
XCEED™ Canola, Introduction of the First Herbicide Tolerant *Brassica juncea* Canola for Western Canada

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Abstract

Canola-quality *Brassica juncea* has been developed to provide a reliable method of producing canola in areas prone to heat and drought and where straight-cut combing is desirable. Conventional varieties have been available since 2002 and have been grown on a limited acreage. CLEARFIELD varieties have been developed and will provide improved weed control options for the crop and thereby increase the cultivated acreage. These varieties will be marketed as XCEED canola by Viterra.

Introduction

Brassica juncea has been traditionally grown as a mustard crop in Canada and has shown good adaptation to relatively hot and dry areas compared to *B. napus* canola (Woods et al., 1991; Miller et al., 2003). In Australia, *B. juncea* is also known to achieve higher seed yield than *B. napus* under high soil water deficits (Wright et al., 1995). *Brassica juncea* is known to have very good blackleg resistance and has been used as a source of resistance in *B. napus* breeding programs (Roy, 1984). Resistance to pod shatter is characteristic of most varieties of *B. juncea*. This characteristic provides the potential to straight-combine the crop, reduces harvest losses and reduces the number of volunteer plants in subsequent crops (Wang et al., 2007).

Development of canola-quality *B. juncea* began with the discovery of low erucic lines in Australia in the 1970s (Kirk and Oram, 1981). Agriculture and Agri-Food Canada (AAFC) developed low glucosinolate lines by interspecific crossing to *B. rapa* (Love et al., 1990). Viterra joined AAFC in a collaborative breeding project in 1991 and developed lines with the same fatty acid profile as canola. Prior to commercialization of canola-quality *juncea*, it was necessary to prove to regulatory authorities in Canada and the United States that the oil and meal were equivalent to current canola standards. When this was accomplished, the first canola-quality *juncea* varieties, Arid and Amulet, were registered in 2002 (Potts et al., 2003).

Since 2002, three other conventional varieties were registered in Canada and one variety was released in Australia. Acreage has been limited, primarily due to a lack of herbicide options for the crop. BASF and Viterra collaborated on a project to introduce the CLEARFIELD® herbicide tolerance system to *B. juncea*. This was accomplished in 2008 with the registration of the first

two CLEARFIELD *B. juncea* varieties, XCEED™ 8570 and XCEED 8571. The imidazolinone herbicides Odyssey and Solo have been registered for use on the crop.

The agronomic performance and quality characteristics of XCEED canola have been assessed since 2006 in yield trials across Western Canada. To gain more knowledge of the performance of the varieties and to let growers gain some experience with the crop, 54 demonstration plots of approximately 20 acres each were sown on farms in Western Canada in 2008.

Methods

Until May 2008, CLEARFIELD *B. juncea* was classed as a Plant with Novel Trait (PNT) in Canada and therefore the number of yield trial sites was limited by confined trial regulations. Yield trials were conducted according to the rules and standards of the Western Canada Canola and Rapeseed Recommending Committee. In 2006 and 2007, two sets of trials were conducted. Half of the data were collected from trials sprayed with an imidazolinone herbicide and half were from trials sprayed with conventional herbicides. A *B. napus* check was included in all of the trials, but it changed between years and between conventional and CLEARFIELD trials. In 2006, the imidazolinone resistant, open-pollinated variety 46A76 was used as a check for all trials. In 2007, Invigor 5020 hybrid was the check in the conventional trials and the CLEARFIELD hybrid 45H73 was used in the imidazolinone trials. In 2008, the CLEARFIELD hybrid 45P70 was used in all trials.

In 2008, 54 demonstration plots of XCEED canola of approximately 20 acres each were grown by farmers across Western Canada. These trials were grown and harvested using farm-scale machinery. All plots were straight-cut combined. XCEED 8570 was grown at every location. Farmers were encouraged to grow *B. napus* canola nearby for comparison.

Results and Discussion

The three yield trial years (2006 – 2008) had contrasting weather conditions during the growing season. 2006 was a fairly average year, whereas 2007 was very hot during the July flowering period and 2008 was generally cool. The variation in weather conditions at flowering was reflected in the yield comparisons between XCEED and *B. napus* checks (Table 1). In 2006, the XCEED varieties had significantly higher yield than the open-pollinated *B. napus* check. In 2007, under hot conditions, the XCEED varieties were approximately equal in yield to high-yielding *B. napus* hybrids. With very cool, ideal conditions for *B. napus* in 2008, the XCEED varieties were lower yielding than the high-yielding *B. napus* hybrid check.

The approximate yield results from the 54 demonstration fields are presented in Figure 1. The yield of the plots ranged from a low of four bushels per acre on a field severely damaged by hail, to a high of 41 bushels per acre. The characteristic of the variety that held the most appeal for growers, was the ability to straight-cut combine. The variety used stood up very well, and with reduced pod shatter tendency, it is a good candidate for straight cutting. Many growers have difficulty finding time to swath canola during the busy harvest period and the extra field

operation is costly. In a few cases where there was a hard frost after emergence, growers also noted that there was less frost damage in the XCEED field than in nearby *B. napus* fields.

Success of the crop was also dependent on field selection. Best results were obtained in fields that were relatively free of weeds that are not controlled by imidazolinone herbicides, such as Group 2-resistant kochia.

Table 1. Yield Comparisons Between XCEED Canola Varieties 8570 and 8571 and Various *Brassica napus* Checks from 2006 to 2008.

Cultivar	Yield (kg/ha)			
	2006	2007A ¹	2007B	2008
45A76	3620			
InVigor 5020		2331		
45H73			2426	
45P70				3961
XCEED ²	4178*	2490	2428	3310*
Trials	10	6	7	5
LSD(0.05)	282	301	261	306

¹ 2007A was a conventional herbicide trial, 2007B utilized an imidazolinone herbicide.

² Mean of XCEED 8570 and XCEED 8571.

* Significantly different from *B. napus* check.

XCEED canola will be grown on a commercial scale in 2009. The increased tolerance of *B. juncea* to stresses such as heat, drought and frost will help to stabilize and increase supply of canola in the future. The ability to straight-cut combine will also help to increase canola acreage by helping to reduce harvest workload and by making canola a viable option for farmers without swathers.

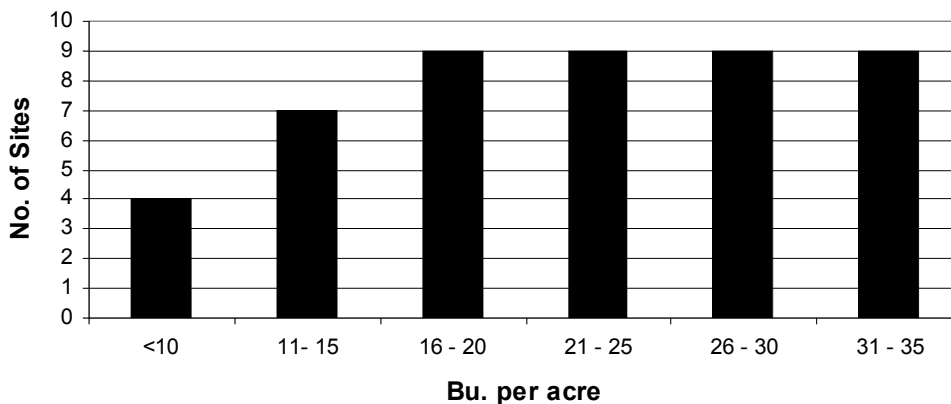


Figure 1. Distribution of yield of 54 demonstration plots of XCEED canola in 2008.

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