

## **Report to the Ontario Tomato Research Institute: Processing Tomato Breeding 2003**

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### **Background**

- In 2003 additional changes were made in breeding effort to come into line with the revised breeding objectives set in 2002.
- Between 1984 and 2002 at AAFC-Harrow, modern cultivated varieties of tomato were hybridized with every wild species of tomato that is reasonably compatible. This past work successfully bridged some of the genetic gaps between wild and cultivated tomatoes. It resulted in a large number of intermediate tomato lines with new genetic variation that can be more easily crossed with modern cultivated tomatoes.
- Most of these Harrow breeding lines still cling to traits of their wild ancestors. If private sector tomato breeders hybridize their own breeding lines with this enhanced germplasm they will lose breeding progress.

### **Program Objectives**

- The Ridgetown processing tomato breeding program has the primary objective of providing enhanced germplasm for Ontario Tomato Research Institute (O.T.R.I.) member breeders. The Ridgetown breeding effort is based on the foundation set by Harrow, and will continue to develop the Harrow enhanced germplasm so that breeders may have breeding lines with a broader genetic base, but without the large number of negative traits.
- This enhanced germplasm (ie. breeding lines) will permit private sector breeders to broaden the genetic base and increase genetic diversity in processing tomato cultivars in Ontario.
- Increased genetic diversity results in a greater chance of finding new, useful genetic traits, and is associated with a reduced risk of disease epidemics.

### **Release of Breeding Lines**

- Thirty-seven advanced lines from the Ridgetown program were released to OTRI member breeders for 2003 planting.

### **Transition and Integration of Breeding Lines from Harrow**

- Fourteen acres of breeding plots were established at Ridgetown in 2003. The over 1,600 breeding lines from F2 to F6 generations consisted of selections made at Ridgetown during fall 2002 combined with the final selections made at Harrow during fall 2002.

- Most, but not all of the Harrow enhanced germplasm was planted out. Some Harrow lines that still very strongly resemble wild tomatoes are being kept for future work. There is a large number of breeding lines of somewhat more adapted material that should result in useful breeding lines in the short term.
- Selection in 2003 tended to focus on traits such as acceptable vine size, acceptable maturity, and acceptable fruit size. Where these traits already existed in the breeding lines, then early maturity, firmness, colour, yield and field-holding ability were important traits under selection. Just under 1,100 selections were made in fall 2003.

### **Progress on Broadening the Genetic Base of Tomato Germplasm**

- Unpublished data from work done in Ohio ( W. Yang and D. M. Francis, 2003) have demonstrated that on a *relative basis*, recent breeding lines released from Ridgetown have “as much as 40% more variation than California germplasm for the processing market” (D. Francis, personal communication). Based on the adapted lines evaluated in that work, the breeding approach used is successful in broadening the genetic base.
- This same study showed that, because the amount of genetic variation in tomato is so low overall, on an *absolute basis* this is equivalent to an actual difference of between 3% and 5% (Francis, D., personal communication). Much potential remains for improving genetic variation in tomato overall.

### **Disease Resistance Breeding**

- Horizontal resistance breeding under field conditions was continued again this year. Instead of culturing and inoculating with anthracnose, an early maturing, very susceptible, check cultivar was planted in every other row of the horizontal resistance plots. This provided good disease pressure for selection and saved a significant amount of work. Additional populations are being developed to increase the output from this breeding strategy.

### **Selection for Earliness and Field Holding Ability**

- New methods of selection for early maturity and selection for field holding ability are being evaluated. Based on a comparison between 2003 and 2002 data it appears that we may be able to make very good breeding progress. Results will be monitored annually to determine if the approaches used will be successful for the long term.

### **Immediate Goals for the Program**

- Program transition and integration of the breeding work from Harrow was not as easy as anticipated; the process of change in program format is not complete. More time is needed to become familiar with the germplasm received from Harrow.