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IMPACT OF WEED MANAGEMENT ON RAPESEED*

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ABSTRACT

To study the efficacy of different pre- and post-emergence herbicides for controlling weeds in rapeseed, an experiment was conducted at Chakdara, NWFP during rabi 2002–03. The experiment comprised of nine treatments having seven herbicides, weedy check and hand weeding treatments. The herbicides included trifluralin @ 1.2 kg, pendimethalin @ 1.32 kg and S-metolachlor @ 1.92 kg applied as pre-emergence, while the post-emergence herbicides were clodinafop-propargyl @ 0.05 kg, fenoxaprop-p-ethyl @ 0.75 kg, propaquizafop @ 0.02 kg and oxadiazon @ 0.36 kg a i ha^{-1}. For controlling weeds, pendimethalin proved to be the best, giving only 7.75 weeds m^{-2} followed by trifluralin (8 m^{-2}) and S-metolachlor (12.75 m^{-2}) as compared to weedy check (26 m^{-2}). Similarly, maximum seed yield (2291 kg ha^{-1}), 1000 seeds weight (4.04 g) and number of seeds siliqua^{-1} (25.75) were recorded in pendimethalin treated plots followed by trifluralin (2141 kg ha^{-1}, 3.99 g and 25.50) and S-metolachlor (1950 kg ha^{-1}, 3.88 g and 25.06), respectively.

Key words: Rapeseed, weed control, herbicides.

INTRODUCTION

Rapeseed and mustard is (*Brassica* spp.) belong to family Brassicaceae. They are the main oil producing crops in Pakistan grown in rabi season. They have remained the major sources of edible oil in the subcontinent and China for centuries. Their cultivation goes back to 2000-1500 B.C in the 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 Abbassi, 1994).

The sweet mustard or canola which is a high yielding type of mustard was developed by the Canadian oilseed breeding programme. It has a better taste as well as highest level of unsaturated fatty acid. And thus helps lowering blood cholesterol levels. It is also a rich source of oil and protein and contains more than 40% oil (Weiss, 1983). Canola has recently been introduced in our country to increase the domestic edible oil production. It is rapidly replacing the older varieties of rapeseed and mustard.

The area under rapeseed and mustard in Pakistan during 2001-02 was 268.9 thousand hectares with an average production of 823 kg ha^{-1}. While on provincial level the total area under rapeseed and mustard cultivation in NWFP was 19.3 thousand hectares with

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an average production of 435 kg ha^{-1} during that year (Anonymous, 2002). The low acreage of rapeseed and mustard is partially due to its sowing season which overlaps with the sowing season of the most important cereals like wheat, barley and oats.

As wheat is the staple food crop of nation, lesser attention is given to oilseed crops of rabi season. That is why mustard is only grown on almost rain fed and less fertile areas. As a result not enough edible oil is produced to fulfill the domestic requirement. So edible oil is imported by spending a lot of foreign exchange and now edible oil is the second most important import item after petroleum. Canola, like mustard, is a smother crop because of its larger leaves, rapid growth and early canopy closing. Still weed competition is very critical during the early stand establishment particularly the parasitic weed, *Orobanche* spp. (Joel *et al.* 1995). Besides lowering production weeds also decrease oil quality. Due to smaller seed size of the crop it is difficult to separate weed seeds from it. Several methods have been in use for weed control in canola, like hand weeding, cultivation in row cropping and use of chemicals. But most reliance is made on chemical weed control, as it comparatively more independent of weather, cheap and saves labor. Pre emergence herbicides are more effective than post-emergence or manual control methods (Rapparini, 1996). Khan *et al.* 1995 suggested the use of post emergence with hand weeding if proper pre-emergence herbicide is not available. Keeping in view the importance of the different herbicides for controlling weeds in Rapeseed, the experiment was conducted to figure out the most effective, economical and suitable herbicide for the area concerned.

Materials And Methods

Field trial was conducted on a local variety of *Brassica campestris* at Chakdara, NWFP during rabi season 2002-03, sown on 2.11.2002. The crop was irrigated at 2-3 leaf stage. NPK and micronutrients in liquid form were applied. The experiment was laid out in a randomized complete block (RCB) design with 4 replications. The plot size was 4x3 m^2. Each treatment had 4 rows, 75 cm apart. The detail of treatments is as under:

Table-1. Detail of treatments employed in the experiment

Sr. No	Treatment	Common name	Application time	Rate (kg a.i ha^{-1})
1	Treflan 4 EC	trifluralin	Pre-emergence	1.20
2	Stomp 330 EC	pendimethalin	Pre-emergence	1.32
3.	Dual Gold 960 EC	S-metolachlor	Pre-emergence	1.92
4	Topik 15 WP	clodinafop-propargyl	Post-emergence	0.05
5	Puma super 75 EW	fenoxaprop-p-ethyl	Post-emergence	0.75
6	Agil 100 EC	propaquizafop	Post-emergence	0.02
7	Ronstar 12 L	oxadiazon	Post-emergence	0.36
8	Hand weeding	-	-	
9	Weedy check	-		

Trifluralin was incorporated in to the soil and other pre-emergence herbicides were applied one day after sowing. The post-emergence herbicides were applied at 2-3 leaf stage of the crop after the second application of nitrogen fertilizer. Data were recorded on weed density m^{-2}, dry weed biomass (g m^{-2}), number of branches plant^{-1}, number of siliquae plant^{-1}

siliqua length (cm), plant height at maturity (cm), number of seeds siliqua^{-1},1000 seed weight (g) and seed yield (kg ha^{-1}). The data collected were subjected to ANOVA and the treatment means were separated by LSD test (Steel and Torrie, 1980).

Results and Discussion

Weed Density (m^{-2})

The weeds infesting the crop were *Medicago denticulata, Melilotus parviflora, Euphorbia helioscopia, Sonchus arvense, Vicia sativa, Coronopus didymus, Sinapis arvense, Cyperus rotundus, Leptochloa* sp., *Setaria viridus, Convolvulus arvensis, Chenopodium album, Cynodon dactylon, Bromus tectorum, Anagallis arvensis and Lepidium* sp. The statistical analysis of the data showed that there was significant ($P<0.05$) effect of different herbicides on the weeds density (Table-2). Maximum weeds m^{-2} (26) were recorded in the weedy check. Minimum weeds (7.75 m^{-2}) were recorded in Stomp 330 EC treated plots. However, it was statistically at par with Treflan 4EC (8 m^{-2}), Dual Gold 960EC (12.75 m^{-2}), Topik 15WP (19.25 m^{-2}) and Ronstar 12L (18 m^{-2}). The variability in weed population in different treatments can be attributed to the fact that some herbicides are more effective for weed control than the others. These results are in line with the findings of Khan *et al.* (1995).

Weed Biomass (g m^{-2})

The analysis of variance showed that different herbicidal treatments had significant effect on weed biomass. The data in Table-2 indicated that minimum weed biomass (22.084 g m^{-2}) was found in Stomp 330 EC treated plots. Maximum weed biomass (76.542 g m^{-2}) was obtained in the weedy check. The best treatment is however statistically at par with Treflan 4EC (22.392 g m^{-2}), Dual Gold 960EC (64.667 g m^{-2}) and Agil 100EC (65.459 g m^{-2}). The data describe that all the herbicides have played their role in significantly reducing the weed biomass by comparing their means with the weedy check. These results agree with the work of Rapparini (1996) and Singh *et al.* (1999).

Branches Plant^{-1}

Analysis of the data revealed that different herbicides had significant effect on the number of branches plant^{-1}.The data pertaining to number of branches plant^{-1} as affected by different herbicidal treatments are presented in Table-2. Comparison of the treatment means reflects that maximum number of branches plant^{-1}(6.88) were recorded where Stomp 330EC was sprayed, while minimum number of branches plant^{-1} (5.69) were counted in the weedy check. The number of branches plant^{-1} in the best treatment was statistically equal with Dual Gold 960EC (6.56). The possible reason for increase in number of branches plant^{-1} by Stomp 330EC could be the best control of weeds and consequently increased nutrients availability to the crop while the reason for minimum number of branches plant^{-1} for the weedy check could be attributed to weed competition for nutrients, light, moisture and space. These results are in line with the findings of Larik *et al.* (1999).

Siliquae Plant^{-1}

The analysis of variance of the data exhibited that different herbicides had non-significant effect on the number of siliquae plant^{-1}(Table-2). However, the highest number of siliquae plant^{-1} (286.13) was recorded in Stomp 330EC treated plots while lowest number (216.94) was noted in weedy check. The probable reason for the best performance of

Stomp 330EC could be the most effective weed control. Similar results have been reported by Yadav *et al.* (1995).

Siliquae Length (cm)

The analysis of variance of the data showed that different herbicidal treatments had non-significant effect on siliqua length (Table-2). However, maximum siliqua length (6.80 cm) was recorded in Stomp 330EC. The minimum siliqua length was observed in weedy check (6.30 cm). The maximum siliqua length (6.80 cm) as recorded in Stomp 330EC treatment can be attributed to the best weed management by the treatment which enabled the flow of nutrients into the crop resulting in robust pods. The results are in analogy with the findings of Raghavan and Hariharan (1991).

Plant Height (cm)

In case of plant height, the effect of different herbicides was significant (Table-2). Among all the treatments the Stomp 330EC treated plots possessed the highest plants' height (147.25 cm) while the weedy check had the minimum plant height (131.13 cm). However, Stomp 330EC was statistically at par with all the other herbicidal treatments and hand weeding. The results are in conformity with those of Larik *et al.* (1999).

Seeds Siliqua^{-1}

Number of seeds siliqua ^{1} was significantly affected by various herbicidal treatments. The data in Table-2 exhibited the highest number of seeds siliqua^{-1} (25.75) obtained from Stomp 330EC treatment, while the lowest number of seeds siliqua^{-1} (21.63) was found in the weedy check. The result from the Stomp 330EC treatment (25.75) was however statistically similar with the rest of the herbicidal treatments and hand weeding. Similar result has been reported by Raghavan and Hariharan (1991).

1000 Seed Weight (g)

The analysis of the data showed that herbicides had non-significant effect on thousand seeds weight (Table-2). The maximum thousand seeds weight (4.04 g) was obtained from Stomp 330EC treated plots while the lowest thousand seeds weight (3.74 g) was obtained from the weedy check.

Seed Yield (kg ha^{-1})

Analysis of variance of the data depicted that different herbicides had significant ($P<0.05$) effect on the seed yield. Table-2 shows the effect of different herbicides on the seed yield. Data indicated that maximum seed yield (2291 kg ha^{-1}) was produced by Stomp 330EC treated plots. However, it was statistically at par with Treflan 4EC (2141 kg ha^{-}), Dual Gold (1950 kg ha^{-1}) and hand weeding (1935 kg ha^{-1}). Minimum seed yield (1494 kg ha^{-}) was obtained in the weedy check. The best performance of Stomp 330EC can be attributed to the best weed control. Similar results have been reported by Singh *et al.* (2000).

Table-2. **Efficacy of different herbicides on weeds density and biomass m^{-2} and their impact on yield and yield components of Rapeseed**

Treatments	Weed density m^{-2}	Weed biomass ($g\ m^{-2}$)	Branches $Plant^{-1}$	Siliquae $Plant^{-1}$	Siliqua length (cm)	Plant heigh (cm)	Seeds/ siliqua	1000 seed weight (g)	Seed yield ($kg\ ha^{-1}$)
Treflan 4EC	8.00 c*	22.392 b	6.06 bc	276.44	6.77	145.03 a	25.50 ab	3.99	2141 ab
Stomp 330EC	7.75 c	22.084 b	6.88 a	286.13	6.80	147.25 a	25.75 a	4.04	2291 a
Dual Gold 960 E(	12.75 bc	64.667 ab	6.56 ab	272.31	6.69	144.94 a	25.06 ab	3.88	1950 abc
Topik 15WP	19.25 abc	70.375 a	5.88 bc	247.13	6.42	141.75 ab	24.44 ab	3.76	1796 bcd
Puma super 75W	21.5 ab	76.500 a	6.00 bc	235.56	6.44	140.56 ab	22.13 ab	3.88	1676 cd
Agil 100EC	22.25 ab	65.459 ab	5.81 bc	267.88	6.62	136.66 ab	24.94 ab	3.85	1800 bcd
Ronstar 12 L	18.0 abc	75.600 a	6.00 bc	256.63	6.48	143.45 a	24.38 ab	3.82	1780 bcd
Hand weeding	20.5 ab	75.792 a	6.00 bc	234.75	6.43	138.69 ab	23.31 ab	3.80	1935 abc
Weedy check	26.0 a	76.542 a	5.69 c	216.94	6.30	131.13 b	21.63 b	3.74	1494 d
$LSD_{0.05}$	**11.608**	**46.584**	**0.749**	**NS**	**NS**	**12.255**	**4.043**	**NS**	**370.461**

*Means in the columns followed by different letters are significantly different by LSD at $P<0.05$.
NS=Non Significant

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