

# Present Status of Herbicide Tolerant Canola in Canada

R. Keith DOWNEY

Agriculture and Agri-Food Canada, Saskatoon

Canadian farmers have embarked on a new era of weed control in their canola crops. New varieties of spring *B. napus*, each tolerant to a different broad spectrum herbicide, were registered for use in Canada in 1995-96. Of course, growing herbicide tolerant canola is not entirely new to Canadian producers. Several varieties of *B. napus*, tolerant to the triazine family of herbicides, have been available to growers since the early 1980's. Unfortunately, the natural mutation which imparted this herbicide tolerance reduced the plant's ability to fully utilize the sun's energy resulting in a yield penalty when weed infestations were light. The new varieties which are tolerant to broad spectrum herbicides such as Monsanto's glyphosate (Roundup), AgrEvo's glufosinate (Liberty, Basta or Ignite) and Cyanamide's imidazolinone (Pursuit) do not exhibit a yield penalty and are agronomically similar to standard herbicide susceptible varieties. PGS hybrid varieties which are tolerant to glufosinate have also been cleared and registered for use in Canada but will not be available to growers until 1997. It should be noted that varieties tolerant to glyphosate and glufosinate attained their herbicide tolerance through the transfer of herbicide resistance genes from microorganisms. Varieties resistant to the herbicide imidazolinone on the other hand, are the result of an induced mutation in the plant's own genetic makeup. Although this difference in the source of the herbicide tolerance may not make much difference in the way the crop is grown or the weeds controlled, it does make a major difference in how regulators and environmentalists in some countries, may view them.

After considerable study by federal, university and company researchers, it has been agreed that none of the herbicide tolerant varieties pose a threat to the Canadian environment or to human or animal health. Plants carrying these genes are no more invasive of habitats

than herbicide susceptible plants unless the relevant herbicide is applied. Since refined vegetable oil contains no detectable protein, the oil is exactly the same whether it is extracted from a herbicide tolerant or susceptible variety. Nothing has been added to the oil and nothing taken away. The meal is consumed by livestock and any foreign protein is destroyed in the digestive tract. Outcrossing to weedy species has also been extensively investigated and although a herbicide tolerant gene may, with time, escape to very closely related crop species like *Brassica rapa* (syn = *B. campestris*), (summer turnip rape) and *B. juncea*, (condiment mustard) the chances that it will be transferred to serious weeds such as *Sinapis arvensis* (charlock or wild mustard), is extremely remote. If such an event were to occur the worst case scenario would be that the particular herbicide would no longer be effective against that weed and we would be back to the weed controls we use today. Since everyone wishes to minimize the risk of selecting herbicide resistant weeds, companies and agronomists are advising Canadian growers to rotate or frequently change the varieties and related herbicides they use. It is not anticipated that the use of herbicide tolerant canola will give any problems in the rotation since the phenoxy herbicides used on the following cereal crops will effectively control volunteer plants. If chemical fallow is part of the rotation then 2-4, D is added to the Roundup treatment.

The first commercial production of a transgenic herbicide tolerant variety was undertaken in Canada in 1995. AgrEvo contracted production of their Innovator variety on some 35,000 acres (14,100 ha) for delivery to domestic oil extraction plants. Thus a comparison of the relative economics of the various variety-plus-herbicide packages was not possible until 1996 when varieties with all three types of herbicide tolerance became available. It is

estimated that if a grower purchased Certified seed of the latest high yielding susceptible variety his seed cost would have been about \$ 37.00 CDN/ha and, depending on his weed spectrum and degree of control he was willing to pay for, the cost of herbicides would be between \$ 49.00 and \$ 86.00 CDN per ha. For the mutant varieties tolerant to imidazolinone, the seed was sold separately for about \$ 60.00 CDN/ha and the chemical cost was \$ 45/00 /ha for a total cost of \$ 105.00/ha. For the transgenic herbicide tolerant varieties from Monsanto and AgrEvo, the seed and chemical was sold as a package at a cost of \$ 105. 00/ha. However, Monsanto required all growers purchasing Roundup Ready canola varieties to sign a tight contract stating that no seed from their production will be retained or sold for sowing in subsequent years.

It is estimated that in 1996, transgenic varieties were sown on some 300,00 acres (121,000 ha), with 85% being AgrEvo's Innovator variety. The mutant imidazolinone tolerant varieties occupied an additional 500,000 acres (202,000/ha). The initial farm reaction to all the herbicide tolerant varieties has been generally favourable and it is anticipated that approximately 15 to 20 % of Canada's 5 million ha of canola will be sown with herbicide tolerant varieties in 1997.

The market acceptance of canola oil and meal from the genetically modified varieties in Canada and the United-States, where much of Canadian canola oil and meal is sold, has been very good. It might be described as a non-event with lobby groups taking little notice. In

Japan, our major export market, acceptance was delayed until they were able to develop environmental, health and feed regulations to deal with products from genetically modified organisms. These are now in place and environmental, health and feed approvals have now been given for processing and use of the seed and its products from the present transgenic herbicide tolerant canolas.

There is still a great deal of uncertainty in the European market and it is expected that no transgenic canola seed will be exported to Europe from the 1996 crop. Ironically, seed from the imidazolinone herbicide tolerant varieties will be able to move to Europe without hindrance since genetic changes brought about by mutation are specifically excluded from European biotech regulations.

Canadian farmers are looking forward to additional opportunities that gene transfer offers including insect and disease resistance, increased oil content, specialty oils for new markets, nutritionally improved canola meal and the production of pharmaceuticals, to mention only a few.

Canadian federal authorities have been very diligent in the development and application of plant biotech regulations to assess any risk to the environment as well as human and animal health. In comparison with regulations developed by other countries, Canadian controls and requirements are as stringent as you will find anywhere. Canada strongly opposes the concept of labelling products of biotechnology.