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Efficacy of Post-emergence Herbicides for Controlling Weeds in Canola

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Abstract: Study was conducted during the rabi season 2000-01, to investigate the effectiveness of different post-emergence herbicides for controlling weeds in canola. The treatments were post-emergence application of ronstar (oxadiazon), fusilade (fluzifop-butyle), topik (clodinofof), puma super (fenoxaprop-ethyle) and agil (propaquizafop) @ 0.36, 0.26, 0.03, 0.75 and 0.15 kg ha⁻¹. Weedy check was also included for comparison. Herbicidal treatments significantly effected weeds density m⁻², number of branches plant⁻¹, number of siliquae plant⁻¹, siliquae length (cm), number of seeds siliqua⁻¹, 1000 seeds weight (g) and seed yield (kg ha⁻¹). Among the herbicides, fusilade showed promising results with seed yield (1563 kg ha⁻¹) as compared to weedy check (920 kg ha⁻¹). The weed species found were *Convolvulus arvensis*, *Medicago denticulate*, *Rumex crispus*, *Vicia* sp. and *Anagalis arvensis*.

Key words: Post-emergence, herbicide, weeds, canola

Introduction

Rapeseed and mustard belonging to genus *Brassica* is a member of the family Cruciferae or Brassicaceae. In genus *Brassica*, the species *napus* and *campestris* are the main oil producing crops in Pakistan. It is grown in rabi season in irrigated and barani areas of Sindh, Punjab and NWFP. Rapeseed and mustard have remained one of the major sources of edible oil in the sub-continent and China for centuries. Their cultivation goes back to 2000-1500 BC in sub-continent as indicated by Sanskrit records. After that these crops have been cultivated as oilseed crops in this region and other countries (Hatam and Abbasi, 1994). The area under rapeseed and mustard in Pakistan has decreased from 417,000 ha in 1980-81 (Anonymous, 1995) to 327.3 thousand hectares in 1999-2000 with a total production of 297.3 thousand tones and an average yield of 908 kg ha⁻¹ (Anonymous, 2001).

One of the main reason for low average of *Brassica* spp. is its sowing season overlaps with wheat. As wheat is the staple food of the nation, lesser attention is devoted to oilseed crops in rabi season. Canola like other members in its group is a smother crop, because of its larger leaves, rapid growth and early closing canopies, yet the weed competition is critical during early stand establishment. In canola weeds compete for nutrients, moisture, solar radiation and space. Moreover, due to its very small seeds the screening of contaminating weed seed is extremely difficult. Thus, infested crop fetch lower prices in the market apart from quantitative losses. Several reports address the importance of chemical weeds control in canola. Murawa *et al.* (1993) and Singh and Singh (1993) reported that post-emergence herbicides increased seed yield significantly. Khan *et al.* (1995) demonstrated that

chemical weed control increased the seed yield and decreased the weed density in canola. Similarly, Montvilas (1997) reported that herbicides reduced the weed density by 87% and increased the rapeseed yield.

Keeping in view the importance of the problem, the study was conducted with the objectives to find out the most suitable herbicides for weed control in canola, the effect of different herbicides on yield and yield components and quantify the phytotoxicity of herbicides on the crop.

Materials and Methods

The study on the efficacy of different post-emergence herbicide for controlling weeds in canola was conducted at Malkandher Research Farm, NWFP Agricultural University, Peshawar during the rabi season 2000-01. Dunkled variety of canola was planted on 28th October with seed rate of 5 kg ha⁻¹. The experiment was laid out in randomized complete block (RCBD) design with four replications. The size of the plot was 6x3 m², having four rows, 75 cm apart. The detail of the treatments was as under:

Treatments	Common name	Rate (kg ha ⁻¹)
Ronstar 12 L	Oxadiazon	0.36
Fusilade 13 EC	Fluzifop-butyle	0.26
Topik 15 Wp	Clodinofof	0.03
Puma super 75 EW	Fenoxaprop-ethyle	0.75
Agil 100 EC	Propaquizafop	0.15
Weedy check	-----	-----

The following parameters recorded during the study were: weeds density m^{-2} , days to 50% flowering, number of branches and siliquae plant^{-1} , siliqua length (cm), days to maturity, plant height at maturity (cm), number of seeds siliqua^{-1} , 1000 seeds weight (g) and seed yield (kg ha^{-1}). Standard agronomic procedures were followed to record data regarding different parameters. However, weeds density m^{-2} was recorded before and after 28 days of herbicides application, using 1.00 m^2 quadrat. The data on days to 50% flowering was recorded when half the plants in each plot flowered.

The data recorded for each trait was individually subjected to the ANOVA techniques by using MSTATC computer software and means were separated by using Fisher's protected LSD test (Steel and Torrie, 1980).

Results and Discussion

Weed density m^{-2} : The data (Table 1) showed significant ($P < 0.0001$) effect of different herbicides on weeds density m^{-2} . Maximum weeds m^{-2} (15.50) were recorded in weedy check plots while minimum weeds m^{-2} (3.20) were recorded in fusilade treated plots. The variability in weed population in different treatments can be attributed to the fact that some herbicides were more effective for weed control than others. Similar results were reported by Singh *et al.* (1999).

Days to 50% flowering: The data revealed that different herbicides had non-significant effect on days to 50% flowering (Table 1). However, maximum of 123 days to 50% were recorded in plots receiving fusilade and minimum of 119 days in plots treated with ronstar.

Number of branches plant^{-1} : Statistical analysis of the data showed that different herbicides had significant effect on the number of branches plant^{-1} (Table 1). Comparison of the means of the treatments reflected that maximum number of branches plant^{-1} (12.80) were recorded in fusilade treated plots while minimum number of branches plant^{-1} (8.90) in weedy check plots. The possible reason of increase in number of branches in fusilade treated plots could be the best control of weeds and consequently the increase in nutrients availability to the canola crop. The least number of branches plant^{-1} recorded in weed check could be attributed to weed competition for nutrients, light, moisture and space.

Number of siliquae plant^{-1} : Data (Table 1) regarding siliquae plant^{-1} exhibited that herbicides had significant effect on number of siliquae plant^{-1} . Highest (530.3)

number of siliquae plant^{-1} were recorded in plots treated with fusilade while lowest number were (382.0) noted in weedy check plots. As branches plant^{-1} increased, the number of siliquae also increased significantly. Similar results were reported by Yadav *et al.* (1995).

Siliqua length (cm): Statistical analysis of the data (Table 1) revealed that post-emergence herbicides had significant effect on siliquae length. Maximum siliquae length (7.90 cm) was recorded in fusilade treated plots which was statistically at par with all other treatments, except weedy check plots. As the crop/weed competition decreased in herbicides treated plots, the siliquae length also increased. Because there is a certain density of weeds at which competition with crop starts. These results are in analogy with those reported by Raghavan and Haritharan (1991).

Days to maturity: Statistical analysis of the data (Table 1) regarding to days to maturity revealed that different post-emergence herbicides had no significant effect on days to maturity. However, maximum of 173 days were noted in fusilade treated plots and minimum of 169 days to maturity were recorded in plots treated with ronstar.

Plant height (cm): The analysis of the data showed that different treatments had non significant effect on plant height (Table 1). All the treatments possessed the comparable plant height with the weedy check plots. However, maximum plant height (149.8 cm) was recorded in weedy check plots and minimum plant height (144.8 cm) was recorded in ronstar treated plots.

Number of seeds siliqua^{-1} : Number of seeds siliqua^{-1} were significantly effected by various herbicidal treatment (Table 1). The data exhibited that highest (29.0) seed siliqua^{-1} were obtained from fusilade treated plots while lowest number (20.10) of seeds siliqua^{-1} were obtained from weedy check plots. Similar results were also reported by Raghavan and Haritharan (1991), who stated that there was significant increase in seeds siliqua^{-1} with the application of herbicides in canola.

1000 seed weight (g): The data (Table 1) revealed that herbicidal treatments had significant effect on 1000 seed weight. Maximum 1000 seed weight (3.85 g) was recorded in fusilade treated plots while minimum seed weight (2.69 g) was recorded in weedy check plots. The reason of decreased in 1000 seeds weight in weedy check plots is attributed to the increasing weed/crop competition.

Table 1: Effect of different post-emergence herbicides on the yield and yield components of canola

Treatments	Weed density ⁻²	Days to 50% Flowering	No. of branches plant ⁻¹	No. of siliquae plant ⁻¹	Siliqua length (cm)	Days to maturity	Plant height at maturity (cm)	No. of seeds siliquae ⁻¹	1000 seeds weight (g)	Seed yield (kg ha ⁻¹)
Ronstar 12L	5.50bc	119	10.0b	504.5ab	7.0a	169	144.8	25.2ab	2.88b	1365ab
Fusilade 13 EC	3.20c	123	12.8a	530.3a	7.9a	173	147.4	29.0a	3.85a	1563a
Topik 15 WP	7.30b	120	10.50b	495.3ab	6.8ab	170	148.0	24.40ab	2.86b	1326b
Puma super 75 EW	5.00bc	122	9.90b	476.9b	7.0a	170	146.2	25.2ab	2.82b	1366ab
Agil 100 FC	6.30bc	120	10.9ab	504.1ab	7.6a	172	149.3	27.3a	3.26ab	1482ab
Weedy check	15.50a	120	8.9b	382.0c	5.6b	171	149.8	20.1b	2.69b	920c
LSD _(0.05)	3.76	NS	2.14	46.94	1.22	NS	NS	5.84	0.91	234.1

Means followed by different letters in the respective column are significantly different at 5 % level of probability, using LSD test

NS = Non significant

Seed yield (kg ha⁻¹): Statistical analysis of the data (Table 1) showed that different post-emergence herbicidal application had significant ($P < 0.0001$) effect on seed yield of canola. Maximum seed yield (1563 kg ha⁻¹) was recorded in fusilade treated plots and minimum seed yield (920 kg ha⁻¹) was recorded in weedy check pots. All other treatments were statistically at par with each other. Similar results were also reported by Sahota *et al.* (1991), who stated that application of herbicides increased seed yield significantly.

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