EFFECTS OF SWATHING ON YIELD AND QUALITY OF SPRING CANOLA (*BRASSICA NAPUS* L.) IN THE PACIFIC NORTHWEST

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ABSTRACT

From 1990 to 1994, spring canola has increased to over 35,500 hectares in the Pacific Northwest of the U.S.A. A small plot trial, containing five spring canola cultivars, was planted in 1992 and 1993 to compare the yield and quality of swathed and directly-combined crops. In 1992, yields of directly harvested plots were significantly higher (2,065 kg ha^{-1}) than swathed plots (1,716 kg ha^{-1}). The following year a reversed trend was observed where swathed plots yielded more than directly harvested plots (2,899 kg ha^{-1} and 2,541 kg ha^{-1}, respectively). Oil content and fatty acid profile were unaltered by swathing compared to direct harvest; although swathing did result in a slightly smaller seed and greater chlorophyll content. In 1994, larger plots, using commercial agricultural machinery, were utilized to compare three different swathing dates and direct harvest. In this large plot trial, swathing resulted in lower seed yield compared to direct harvest. Greatest yield reductions were found with earliest swathing dates.

INTRODUCTION

Since 1990 the acerage of spring-planted canola, in the Pacific Northwest U.S.A. has increased from nearly none to an estimated 35,500 hectares in 1993. Spring canola is new to these growers, and they have adopted cultural practices developed in the western Canadian prairies where spring canola is grown extensively. The short growing season in Canada often requires that canola be swathed prior to threshing to hasten maturity and avoid frost damage. Because of the longer growing season in the Pacific Northwest, swathing of spring canola may not be required. In order to investigate the need for swathing and the effect of swathing, a series of trials were initiated in 1992 at the University of Idaho.

MATERIAL AND METHODS

Small plot trials, containing five cultivars of canola were planted in 1992 and 1993 to compare the yield and quality of swathed and directly combined crops. In 1992, plots measured 1.07 by 4.9 m, while in 1993 larger plots, 2.14 by 11 m, were used. Four replications were used in each trial. Following Canadian recommendations, plots were swathed when approximately 40% of the seed on the main raceme had turned brown. Once the plants had sufficiently dried, the windrows were picked up and threshed with a Hege 125B plot combine. Directly combined treatments were harvested with the same plot combine when the plots were mature. Indices measured included yield,

percent oil and fatty acid composition. In 1993, two replicates of each treatment were also assessed for chlorophyll content.

In 1994, two additional trials were planted (Genesee and Moscow) where larger plots and commercial agricultural machinery were used. At Genesee, three cultivars ('Helios', 'Westar' and 'Legend') were evaluated. Each cultivar was grown in eight plots each of 150 m^2. The treatments of three swathing dates (early, intermediate and late) and a direct harvest were assigned to eight plots as a two replicate randomized complete block design. At Moscow, a similar arrangement of plots (310 m^2) were grown using the same three cultivars. When approximately 40% of seed had turned brown in color, half the plots were swathed. Ten days later, half of the swathed plots along with half of the non-swathed plots were harvested. The other swathed and non-swathed plots were not harvested until 35 days later, to determine the degree of pod shatter in swathed plots compared to non-swathed plots.

RESULTS

In 1992, swathing reduced yield across all five cultivars tested. Yield of swathed plots was 1716 $kgha^{-1}$ and yield from direct harvest was 2065 $kgha^{-1}$. Weight of 1,000 seeds showed a slight reduction in seed size caused by swathing in 1992. Oil content and fatty acid composition were not affected. Conversely, swathed plots produced the highest yields than direct harvest in 1993 (2889 $kgha^{-1}$ and 2541 $kgha^{-1}$, respectively). Oil content and fatty acid composition were unaffected in either year. Mean chlorophyll content in the seeds from swathed plots was 7.3 ppm. When directly harvested, four of the cultivars contained less than 1 ppm chlorophyll in the seed while the other contained 12.0 ppm and 4.8 ppm chlorophyll in swathed and directly harvested plots, respectively.

At the Genesee site in 1994 swathing reduced yield over all three cultivars (Table 1). Average yield of seed from the first swath date was 803 $kgha^{-1}$, while yields from the second and third swath dates were 861 $kgha^{-1}$ and 986 $kgha^{-1}$, respectively. Averaged over all three cultivars, the direct harvest produced a seed yield of 1,113 $kgha^{-1}$. Therefore, greatest yield reduction was observed with earliest swathing times. Yield response of each of the three cultivars differed between swathing treatments. Westar showed greatest loss, with 1,448 $kgha^{-1}$ on direct harvest and 821 $kgha^{-1}$ at the earliest swathing date. Conversely, Legend showed least response and indeed produced highest seed yield from the latest swath date.

To determine causes of yield loss, 1,000 seed weights were taken from each plot and in accordance with results for seed yield, there was a linear relationship between time of swathing and 1,000 seed weight. Averaged over the three cultivars, 1,000 seed weights were 2.9 g, 3.0 g and 3.1 g, for the early, intermediate and late swath dates, respectively.

From the Moscow trial, the swath plot yield was considerably lower (558 $kgha^{-1}$) than direct harvesting (1,064 $kgha^{-1}$). Harvesting later than optimal resulted in reduced yield in both the swathed and directly harvested plots. From the early harvest, swathed plots produced seed yields of 651 $kgha^{-1}$, while delayed harvest of swathed plots resulted in an average seed loss of 186 $kgha^{-1}$. When plots were harvested directly, delayed harvest resulted in a smaller yield reduction

(99 $kgha^{-1}$). Comparing the difference (%) in seed yield from early and late harvest indicates the degree of pod shatter due to delayed harvest. On average, 27% of potential yield was lost due to shatter in the swathed rows, while considerably lower loss (9%) was observed when plots were not swathed and harvested directly.

Table 1 Seed yield ($kgha^{-1}$) of three canola cultivars from direct combine harvest and from three swath dates (early, intermediate and late) prior to harvest at Genesee in 1994. Also shown is the average seed yield for each cultivar over all treatments.

	Swathed			
	Early	Inter	late	Direct
Helios	820	928	968	1129
Legend	769	800	894	763
Westar	821	855	1095	1448
Average	803	861	986	1113

DISCUSSION

Compared across 1992 and 1993, yields for swathed and directly harvested plots were essentially equal. The yield reduction associated with swathing in 1992 was probably a result of shrinkage and is in the range of what would be expected. In 1993, the yield of the directly harvested treatment was reduced by shatter losses. Swathing did not produce a reduction in chlorophyll content as expected; conversely, chlorophyll content was actually higher in the swathed treatment.

Swathing at Genesee in 1994 showed reduced seed yields, with greatest yield loss at earliest swath date. As with yield losses in previous years, this was due in part to some shatter caused by the swathing operation combined with a reduced seed size. It has been suggested that swathing can be used to protect canola crops from shatter in the event of a delayed harvest compared to non-swathed plots. Despite the fact that the late harvest at Moscw was delayed far longer that would ever seem practical, there was greater shatter in the swath than the stand. It should, however, be noted that the weather condition at this location were particularly mild and more research will be needed to examine this effect over more environments.

Canola producers should note that swathing, in addition to potentially reducing average yields when compared to direct harvest, does add to input costs of crop production and requires an additional trip to the field. For example, if swathing cost $20 per hectare and canola was 22 cents per kg, a grower could afford to lose about 90 $kgha^{-1}$ if he did not swath and still receive the same income if he had swathed.