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Efficacy of Pre-emergence Herbicides on the Yield and Yield Components of Canola

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Abstract: The efficacy of pre-emergence herbicides on the yield and yield components of canola was studied. The herbicides included Treflan 4EC @ 1.20 kg, Dual Gold 960EC @ 1.44 kg, Stomp 330EC @ 0.99 kg and Sencor WP70 @ 0.35 kg a.i ha^{-1}. The data were recorded on weed density m^{-2}, days to 50% flowering, number of branches/plant, number of siliquae/plant, siliqua length (cm), days to maturity, plant height at maturity (cm), number of seeds/siliqua, 1000 seeds weight (g) and seed yield (kg ha^{-1}). None of the herbicides except Sencor WP70 had a photoxic effect on the crop. Minimum weeds m^{-2} (2.8) were observed in plots to which was applied Treflan 4EC. Maximum weeds m^{-2} (19.3) were observed in weedy check plots. Number of branches/plant (15.32), number of siliquae/plant (616.4), siliqua length (8.1 cm), number of seeds/siliqua (29.1), 1000 seeds weight (3.77 g) and seed yield (1630 kg ha^{-1}) were maximum in plots, where treflan 4EC was applied.

Key words: Pre-emergence herbicides, weeds, canola, yield

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. Canola originated from *B. napus* containing less than 2% erucic acid and less than 851 μ mol of glucosinolates/oz oil free meal. Genotypes have also been isolated in *B. campestris* which have 0-0 erucic acid and glucosinolate content. Moreover, isolates have also been identified in Indian mustard (*B. juncea*) which are extremely low in erucic acid and glucosinolate content. (Personal Communication: Rabbani, A., NARC, Islamabad). Canola has been recently introduced to this country with the objective to increase the domestic edible oil production. It is a rich source of oil and protein. More than 40% oil is recorded in it (Weiss, 1983). Canola like other members in its group is a smoother 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. Therefore, the present study was conducted to screen out best pre-emergence herbicide. Khan *et al.* (1995) reported that Treflan 4EC @ of 1-2 liters ha^{-1} in rapeseed and @ of 1-1.5 liters ha^{-1} in mustard was the best treatment, significantly reduced the weed density, dry weight and increased seed yield. Yadav and Shrivastava (1997) evaluated different herbicides for weed control in Indian mustard (cv. Pusabold) and reported that all herbicides significantly reduced weed dry matter but some herbicides resulted in phytotoxic effects. Yadav *et al.* (1995) on the basis of field experiment stated that application of some herbicides increased seed weight and number of siliquae/plant in rape and mustard. Raghavan and Hariharan (1991) observed that pod length significantly increased with the application of some herbicides as compared to the others in their studies. Sharma and Mishra (1997) reported inhibitory effect of some herbicide on canola crop. The present experiment was conducted to find out the most suitable pre-emergence herbicide for weed control in canola.

Materials and Methods

Experiment was conducted at Malakandher Research Farm, NWFP Agricultural University, Peshawar during rabi season 2000-2001. Dunkled variety of canola, as availed from the Directorate of Oilseeds, Agricultural Research Institute, Tarnab was planted on 28th October 2000 using 5 kg ha^{-1} seed rate. The experiment was laid out in randomized complete block (RCB) design with four replications. There were 5 treatment in each replication. The size of each plot was 6x3 m^2. Each treatment had 4 rows, 75 cm apart. The detail of treatments during the study were as under:

Treatments	Common name	Time of application	Rate (kg a.i ha^{-1})
Treflan 4EC	Trifluralin	Pre-emergence	1.20
Dual Gold 960EC	S-metolachlor	Pre-emergence	1.44
Stomp 330EC	Pendimethalin	Pre-emergence	0.99
Sencor WP70	Metribuzin	Pre-emergence	0.35
Weedy check			

Data were recorded on weeds density m^{-2}, days to 50% flowering, number of branches/plant, number of siliquae/plant, siliqua length (cm), days to maturity, plant height at maturity (cm), number of seeds/siliquae, 1000 seeds weight (g) and seed yield (kg ha^{+}).

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

Results and Discussion

Weeds density m^{-2}: The weed species infesting the experiment were *Avena fatua, Sorghum helapense, Phalaris minor, Cyperus rotundus, Vicia* sp., *and Anagallis arvensis etc.* The statistical analysis of the data showed that there was a significant effect of different pre-emergence herbicides on weed density m^{-2} (Table 1). Maximum weeds m^{-2} (19.3) were recorded in weedy check. Minimum weeds (2.8 m^{-2}) were recorded in Treflan 4EC treated plots (Khan *et al.,* 1995).

Days to 50% flowering: The comparison of the mean values (Table 1) indicated that maximum days (129) to 50% flowering were recorded in those plots receiving Sencor WP70 while the other treatments were at par with each other. The possible reason for delay in flowering in Sencor WP70 may be due to its phytotoxic effect which was observed during the experiment. Yadav and Shrivastava (1977) reported that some herbicides have phytotoxic effect on canola.

Number of branches/plant: Statistical analysis of the data revealed that different herbicides had significant effect on the number of branches/plant (Table 1). Maximum number of branches/plant (15.32) were recorded where Treflan 4EC herbicide was sprayed, while minimum number of branches/plant (7.55) and (8.07) were recorded in Sencor WP70 and weedy check respectively.

Number of siliquae/plant: Data regarding the effect of different herbicidal treatments on the number of siliquae/plant show that herbicides had significant effect on number of siliquae/plant (Table 1). The highest (616.4) number of siliquae/plant were recorded in those plot, to which Treflan 4EC was applied while lowest (346.8) number of siliquae/plant were noted in those plot, to which Sencor WP70 herbicide was applied. Raghavan and Hariharan (1991); Yadav *et al.* (1995) also reported that the application of Treflan 4EC increased the number of siliquae/plant.

Siliqua length (cm): Statistical analysis revealed significant effect of various herbicidal treatments on siliqua length (Table 1). Maximum siliqua length (8.1) was recorded in Treflan 4EC plots. The minimum siliqua length was observed in Sencor WP70 treated plots (5.5) and weedy check (5.8). These results are in line with those reported by Raghavan and Hariharan (1991).

Days to maturity: Maximum (179.8) days to maturity were recorded for Sencor WP70, while the other treatments were at par with each other (Table 1). The delay in maturity of Sencor WP70 is due to the fact that Sencor WP70 caused injury during the experiment and the crop took some more time to recover (Sharma and Mishra, 1997).

Plant height (cm): All the treatments possessed the comparable height with the weedy check (150) which had the maximum height except Sencor WP70 (135.7) which possessed the shortest plants.

Number of seeds/siliquae: The analysis of the data showed that different herbicidal treatments had significant effect on number of seeds/siliqua (Table 1). The highest (29.1) number of seeds/siliqua was obtained Treflan 4EC treated plots, while the lowest (19.9) number of

Table 1: Means to weeds density m^{-2}, days to 50% flowering, number of branches/plant, number of siliquae/plant, siliqua length (cm), days to maturity, plant height at maturity (cm), number of seeds/siliqua, 1000-seeds weight (g) and seed yield kg ha^{-1} of canola as affected by different pre-emergence herbicides

Treatments	Weeds density (m^{-2})	Days to 50% flowering	Number of branches/ plant	Number of siliquae/ plant	Siliqua length (cm)	Days to maturity	Plant height (cm)	Number of seeds/ siliqua	1000 seed weight(g)	Seed Yield ($kgha^{-1}$)
Treflan 4EC	2.8c	121b	15.32a	616.4a	8.1a	171b	149.9a	29.1a	3.77a	1630a
Dual Gold 960EC	6.2b	120b	10.10b	495.5b	6.4bc	170b	148.9a	24.3b	2.92b	1321b
Stomp 330EC	6.26b	121b	10.13b	492.7b	6.8b	171.3b	147.4a	24.5b	2.90bc	1331b
Sencor WP70	6.70b	129a	7.55c	346.8d	5.5d	179.8a	135.7b	19.9c	2.72cd	1077c
Weedy Check	19.3a	120b	8.07c	389.1c	5.8cd	170.8b	150.1a	20.6c	2.71d	1106c
LSD value at 5%	3.212	2.289	1.716	38.93	0.7749	2.165	2.989	2.080	0.1887	104

Means showing a letter in common in the respective column do not differ significantly ($P \leq 0.05$) by least significant

seeds/siliqua were obtained in Sencor WP70 treated plots and weedy check (20.6) (Raghavan and Hariharan, 1991).

Thousand seed weight (g): The highest (3.77 g) 1000 seeds weight was obtained from Treflan 4EC, while lowest (2.27 g) 1000 seeds weight was obtained from weedy check treated plots which was statistically equal (2.72) with Sencor WP70 (Yadav *et al.*, 1995).

Seed yield (kg ha^{-1}): Analysis of variance of the data exhibited that herbicides had significant effect on the seed yield (Table 1). Maximum seed yield of 1630 kg ha^{-1} was produced by those plots to which Treflan 4EC was applied. Minimum seed yield 1077 kg ha^{-1} was recorded for Sencor WP70 which was at par with weedy check. Khan et al. (1995) reported that application of Treflan 4EC herbicide significantly increased the seed yield of canola. In the light of our data, the herbicide Treflan 4EC is recommended as pre-emergence herbicide @ 1.2 kg a. I ha^{-1} for weed control in canola.

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