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EFFICACY OF SOME PRE AND POST-EMERGENCE HERBICIDES ON YIELD AND YIELD COMPONENTS OF CANOLA

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Abstract

An experiment was conducted at Malakandher Research Farm, NWFP Agricultural University, Peshawar during 2000-2001 using RCB design, having four replications. Dunkled Variety of canola in a plot size of 6x3m² was planted during the last week of October, 2000. The data were recorded on weed density m^{-2}, days to 50% flowering, 1000 seed weight (g) and seed yield (kg ha^{-1}). None of the herbicides except Sencor WP70 had a phytotoxic effect on the crop. All the parameters were significantly affected by different herbicidal treatments. Minimum weeds 3.20 m^{-2} were observed in plots to which Treflan 4EC was applied as compared to 18.83 weeds m^{-2} counted in the weedy check plots. Thousand seed weight (3.68 g) and seed yield (1568 kg ha^{-1}) were also maximum in the plots to which Treflan 4EC was applied as pre-emergence herbicide.

Introduction

Rapeseed and mustard belonging to the genus *Brassica* is a famous member of the family Cruciferae or Brassicaceae. In the 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 N.W.F.P. Rapeseed and mustard have remained one of the major sources of edible oil in the sub-continent and China for centuries. These crops have been cultivated as oilseed crops in this region and other countries (Hatam & Abbasi, 1994).

The canola (*Brassica napus*) developed in western Canadian breeding program is low in erucic acid and glucosinolate. Canola oil has the lowest level of saturated and highest level of mono and poly unsaturated fatty acids. It is known that saturated fats tend to raise blood cholesterol level while mono and poly unsaturated fats have the ability to reduce it (Nowlin, 1991). Canola originated from *B. napus* containing less than 2% erucic acid and less than 851 µmol 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 recently been 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).

One of the main reasons for low acreage of *B. napus* is that its sowing season overlaps with that of wheat. As wheat is the staple food of the nation, lesser attention is devoted to oilseed crops of rabi season. *Brassica* is mostly grown on barani and marginal lands and no improved practices are applied for this crop as most of the farmers are involved in wheat sowing. During 2006-7 canola was planted on an area of 8.7 thousand ha in Pakistan with a seed yield of 879 kg ha^{-1}. A declining trend both in area and production was recorded (Anon., 2007).

Canola is a smother crop, because of its larger leaves, rapid growth and early closing canopies, yet the weed competition is critical during its early stand establishment. Moreover, due to its very small seeds the screening of contaminating weed seeds is extremely difficult. Thus, planting infested seeds of the crop fetches lower prices in the market apart from quantitative losses. The most common weeds of canola are *Melilotus indica, Medicao denticulate, Vicia sativa, Avena fatua, Phalaris minor, Sorghum halepense, Fumaria indica, Convolvulus arvensis and Anagallis arvensis*.

Keeping in view the importance of different herbicides for controlling weeds in canola, the present experiment was carried out with the following objectives:

i. To find out the most suitable herbicide for weed control in canola.
ii. To figure out the effect of different herbicides on yield and yield components of canola.

Materials and methods

Experiment was carried out at Malakandher Research Farm, NWFP Agricultural University, Peshawar during rabi season 2000-2001. Dunkled variety of canola, obtained from the Directorate of Oilseeds, Agricultural Research Institute, Tarnab, Peshawar was planted on 28th October 2000. The seed rate used was 5 kg ha^{-1}. The experiment was laid out in Randomized Complete Block (RCB) design with four replications. There were 10 treatments in each replication. The size of each plot was 6x3 m². Each treatment consisted of 4 rows, 6 m long and 75 cm apart. Detail of the treatments during the study was as following:

Pre-emergence herbicides

Trade name	Common name	Rate (kg ai ha^{-1})
Treflan 4 EC	trifluralin	1.20
Dual Gold 960 EC	s-metolachlor	1.44
Stomp 330 EC	pendimethalin	0.99
Sencor WP70	metribuzin	0.35

Post-emergence herbicides

Ronstar 12 L	oxadiazon	0.36
Fusilade 13EC	fluazifop-butyl	0.26
Topik 15 Wp	clodinafop-propargyl	0.03
Puma super 75 EW	fenoxaprop-p-ethyl	0.75
Agil 100 EC	propaquizafop	0.15
Weedy check	-	-

The data on weeds density m^{-2}, days to 50% flowering, 1000 seed weight (g) and seed yield (kg ha^{-1}) were recorded.

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

Results and Discussion

Weeds density m^{-2}: The weed species infesting the experimental field were *Avena fatua, Sorghum helapense, Phalaris minor, Convolvulus arvensis, Cyperus rotundus, Fumaria* *indica, Vicia sativa*, *Medicago denticulata*, *Rumex crispus* and *Anagallis arvensis* etc. The maximum weeds m^{-2} (18.83) was recorded in the weedy check (Table 1) and minimum in Treflan 4EC (3.20 m^{-2}) treated plots. The density in the best treatment was however statistically at par with Fusilade 13EC (4.77 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. The results are in conformity with those reported by Khan *et al.,* (1995) and Marwat *et al.,* (2005), who stated that Treflan 4EC @ 1-2 liters ha^{-1} in rapeseed and @ 1-1.5 liters ha^{-1} in mustard was the best treatment, significantly reducing the weed density and dry weight.

Days to 50% flowering: The comparison of the mean values (Table 1) indicated that maximum days (129.8) to 50% flowering were recorded in the plots receiving Sencor WP70 treatment while minimum (119.8) days to 50% flowering were recorded in Ronstar 12L treated plots. It was however, statistically at par with Dual Gold 960EC and Puma Super 75EW (120 days) each, Fusilade 13EC (120.8 days), Treflan 4EC (121 days), Stomp 330EC (121.3 days), Topik 15WP (120.8 days) and Weedy check (120.5 days). The possible reason for delay in flowering in Sencor WP70 might be due to its phytotoxic effect on the crop which was observed during the course of experimentation. The phytotoxic effect of different herbicides has also been observed by Yadav & Shrivastava (1997). The shortest duration availed by the Ronstar 12L plots can be attributed to the effective weed management which encouraged the crop growth to consequently attain maturity in a shorter duration.

Thousand seed weight (g): Statistical analysis of the data revealed that herbicides had significant effect on 1000 seed weight (Table 2). The highest (3.68 g) 1000 seed weight was obtained from Treflan 4EC and Fusilade 13EC (3.40 g) plots. It was further observed that the lowest 1000 seed weight (2.72 g) was obtained from Sencor WP70 treated plots, which was statistically equal (2.78 g) to the weedy check plots which in turn was statistically similar with the remaining herbicidal treatments except the top scoring treatments and the Ronstar 12L (3.20 g). The reason for lower seed weight in the Sencor WP70 treated plots might be the injury caused by Sencor WP70 during the experiment while 1000 seed weight increased with application of some herbicides which effectively controlled weeds and did not injure the crop. These results are in conformity with those reported by Singh *et al.,* (2000), Amin *et al.,* (2003), Raghavan & Hariharan (1991) and Yadav *et al.,* (1995) who stated that seed weight increases with the application of some herbicides.

Seed yield (kg ha^{-1}): Maximum seed yield of 1568 kg ha^{-1} was produced by Treflan 4EC treated plots (Table 2). However, it was statistically at par with the Fusilade 13EC (1458 kg ha^{-1}). The Fusilade 13EC was in turn statistically similar with Ronstar 12L (1346 kg ha^{-1}), Topik 15WP (1365 kg ha^{-1}), Puma Super 75EW (1376 kg ha^{-1}) and Agil 100EC (1341 kg ha^{-1}). Minimum seed yield of 1077 and 1155 kg ha^{-1} was obtained in Sencor WP70 treated and weedy check plots, respectively. Grain yield significantly increased with the application of Treflan 4EC and Fusilade 13EC herbicides. These findings are in conformity with those reported by Marwat *et al.,* (2005) and Khan *et al.,* (1995) who found that the application of Treflan 4EC @ 1-2 liters ha^{-1} in rapeseed and @ 1-1.5 liters ha^{-1} in mustard significantly increased the grain yield. The minimum grain yield for Sencor WP70 treated plots is due to the inhibitory effect of Sencor WP70. Sharma & Mishra (1997) have also reported phytotoxicity on crop due to some herbicides in their studies on rapeseed.

Table 1. Weeds density m^{-2} and days to 50% flowering as affected by different herbicide treatments in canola.

Treatments	Weeds density m^{-2}	Days to 50% flowering
Treflan 4EC	3.20 d*	121.0 bc
Dual Gold 960EC	6.10 bc	120.0 c
Stomp 330EC	6.27 bc	121.3 bc
Sencor WP70	6.70 bc	129.8 a
Ronstar 12L	7.37 b	119.8 c
Fusilade 13EC	4.77 cd	120.8 bc
Topik 15WP	7.70 b	121.0 bc
Puma Super 75EW	7.07 bc	120.0 c
Agil 100EC	8.07 b	122.5 b
Weedy Check	18.83 a	120.8 bc
$LSD_{0.05}$	2.493	2.239

*Means followed by different letters in the respective column are significantly different by Fisher's Protected LSD test at $p \leq 0.05$.

Table 2. Thousand grain weight (g) and seed yield (kg ha^{-1}) as affected by different herbicide treatments in canola.

Treatments	Thousand grain weight (g)	Grain yield (kg ha^{-1})
Treflan 4EC	3.68 a*	1568 a
Dual Gold 960EC	2.93 cd	1321 c
Stomp 330EC	2.91 cd	1331 c
Sencor WP70	2.72 d	1077 d
Ronstar 12L	3.20 bc	1346 bc
Fusilade 13EC	3.40 ab	1458 ab
Topik 15WP	2.92 cd	1365 bc
Puma Super 75EW	2.93 cd	1376 bc
Agil 100EC	2.92 cd	1341 bc
Weedy Check	2.78 d	1155 d
$LSD_{0.05}$	0.371	122.87

*Means followed by different letters in the respective column are significantly different by Fisher's Protected LSD test at $p \leq 0.05$.

Conclusions

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 which consequently increased yield of canola. However, the herbicide Fusilade 13EC is equally effective when there is a preponderance of grassy weeds infesting the crop.

References

Amin, R., S.K. Khalil and M. Asim. 2003. Phenological development and weeds dry matter production in canola as affected by pre and post emergence herbicides and row spacing. *Pak. J. Weed Sci. Res*., 9(3&4): 201-208.

Anonymous. 2007. *Agricultural Statistics of Pakistan*. Ministry of Food, Agriculture and Livestock, Govt. of Pak., Islamabad.

Hatam, M. and G.Q. Abbassi. 1994. *Oilseed Crops Production Book* p. 329-389. First Edition (1994). Managing author Shafi Nazir (Eds.): Elena Bashir & Robyn Bantel. National Book Foundation, Islamabad.

Khan, R.U., N.A. Khan, A. Mumtaz and M. Ahmad. 1995. Performance of Treflan: a preplant applied herbicide in rapeseed and mustard. *Sarhad J. Agric*., 11(5): 647-655.

Marwat, K.B., M. Saeed, B. Gul and Z. Hussain. 2005. Efficacy of different pre and post-emergence herbicides for weed management in canola in higher altitudes. *Pak. J. Weed Sci. Res*., 11(3-4): 165-170.

Nowlin, O. 1991. *Winter Canola*: Agriculture consultants 47(4): 8. Reported in M.Sc. (Hons) Thesis, Deptt. Agron. Agri. Univ., Faisalabad.

Raghavan, K. and N.M. Haribara. 1991. Effect of 2,4-D pre-sowing seed treatment on growth and yield of *Brassica juncea* (L.) Cosson. *Acta Botanica Indica,* 19(10): 13-17. [Weed Absts., 41: 1809; 1992].

Sharma, S.N. and P.J. Mishra. 1997. Effect of weed control methods on weed, crop growth and yield of Indian mustard *Brassica juncea* (L.) Czernj & Cosson varieties. *Envir. & Ecol*., 15(3): 511-514.

Singh, S.K., N.K. Jain and B.L. Poonia. 2000. Integrated weed management in Indian mustard *(Brassica juncea). Indian J. Agric. Sci*., 70(12): 850-852.

Steel, R.G.D. and J.H. Torrie. 1980. *Principles and Procedures of Statistics*. McGraw Hill Book Co., Inc. New York. 481. pp.

Weiss, E.A. 1983. Rapeseed. In: Oil Seed Crops. Longman Group Publishers, New York. p. 161-215.

Yadav, R.P. and U.K. Shrivastava. 1997. Chemical weed control in mustard (*Brassica juncea*). *Agric. Sci. Digest Karnal*, 17(1): 47-50.

Yadav, R.P., U.K. Shrivastava and K.S. Yadav. 1995. Yield and economic analysis of weed-control practices in Indian mustard (*Brassica juncea*). *Indian J. Agron*., 40(1): 122-124.

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