Development of Canola (Brassica napus) Expressing Resistance to Acetolatate Synthase Inhibiting Herbicides.

R.E. Blackshaw, D. Kanashiro, I. Babic, F. Bekkaoui*, W.L. Crosby* and M.M. Moloney**.**
Agriculture Canada Research Station, Lethbridge, Alberta; *National Research Council Canada, Plant Biotechnology Institute, Saskatoon, Saskatchewan; and **University of Calgary, Calgary, Alberta, Canada.

Canola is successfully grown on 3 to 4 million hectares annually in western Canada, yet weed control remains a prime concern of producers. Commonly used canola herbicides control only a limited number of weeds and must be soil-incorporated, leading to increased soil erosion problems. Development of herbicide tolerant canola would allow improved control of weeds and result in greater yields of high quality. Studies were conducted to incorporate genes conferring resistance to acetolactate synthase (ALS) inhibiting herbicides into canola (Brassica napus L.). Genetically modified ALS genes from Arabidopsis thaliana L. and B. napus were transferred into canola through an Agrobacterium-mediated gene transfer system. Determination of ALS catalytic activity from leaf extracts of canola containing these mutant Arabidopsis or Brassica genes indicated a high level of tolerance to the herbicide chlorsulfuron compared to that of wild-type canola. However, tolerance at the biochemical level did not necessarily translate into tolerance at the whole plant level. While canola harboring the Arabidopsis gene exhibited excellent tolerance to chlorsulfuron in greenhouse and field trials, canola containing single or double Brassica mutants was severely injured by chlorsulfuron, surviving only slightly better than wild-type canola. Expanded field trials with canola containing the Arabidopsis gene demonstrated that successful expression of an altered ALS enzyme will not confer the same level of tolerance to all ALS herbicides. Differences in tolerance existed within and among chemical families of ALS herbicides. Ongoing studies will attempt to determine the reasons for the lack of expression of the modified Brassica genes at the whole plant level and continued effort will be placed on developing improved mutations conferring superior levels of tolerance to ALS herbicides in canola.