*Pak. J. Weed Sci. Res., 19(4): 393-401, 2013*

# EFFECT OF CUTTING ON PRODUCTIVITY AND ASSOCIATED WEEDS OF CANOLA

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## ABSTRACT

*Dual-purpose canola means cutting or grazing the crop and then letting it to re-grow and produce grain with no or little yield penalty similar to dual-purpose cereals. A field experiment was conducted to study the effect of cutting on seed and biomass yields, weed density, fresh and dry* biomass *of canola at New Developmental Farm of the University of Agriculture, Peshawar during winter 2009-10. The experiment consisted of cutting treatments i.e. cut and no cut was in Randomized Complete Block Design with three replications. Cutting treatments significantly suppressed weed density, weed fresh and dry* biomass *and seed and biomass yield of canola. Cutting of canola for fodder 70 days after sowing considerably trimmed down weed density and their fresh and dry* biomass*. Similarly, it also radically decreased seed and biomass yield of canola. It is concluded that canola can be used for both fodder and seed production but at the cost of about 27% yield penalty though weeds are suppressed.*

**Key words:** Canola, cutting, seed yield, biomass yield, weed.

**Citation:** Ali, K., M. Arif, Z. Khan, M. Tariq, M. Waqas, B. Gul, S. Bibi, Zia-ud-Din, M. Ali, B. Shafi and M. Adnan. 2013. Effect of cutting on productivity and associated weeds of canola. Pak. J. Weed Sci. Res. 19(4): 393-401.

## INTRODUCTION

Like other developing countries, Pakistan is also facing severe scarcity of edible oil and 70% of the supplies are met through import which results in huge loss of foreign exchange (Aslam *et al*., 1996). Canola (*Brassica napus* L.) is a specific type of rape seed associated with high quality oil and meal. It contains 40-45% oil and 36-40%

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protein in meal. It has the potential to become leading oil seed crop in Pakistan. Increased local production would decrease Pakistan's dependence upon costly imports, as well as having other benefits such as fulfilling the increasing demand of diet-conscious consumers and its meal for the developing poultry industry and livestock sectors. Its oil and meal are now very acceptable as alternative to soybean oil and meal (Amin and Khalil, 2005).

In Pakistan, farmers face acute shortage of green fodder for livestock during winter from mid November to end of February due to harsh winter season. Current production of fodder crops can only meet about 30% of the total national fodder requirements (Economic Survey, 2012-13). Low fodder production and unavailability of feed are the major limiting factors for increasing livestock productivity particularly in Pakistan. Food and feed security at local level is extremely important for the region, specifically during winter months. Fodders are cultivated on about 3.35 million hectares (15%) out of a total cropped area of 21.85 million hectares due to its competition with wheat which is a staple food crop of the region (Arif *et al*., 2006).

Dual-purpose canola, like dual-purpose wheat, describes the process of using canola crop for forage, and then letting it grow for seed. The common advantages are grass weed control, pasture spelling in winter, flexibility, profitability, sustainability of the farm, high quality feed, high early biomass and excellent recovery seed yield after grazing. It provides good fodder at the time when the quality and quantity of other fodders are limited. Canola can provide quick and abundant feed, with high digestibility, energy, and protein. The crude protein content of canola leaves ranges from 15 to 25 percent (Ayres and Clements, 2002; Lemerle *et al.*, 2012; Toosi and Baki, 2012).

It is well known that weeds interfere with crop plants causing serious impacts either in the competition for light, water, nutrients and space (Shah et al., 2003, Roshdy *et al*., 2008; Marwat *et al.,* 2007). Weeds suppress growth and productivity of canola. They are often the most limiting factor in canola production. Although it is possible to control annual grassy weeds, perennial weeds and certain annual broadleaf weeds in conventional canola varieties may require three or more herbicide treatments plus tillage-a considerable cost. In addition to yield losses, it is hard to control weeds in conventional canola crops, especially those of the cruciferae or mustard family, reduce oil and meal quality by contaminating the harvested canola.

Canola as slowly growing crop is particularly exposed to severe competition from weeds especially during early growth stage. Weed suppression by shading only begins after the canopy development. Weed competition with canola reduces crop growth, leaf area and subsequently increase infertile flowers and pods (Tomass, 1992).

Therefore, weed control at initial growth stages is indispensable for gaining a higher seed yield of canola (Blackshaw *et al.*, 2002). The most notorious weed species in canola at the experimental site included *Coronopus didymus, Cynodon dactylon, Rumex crispus, Fumaria indica, Convolvulus arvensis* and *Ammi-visnaga*. Weed control in canola needs to involve integrated weed management, since there are a limited number of herbicides that can be applied to this crop. If good annual weed management occurs during the first three to four weeks following planting, good season-long control of annual weeds would occur, since canola is a competitive species once it is established. The aim of this study was to quantify the impact of cutting a canola crop for fodder purpose and letting it to re-grow for seed production on weeds and crop biomass accumulation and to relate both to final seed yield.

## MATERIALS AND METHODS

A field trial was conducted to study the effect of cutting on productivity and associated weeds of canola at New Developmental Farm of the University of Agriculture, Peshawar during winter 2009-10. The experiment consisted of following treatments i.e. single cut (70 days after sowing just before rosette stage) and control having no cut. For experiment, randomized complete block design (RCBD) with three replications was used. Seed of improved canola cultivar "Abasin-95" was obtained from Nuclear Institute for Food and Agriculture, Peshawar and was sown with the help of a hand hoe in rows 50 cm apart with a uniform seed rate of 5 kg $ha^{-1}$. A fine seedbed was prepared with the help of cultivator. Phosphorus and nitrogen were applied at the rate of 60 and 100 kg $ha^{-1}$ in the form of DAP and Urea, respectively. The DAP and Urea were procured from Fauji Fertilizer Company, Pakistan. After the completion of emergence, seedlings were hand thinned to maintain a uniform plant to plant distance of 10 cm. The crop was irrigated three weeks after sowing and later on as per crop need. For insect control lambda-cychanothrine 2.5% of Bayer Crop Science Company, Pakistan was applied at the rate of 617.5 ml $ha^{-1}$. All other cultural practices were carried out uniformly in all plots. Data were recorded on weed density ($m^{-2}$), fresh and dry biomass of weeds (g $m^{-2}$), seed and biomass yield (kg $ha^{-1}$) of canola.

### Statistical analysis

The data were analyzed statistically using one way analysis of variance (ANOVA) technique appropriate for randomized complete block design. The Statistix 8.1 software was used for the data analysis. Means were compared using LSD test at 0.05 level of probability, when the F-values were significant (Jan *et al*., 2009). Graphs were created using

Sigma Plot 11 which is an advance scientific graphing and data analysis software package.

## RESULTS AND DISCUSSION

Data regarding weed density, weed fresh and dry biomass, seed and biomass yields are shown in Fig 1, 2, 3, 4 and 5. Cutting treatments significantly affected weed density, weed fresh and dry biomass, seed and biomass yield of canola. Cutting of canola 70 days after sowing drastically suppressed weed density and their fresh and dry biomass by 17%, 18% and 18% respectively. As a consequence, it also reduced seed and biomass yields of canola respectively by 27 and 39%.

Dual purpose canola is the practice of grazing canola during the vegetative stage while producing an economic seed yield. A small number of farmers have previously grazed canola crops without a noticeable effect on yield. Cutting stress imposed by removing the above-ground vegetative portion for fodder 70 days after sowing could be the possible reason for significant reduction in seed and biomass yield of canola. After cutting, most of the nutrients taken up were used by plants to recover from the cutting shock and restart growth and thus less final biomass was produced. Similar results are reported by Kirkegaard *et al*. (2008a, b) who concluded that grazing reduced biomass and delayed development both of which are important in determining seed yield. Similarly, they further reported that grazing a canola crop in a less favorable environment heightens the risk of biomass reduction. Likewise, many researchers have found that seed yield of dual purpose canola is closely associated with biomass accumulation (Hocking and Stapper, 2001; Thurling, 1974; Thurling and Das, 1979). However, our results do not agree with Kirkegaard *et al*. (2008a, b) who demonstrated that there was little effect of winter grazing on canola seed yield with favorable spring conditions and timely grazing. Similarly, McCormick *et al*. (2009) reported that canola can be grazed in winter with little impact on seed yield.

Well managed dual-purpose cereal crops have provided opportunities to increase the profitability and flexibility on mixed farms by increasing winter stocking rates and providing income from feed and seed. Dual-purpose canola can also generate similar benefits while providing a break crop for weeds and disease to clean up paddocks for subsequent cereals. In combination with grazed cereals, grazed canola can also spread the timing of operations and potentially extend the grazing window. In our study, cutting of the canola crop 70 days after sowing also suppressed weed density and thus their fresh and dry biomasss. It may be due to cutting of weeds with the crop and quicker recovery of canola from the cutting shock Kirkegaard *et al*. (2008a, b).

## CONCLUSION

It is concluded from the results that due to re-growth potential canola can be used as dual purpose crop however; this practice will drastically reduce seed and biomass production though it will suppress weed density and weeds fresh and dry weight. Furthermore, study is needed to evaluate the dual purpose potential of canola at different plant growth stages, and its recommendations to growers to meet there livestock fodder requirements.

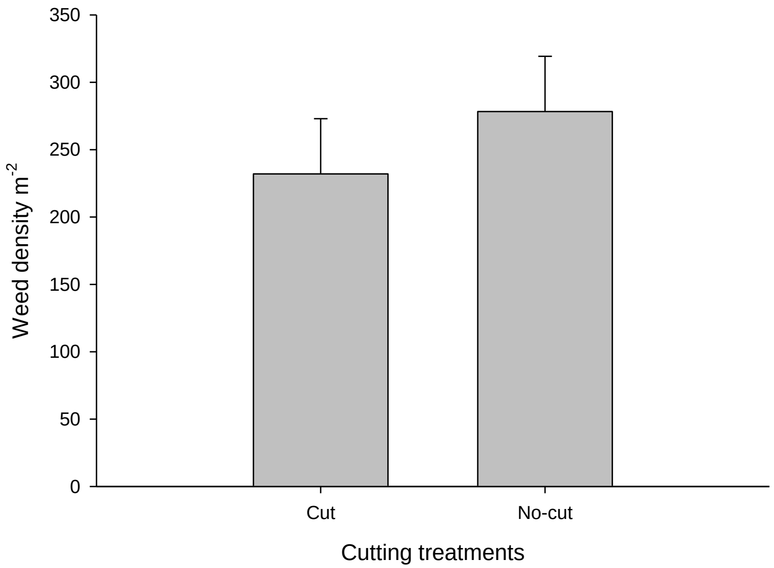


**Figure 1.** Effect of cutting treatments on weed density $m^{-2}$ in canola. Vertical bars denote LSD.

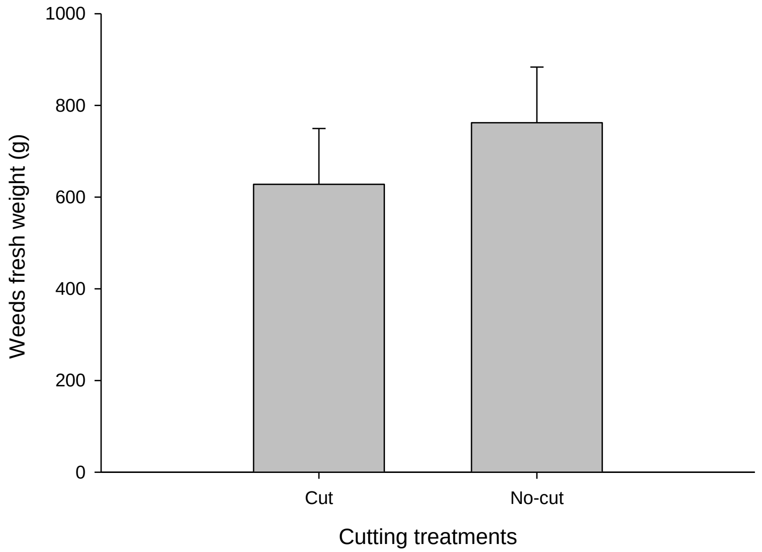


**Figure 2.** Effect of cutting treatments on weed fresh biomass (g $m^{-2}$) in canola. Vertical bars denote LSD.

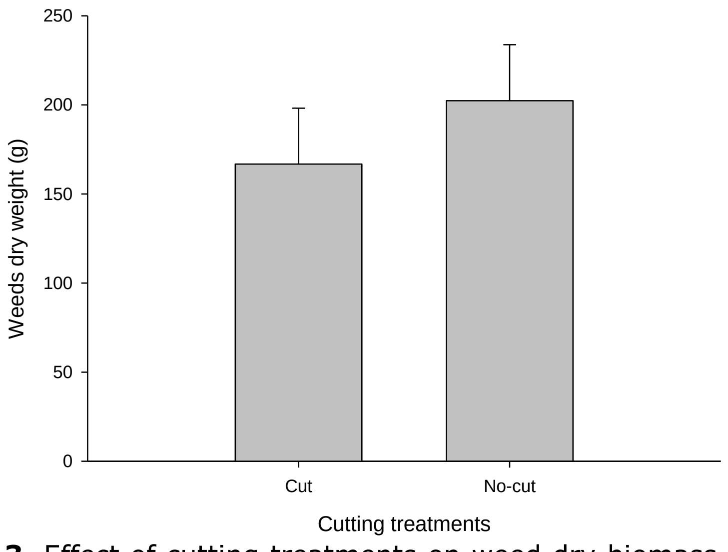


**Figure 3.** Effect of cutting treatments on weed dry biomass in canola. Vertical bars denote LSD.

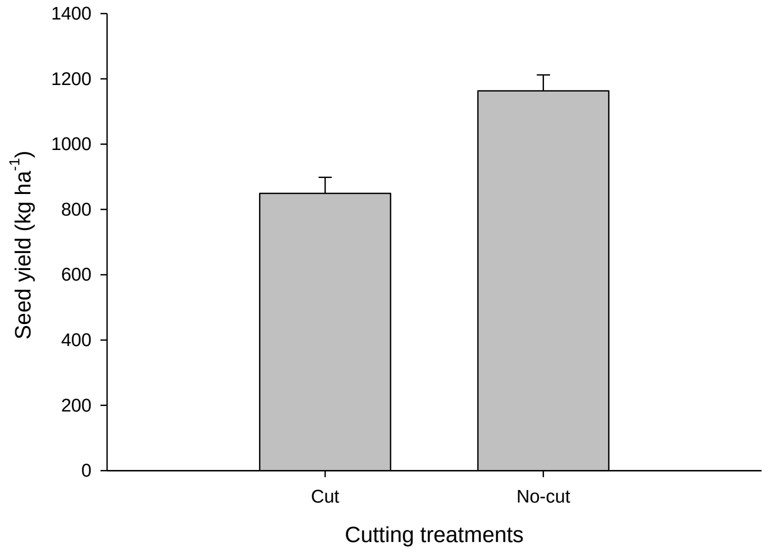


**Figure 4.** Effect of cutting treatments on seed yield of canola. Vertical bars denote LSD.

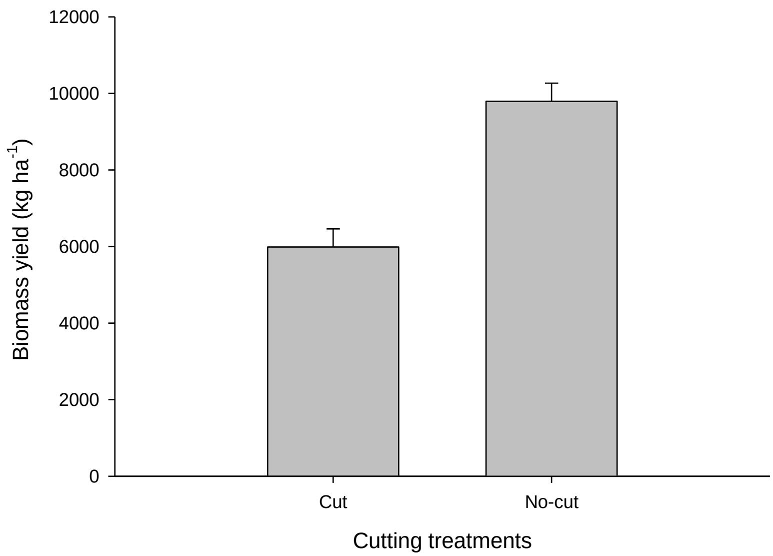


**Figure 5.** Effect of cutting treatments on biomass yield of canola. Vertical bars denote LSD.

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