

Development of day-neutral strawberries adapted to the Canadian climate and to new sustainable production systems

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1. Evaluate and develop dayneutral vegetative and F1-hybrid cultivars and selections.

In Canada, dayneutral strawberry cultivars are difficult to breed, partly because the adapted germplasm is not short-day adapted and does not exhibit low dormancy, and they are difficult to propagate as they produce few runners. To overcome these issues, we are cooperating with the University of Florida to breed F1 hybrid dayneutral seed-propagated cultivars which can fruit in Florida during the winter and Ontario during the summer.

Our emphasis was to develop female lines and to continue inbreeding of the hermaphrodite inbred lines. In 2009-2012, seedlings were planted in Ontario in May, and non-dayneutral plants removed in September. These were retained over winter to test for winter hardiness, and then selected for horticultural traits the following spring. Seventy-six selections were retained in 2010, 57 in 2011, and 45 in 2012. Seeds were sent to Florida in June, germinated and planted in October. In Florida, plants were selected for short-day seasonal growth and mildew resistance. In March 2011, 53 selections were made, 43 in March 2012 and 19 in March 2013. Open-pollinate seed was collected from the Florida selections and sent to Ontario. In March 2013 plants were also sent. We now have several inbred lines which have 100% dayneutral. Fifteen dayneutral selections with small, easy-capping fruit, were made from 1200 seedlings. Runners are being propagated to be sent to New Liskeard to be propagated in in-vitro.

A field trial was planted to test the effectiveness of the dominant gene for female flowers in F1 hybrids. This resulted in uniform fruit production in the field and 50% segregation of females. Also, several of the F1 hybrid families yielded four times the per plant yield than the control cultivar, 'Albion', with 90% of its fruit size. Four families from female 2022-14 gave 10% females. From the families ten parents were selected.

Fourteen inbreds have been successfully established in vitro. Two disinfection techniques appear superior. One disinfection technique was detrimental to both seedling germination and vigor. Two media appear superior, however, there is a lot of variability between the inbred lines. Long-term cold storage is working very well to maintain inbreds in vitro over the long term with little cost.

The cultivar trial comparing Albion and Seascape to the newer cultivars Evie II, Monterey and Portola in the high tunnel and outside was harvested in 2010 and 2011. Yield data as well as plant counts, and weekly runner and tarnished plant bug counts were collected and is currently being analyzed. In New Liskeard, the cultivar Portola looked promising. This trial was also grown at Cedar Springs in southwestern Ontario

2. Develop and improve the production systems under tunnels

A trial was established in 2010 at New Liskeard and Cedar Springs to test overwintering in high tunnels and outside with the cultivars Albion and Seascape. Three overwintering treatments were applied in November 2010 in New Liskeard: no cover; a heavy-weight cover (42g) removed at 1st open blossom; and straw mulch plus a heavy cover removed when the plants started to grow. At Cedar Springs, five overwintering treatments were applied, no cover, two light weight cover treatments to be removed either when the tunnel was covered in the spring or at first flower, and two heavy cover treatments to be removed at the same time as the light weight covers. Because of the early spring in 2011 treatment removal times coincided. There were no significant differences in the cover treatments at Cedar Springs. At New Liskeard, the

yield was significantly higher and earlier for the floating row cover treatments. The yields were earlier and higher under the high tunnels than outside.

In 2011 a trial was planted in the high tunnels and outside in Cedar Springs and New Liskeard to test plant size and blossom removal times. Treatments consist of different two crown sizes and waiting-bed plants of Albion and Seascape with blossoms removed for 0, 3, 6 and 8 weeks after planting. Most of the waiting bed plants died, and the data is currently being analyzed

3. Determine the effect of nitrogen and potassium rates and slow release fertilizers applied through fertigation for conventional and out-of-soil culture of day-neutral strawberries. Strawberry fertigation trials were established at the University of Guelph's Cedar Springs Research Station and Simcoe Research Station in southwestern Ontario, and on the farm of David Cote, St-Paul-d'Abbotsford, QC. The purpose of the trials were to evaluate the rate and timing of nitrogen fertilizer applications, the impact of changing the ratio of nitrogen to phosphorous, and the effectiveness of soil applied slow release nitrogen formulations on fruit yield and quality in a day neutral strawberry production system. The spring of 2011 was cool and wet in Ontario, and plants receiving no nitrogen soon became pale. Delaying nitrogen applications later in the season to coincide with the start of flowering and fruiting provided no yield advantage. Fruit yields were maximized at seasonal nitrogen rates of 75 kg/ha, unless extra phosphorous was applied; in this case yields tended to increase at rates of 125 kg/ha N. Soil and tissue samples were collected throughout the season and are presently being analyzed; these will allow us to determine the fate of excess nitrogen in the system.