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EVALUATING CLOPYRALID AS A BROAD LEAF HERBICIDE IN CANOLA FIELDS OF IRAN

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ABSTRACT

Efficacy of clopyralid to control weeds of the Umbelliferae, Asteraceae, Papilionaceae, Polygonaceae and Poaceae families was tested in canola fields of Fars, Golestan and Khuzestan Provinces, Iran, during 2005. Treatments included post-emergence application of clopyralid at 0.12, 0.18, and 0.24 kg ha^{-1} when broadleaf weeds of above families were at 6-leaf stage; pre plant incorporation of trifluralin at 0.96 kg ha^{-1}; trifluralin + clopyralid at times and doses mentioned above and weed-free check. All treatments were sprayed with cycloxidim against grassy weeds (2-6 leaf stage) at the rate of 0.2 kg ha^{-1}. Results showed that 0.24 kg of clopyralid could control Malva sylvestris by 76%, Melilotus spp. by 87%, Ammi majus by 90%, Silybum marianum by 94%, Cardauus pycnocephalus by 95% and Polygonum sp. by 94%. Combination of clopyralid with trifluralin did not affect percentage control of above weeds, or much effect on yield.

Key words: Canola, clopyralid, trifluralin, cycloxidim

INTRODUCTION

There are several species of weeds that dominate canola fields of Iran. Many of these weeds belong to the families, *Umbelliferae*, Asteraceae, *Papilionaceae*, *Poaceae* and *Polygonaceae* which include *Vicia* spp., *Medicago* spp., *Melilotus* spp., *Ammi majus*, *Pimpinella* spp., *Sonchus* spp., *Lactuca* spp., *Cardauus* spp., *Silybum marianum* , *Cirsium arvense* and *Polygonum* spp. Besides some grass killers that are recommended in Iranian canola fields, the only recommended herbicide that can control broad leaf weeds is trifluralin (Mossala-Nejad *et al.*, 2002) which is not able to control the above weeds except *Polygonum* spp. Shimi *et al.*, 2003, have reported that 0.18 kg ha^{-1} of clopyralid was able to control above weeds at 10-15 leaf stage, except for *Silybum* sp., *Cirsium* sp., *Melilotus* spp. and *Medicago* spp. whose growth was stopped but not completely controlled. Clay and Dixon (1998), have reported that to control *Silybum* sp. and *Cirsium* sp. with clopyralid, a second spray in the spring is necessary and that the weeds should not be older than six leaves. Shimi *et al.*, 2003, have claimed that *Convolvulus arvensis* is also controlled by clopyralid, but it can re-grow with no real harm to canola. Shimi *et al.*, 2005, have reported that 0.24 kg ha^{-1} of clopyralid was able to control *Melilotus* sp. and *Medicago* sp Clopyralid can control *Matricaria* sp.and *Papaver* sp. (Ziminska *et al.*, 1997). Laureti *et al.*,1989 have reported that canola is resistant to clopyralid, and Jewel, 1990, believes that clopyralid is a suitable broad leaf killer for canola fields. Blackshaw (1992), has written that clopyralid may be mixed with

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sethoxidim, a grass killer. Blackshaw (1989), has reported that clopyralid controls *Polygonum* sp in canola fields. This weed is very common in canola fields of Qom Lorestan and Golestan province Bowerman (1990) reported that dosages of over 0.3 kg ha^{-1} of clopyralid can damage canola crop. Clay and Dixon, 1998 and Zarnstorff *et al.*, (1996) have referred to the usage of clopyralid in canola fields. Clopyralid has been registered for use on canola fields of Canada at 0 15 kg ha^{-1} when canola is at 4-10 leaf stage (Loeppy and Blackshaw, 1994). Knott *et al.* (1995), are the view that clopyralid is regularly used in canola fields of England and Wales. It is also registered for use in canola fields of Czechoslovakia, Poland and Croatia. Technically, Clopyralid is a synthetic auxin pyridinecarboxylic acid, systemic and selective herbicide which is absorbed by the leaves and roots, with translocation acropetally and basipetally, and accumulation in meristematic tissue (Tomlin, 2004). It acts on cell elongation and respiration Acute oral LD_{50} for male rats is 3738 mg kg^{-1} and field dissipation DT_{50} is 8-66 days (Tomlin, 2004)

MATERIALS AND METHODS

The experiments were carried out in Kuzestan, Fars and Golestan provinces during 2005. The trial were laid in Randomized Complete Block Design with four replications and plot size of 10 x 3 m^2 m The experiment comprised of seven treatments which included spray application of 0 12.0 18, and 0 24 kg ha^{-1} clopyralid, at the six leaf stage of broad leaf weeds. 0.96 kg ha^{-1} trifluralin pre plant incorporated (ppi) to 10 cm depth of soil, trifluralin ppi @0 96 kg ha^{-1} + 0.12, 0.18 and 0.24 kg ha^{-1} clopyralid at the times recommended above. A knapsack sprayer with a flat nozzle was used for herbicide treatments in 300 L ha^{-1} of water. Irrigation water was set such that out-going water from one plot would not enter any other plot.

Each plot was divided into two equal parts. The upper part of the plot was considered as weedy check of that plot and the lower part was treated as mentioned above Data collected from each treatment was calculated as percentage of the weedy section Two fixed 1x1m^2 quadrates were set in each section and all weed data which included weed number, 30 days after treatment, and, weed dry weight, before harvest, were collected from these quadrates. Canola yield was determined from a 2 m^2 area in the middle of each section, not including the quadrate area.

Canola varieties used in these experiments included Hyola 405 in Khuzestan, Licord in Fars and Hyola 405 in Golestan. Data were analyzed statistically using SAS soft-wear and mean comparison were performed using Duncan's Multiple Range Test (DMRT) Data for each province was analyzed separately because weed species varied in all provinces

RESULTS AND DISCUSSION

Results of the experiment are summarized in Table-1 The data reveals that in Golestan, the best treatments to control *M. officinalis* in the province was 0 18 and 0 24 kg ha^{-1} of clopyralid with or without trifluralin. We can thus conclude that clopyralid at above dose can control this weed by about 80-90%. In the same province, clopyralid at 0.24 kg ha^{-1}controlled *Polygonum* spp. by 92%. Combined with trifluralin, clopyralid controlled the weed by 85% (0 18 kg ha^{-1}) and 87% (0.24 kg ha^{-1}) [Table-1]

The highest canola yield was observed in Clopyralid at 0.24 kg ha^{-1} and Clopyralid 0 18 kg ha^{-1}+ trifluralin treatments

In Fars, the highest control of *Cardauus picnocephallus* occurred at all doses of clopyralid and the higher dose of clopyralid + trifluralin. In these treatments, the weed was controlled 87-95%. Highest canola yield was detected in the 0.18 kg ha^{-1} dose of clopyralid, or clopyralid 0.24 kg ha^{-1}+ trifluralin.

In Khuzestan, clopyralid at 0.18 and 0.24 kg ha^{-1}, with or without trifluralin could control *Ammi majus* 87-90%, *Melilotus* spp. 82-87% and *Silybum marianum* by 87-94%. The best treatment to control *Malva* spp. was the higher dose of clopyralid + trifluralin. The highest yield was obtained from treatments clopyralid 0.18 and 0.24 kg ha^{-1}+ trifluralin.

There is no doubt that clopyralid is an effective broad-leaf post-emergent herbicide in canola fields. Dosage is dependant on the species of weeds present. According to above trials, 0.12 kg ha^{-1} of this herbicide could control *Cardauus picnocephallus*, while 0.18 kg ha^{-1} was able to control *Melilotus* spp. and *Silybum marianum*; *Malva* spp.was best controlled by 0.24 kg ha^{-1}. Shimi *et al.*(2005) have reported that the lowest dose of clopyralid that has been able to control *Melilotus officinalis* and *Silybum marianum* in the northern province of Golestan is 0.24 kg ha^{-1}. In another experiment performed by Shimi *et al.*2005 in Fars province (southern Iran), *Vicia* spp. was controlled by 0.18 kg $ha^{-1}$of clopyralid.

Data indicates that combining clopyralid with trifluralin does not have much effect on yield. Therefore, when you intend to spray clopyralid in your canola field, you need not use trifluralin.

Table-1. Percentage control of weeds (dry wt.),as compared to weedy check of each plot, and canola seed yield (%increase relative to weedy checkof each plot) in different provinces and treatments.*

Treatments Kg ha^{-1}	Golestan province			Fars province		Khuzestan pronince				
	Mellilotus officinalis	*Polygonum* spp.	% Canola yield increase	*Carduus picnocephallus*	% Canola yield increase	*Ammi majus*	*Mellilotus* sp.	*Silybum marianum*	*Malva* sp.	% Canola yield increase
Clopyralid 0.12	49 b	63 cd	7 e	87 a	54 b	25 b	28 b	14 c	42 c	45 c
Clopyralid 0.18	73 a	46 d	15 bc	93 a	61 a	90 a	82 a	87 a	70 b	64 ab
Clopyralid 0.24	84 a	92 a	19 a	95 a	52 b	90 a	86 a	94 a	76 ab	64 ab
Trifluralin .96	41 b	46 d	9 de	7 c	4 c	5 c	31 b	28 b	5 d	32 d
Trifluralin .96 + Clopyralid 0.12	57 b	52 cd	13 c	77 b	48 b	30 b	20 b	13 c	36 c	53 bc
Trifluralin .96 + Clopyralid 0.18	76 a	85 ab	18 ab	77 b	54 b	87 a	83 a	89 a	75 ab	68 a
Trifluralin .96 + Clopyralid 0..24	79 a	87 ab	21 a	95 a	67 a	89 a	87 a	91 a	88 a	68 a

*In the same column, values followed by the same letter are not significantly different according to DMRT at P≤0.01.

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