Canola Improvement in Canada

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The responsiveness of canola to biotechnologies and the potential for hybrid varieties have stimulated additional canola research and breeding programs in and for the Canadian market. Where once there were five breeders working in three public breeding programs at the Universities of Manitoba and Alberta and the Agriculture Canada Research Station at Saskatoon, we now have seven different programs with at least 14 full-time breeders, not counting several biotechnologists in Canada, as well as those with U.S. companies, such as Calgene and Sungene. Several European rapeseed/canola breeding firms have also entered their varieties in Canadian evaluation trials, particularly in the province of Ontario where the climatic restrictions are not as severe as the short dry growing season of Western Canada.

The dominant Canadian varieties are Westar *(Brassica napus)* and Tobin *(B. campestris)* which occupied 49.1 and 32.4 % of the canola acreage, respectively, in 1984, with the proportion sown to Westar in 1985 expected to increase further. The *B. napus* triazine-tolerant variety OAC-Triton is believed to occupy only a limited acreage in Western Canada in 1985, being largely confined to fields where hard-to-control weeds, such as wild mustard *(Sinapis arvensis)* and stinkweed *(Thlapsi arvense)* are serious problems. Tribute, a replacement for Triton in Western Canada, was licensed this spring. Although Tribute has the same low seed and oil yield as Triton, it matures some three days earlier and retains less chlorophyll in its ripened seed. Unfortunately, under weed-free conditions all triazine-tolerant strains and varieties of *B. napus, B. campestris* and *B. juncea* evaluated to date produce significantly less (20-30 %) seed, have oil contents 3 to 3.5 % lower and mature later than their conventional backcross parents. These undesirable characteristics are attributed to the lower energy conversion capability of the mutated chlorophyll molecule which provides the herbicide resistance.

To serve the Eastern Canada market, the Swedish spring *B. napus* variety Global was licensed, and a temporary licence was granted the French winter rapeseed variety Tandem, despite its non-canola meal quality. Tandem will be removed from the list as soon as the evaluation of true canola winter-hardy material is completed. Potential commercial hybrids of *B. napus* are being field-evaluated in Canada for the first time, by at least three different organizations. Most, if not all, these hybrids are based on the Polima system which originated in China. If these prove successful, commercial hybrid production could occur as early as 1988.

Dr. Stefansson at the University of Manitoba has developed agronomically acceptable *B. napus* strains of canola which have less than 3 % linolenic and about 24 % linoleic. Oil from this material is presently undergoing evaluation on a pilot-plant scale.

Anther and microspore culture of many *B. napus* varieties and crosses is working well at several research centres. Large numbers of doubled haploid lines will be evaluated this summer.

A program to develop a low and very high erucic *B. juncea* oil crop, to service the edible and industrial markets, is underway at the Saskatoon Research Station. The seed would be processed using the patented ammonia treatment processes developed by Dr. McGregor to produce a canola quality meal. Under Western Canada growing conditions *B. juncea* combines the advantages of higher seed yield, shattering resistance, early maturity, drought tolerance, blackleg resistance, and a pure yellow seedcoat.

Under the sponsorship of the Association of Official Analytical Chemists, studies are being conducted toward the establishment of an official method of glucosinolate analysis. To date five glucosinolates, allyl, 3-butenyl, 4-pentenyl, 2-hydroxyl-3-butenyl, benzyl, and 4-hydroxybenzyl, have been isolated in gram quantities with greater than 98 % purity. These will be used to optimize conditions of the TMS method (gas chromatography of trimethylsilyl derivatives) and then, through a collaborative study, to reduce variation within and between laboratories. A recent collaborative study by the International Standards Organization and data from the collaborative check sample program conducted by the Canola Council of Canada indicate that the interlaboratory variability is still 10 to 15 %, which is unacceptably high.

Sclerotinia continues to be the most serious disease affecting Canadian canola production. Although the fungicides benomyl (Benlate) and iprodione (Rovral) are now registered for use, and vinclozolin (Ronilan) soon will be, only a limited percentage of growers invest in such protection because of (a) difficulties in predicting the severity of infection, (b) the cost of purchasing and aerial application, and (c) the short growth period available for effective application. Recent studies have shown that ground rig application is cheaper, gives better control and permits effective application from 10 to 50 % bloom.

Rhizoctonia solani is now considered to be the major organism responsible for poor canola stands, pre- and post-emergence damping-off, and seedling and mature plant root rot in major rapeseed-growing areas of Western Canada, although *Pythium ultimum* and several *Fusarium* species are also involved.