Andhra Pradesh J Agril. Sci : 6(2): 75-80, 2020

CHEMICAL WEED CONTROL IN BROADCASTED SESAME

E. ARUNA*, G. KARUNA SAGAR AND A. PRATAP KUMAR REDDY

Agricultural Research Station, Utukur, Kadapa, Andhra Pradesh.

Date of Receipt: 11-03-2020 Date of Acceptance: 13-05-2020

ABSTRACT

A field experiment was conducted at Agricultural Research Station, Utukur, Kadapa, Andhra Pradesh during summer season of 2018 to test the efficiency of pendimethalin, quizalofop ethyl and metribuzin herbicides in broadcasted sesame. The experiment comprised of ten treatments laid out in a randomized block design with three replications. Among the different herbicides tested pre emergence application of pendimethalin @ 0.75 kg ha^{-1} and post emergence application of quizalofop ethyl @ 0.05 kg ha^{-1} at 20 DAS recorded lower weed density and dry weight. Quizalofop ethyl was effective in controlling annual grasses only. Application of metribuzin though controlled weeds it caused phytotoxicity to sesame crop.

KEYWORDS: Broadcasted sesame, metribuzin, pendimethalin, quizalofop ethyl, weed control

INTRODUCTION

Sesame (*Sesamum indicum* L.) is the most conventional oilseed crop which is known as the 'Queen of oil seeds' due to its high oil content (50% - 60%). Among the several constraints in sesame production, heavy weed infestation is one of the major factors limiting the yield. Babiker *et al*. (2014) reported that unrestricted weed growth reduced sesame seed yield by 30 per cent and keeping the sesame crop weed free for 2, 4, 6 and 8 weeks after planting increased the seed yield by 8, 37, 40 and 43 per cent respectively. The critical period of weed control in sesame appeared to be between 2 and 6 weeks after planting. Zuhair *et al*. (2011) found that insufficient weed control during the early growth period of sesame caused 35 to 70 per cent yield reduction and they added that the critical period of weed control in sesame is 2 to 3 weeks after crop emergence. Pre-emergence application of pendimethalin 1000 g ha^{-1} is recommended for line sown sesame to control the weeds but the selectivity of pendimethalin is mainly depends on soil type and depth of sowing of crop. In broadcasted sesame, most of the crop seeds are placed at shallow depth, hence applied pre-emergence herbicides comes in close contact with crop seeds resulting in phytotoxicity or stand loss of sesame. There is a critical need to find suitable herbicides which can be used in sesame cultivation to extend weed control especially during the early stages of crop growing season. In order to achieve the broad spectrum and season long weed control in broadcasted sesame, the present experiment was undertaken to identify the suitable pre and post - emergence herbicides.

MATERIAL AND METHODS

A field experiment was conducted at Agricultural Research Station, Utukur, Kadapa of Acharya N.G Ranga Agricultural University during summer season of 2018 to evaluate the different pre and post-emergence herbicides on broadcasted sesame. The soil of the experimental field was sandy loam in texture, low in organic carbon, high in available nitrogen, available phosphorus and medium in available potassium with a soil PH of 7.9. There were ten treatments *viz.*, pendimethalin 0.75 kg ha^{-1} as PE, pendimethalin 0.75 kg ha^{-1} as PE *fb* metribuzin 0.35 kg ha^{-1} at 20 DAS, pendimethalin 0.75 kg ha^{-1} as PE *fb* quizalofop-ethyl 0.050 kg ha^{-1} at 20 DAS, pendimethalin 0.75 kg ha^{-1} as PE *fb* metribuzin 0.35 kg ha^{-1} + quizalofop-ethyl 0.050 kg ha^{-1} at 20 DAS, quizalofop-ethyl 0.050 kg ha^{-1} at 20 DAS, metribuzin 0.35 kg ha^{-1} at 20 DAS, metribuzin 0.35 kg ha^{-1} + quizalofop-ethyl 0.050 kg ha^{-1} at 20 DAS, pendimethalin 0.75 kg ha^{-1} as PE + hand weeding at 30 DAS, hand weeding at 15 and 30 DAS and Weedy check in randomised block design with three replications. The sesamum variety "*YLM – 66*" was sown on 09-01-2018 in a plot of size 4.8 m × 3.6 m. The recommended dose of 60, 20 and 20 kg N, P_2O_5 and K_2O ha^{-1} was applied in the form of urea, single super phosphate and muriate of potash respectively. The half of the dose of nitrogen along with entire dose of phosphorus and potassium was applied as

*Corresponding author, E-mail: arunaettapu@gmail.com

basal at the time of sowing and the remaining half of the dose of nitrogen was top dressed at 30 DAS. The crop was irrigated whenever needed. Pre emergence herbicide was applied one day after sowing of the sesame crop and post emergence herbicides were applied at 20 days after sowing.Weed density of narrow , broad leaved weeds and sedges was taken at 15 and 30 days after application of herbicides and subjected to square root transformation during statistical analysis.

RESULTS AND DISCUSSION

The dominant weed flora of the experimental field were *Cyperus rotundus, Digera arvensis, Phyllanthus maderaspatensis* and *Trichodesma indicum, Panicum repens and Dactyloctenium aegyptium.*

Effect on weeds

The data on weed density at 15 and 30 days after application of post emergence herbicides was given in Table 1. Application of pre emergence herbicide alone (pendimethalin @ 0.75 kg ha^{-1}) controlled weeds at initial stages but some weeds like *Phyllanthus maderaspatensis*, *Trichodesma indicum* were not controlled by pendimethalin. Similarly application of post emergence herbicide quizalofop ethyl @ 0.050 kg ha^{-1} alone controlled grasses effectively but broad leaved weeds became a menace at 15 and 30 days after application of herbicides. Hence, there is a need to apply both pre and post emergence herbicides for effective control of weeds during critical stages. Application of metribuzin @ 0.350 kg ha^{-1} not only controlled all the weeds but also caused phytotoxicity to sesame to the extent of 7 scale and is not a viable option to use in the sesame. Sedges were not efectively controlled by any of the herbicides tested.

Higher weed dry weight at 15 days after application of herbicides was recorded with weedy check (Table 2) followed by pre emergence application of pendimethalin alone and post emergence application of quizalofop ethyl alone at 20 DAS. Similarly at 30 DAA also, higher weed dry weight was with weedy check followed by only post or pre emergence application of herbicides. All post emergence herbicides that control broadleaf weeds in sesame have caused some sesame injury or yield reduction (Grichar *et al*., 2001). For broadleaf weed problems in sesame, the use of soil-applied herbicides still appears to be the only option (Grichar *et al*., 2011). Higher weed control efficiency at 45 DAS was observed with application of Pendimethalin @ 0.75 kg ha^{-1} as PE *fb* metribuzin @ 0.350 kg ha^{-1} + quizalofop ethyl @ 0.050 kg ha^{-1} at 20 DAS. But wherever metribuzin was applied, phytotoxicity of sesame was observed. At 65 DAS, higher weed control efficiency was observed with pre-emergence application of pendimethalin followed by hand weeding at 25 DAS and hand weeding at 15 and 30 DAS.

Effect on crop

Significantly higher plant height was recorded with hand weeding at 15 and 30 DAS. Higher number of branches per plant was recorded with pre emergence application of pendimethalin + post emergence application of quizalofop ethyl at 20 DAS. Capsule length was not affected by weed control treatments. Higher number of capsules per plant was recorded with application of both pre and post emergence herbicides followed by hand weeding. Number of seeds per capsule and 1000 seed weight were not affected by weed control treatments. Higher seed yield was recorded in hand weeding twice at 15 and 30 DAS (874 kg ha^{-1}) which was twice as compared to weedy check (430 kg ha^{-1}) which was followed by pendimethalin @ 0.75 kg ha^{-1} as pre emergence + hand weeding at 25 DAS, quizalofop ethyl as post emergence @ 0.050 kg ha^{-1} at 20 DAS, pendimethalin @ 0.75 kg ha^{-1} as pre emergence and pre - emergence application of pendimethalin followed by post emergence application of quizalofop ethyl at 20 DAS (Table 3).

In metribuzin treated plots, sesame was injured up to 70 per cent and remaining plants recovered shock and gave some yield. Grichar *et al*. (2018) reported that in sesame, plants can compensate for open space and poor growth by additional branches with capsules. However, branching can only compensate for gaps of less than 30 cm. wider gaps not only lead to lower yields, but also let light through the canopy to encourage late-season weed emergence and growth.

Hand weeding is the best option for controlling weeds in any crop. But due to broadcasting of sesame hand weeding is difficult and the only option is to go for herbicides. Pre emergence application of pendimethalin @ 0.75 kg ha^{-1} followed by post emergence application of quizalofop ethyl @ 0.0050 kg ha^{-1} was found to be the better option to control the weeds in broadcasted sesame. Annual grasses can easily be controlled in sesame with quizalofop-P without significant sesame injury. There is a need to identify herbicides for controlling broad leaved weeds in sesame without causing phytotoxicity to sesame.

Table 1. Weed density (0.5 sqm) in broadcasted sesame as influenced by weedicides

Treatments	15 DAA			30 DAA		
	BLW	**NLW**	**Sedges**	**BLW**	**NLW**	**Sedges**
T_1 : Pendimethalin @ 0.75 kg ha^{-1} as pre emergence	4.42 (21)	0.70 (0)	1.38 (2.33)	4.25 (17.66)	0.70 (0)	1.38 (2.3)
T_2 : Pendimethalin @ 0.75 kg ha^{-1} as PE fb metribuzin @ 0.350 kg ha^{-1} at 20 DAS	1.44 (1.66)	0.70 (0)	3.68 (13.3)	1.29 (1.33)	0.70 (0)	3.68 (13.3)
T_3 : Pendimethalin @ 0.75 kg ha^{-1} as PE fb quizalofop ethyl @ 0.050 kg ha^{-1} at 20 DAS	2.77 (8.33)	0.70 (0)	3.37 (11.0)	3.66 (13.33)	0.70 (0)	3.37 (11.0)
T_4 : Pendimethalin @ 0.75 kg ha^{-1} as PE fb metribuzin @ 0.350 kg ha^{-1} + quizalofop ethyl @ 0.050 kg ha^{-1} at 20 DAS	1.67 (2.33)	0.70 (0)	3.34 (11.3)	1.55 (2.0)	1.09 (1.0)	3.34 (11.3)
T_5 : Quizalofop ethyl as post emergence @ 0.050 kg ha^{-1} at 20 DAS	4.93 (25.33)	0.70 (0)	1.72 (3.0)	3.35 (12.3)	0.99 (0.66)	1.72 (3.0)
T_6 : Metribuzin as post emergence@ 0.350 kg ha^{-1} at 20 DAS	1.26 (1.33)	3.9 (15)	2.21 (6.0)	1.26 (1.33)	3.71 (13.3)	2.21 (6.0)
T_7 : Metribuzin @ 0.350 kg ha^{-1} + quizalofop ethyl @0.050 kg ha^{-1} at 20 DAS	0.99 (0.66)	1.17 (1)	2.61 (7.3)	2.05 (4.33)	1.54 (2.33)	2.61 (7.3)
T_8 : Pendimethalin @ 0.75 kg ha^{-1} as pre emergence + hand weeding at 25 DAS	2.95 (8.33)	1.67 (2.33)	1.46 (1.66)	1.81 (3.0)	0.70 (0)	1.46 (1.6)
T_9 : Hand weeding at 15 & 30 DAS	0.98 (0.65)	4.10 (17)	2.25 (4.66)	2.88 (8.0)	1.94 (4.6)	2.25 (4.6)
T_{10} : Weedy check	5.64 (31.66)	3.00 (8.66)	1.35 (1.66)	4.22 (17.6)	2.01 (3.6)	1.35 (1.6)
SEm ±	0.57	0.24	0.54	0.42	0.36	0.04
CD at 5%	1.71	0.73	1.6	1.25	1.09	1.61

Table 2. Weed parameters in broadcasted sesame as influenced by weedicides

Treatments	Weed dry weight (g)		WCE (%)	
	15 DAA (45 DAS)	30 DAA (60 DAS)	45 DAS	65 DAS
T_1 : Pendimethalin @ 0.75 kg ha^{-1} as pre emergence	3.29 (11.6)	7.09 (53.3)	77.4	10.4
T_2 : Pendimethalin @ 0.75 kg ha^{-1} as PE fb metribuzin @ 0.350 kg ha^{-1} at 20 DAS	1.51 (2.0)	2.80 (8.67)	96.1	85.4
T_3 : Pendimethalin @ 0.75 kg ha^{-1} as PE fb quizalofop ethyl @ 0.050 kg ha^{-1} at 20 DAS	2.51 (8.0)	5.17 (26.3)	84.4	55.7
T_4 : Pendimethalin @ 0.75 kg ha^{-1} as PE fb metribuzin @ 0.350 kg ha^{-1} + quizalofop ethyl @ 0.050 kg ha^{-1} at 20 DAS	1.27 (1.16)	3.73 (13.5)	97.7	77.3
T_5 : Quizalofop ethyl as post emergence @ 0.050 kg ha^{-1} at 20 DAS	3.19 (10.5)	5.94 (36.6)	79.6	38.4
T_6 : Metribuzin as post emergence@ 0.350 kg ha^{-1} at 20 DAS	2.91 (8.16)	9.16 (84.67)	84.1	-42.3
T_7 : Metribuzin @ 0.350 kg ha^{-1} + quizalofop ethyl @0.050 kg ha^{-1} at 20 DAS	1.43 (1.66)	3.71 (13.3)	96.7	77.6
T_8 : Pendimethalin @ 0.75 kg ha^{-1} as pre emergence + hand weeding at 25 DAS	1.95 (3.33)	1.57 (2.0)	93.5	96.6
T_9 : Hand weeding at 15 & 30 DAS	2.40 (5.16)	1.85 (3.0)	89.9	94.9
T_{10} : Weedy check	7.12 (51.5)	7.65 (59.5)	-	-
SEm ±	0.56	0.68		
CD at 5%	1.67	2.04		

Table 3. Growth and yield of sesame as influenced by chemical weed management

Treatments	Plant height (cm)	No. of branches plant^{-1}	Capsule length (cm)	No. of capsules plant^{-1}	No. of seeds capsule^{-1}	1000 seed wt (g)	Seed yield kg ha^{-1}
T_1 : Pendimethalin @ 0.75 kg ha^{-1} as pre emergence	85.68^{bc}	3.60^{ab}	2.10	36.13^{abc}	61.23	2.66	638^{b}
T_2 : Pendimethalin @ 0.75 kg ha^{-1} as PE fb metribuzin @ 0.350 kg ha^{-1} at 20 DAS	75.53^{d}	3.53^{ab}	1.98	42.33^{a}	66.36	2.80	303^{d}
T_3 : Pendimethalin @ 0.75 kg ha^{-1} as PE fb quizalofop ethyl @ 0.050 kg ha^{-1} at 20 DAS	83.72^{bc}	4.00^{a}	2.07	42.13^{a}	68.43	2.69	661^{b}
T_4 : Pendimethalin @ 0.75 kg ha^{-1} as PE fb metribuzin @ 0.350 kg ha^{-1} + quizalofop ethyl @ 0.050 kg ha^{-1} at 20 DAS	76.20^{d}	3.46^{ab}	1.97	33.53^{bc}	65.46	2.75	340de
T_5 : Quizalofop ethyl as post emergence @ 0.050 kg ha^{-1} at 20 DAS	87.70^{b}	3.20^{abc}	2.01	29.66^{cd}	66.40	2.83	712^{b}
T_6 : Metribuzin as post emergence@ 0.350 kg ha^{-1} at 20 DAS	75.23^{d}	2.93^{bcd}	1.98	25.23^{d}	51.86	2.71	170^{f}
T_7 : Metribuzin @ 0.350 kg ha^{-1} + quizalofop ethyl @0.050 kg ha^{-1} at 20 DAS	73.90^{d}	3.60^{ab}	2.02	38.60^{ab}	50.20	2.52	260^{e}
T_8 : Pendimethalin @ 0.75 kg ha^{-1} as pre emergence + hand weeding at 25 DAS	81.98^{c}	3.66^{ab}	2.11	32.53^{bc}	70.26	2.64	695^{b}
T_9 : Hand weeding at 15 & 30 DAS	93.5^{a}	2.66^{cd}	2.05	41.53^{a}	74.00	2.73	874^{a}
T_{10} : Weedy check	82.8^{c}	2.40^{d}	2.07	24.26^{d}	73.40	2.42	430^{c}
Sig	**	**	-	**	-	-	**
P value	0.00	0.00	NS	0.00	NS	NS	0.00

LITERATURE CITED

Babiker, M.M., Siraj, O.O and Salah, A.E. 2014. The critical period of weed control in sesame (*Sesamum orientale* L.). *Journal of Forest Products and Industries.* 3: 66–70.

Zuhair, I.T., Asif, A., Muhamed, A., Naeem, A and Muhamed, M.M. 2011. Effect of weed competition on yield and yield components of sesame (*Sesamum indicum* L.). *Pakistan Weed Science Research*. 17: 51–63.

Grichar, W.J., Sestak, D.C., Brewer, K.D., Besler, B.A., Stichler, C.R and Smith, D.T. 2001. Sesame (*Sesamum indicum* L.) tolerance with various post-emergence herbicides. *Crop Protection*. 20(8): 685–689.

Grichar, W.J., Dotray, P.A and Langham, D.R. 2011. Weed control and the use of herbicides in sesame production. In: Soloneski and Larramendy, M.L. (eds). Herbicides, Theory and Applications, 41-72. Intech Open Limited, London, UK.

Grichar, W.J., Rose, J.J., Dotray, P.A., Baughman, T.A., Langhan, D.R., Werner, K and Bhagavathiannan, M. 2018. Response of sesame to selected herbicides applied early in the growing season. *International Journal of Agronomy*. 18: 1-11.