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## ABSTRACT

Experiments in different sugar beet production regions in North America have reported increased speed of emergence, established stand and root yield as a result of emergence enhancement treatments. A total of 17 replicated trials evaluating some of these treatments have been conducted in Alberta since 1996. In all experiments varieties were tested with and without emergence enhancement treatments. Direct comparisons were not made between different enhancement processes in individual trials.

In 4 experiments conducted between 1996 and 1999, PAT<sup>®</sup> (Priming Advancement Treatment) developed by Seed Systems Inc. (now Germain's Seed Technology) was evaluated. PAT was tested using latin square and randomized complete block designs in trials with 6 or 8 replications. Speed of emergence was significantly increased in 1 of 4 trials where PAT treated pelleted seed was compared to naked and pelleted seed without PAT treatment. Conversely, in 1 trial pelleted seed had significantly faster emergence than pelleted PAT seed. The final established stand of sugar beets was not significantly increased in any trials with PAT treated pelleted seed, but plant vigor was significantly increased when PAT was compared to naked and pelleted seed in 1 trial. Treatment with PAT did not significantly increase sugar beet root yield, extractable sugar per tonne or extractable sugar per acre in any individual trials. When averaged over all 4 trials, root yield was 23.5, 23.3 and 23.1 tonnes per acre for respective treatments of naked seed, pelleted seed and pelleted PAT seed, while extractable sugar per tonne was 157.0, 156.0 and 156.9 kg for the same respective treatments. Extractable sugar per acre was 3696, 3650 and 3641 kg for naked seed, pelleted seed and pelleted PAT seed, respectively, when averaged over 4 experiments.

Six trials were conducted in 2006 and 2007 to evaluate UltiPro<sup>®</sup> developed by Betaseed. UltiPro treatments were included as part of larger randomized complete block design variety trials with 8 replications per test. The same commercial Alberta variety was tested with and without UltiPro in all 6 trials. Speed of emergence was significantly increased in 2 of 6 trials where UltiPro treated seed was compared to untreated seed. In 1 trial where UltiPro treated seed initially increased the speed of emergence a frost event (-5°C) occurred 12 days after seeding. Subsequent stand development suggested that nearly-emerged seedlings, particularly in the UltiPro treatment, may have been damaged by this frost event resulting in a significantly greater final established stand in the slower emerging treatment without UltiPro. The final established stand of sugar beets in the other 5 trials was not significantly affected by the UltiPro treatment. Treatment with UltiPro did not significantly increase sugar beet root yield, extractable sugar per tonne or extractable sugar per acre in any individual trials. When averaged over all 6 trials, root yield was 31.2 and 30.8 tonnes per acre for respective treatments with and without UltiPro, while extractable sugar per tonne was 158.3 and 157.3 kg for the same respective treatments. Extractable sugar per acre was 4976 kg for UltiPro treated seed and 4877 kg for untreated seed, when averaged over 6 trials.

Seven trials were conducted between 2008 and 2010 to evaluate XBEET<sup>®</sup> developed by Germain's Seed Technology. All trials were latin square designs with 4 treatments and 4

replications. Two varieties with and without XBEET were tested in each trial, with conventional varieties used in 3 trials conducted in 2008 and Roundup Ready<sup>®</sup> varieties in the 2009 and 2010 trials. Speed of emergence was significantly increased in 5 of 14 assessments where an XBEET treated variety was compared to the same untreated variety. In 1 comparison an untreated variety significantly increased speed of emergence compared to the same XBEET treated variety. The most conspicuous speed of emergence increases with XBEET treated seed occurred in 2 trials conducted in a spring with abnormally cool and wet environmental conditions. The final established stand of sugar beets was also significantly increased with XBEET treated seed in these trials conducted in cool and wet conditions. Final established stand was not increased with XBEET for any of the varieties in the other 5 trials and was significantly decreased for 1 comparison to untreated seed. Treatment with XBEET did not significantly increase sugar beet root yield, extractable sugar per tonne or extractable sugar per acre in any individual trials. When averaged over 14 variety comparisons, root yield was 27.8 and 27.5 tonnes per acre for respective treatments with and without XBEET, while extractable sugar per tonne was 148.4 and 149.7 kg for the same respective treatments. Extractable sugar per acre was 4086 kg for XBEET treated seed and 4088 kg for untreated seed, when averaged over all 14 variety comparisons.

Overall, 35% of trials showed a positive response in speed of emergence to emergence enhancement treatments; however, final established sugar beet stand was only increased for 12% of trials and this only occurred in a year with abnormally cool and wet environmental conditions. Treatment with PAT<sup>®</sup>, UltiPro<sup>®</sup> or XBEET<sup>®</sup> did not significantly increase extractable sugar per acre of sugar beet in any trials conducted.