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RESEARCH PAPER

Influence of metribuzin on weed density and yield of soybean (*Glycine max* L.) under rainfed condition of Vidisha district of Madhya Pradesh

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Abstract : A field experiment was conducted at College of Agriculture, Ganjbasoda during *Kharif* season of 2016, in Randomized Block Design with three replications to find out the effect of new formulation of metribuzin on weeds of soybean (*Glycine max* L.). The population of weeds differed significantly due to weed control treatments. Highest weed control efficiency was recorded with treatment metribuzin 70 WG (Triazinone herbicide) @ 0.525 kg a.i/ha followed by metribuzin 70 WG (Triazinone herbicide) @ 0.385 kg a.i/ha and metribuzin 70 WG (Triazinone herbicide) @ 0.350 kg a.i/ha. application of metribuzin 70 WG (Triazinone herbicide) @0.525 kg a.i/ha produced maximum seed yield followed by metribuzin 70 WG (Triazinone herbicide) @ 0.385 kg a.i/ha, metribuzin 70 WG (Triazinone herbicide) @ 0.350 kg a.i/ha.

Key Words : Metribuzin, Weed control treatments, Soybean

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INTRODUCTION

Soybean (*Glycine max* L.) is a highly nutritive and energy rich legume with biologically effective protein (43 %) and edible oil (20 %), besides the presence of good amount of vitamins, minerals, salts and essential amino acids. It serves as both pulse and oil seed crop and gives 2-3 times more protein yield than other pulses (Ali, 1992). Being a legume, it fixes atmospheric nitrogen and adds about 65-100 kg N/ha/ year to the soil which helps increase the yields of following non-legume crops (Fujitha *et al*., 1992). This crop has gained considerable importance in the agricultural economy of the country. There are several constraints in the soybean production one of them is weeds. Heavy infestation of weeds comprising of grasses, broad leaved weeds and sedges poses a big challenge for soybean production in India. Initial slow growth of soybean coupled with little lateral spread increases opportunity for weeds to easily occupy vacant space between rows and offer serious competition with soybean. Besides, good sunshine and intermittent rains during *Kharif* season provides congenial

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environment for excessive growth of weeds. The yield loss due to weed infestation in soybean was to the tune of 20-77 per cent (Muniyappa *et al*., 1986; Tiwari and Kurchania, 1990 and Kurchania *et al*., 2001).

Manual weeding is effective but it is cumbersome, time consuming and uneconomical due to continuously increasing cost and unavailability of laborers during peak periods of crop cultivation, while mechanical means generally lead to root injury (Casarini *et al.*, 1996). In this context, use of herbicide is better alternative which is cost effective, efficient and more convenient for timely control of weeds and to avoid yield losses. Metribuzin is a broad spectrum herbicide with higher selectivity to soybean. Recently, new formulation of metribuzin has been tested. However, its doses are to be tested for effective control of weeds in soybean crop.

MATERIAL AND METHODS

Field experiment was carried out during *Kharif* season of 2016 at College of Agriculture, Ganjbasoda. Ten treatments *viz.*, metribuzin 70 WP (Sample from imported technical) @ 0.350 and 0.525 kg a.i/ha, metribuzin 70 WG (Triazinone herbicide) @ 0.175, 0.350, 0.385 and 0.525 kg a.i/ha, metribuzin 70 WP (Market sample) @0.350 and 0.525 kg a.i/ha, imazethapyr 10% SL @ 0.1 kg a.i/ha and untreated control were tested in Randomized Block Design with three replications. Application of herbicides as per the treatment was made with knapsack sprayer using 700 litres of water/ha. Soybean variety JS 95-60 was treated with bavistin @ 2.5 g/kg of seed and sown on 22nd July, 2016 at 35 cm apart using 100 kg seed/ha. The crop was harvested on 16th October, 2016. Total rainfall received during the growing period of crop was 952.80 mm. Pre- emergence application of metribuzin was done on two days after sowing (DAS) and post-emergence application of imazethapyr was done 18 DAS. Weed population was recorded by using 0.25 m^2 quadrate at 60 DAS in all the treatments and then converted into number of weeds/ m^2. The weeds were dried in oven till a constant weight was observed and then converted in to kg/ha. The data on total weed count were subjected to square root transformation (x + 0.5) to normalize their distribution (Gomez and Gomez, 1984). Weed control efficiency (Mani *et al*., 1973) was worked out by given formula:

$$WCE = \frac{DWC - DWT}{DWC} x100$$

where, WCE is weed control efficiency, DWC is dry weight of weed in control plot and DWT is dry weight of weed in treated plot.

RESULTS AND DISCUSSION

The experiment field was infested with grassy, broad leaf weeds and sedges. Among the grassy weeds, *Echinochloa crusgalli* (18.73 %) was most dominant weed. Dominant broad leaf weeds that invade the field were *Parthenium hysterophorous* (23.21 %), *Celotia argentia* (17.26 %) and other weeds (13.48 %). Besides, grassy and broad leaf weeds, *Cyperus rotundus* (27.32 %) was the only sedge present in the experimental field.

Effect on weeds :

Echinochloa crusgalli :

The population of weeds differed significantly due to weed control treatments (Table 1). The lowest density of *Echinochloa crusgalli* was recorded under treatment of metribuzin 70 WG (Triazinone herbicide) @ 0.525 kg a.i/ha while untreated control had significantly maximum density. Kewat and Pandey (2001) reported a pre-emergence application of metribuzin at 0.5 and 0.75 kg/ ha effectively controlled most of the dominant weeds.

Other grassy weeds:

The lowest weed density was recorded under metribuzin 70 WG (Triazinone herbicide) @ 0.525 kg a.i/ha which was at par to all the treated plots. All the treatments were at par with each other except untreated control.

Parthenium hysterophorous :

The population of this weed differed significantly due to weed control treatments. The lowest weed density of this weed was recorded under metribuzin 70 WG (Triazinone herbicide) @ 0.525 kg a.i/ha which was at par to all treatments except imazethapyr 10% Sl @ 0.1 kg a.i/ha and untreated control. Treatment of metribuzin 70 WP (Sample from imported technical) @ 0.350 and 0.525 kg a.i/ha was at par to metribuzin 70 WP (Market sample) @ 0.350 and 0.525 kg a.i/ha.

Celotia argentia:

The intensity of this weed was recorded minimum with metribuzin 70 WG (Triazinone herbicide) @ 0.525 kg a.i/ha. It was observed that all treated plots were at par with each other except untreated control.

Other broad leaf weeds :

The density of other broad leaf weeds was lowest under metribuzin 70 WP (Sample from imported technical) @ 0.525 kg a.i/ha followed by metribuzin 70 WP (Sample from imported technical) @ 0.350 kg a.i/ ha. All the treatments were at par with each other except untreated control.

Table 1 : Density of different weeds at 60 days after sowing as influenced by different weed control treatments in soybean

Treatments	Dose/ha (kg)	Density of different weeds (No./ m^2)					
	a.i	*Echinochloa crusgalli*	Other grassy weeds	*Parthenium hysterophorus*	*Celotia argentia*	Other broad leaved weeds	*Cyperus rotundus*
Metribuzin 70 WP (Sample from imported technical)	0.350	1.55 (1.90)	1.95 (3.30)	1.65 (2.22)	1.63 (2.16)	2.20 (4.34)	4.01 (15.58)
Metribuzin 70 WP (Sample from imported technical)	0.525	1.76 (2.60)	1.86 (2.96)	1.60 (2.06)	1.60 (2.06)	2.17 (4.21)	3.97 (15.26)
Metribuzin 70 WG (Triazinone herbicide)	0.175	1.59 (2.03)	1.97 (3.38)	1.58 (2.00)	1.59 (2.03)	2.36 (5.07)	3.94 (15.02)
Metribuzin 70 WG (Triazinone herbicide)	0.350	1.53 (1.84)	1.94 (3.26)	1.49 (1.72)	1.49 (1.72)	2.27 (4.65)	3.89 (14.63)
Metribuzin 70 WG (Triazinone herbicide)	0.385	1.50 (1.75)	1.83 (2.85)	1.39 (1.43)	1.52 (1.81)	2.41 (5.31)	3.97 (15.26)
Metribuzin 70 WG (Triazinone herbicide)	0.525	1.45 (1.60)	1.795 (2.70)	1.28 (1.14)	1.44 (1.57)	2.26 (4.61)	3.84 (14.25)
Metribuzin 70 WP (Market sample)	0.350	2.07 (3.78)	2.01 (3.54)	1.79 (2.70)	1.73 (2.49)	2.44 (5.45)	4.04 (15.82)
Metribuzin 70 WP (Market sample)	0.525	1.98 (3.42)	2.05 (3.70)	1.77 (2.63)	1.70 (2.39)	2.36 (5.07)	3.97 (15.26)
Imazethapyr 10%SL	0.1	1.70 (2.39)	2.39 (5.21)	1.88 (3.03)	1.79 (2.70)	2.81 (7.40)	5.27 (27.27)
Untreated control	-	3.46 (11.47)	3.55 (12.10)	3.09 (9.05)	2.26 (4.61)	3.20 (9.74)	9.34 (86.74)
S.E.±	-	0.22	0.22	0.18	0.14	0.12	0.98
C.D. (P=0.05)	-	0.65	0.63	0.54	0.41	0.36	2.87

Figures in parenthesis are original values and transformed $\sqrt{x+0.5}$ to for analysis

Table 2 : Weed dry weight, weed control efficiency and seed yield of soybean as influenced by different weed control treatments

Treatments	Dose/ha (kg) a.i	Weed dry weight at harvest (kg/ha)	WCE (%)	Seed yield (q/ha)
Metribuzin 70 WP (Sample from imported technical)	0.350	149.8	68.15	7.15
Metribuzin 70 WP (Sample from imported technical)	0.525	141.9	69.82	7.75
Metribuzin 70 WG (Triazinone herbicide)	0.175	139.5	70.34	8.50
Metribuzin 70 WG (Triazinone herbicide)	0.350	137.1	70.85	8.90
Metribuzin 70 WG (Triazinone herbicide)	0.385	133.7	71.57	9.65
Metribuzin 70 WG (Triazinone herbicide)	0.525	126.5	73.09	11.20
Metribuzin 70 WP (Market sample)	0.350	170.1	63.81	6.80
Metribuzin 70 WP (Market sample)	0.525	162.7	65.40	6.95
Imazethapyr 10%SL	0.1	173.4	63.12	6.75
Untreated control	-	470.2	-	3.25
S.E.±	-	3.08	-	1.18
C.D. (P=0.05)	-	9.01	-	3.45

Cyperus rotundus:

Minimum population of this weed was found under metribuzin 70 WG (Triazinone herbicide) @ 0.525 kg a.i/ha which was at par to all treatments except untreated control.

Weed dry weight:

Data related to weed dry weight at harvest stage as affected by different treatments are given in Table 2. It is evident from the data that all the treated plots significantly reduced the weed dry weight over untreated control. Among the treated plots, the lowest weed dry weight was recorded under metribuzin 70WG (Triazinone herbicide) @ 0.525 kg a.i/ha which was at par to metribuzin 70 WG (Triazinone herbicide) @ 0.385 kg a.i/ha and metribuzin 70 WG (Triazinone herbicide) @ 0.350 kg a.i/ha. Singh *et al.* (2001) reported drastic reduction in dry matter production of weeds at all the doses (0.350, 0.525 and 0.700 kg/ha) of metribuzin applied as pre-emergence or early post-emergence. The highest weed dry weight was recorded under untreated control which was differed significantly with all the remaining treatments.

Weed control efficiency:

Highest weed control efficiency was recorded with treatment metribuzin 70 WG (Triazinone herbicide) @ 0.525 kg a.i/ha followed by metribuzin 70 WG (Triazinone herbicide) @ 0.385 kg a.i/ha and metribuzin 70 WG (Triazinone herbicide) @ 0.350 kg a.i/ha. Singh *et al.* (2006) reported highest weed control efficiency (91 %) with metribuzin 0.5 kg/ha followed by chlorimuron 0.01 kg/ha (88 %), imazethapyr 0.07 kg/ha (83 %) and oxyflurfen 0.20 kg/ha (82%), respectively at 45 DAS in soybean.

Seed yield:

Seed yield significantly varied due to different treatments. All the treated plots significantly produced higher seed yield than untreated control. This was due to better suppression of weeds, more availability of nutrients, production of higher crop growth and favourable influence on sink capacity and its effective translocation towards the maximum seed. The data of Table 2 revealed that application of metribuzin 70 WG (Triazinone herbicide) @0.525 kg a.i/ha produced maximum seed yield followed by metribuzin 70 WG (Triazinone herbicide) @ 0.385 kg a.i/ha, metribuzin 70 WG (Triazinone herbicide) @ 0.350 kg a.i/ha. The lowest seed yield was obtained from untreated control. Application of metribuzin at 0.7 kg/ha as pre-emergence reduced weed biomass and nutrient uptake by weeds and increased yields during rainy and winter seasons (Jeyabal *et al*., 2001).

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