Rapeseed and Canola Breeding in North America: The U.S. Potential

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The sight of a flowering field of rapeseed is a common site in many areas of the world. Rapeseed and Canola are currently grown on in excess of 20 million acres which produce 8 million metric tons of oil annually. This oil provides 15% of the edible oil and 100% of the high erucic acid industrial oil consumed worldwide. Food & Drug Administration regulations and a strong dependence on soybean as a source of vegetable oil have historically limited the production of oilseed rape in this country.

Since 1985 when the FDA granted GRAS status to low erucic acid rapeseed (Canola) oil, there has been increasing interest in both the production of this crop and utilization of its unique oil. Canola has low levels of saturated fatty acids, moderate levels of polyunsaturated fatty acids and fairly high levels of monounsaturated fatty acids. Increasingly, the fatty acid composition of Canola oil has been recognized by nutritionists for its benefits in human diets. As domestic consumption of Canola oil increases, it is expected that U.S. production of rapeseed will increase.

Three rates of potential increases of production of Canola in the U.S. were graphed (Fig. 1). The first rate which assumes that production will increase by only 250,000 acres annually, indicated that total production would approach 3 million acres by the turn of the century. The second rate which assumes an annual increase of 500,000 acres, estimates that U.S. acreage in the year 2000 would be 5.5 million acres. The third, and most optimistic estimate, assumed that U.S. Canola production would increase by 1 million acres annually. At this rate of increase, there could be in excess of 11 million acres in production. Most individuals familiar with oilseed crops feel that Canola production in the U.S. will increase, but they realize that many variables will influence the actual rate of increase. It is highly possible that U.S. production of rapeseed could exceed 5 million acres if certain limiting factors can be solved.

The factors which currently limit expanded production of Canola in the U.S. are: 1) the U.S. farm program; 2) the lack of proven varieties; 3) the lack of grower education; 4) the lack of vertical integration of Canola production into U.S. vegetable oil industry; and 5) inevitable fluctuations in the price of all oilseed crops. Efforts are underway in both private industry and public institutions to solve these problems. This paper emphasizes the efforts currently under way to develop proven varieties of Canola.

Adaptation of U.S. Canola

Much of the continental U.S. will be able to produce Canola if adapted varieties are developed (Fig. 2). The Northern Tier of States will be able to grow spring cultivars, but high temperatures and pest problems will probably limit production of spring planted cultivars in the rest of the U.S. Very winter hardy biennial cultivars of either Brassica napus or B. campestris could be grown in much of the upper Midwest. These cultivars will require 6 to 8 weeks of vernalization. Typical European biennial cultivars which require 4

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to 6 weeks of vernalization, will be adapted across much of the Pacific Northwest and the mid section of this country. Winter annual cultivars which require only 2 to 4 weeks of vernalization, will be adapted across southern California and the Southeastern States. In the Southern Coastal Plains, fall planted spring Canola can be produced. In the southern regions of the U.S., production of Canola as a double crop will help improve the economic competitiveness of this U.S. grown oilseed crop.

Several Canadian and U.S. organizations have initiated programs to develop Canola quality cultivars adapted to the U.S. (Table 1). Most of these firms are concentrating on B. napus and B. campestris as either spring or winter types. All of the firms indicated they felt there would be significant U.S. production of Canola and that hybrids will be commercially available over the next decade. Many of the breeding programs are developing specialty oil types as well as Canola quality cultivars. In addition, several firms are testing European derived Canola cultivars for marketing in the U.S.

Pests of U.S. Canola

There are several pathogens, insects, and weed species which could limit U.S. production of Canola (Table 2). Insects such as aphids, flea beetles, diamondback moths and the cabbage seedpod weevil will be serious problems in most areas where Canola is grown. A broad range of plant diseases such as black leg, sclerotinia, black rot, and powdery mildew will be serious problems in much of the U.S. Both broadleaf and grass weeds will need to be controlled to insure successful Canola production except where establishment in the early fall will provide competition with weeds. The lack of registered pesticides will enhance the need for developing tolerance or resistance to as many of these pests as possible.

Conclusion

The U.S. could become a significant producer of Canola over this next decade. The application of new techniques in cell biology and molecular biology in conventional plant breeding programs will allow the development of varieties adapted to most production areas in the U.S. Varieties adapted to the U.S. will require both Canola quality characteristics and multiple pest resistance.

dl/canola/pc

Figure 1. Three potential rates of increased production of U.S. Canola over the next decade.

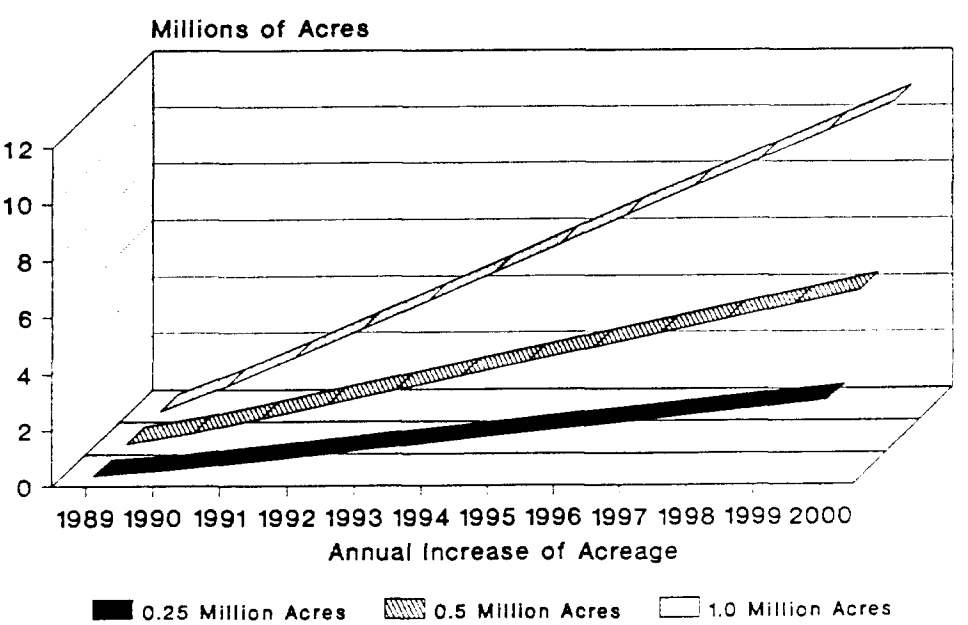

Figure 2. Potential areas where different types of Canola quality rapeseed would be adapted in the continental United States.

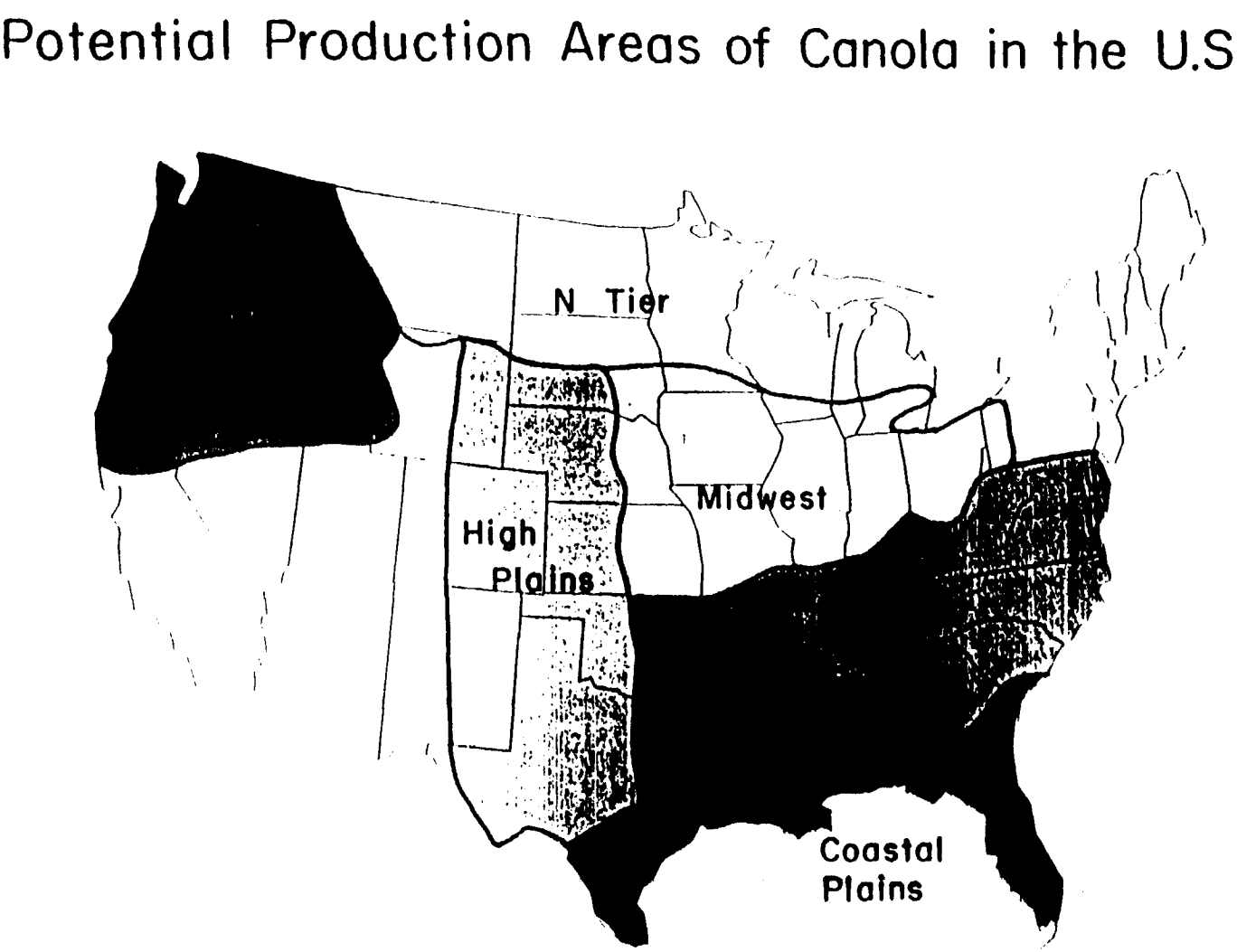

Table 1. Organizations and descriptions of rapeseed programs developing cultivars adapted to the United States.

Program	Contact Person	Growth Habit		*Brassica* species				US Test
		Spring	Winter	*napus*	*campestris*	*juncea*	*carinata*	Sites
Agrigenetics	Larry Sernyk	X	X	X	X	X	-	25
Allelix	Ian Grant	X	X	X	X	-	-	20
Calgene	Matti Souero	X	X	X	X	-	-	42
Cargill Hybrid	Al Jarvi	X	X	X	-	X	-	7
Conti Seed	Greg Buzza	X	-	X	X	X	X	6
Dahenfeldt	Larry Lilley	X	X	X	-	-	-	--
DNAP	Zhegong Fan	X	-	X	-	-	-	21
King Agro	Kees Kennema	X	X	X	X	-	-	7
Maccabee	Dan Cohen	X	X	X	X	-	-	3
Monsanto	Sally Metz	X	-	X	-	-	-	0
Pioneer	Dave Gedge	X	?	X	X	-	-	2
Sigco	Jennifer Fetch	X	-	X	X	X	X	9
U. Idaho	Dick Auld	-	X	X	-	-	-	21

Table 2. Insects, diseases, and weed species which could limit production of different types of Canola in the U.S.

Pests	Varietal Classification					
	Spring	Hardy Biennial	Biennial	Winter Annual	Fall Planted Spring	
Insects:						
Flea Beetle	X	?	?	?	?	Planting Date
Aphids	X	X	X	X	X	Widespread
Seed Pod Weevil	X	?	X	X	X	Potential
Diamond Back Moth	X	X	X	X	X	Loc. Dependent
Maggots & Loopers, Cutworms	X	?	X	X	X	Potential
Diseases:						
Blackleg	X	?	?	X	X	Envir Dependent
White Mold	X	X	X	X	X	Moist Dependent
Alternaria	X	?	?	X	X	Wet Harvest
White Rust	X	X	X	X	X	campestris
P. Mildew	?	?	?	X	X	Dry Conditions
Black Rot	X	?	?	X	X	Temp Dependent
Nematodes	?	?	?	?	?	Sugarbeet
Viruses	?	?	?	?	?	Aphid Trans.
Weeds:						
Broadleaf	X	?	?	X	X	
Grasses	X	?	?	X	X	