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Canadian Canola/Rapeseed Developments

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Canada seeded a record 3.63 million hectares of canola in 1988, but due to severe drought in the main producing regions, the total production was similar to that of 987 at 4.2 million tonnes. It is estimated that some 2.9 million hectares have been sown this spring but actual plantings may be higher due to occurrence of the late spring rains. In the 1988 crop, as has been the case over the past seven years, the erucic acid level has been less than 1% of the total fatty acids in the oil and the aliphatic glucosinolate content in the dry, oil-free meal has been less than 30 µmoles in the commercial crop. Experience has shown that if varieties entering the market have not exceeded 20 µmoles of aliphatic glucosinolates in the meal, at any one test location in pre-registration evaluation trials, it is highly unlikely that they will exceed the 30 µmole level in commercial production. In general the *B. napus* varieties have had a lower level of glucosinolate than the present *Brassica campestris* varieties, however, this is likely to change within the next few years. Indeed, a very low glucosinolate (approx. 1 µmole) strain of *B. campestris* has been developed and is undergoing feeding trials.

Several new canola cultivars of both *B. napus* and *B. campestris* have been registered for use in Canada in 1988 and 1989. The main criteria for many of these spring cultivars is their improved resistance to the disease, blackleg (*Leptosphaeria maculans* or *Phoma lingam*). The virulent form of this disease continues to spread and increase in severity over much of the western Canadian production regi*n. Among the new *B. napus* varieties is the first hybrid canola cultivar developed by Conti Seeds. It will b marketed under the name, Hyola-40. Although this hybrid offers minimal seed yield advantage and is lower in oil content than the check cultivar, Westar, it does offer improved blackleg resistance. The hybrid is based on the polima CMS-genic restorer system. Other hybrid varieties are expected to enter the market in the next few years and will be based either on the polima CMS system or a self-incompatibility (SI) system.

White rust (*Albugo candida*) has been a major disease of Canadian grown *B. campestris*. The variety, Tobin, registered in 1980, has had a high measure of resistance to Race 7 which normally attacks this species. In the last two years a new Race has appeared which will attack the Tobin variety. Plants resistant to the new Race have been identified and work is underway to develop varieties with resistance to both the old and the new Race 7.

Breeding for additional modifications of the fatty acid composition in *Brassica* oil is continuing but the desirability or need for additional changes in the present canola oil composition for human consumption is now questioned by nutritionists. Indeed, in 1987, canola oil received the Food Product of the Year Award from the American Heart Foundation of New York and, in 1989, the American College of Nutrition presented canola oil with its first "Product Acceptance" Award. Nevertheless, Stellar, a low (< 3%) linolenic cultivar developed by Dr. Baldur Stefansson of the University of Manitoba, has been registered and is undergoing commercial evaluation in Canada. Several breeding programs are underway to increase the erucic acid to more than 50% and oleic acid to more than 80%. Strains of *B. campestris* developed by Sweden, are also in evaluation trials that have a palmitic acid content of about 7-8%. It is anticipated that the high palmitic strains may have a place for contract production to provide oil for the manufacture of 100% canola margarines.

One of the primary objectives of the Saskatoon Research Station and other oilseed *Brassica* programs, has been to develop a canola quality *Brassica juncea*. Under western Canadian conditions, *B. juncea* has shown a higher seed yield, greater drought and heat tolerance and resistance to blackleg and pod shattering, than either of the other *Brassica* oilseeds. Since low erucic and high oil strains are now available in *B. juncea*, the barrier to achieving this goal has been the absence of the low glucosinolate characteristic. Fortunately, through some excellent work by Drs. H. Love and G. Rakow at Saskatoon, a low glucosinolate *B. juncea* strain has now been developed. The strain has been grown at four locations over two years and the glucosinolate level of these increase plots has ranged from 4-8 µmoles per gra of the aliphatic glucosinolates in the oil-free meal. Although a great deal of work remains to be done before an adapted high-yielding canola *B. juncea* cultivar can be developed, the breeding of the low glucosinolate strain is a major breakthrough, not only for Canada but also for the Indian sub-continent where B. juncea is the major *Brassica* oil crop species. Seed of the low glucosinolate *B. juncea* strain will be available for international distribution from the Saskatoon Research Station in February-March 1990.

Many forms of biotechnology are now being applied to the *Brassica* oilseed crops. In the past growing season, the Saskatoon Research Station, in cooperation with Monsanto, tested plants of the Westar cultivar (*B. napus*) that had been transformed with the gene imparting tolerance to the herbicide Roundup (glyphosate). Although the transformed plants were tolerant to the herbicide, the level of resistance was not sufficient for commercialization. Further modifications to the gene have been made by Monsanto to provide an increased level of tolerance. These new transformants have been field-sown this spring. Other herbicide-resistant genes have been placed in B. *napus* plants, including the ALS gene for resistance to sulfoneturon-methyl by DuPont. These plants are also in field trials near Saskatoon. The University of Guelph also has transformed plants for herbicide resistance in field trials this year.

Several centers continue to work with the cytoplasmically inherited tolerance within the *Brassica* oilseeds species to the family of triazine herbicides. This characteristic has now been transferred into *B. juncea* and appears to be less detrimental in that species than in either *B. napus* or *B. campestris*. New varieties of *B. napus*, either just released or about to be registered, have shown that yield and oil content of triazine-tolerant material can be improved but it has not been possible, due to the lower efficiency of the mutated chlorophyll molecule upon which the tolerance depends, to recover the yield of seed and oil present in the recurrent parent. Triazine-tolerant hybrids have shown heterosis for yield, however, in no case have such hybrids surpassed the performance of the higher-yielding parent. Despite the relatively poor performance of triazine-tolerant varieties, a significant Canadian acreage is sown each year in areas where wild mustard (*Sinapis arvensis*) or stinkweed (*Thlaspani arvensis*), are prevalent or where atrizine residue is a problem.

RFLP mapping for numerous characteristics in *B. napus* is underway at a number of Canadian locations. It is hoped that the application of RFLP findings will result in a more rapid identification of desirable characteristics in breeding populations, thus accelerating the development of superior varieties.