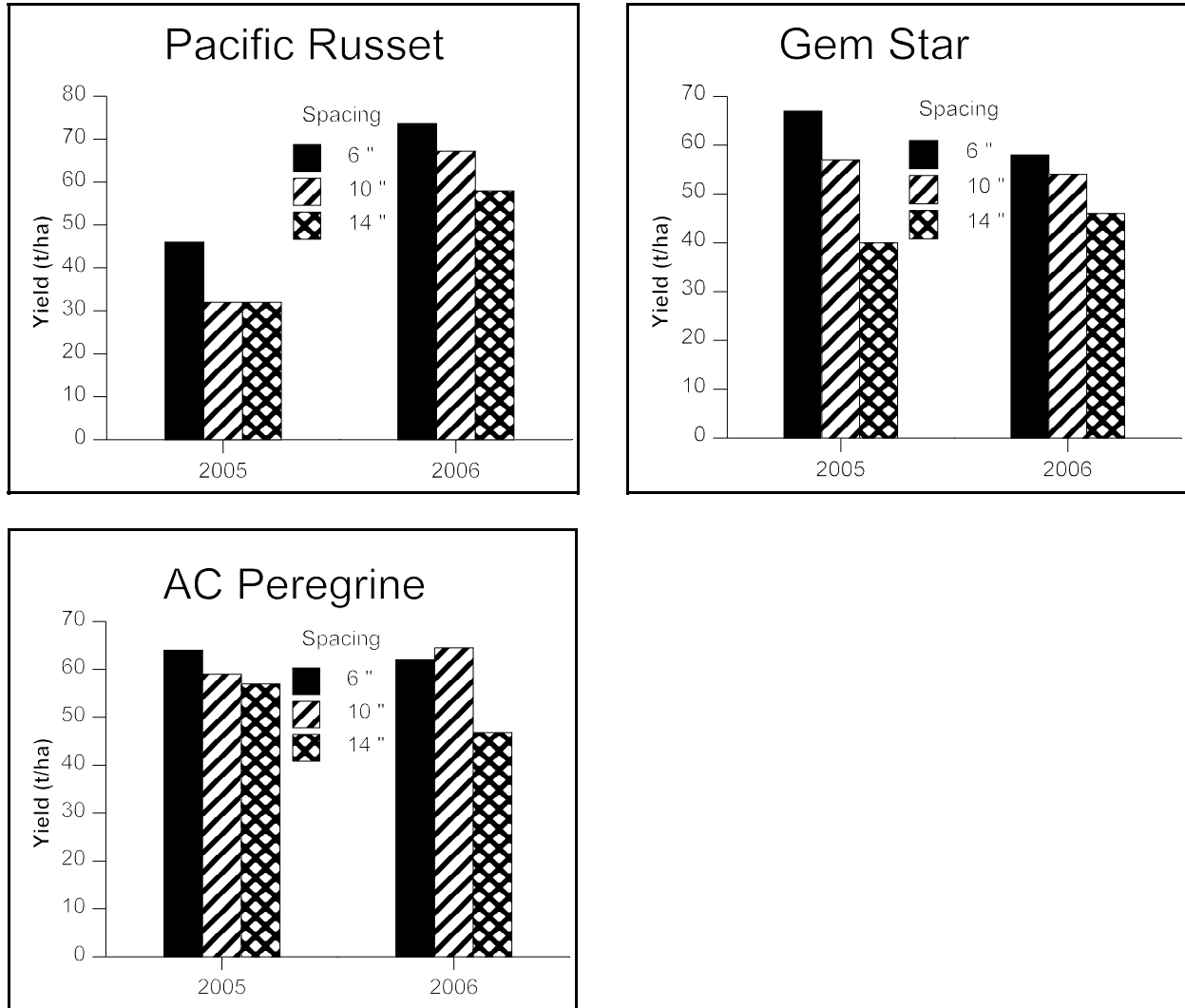
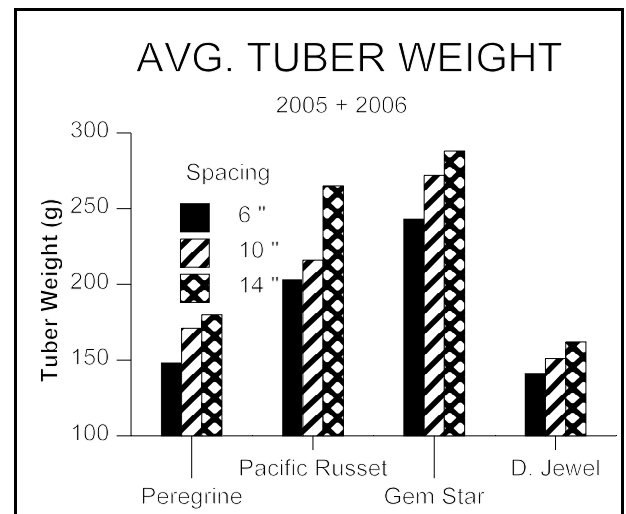


Fig 06-6b. Influence of in-row spacing on average tuber weights of Pacific Russet, Gem Star and AC Peregrine.



Metribuzin Responses

Post-emergence application of the herbicide metribuzin represents a useful weed control tool in potato production. However yields of some varieties like Shepody can be suppressed by post-emergence treatments and there are also concerns that the treatments may adversely affect skin color in red potatoes. This trial evaluated the yield and quality response of new SSPGA lines - AC Peregrine and Pacific Russet to post-emergence treatment with standard and 2X rates of post-emergence metribuzin.

The trial was conducted on the Plant Sciences Department Potato Research plots utilizing standard production practices for irrigated potatoes. Eptam (2.4kg ai/a) and metribuzin (150g ai/a) were applied prior to planting in mid-May. Norland was included in the trial as a metribuzin sensitive red skinned check variety. Each treatment variety combination was planted in an 8m long row, and all treatments were replicated twice. The crop was hilled at emergence. At 4 weeks after emergence, when the plants were about 30cm tall the post-emergence metribuzin treatments were applied utilizing a CO₂ powered small plot sprayer. This represented an advanced stage of crop development for post-emergence treatment - and as such would be expected to increased any crop stress associated with the herbicide treatment. The metribuzin rates tested were the recommended rate of 150g ai/a plus a 2X treatment (300g ai/a). Weather conditions at the time of spraying were sunny and 24°C. The crop was evaluated at weekly intervals for visual symptoms of herbicide damage as well as for weed control. The crop was chemically desiccated in early September and harvested in late September. The tubers were weighed and graded according to size: small = < 44 mm diam., medium = 44 - 88 mm diam. and oversize = > 88 mm diam..

Results

The pre-plant eptam/metribuzin treatment provided excellent weed control through until the time of the first hilling. By the time that the post-emergent herbicide treatment was applied, significant numbers of red-root pigweed and Russian thistle had emerged. These were effectively controlled by both rates of metribuzin. No further attempt was made to clean up the weeds in the control treatments or any escapes in the herbicide-treated rows. There were no visual indications of any herbicide damage to the foliage at any time in this trial. Post-emergent applications of metribuzin had no significant impact on total yields of AC Peregrine or Pacific Russet even when applied at 2X the recommended rate and at an advanced stage of crop development. Yields of the metribuzin sensitive check Norland were reduced at the 2X rate. The average tuber size for all varieties was slightly higher in the treatments that received the 2X metribuzin treatment. Impact of the metribuzin treatments on tuber color after storage has yet to be determined.

