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EFFECT OF NITROGEN APPLICATION TIMINGS ON THE SEED YIELD OF BRASSICA CULTIVARS AND ASSOCIATED WEEDS

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ABSTRACT

To study the effect of nitrogen application timings on Brassica cultivars, an experiment was conducted at New Developmental Farm, University of Agriculture, Peshawar, during winter 2011-12. The experiment consisted of three Brassica cultivars (Abasin-95, Dure-e-NIFA and NIFA Raya), three nitrogen application timings (all at sowing, half each at sowing and flowering, one third each at sowing, flowering and pod formation). Different cultivars showed significantly varied response for weed fresh and dry weight and seed yield. Abasin-95 cultivar showed the strong weeds growth suppression and resulted in lower weeds fresh and dry weight of the weeds and also produced higher seed yield. Nitrogen applied in two or three splits doses resulted in higher Brassica seed yield. Cutting declined weeds fresh and dry weight and seed yield of Brassica.

Keywords: Dual purpose Brassica, nitrogen timing, cultivars, weeds and yield.

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INTRODUCTION

Rapeseed (*Brassica napus* L.) being traditional oilseed crops of Pakistan are grown over large area in all the four provinces of the country under both irrigated and rainfed conditions (Khan *et al*.,

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2004). Its average yield is 839 kg ha^{-1} (MINFAL, 2005), which is very low as compared to other advanced countries. The European countries have a yield level of 3500 kg ha^{-1}, Canada 3200 kg ha^{-1} and Australia 2000 kg ha^{-1} (Reddy, 2004). Higher yield can be achieved by adapting modern cultural practices with better nutrients management. Nutrients management of the soil on sustainable basis includes fertilizer amounts, time and methods of their application. Proper amount and time of fertilizer application is considered a key to the bumper crop.

The annual losses caused by weeds in Pakistan are estimated about Rs.1150 million which are almost equal to those caused by diseases (Haq, 1970). The lower yield of canola in Pakistan is due to the serious weeds infestations in the fields. Weeds compete for moisture, nutrients, space and sunlight with the crop and deteriorate the quantity and quality of crops. The most notorious weed species found in in Brassica at the experimental site included *Cronopus didymus, Cynodon dactylon, Rumex crispus, Fumaria indica, Convolvulus arvensis* and *Ammi visnaga* etc. Seed yield increased by 78% relative to the current farmer's practices of selective and partial hand weeding (Tanner *et al.*, 1993; Toosi and Bakar, 2012). Jarwar *et al.* (1999) observed that chemical weed control method is also effective along with cultural methods of weed control. However, it is the right time to work out strategies that could lead to weeds control and which are environment friendly and cost effective.

The Brassica can recover well from heavy grazing. In the cooler, higher rainfall areas, there appears to be significant scope to capture value from grazing during the vegetative period without significant impacts on yield. The trade-off between continued grazing at the possible expense of seed yield is one which could be managed by individual enterprises once clear guidelines to predict these trade-offs are established. Hay-cutting and silage are other viable options providing further flexibility for brassica within mixed farming systems. Winter or long-season spring brassica can be sown early produce significant high-quality fodder for grazing in mid-winter and recover from grazing to produce high grain yield (4000 kg ha^{-1}) with good oil content (Kirkegaard *et al.,* 2006; Lemerle *et al*., 2012).

To reduce the losses of N trend for the split application has gained importance. Higher efficiency of split application (50 + 50%) has been reported by Barlog and Grzebisz (2004). While Ali and Ullah (1995) reported that 50-75% nitrogen applied as basal dose and the rest as foliar is the best method of N application for rapeseed. Holmes (1980) concluded that choosing the correct rate and timing of nitrogen fertilizer application is one of the most important aspects of successful oilseed rape production. Nitrogen, which is one of the major plant nutrients, is always a limiting factor of plant growth and hence yields.

In this experiment, we study the effect of nitrogen application timings on seed yield and associated weeds of dual purpose Brassica cultivars.

MATERIALS AND METHODS

To study the effect of times of nitrogen application on dual purpose Brassica cultivars, an experiment was conducted at New Developmental Farm of Agricultural University, Peshawar during winter 2011-12. The experiment consisted of three Brassica cultivars (Abasin-95, Dure-e-NIFA and NIFA Raya), three nitrogen application times (all at sowing, half each at sowing and flowering, one third each at sowing, flowering and pod formation) and cutting treatments (cut and no-cut). For experiment, Randomized Complete Block Design with split plot arrangement was used. Treatment combinations of cultivars and nitrogen application timing were assigned to the main plots while cutting treatment was allotted to the sub plots. Brassica cultivars Abasin-95, Dure-e-NIFA and NIFA Raya were sown with the help of a hand hoe in rows with a uniform seed rate of 5 kg ha^{-1}. The size of sub plot was 4 m by 4 m. Phosphorus was applied at the rate of 60 kg ha^{-1} in the form of DAP prior to sowing with seedbed preparation. Nitrogen was applied at the rate of 100 kg ha^{-1} as per treatment requirements using three application times i.e. all at sowing, half each at sowing and flowering, one third each at sowing, flowering and pod formation using urea as source. After the completion of emergence, seedlings were hand thinned to maintain a uniform plant to plant distance of 15 cm. A cut was given as per treatment requirement 62 days after sowing. The crop was irrigated as and when needed. All other cultural practices were carried out uniformly in all subplots. Data were recorded on weeds fresh and dry fodder weight (g m^{-2}) and seed yield (kg ha^{-1}). Weed samples were collected from each plot at random from three places using 1 m^{-2} quadrate. Fresh and dry weight of the samples were recorded to get weed fresh and dry weight data with the help of an electronic balance.

Statistical analysis

The data were analyzed statistically using analysis of variance (ANOVA) technique appropriate for randomized complete block design with split plot arrangement with the help of Statistix 8.1 sofware. Means were separated using LSD test (at 0.05), when the F-values were significant (Jan *et al*., 2009).

RESULTS AND DISCUSSION

Weed fresh and dry weight (g m^{-2})

Brassica cultivar and cutting treatments significantly affected weed fresh and dry weight (Figs. 1 & 2) while the effect N application timing was not significant. All interactions remained not significant for fresh and dry weeds weight. Brassica cultivar Abasin-85 greatly suppressed weed fresh weight as compared Dure-e-NIFA and NIFA Raya. It may be due plentiful vegetative growth and broader leaves of Abasin-85 which may have shaded the ground and little sunlight was available for the weed. Similar results are reported by Kirkegaard *et al.* (2008a) who stated that dual-purpose canola can provide a break crop for weeds and disease to clean up paddocks for subsequent cereals. Using canola for dual purpose use like cereals can also spread the timing of operations and potentially extend the grazing window. In our study, cutting of the canola crop suppressed weed density and thus their fresh and dry weights. 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).

Seed yield (kg ha^{-1})

Seed yield was significantly affected by cultivars, timing of nitrogen application and cutting treatments (Figs. 4-6). None of the interaction was significant for seed yield. Higher seed yield was recorded for Abasin-95 followed by Dure-e-NIFA and NIFA Raya. Timing of nitrogen showed that higher seed yield was produced by nitrogen application in two splits, which was at par with three splits; whereas lower seed yield was produced in plots where nitrogen was applied full at sowing. No-cut treatment produced significantly higher seed yield as compared to cut treatment.

These results are in agreement with the findings of Sultana *et al.* (2007) who reported that canola varieties differed significantly for seed yield.

Cutting caused a reduction in seed yield of Brassica. Similar results are reported by Kirkegaard *et al.* (2012) who found that canola yield reduced significantly when the crop was grazed by sheep after buds elongation due to delay in flowering, buds removal and inadequate time for recovery from grazing shock and biomass and seed production. The reduction in seed yield by cutting may be due to less regenerative power of Brassica cultivars. These results are in line with that of Laba *et al.* (1987) who reported that defoliation up to 14 days before anthesis led to reduced seed yield.

These results are also in line with Qayyum *et al.* (1991) who stated that seed yield increased with split application of N up to 120 kg ha^{-1}, while Afridi *et al.* (2002b) observed that plots which received N in split application produced higher seed yield. The results also agree with Ramsey and Callinan (1994) who found that canola seed yields response to N fertilizer was generally increasing applied either at sowing or bud stage. Similarly, Faramarzi *et al.* (2009) and Cheema *et al.* (2010) reported that split application of N resulted in higher seed yield of canola.

CONCLUSION

This present study concluded that the Brassica cultivar Abasin-95 performed better and suppressed the weeds growth in terms of biomass and produced higher seed yield as compared to the other cultivars. Application of N in two or three split doses increased seed yield of Brassica. Cutting caused reduction in seed yield and weeds infestation.

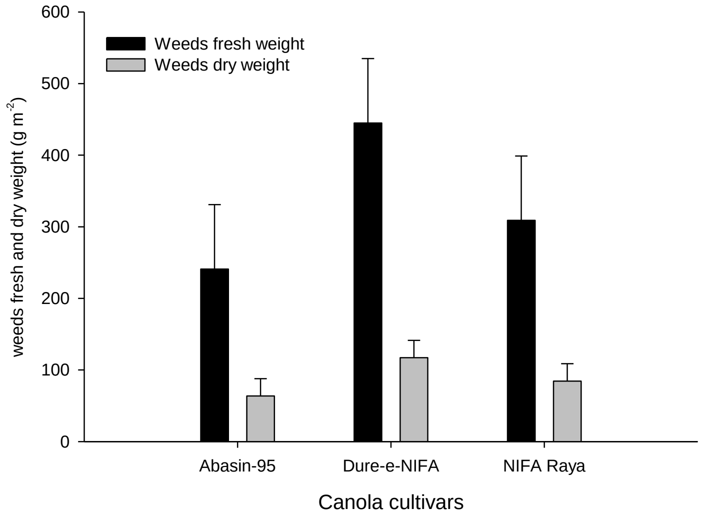

Figure 1. Weeds fresh and dry weight as affected by brassica cutlivars.

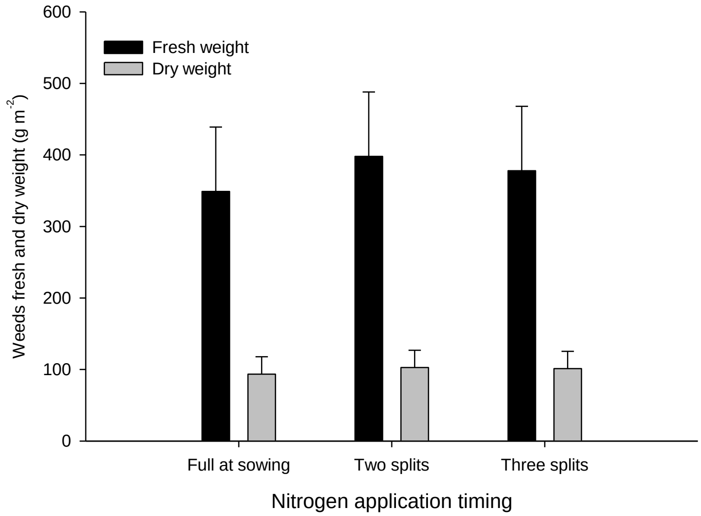

Figure 2. Weeds fresh and dry weight as affected by nitrogen application timing.

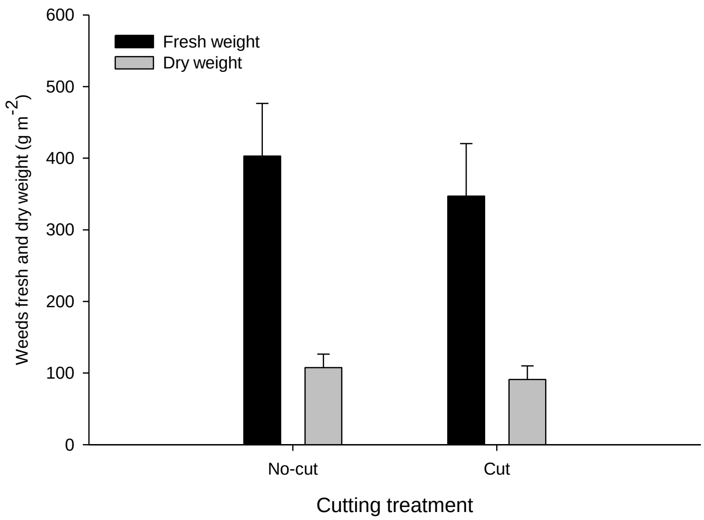

Figure 3. Weeds fresh and dry weight as affected by cutting treatments.

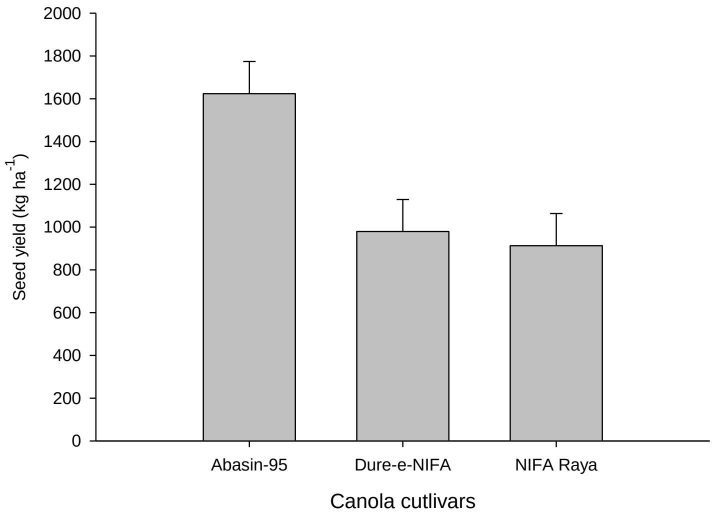

Figure 4. Seed yield of brassica as affected by brassica cultivars.

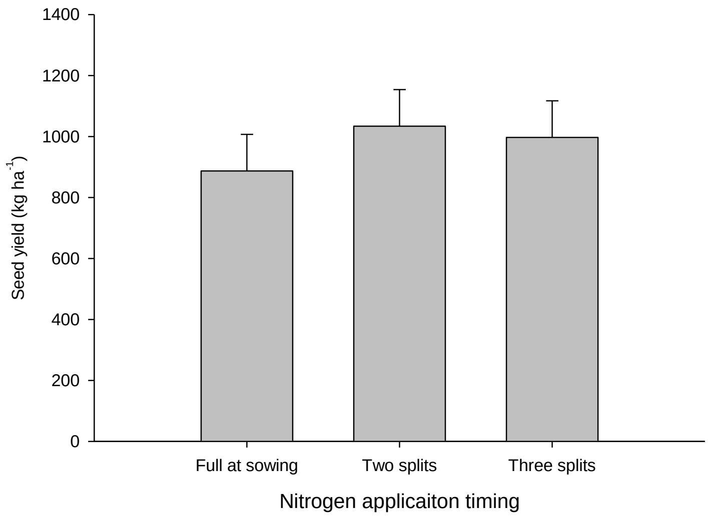

Figure 5. Seed yield of brassica as affected by nitrogen application timing.

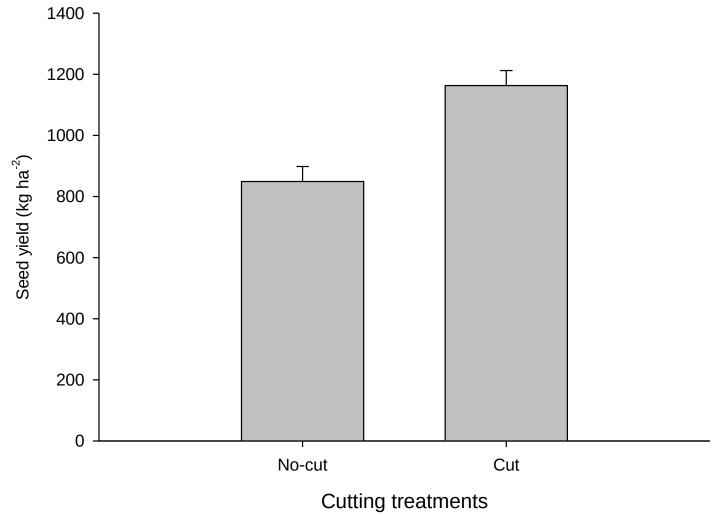

Figure 6. Seed yield of brassica as affected by cutting treatments.

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