Indian Journal of Weed Science 41(1&2) : 19-22, 2009

Weed management strategies in jute grown for seed production in calcareous soils of north Bihar

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ABSTRACT

A field experiment was conducted at the Crop Research Centre of RAU, Pusa, Bihar during *kharif* 2006 and 2007 to evaluate the comparative efficacy of herbicides fenoxaprop-p-ethyl with standard doses of quizalofop and pendimethalin to control grassy weeds in jute grown for seed production. Losses in seed yield in control plot were observed 63.4% in comparison to hand weeding twice. Weed species count at 40 and 60 days after sowing (DAS) was found lowest in fenoxaprop-p-ethyl at 67.5 g/ha treated plot while seed yield was higher in the fenoxaprop-p-ethyl at 56.25 g/ha. Morpho-physiological attributes of jute *viz*., plant height, base diameter, number of capsules per plant, 1000 seed weight and seed yield were found significantly higher in fenoxaprop-p-ethyl at 56.25 g/ha which showed at par with quizalofop at 62.5 g/ha among the herbicidal treatments. The highest weed control efficiency was observed in fenoxaprop-p-ethyl at 67.5 g/ha but yield attributes and yield were found higher in fenoxaprop-p-ethyl at 56.25 g/ha. The study also revealed post emergence herbicides-fenoxaprop-p-ethyl and quizalofop more effective than pre emergence herbicides pendimethalin in controlling the weeds in jute.

Key Words : Weed management, Jute, *Corchorus olitorius*, Fenoxaprop-P-ethyl, Quizalofop, Pendimethalin

Jute (*Corchorus olitorius* L.) is an important cash crop of West Bengal, Bihar, Assam and Orissa. It is one of the largest foreign exchange earner crops. The conservative estimate of requirement of jute seed in the country is around 50 thousand tones, Bangladesh is totally dependent for its requirement of jute seed in india which is estimated to be around 35 thousand tones. Some of the traditional area meant for jute seed production in Andhra Pradesh and Maharastra, are located more than 1000 km away from the dignified jute growing area. Now it has recently been shifted to cotton, particularly for Bt cotton, because of higher productivity and income. This has resulted in over all shortage of jute seed which would continue to pose serious problem in future (Anonymous 2005). Un-organized sectors infuse rest quantity of seed in the market which include farm saved seed and farmer to farmer exchange. Thus, India is facing the problem of shortage of jute seed and it is high time to increase the seed production of jute.

Heavy infestation of weed is a major constraint in jute. The hot and humid climate coupled with intermittent rainfall during the jute-growing season, encourages weed growth resulting in severe crop-weed competition (Saraswat 1999) and yield losses up to 75 to 80% (Sahoo and Saraswat 1988), implying the need for judicious weed management. Grasses constitute the dominant weed flora in jute fields and its management using pre-emergence herbicides is impossible (Sarkar *et al.* 2005), provided the farmers get sufficient time for land preparation and herbicide application before sowing. The farmers in the state mainly depend upon the monsoon showers, and sow jute crop early to get the full benefit of the pre-monsoon showers without any delay in the sowing even by a single day. Use of post-emergence herbicides such as cyhalofop butyl, quizalofop ethyl and fenoxaprop-p-ethyl, which selectivity control grassy weeds in broadleaved crops like sunflower, soybean, and potato (Ito *et al*. 1998, Bedmar 1997), therefore, holds promise. However, among the available post-emergence herbicides, only quizalofop ethyl was found effective in controlling grassy weeds of jute (Ghorai *et al*. 2004). However, Sarkar (2006) observed that post emergence application of fenoxaprop-p- ethyl at 75 g/ha gave higher fiber and stick yield of jute. But, till date, literature is meager to understand the effect of herbicides on seed yield of jute. To ensure higher seed yield in any crop, effective weed management at appropriate time with suitable methods is imperative. In view of these facts and paucity of adequate evidences on effects of herbicides in relation to jute seed production, the present study was undertaken to evaluate the effectiveness of herbicides for grassy weed suppression in calcareous soils of north Bihar.

MATERIALS AND METHODS

The present experiment was conducted during *kharif* 2006 and 2007 at the experimental field of All India Coordinated Research Programme on Weed Control, Rajendra Agricultural University, Pusa, Samastipur, Bihar. The soil of the experimental plot was sandy loam and calcareous in nature, low in organic carbon (0.45%), low in available nitrogen (208.6 kg/ha), medium in phosphorus (23.3 kg/ha) and low in potassium (103.5 kg/ha) with pH of 8.7. Different doses of fenoxaprop-p-ethyl *viz*., 45, 56.25, and 67.5 g/ha and quizalofop 62.5 g/ha as post emergence (25 DAS) and pendimethalin at 600 g/ha as pre-emergence (2 DAS) were compared to work out the effectiveness in managing grassy weeds in relation to two hand weeding (HW) and unweeded control (water spray). These treatments were replicated four times in randomized block design Jute variety *JRO 632* was sown at the spacing of 25 × 7 cm. Manures and fertilizers were used as per recommendations. The crop was sown on 14.05.2006 and 16.05.2007, in first and second year respectively.

Herbicides were applied using 500 liters of water/ha with a flat fan nozzle attached in a high volume Knap sack sprayer as per schedule. Harvesting of jute crop was done - in first and second year on 25.09.2006 and 27.09.2007, respectively.

The phyto-toxic rating was done on 15th and 30th days after spraying (DASH) of herbicides using 0 to 10 scale (0 indicates no adverse effect of herbicides on the crop, and 10 indicates 100% adverse effect of herbicides on the crop). Weed control rating was also done on 15 and 30 DAS using 0 to 10 scale (0 = very poor control of weeds, 10 = excellent control of weeds).

The data on weed count and dry weight was recorded by using quadrate of 50 ×50 cm. Observations on plant height, base diameter, number of capsules per plant, number of seeds per capsule, 1000 seed weight, seed yield, weed control efficiency (%), weed population species wise (40 and 60 DAS) and weed dry weight at harvest was recorded and analyzed using the analysis of variance technique.

RESULTS AND DISCUSSION

Effect of treatment on weeds

The major weed flora observed in the control plot of experimental field were *Dactyloctenium aegyptium, Echinochloa colona, Eleucine indica, Panicum repens, Paspalum disticum* and *Setaria glauca.* Annual grasses accounted 95% of total weeds and 4% of total was broadleaved weeds with the predominant species of *Physalis minima* and *Phyllanthus niruri* and sedges constituted 1% of total with only species of *Cyperus rotundus.*

The higher doses of fenoxaprop-p-ethyl had greater influence over the total weed population when observations were recorded at 40 and 60 DAS. The unweeded control plot (water spray) recorded the highest weed density as compared to other treatments. The two major grasses in jute field, *viz., Dactyloctenium aegyptium* and *Setaria glauca* were observed to be highly affected with the treatment of fenoxaprop-p-ethyl at 67.5, and 56.25 g/ha and quizalofop at 62.5 g/ha at 40 and 60 DAS (Table 1). Highest weed dry weight was noted in unweeded plot (66.8 g/m^2; Table 2) and the lowest (2.1 g/m^2) for 2-HW. The observations corroborate the findings obtained by Ghorai *et al*. (2004), Sarkar *et al*. (2005) and Sarkar (2006). Among the post-emergence herbicides tested, the lowest weed dry weight (3.5 g/m^2) was for fenoxaprop-p-ethyl at 67.5 g/ha, closely followed by fenoxaprop-p-ethyl at 56.25 g/ha (4.9 g/m^2). The highest weed control efficiency (WCE) of 94.7% was also recorded in the fenoxaprop-p-ethyl at 67.5 g/ha, followed by fenoxaprop-p-ethyl at 56.25 g/ha (92.6%), quizalofop at 62.5 g/ha (87.7%), fenoxaprop-p-ethyl at 45 g/ha (76.7%) and pendimethalin at 600 g/ha (69.3%). It was also pertinent from the findings that the treatment pendimethalin at 600 g/ha had a relatively lower WCE among herbicidal treatments.

Effect on crop

Phytotoxicity : No herbicide at different doses showed any visual phytotoxic symptom in jute crop at any stage of crop growth in terms of epinasty, hyponasty, chlorosis, necrosis, scorching, wilting injury to leaf tips and leaf surface.

Effect on growth and yield : Height of jute plants at harvest was the maximum in 2-HW (2.95 m), which was statistically at par with fenoxaprop-p-ethyl at 56.25 g/ha (2.92 m). Conversely, the unweeded control produced the shortest plants (1.86 m). Basal diameter, number of capsules per plant, seeds per capsule, 1000 seed weight and seed yield of jute also followed the similar pattern (Table 2). Two hand weedings produced the maximum seed yield of 623 kg/ha while the lowest seed yield was recorded in the unweeded check (328 kg/ha). Seed yield in the fenoxaprop-p-ethyl at 56.25 g/ha and quizalofop ethyl at 62.5 g/ha was 617 and 610 kg/ha, respectively. It was important to note that, weed densities and weed dry weight were least in the treatment fenoxaprop-p-ethyl at 67.5 g/ha but seed yield was lower than fenoxaprop-p-ethyl at 56.25 g/ha and quizalofop ethyl at 62.5 g/ha. Comparatively lower yield in the treatment fenoxaprop-p-ethyl at 67.5 g/ha may be due to the slight amount of physiological

Table 1. Effect of different treatments on weed densities of different species in jute at 40 DAS and 60 DAS (days after sowing)

Treatment	Weed density (no./m^2)													
	Dactyloctenium aegyptium		*Echinocloa colonum*		*Eleucine indica*		*Panicum repens*		*Paspalum disticum*		*Setaria glauca*		Total weeds	
	40 DAS	60 DAS	40 DAS	60 DAS	40 DAS	60 DAS	40 DAS	60 DAS	40 DAS	60 DAS	40 DAS	60 DAS	40 DAS	60 DAS
Fenoxaprop-p-ethyl 45 g/ha	03	06	05	09	08	10	07	09	10	14	04	10	45	70
Fenoxaprop -p-ethyl 56.25 g/ha	-	-	02	03	03	04	03	06	05	07	-	-	15	22
Fenoxaprop -p-ethyl 67.5 g/ha	-	-	01	02	03	04	03	04	03	04	-	-	12	16
Quizalofop 62.5 g/ha	-	-	03	04	06	07	04	05	03	06	02	03	19	27
Two hand weeding (at 25 and 45 DAS)	-	-	-	01	01	01	01	02	02	03	01	02	06	11
Pendimethalin 600 g/ha	07	11	12	17	11	16	08	11	11	16	12	18	65	90
Unweeded control	18	28	15	18	11	16	25	32	18	24	40	49	131	169

Table 2. Effect of treatments on dry weight of weed, weed control efficiency, plant height, basal diameter, yield component and yield of jute

Treatment	Weed dry weight at harvest (g/m^2)	Weed control efficiency (%)	Plant height (m)	Base diameter (mm)	Number of capsules / plant	1000 seed weight (g)	Seed yield (kg/ha)
Fenoxaprop -p-ethyl 45 g/ha	15.5	76.7	2.65	11.22	12.38	1.45	563
Fenoxaprop -p-ethyl 56.25 g/ha	4.9	92.6	2.92	15.66	14.25	1.70	617
Fenoxaprop -p-ethyl 67.5 g/ha	3.5	94.7	2.72	13.75	12.62	1.60	590
Quizalofop 62.5 g/ha	8.2	87.7	2.84	14.12	13.75	1.65	610
Two hand weeding (at 25 and 45 DAS)	2.1	96.8	2.95	16.86	15.45	1.75	623
Pendimethali n 600 g/ha	20.5	69.3	2.25	11.10	12.30	1.35	543
Unweeded control	66.8	-	1.86	10.52	10.22	1.10	328
LSD (P=0.05)	3.0	-	0.45	1.55	1.64	0.22	26

phytotoxicity which was not visually apparent on the plants. Highest seed yield in fenoxaprop-p-ethyl at 56.25 g/ha may be due to the enhancement of metabolic activity corroborating higher photosynthate formation and combining with the reduced weed densities and weed dry weight. Results also indicated that the post emergence application of fenoxaprop-p-ethyl at 56.25 g/ha or quizalofop ethyl 62.5 g/ha at 25 DAS was more effective than the pre emergence application of pendimethalin at 600 g/ha, which not only controlled the grassy weeds but, also resulted in higher seed yield. Though the seed yield was the highest in the hand weeded plot, but considering the scarcity of labourer in the peak period of the crop and labour cost, it may be concluded that the herbicides may be alternative option for weed management in jute as also reported by Sarkar (2006).

On the basis of above study, it was revealed that the application of fenoxaprop-p-ethyl at 56.25 and quizalofop 62.5 g/hain jute may appreciably manage the grassy weeds and also gave higher seed yield comparable to that of hand weeding twice.

Acknowledgment

Authors expressed their sincere thank to the Director Research, Rajendra Agricultural University, Pusa, Samastipur, Bihar for providing facilities. Technical help rendered by Mr. Ram Dayal Pandit and Mr. Rajesh Kumar are duly acknowledged.

REFERENCES

Anonymous. 2005. *Report on price policy for raw jute for the 2006-07 seasons*, Ministry of Agriculture, Government of India, New Delhi : 20 p.

Bedmar F. 1997. Bermuda grass control in sunflower, soybean and potato with post-emergence graminicides. *Weed Technology* **11**: 683–688.

Ghorai AK, Chakraborty AK, Pandit NC, Mondal RK and Biswas CR. 2004. Grass weed control in jute by Targa super (quizalofop-ethyl 5% EC). *Pestology* **28**: 31–34.

Ito M, Kawahara H and Alai M. 1998. Selectivity of cyhalofop-butyl in Poaceae species. *Journal of Weed Science and Technology* **43**: 122–128.

Sahoo KM and Saraswat VN. 1988. Magnitude of losses in the yields of major crops due to weed competition in India. *Pesticide Information* **14**: 2–9.

Saraswat VN. 1999. Weed management in jute and jute based cropping system. In: *Jute and Allied Fibres Agriculture and Processing*, Palit, P., Pathak, S. and Singh, D.P. (eds.), Central Research Institute for Jute and Allied Fibres, Barrackpore : 193–200.

Sarkar S. 2006. Weed management in jute (*Corchorus olitorius* L.) by post emergence herbicides. *Journal of Tropical Agriculture* **44** (1-2): 71-73.

Sarkar S, Bhattacharjee AK and Mitra S. 2005. Weed management in jute by trifluralin (48% EC) in the early jute-weed competition phase. *Journal of Crop and Weed* **2**: 30–33.