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ORIGINAL ARTICLES

Review of Morphology and Biologic in Canola *(Brassica napus L.)*

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ABSTRACT

Canola (*Brassica napus* and to a less extent *B. rapa*) is grown worldwide as an oilseed crop. It is grown both for edible and industrial oil. Canola is the third most important oil producing crop in the world only surpassed by soybean and oil palm. *Brassica napus* L. is a member of the subtribe Brassicinae of the tribe Brassiceae of the Cruciferous (Brassicaceae) family, sometimes referred to as the mustard family. The name "cruciferous" comes from the shape of its flowers, which have four diagonally opposite petals in the form of a cross. The dark bluish green foliage of *B. napus* is glaucous, smooth or has a few scattered hairs near the margins, and is partially clasping. Canola is a type of *Brassica napus* which yields oil cont aining less than two per cent erucic acid, and meal containing less than 30 µmol of glucosinolates. Canola seed is crushed to yield around 40 to 50 per cent oil with the remainder being used as canola meal.

Keywords: Canola(*Brassica napus*), Oil , Yield, Glucosinolates

Introduction

Taxonomy of Brassica species:

The taxonomy and genetics of the Brassica species are complex (Fig. 1). The Brassica genus includes crops and weed species. One of the unique aspects of the crop species is that several crops with very different morphology were derived from the same species and are therefore highly interfertile (Friesen, L.F., 2003). Cabbage, kohlrabi, cauliflower, broccoli, Brussels sprouts, and kale all originated from *Brassica oleracea*. Canola and rutabaga are both *B. napus*. Canola can be either *B. napus* or *B rapa*. In North America, most of the canola grown is *B. napus*. Chinese cabbage and turnip are both *B. rapa* formerly (*B. campestris*) (Karpechenko, G.D., 1927; Pekrun, C., P.J.W. Lutman, 1998).

Two-n gametes and the origin of Brassica species:

A distinctive feature of *Brassica* species origin and evolution is the formation of allotetraploid species from hybridization of diploid progenitors (Fig.1). This was first elucidated by U (1935), where he showed for example, that *B. napus* shares genomes with *B. oleracea* and *B rapa*. This close species relationship between diploid and allotetraploid *Brassica* species contributes to the ease with which interspecies crossing occurs in certain cross combinations. In general, viable crosses between diploids and allotetraploids occur more readily when the diploid parent has a genome in common with the allotetraploid parent. Little is know about what events led to the production of allotetraploids, and about how much and what direction gene flow continues to occur (Lutman, P.J.W., 1993; Warwick, S.I., 1999).

At one time, researchers thought that allopolyploids were most likely obtained through crossing followed by somatic chromosome doubling. Most interspecies are highly sterile because chromosome sets from each species are unpaired and cannot form normal gametes following meiosis. Chromosome doubling allows each genomic set to pair normally, thereby restoring fertility. It now appears much more likely that chromosome doubling occurs *before* crossing via 2n or unreduced gamete formation (Harlan, J.R. and J.M.J. DeWit, 1975).

From an evolutionary standpoint, sexual polyploidization via 2n gametes provides clear fitness advantages over somatic polyploidization (Legere, A., 2001). Many genera have polyploid series and 2n gametes are a major feature of many of these (Harlan, J.R. and J.M.J. DeWit, 1975 Veilleux, R., 1985). For the *Brassica* genus, unreduced gametes have been reported, and some information is available on the frequency of naturally occurring hybrids (Harlan, J.R. and J.M.J. DeWit, 1975; Fukushima, E., 1931; Mesquida, J. and M. Renard, 1982).

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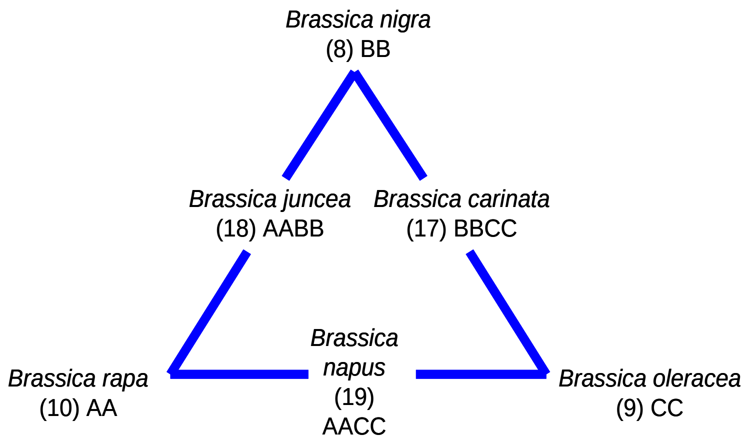

Fig. 1: Triangle of U (1935) showing relationship among *Brassica* species. Numbers indicate haploid chromosome set; letters designate genomes.

Seed production contamination:

In Canada in 2002, 25 certified seed lots of no transgenic canola were tested for the presence of transgenic canola all but one had detectable levels of transgenic seed (Friesen, L.F., 2003). Of the transgenic glufosinate resistant certified seed lots, six of the seven lots tested positive for glyphosate resistant transgene (Gilkey, H.M. and L.R.J. Dennis, 1980; Kaminski, D., 2001). These results were obtained seven years after the introduction of transgenic canola in Canada. This study provides strong evidence that it will be difficult to prevent the introduction of transgenic canola into an area even if there was a provision to only allow conventional canola production in the Willamette Valley of Oregon.

Hybridization among Brassica crops and weeds in Oregon:

Gene flow and hybridization studies among the species related to *B. napus* have concentrated on gene flow to either *B. rapa* or to weedy relatives. There is very little information about gene flow between *B. napus* and its related vegetable crop relatives (Chèvre, A.M., 1996). The difference in pollen source to pollen receptor size when two crops are grown is very different that what would occur if the is a field of *B. napus* and a few receptor plants. In addition, many of the vegetable crops are male sterile or self-incompatible so greater crossing would be expected to occur. Raphanus raphistrum and R. sativus, non Brassica species that hybridize with *B. napus*, also occur as frequent weeds in the Willamette Valley (Gliddon, C., 1994). Varying levels of interfertility are reported between species and reports vary a great deal in the percent of hybridization that can occur between species. Reports also vary as to whether hybrids are viable or whether they will have restored fertility in subsequent generations and whether introgression of genes occurs. Hybridization rates vary depending on environment and distance between the plants. Data are lacking on gene flow, hybridization rates, and success of crosses between *B. napus* and the related vegetable crops. *Brassica napus* is self-fertile; however, outcrossing rates as high as 47% have been reported (Darmency, H., 1998; Williams, I.H., 1986). Pollen flow between cultivars is common. In Canada, gene movement between two transgenic lines was found at 800 meters which was the limit of the study. Canola volunteer plants were identified that had transgenes for both Roundup Ready and Liberty Link and were the result of natural pollen movement under field conditions (Veilleux, R., 1985; Beckie, H.J., 2000). *Brassica rapa* is self-incompatible and therefore is an obligate outcrossing species. Crosses are common between *B. rapa* and *B. napus*. Reported levels of hybridization vary widely. Hybrids have been reported to have reduced fertility and low seed set compared to the parents (Rieger, M.A., 2001). *Brassica oleracea* and *B. napus* hybridization is not common. However, spontaneous hybrids have been found in the wild (U.N. 1935; Williams, I.H., 1986). The authors also identified individuals as introgressed genotypes between the crop and weedy *B. oleracea*.

Conclusions:

Seeds of canola oil seed rich in oil, which can reduce dependence and withdrawal from the country's currency, to be effective (Heyn, F.W., 1977; Hancock, J.F. 2004). Canola's main selling point has been its low level of saturated fats, making it popular as a cooking oil and for use in processed food. Research shows that rapeseed oil, blood cholesterol, and ordinary people who have high blood cholesterol levels reduces them. This oil is low in cholesterol than other vegetable oils are low in saturated fatty acids (Gilkey, H.M. and L.R.J. Dennis, 1980; Karpechenko, G.D., 1927).

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