

Studies on the Crop-Weed Competition and Chemical Weed Control in Irrigated and Dryland Bajra (*Pennisetum typhoideum* L.)

BY

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ABSTRACT

Experiments conducted at Coimbatore during *kharif* 1973 revealed that a weed free condition upto 35 days was required for getting economic yield in direct sown irrigated Bajra (var HB. 3). Application of atrazine at 0.5 kg a. i./ha as pre-emergence spray was found to be the best effective and economic weed control treatment under irrigated condition. For dry crop, pre-sowing application of atrazine 0.5 kg a. i./ha is recommended. Post-emergence application of 2, 4-D at 1 kg a. i./ha was not effective in controlling weed in both irrigated and dry crop.

INTRODUCTION

Bajra occupies 2.9 million ha in India, mostly grown under rainfed condition. In Tamil Nadu the area under this crop is 4.6 lakh ha with a production capacity of 3.1 lakh tonnes (Anon. 1973). The competition of weeds with the crop for moisture, nutrient, sunlight and space are to be effectively checked to get higher yields. Trials conducted at Rajasthan indicated that blade harrow or tooth hand hoe could be used for weeding in sandy soils with reduction in cost upto half as compared to *Khurpi* and long hand hoe (Shekawat *et al.*, 1962). Deep ploughing to a depth of 25 cm with tractor significantly increased the yield in well drained soils of New

Delhi. Weeding with hand hoe was given higher yield over interculture of bullock hoe in the standing crop (Khan and Mathur, 1961). Plots without cultivation were equally good and repeated ploughings had no advantage (Tomer and Singh, 1973). With the object of finding out effective chemical weed control and optimum weed free condition for getting economic yield trials were taken up.

MATERIALS AND METHODS

Experiments were laid out in Tamil Nadu Agricultural University Farm, Coimbatore in *kharif*, 1973. Weed flora of the fields were *Trianthema portulacastrum* L., *Portulaca oleracea* L., *Digera arvensis*, *Lagasca*

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mollis Cav., *Argemone mexicana* L., *Ruellia tuberosa*, *Gynandropsis pentaphylla*, *Cyperus rotundus* L., *Cynodon dactylon* (L.) Pers., *Panicum* sp and *Echinochloa fastuosa*. The annual weed

Trianthema portulacastrum formed more than 90 per cent of the weed population in the fields.

1. Crop - weed competition ex-

TABLE 1. Effect of crop weed competition in irrigated bajra (var. HB-3)

Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)	Weed weight at harvest kg/10m ²	Cost of weeding		Increased yield over control (kg/ha)
				Labour No.	Cost in Rs.	
Control	624	2830	3.57	—	—	—
Weed free upto 7 days	1612	6346	1.27	25	75	988
„ 14 „	1735	6774	1.00	33	99	1111
„ 21 „	1999	7117	0.78	40	120	1375
„ 28 „	2428	7887	0.14	46	138	1804
„ 35 „	2696	8407	0.02	51	153	2072
„ 42 „	2510	8575	0.05	54	162	1886
„ 49 „	2232	8146	0.05	58	174	1608
„ 56 „	2459	8402	0.05	62	186	1835
„ 63 „	2449	8402	0.01	66	198	1825
„ 70 „	2232	8232	0.04	70	210	1608
S. E.	119	525	0.27			
C. D. at 5%	349	1544	0.78			

periment for irrigated crop was laid out in Randomised Block Design with 3 replications. Hybrid Bajra (Var. HB. 3) was sown on 25-7-73 in 9.72 m² area with a spacing of 30 x 15 cm. There were 11 treatments consisting of maintaining the crop weed free for 7, 14, 21, 28, 35, 42, 49, 56, 63 and 70 days after sowing and an unweeded control. A basal dose of 45 kg N, 35 kg P₂O₅ and 22.5 kg K₂O per ha and 25 kg N/ha as top dressing was common to all the treatments. Hoeing and hand weeding was given once in 7 days to the treatmental plots. Cost of weeding and energy required for the treatments were worked out.

2. Weed control experiment in bajra under irrigated condition was sown on 25-7-73 in 10.8 m² area with a spacing of 30 x 15 cm. The experiment was laid out in Randomized Block Design with 3 replications. The weed control treatments consisted of (1) unweeded control; (2) Hoeing and hand weeding once at 21st day; (3) Pre-sowing atrazine 0.25 kg a.i/ha; (4) Tr. 3 plus one hoeing and hand weeding; (5) Pre sowing atrazine 0.5 kg a.i/ha; (6) Tr. 5 plus one hoeing and hand weeding; (7) Pre-emergence atrazine 0.25 kg a.i/ha; (8) Tr. 7 plus one hoeing and hand weeding; (9) Pre-emergence atrazine 0.5 kg a.i/ha; (10) Tr. 9 plus one hoeing and hand weeding; (11) Post-emergence 2,4-D 1 kg a.i/ha and (12) Tr. 11 plus one hoeing and hand weeding. Pre-sowing spraying was given in the levelled plots one day before sowing and incorporated. Pre emergence spray was given two days after sowing and followed by a

light irrigation. Post-emergence spray of 2,4-D was given 10th day after sowing. Weed count was recorded on 30th day after sowing. Weed weight was recorded at the time of harvest. Cost of weeding and economics of weed control were worked for all the treatments.

3. Weed control experiment in the dry crop was sown on 7-8-73 in 20.05 m² plots with a spacing of 45 x 15 cm. A basal dressing of 45 kg N and 22.5 kg P₂O₅ per ha was given to all treatments. There were 7 treatments namely (1) Unweeded control; (2) hoeing and handweeding once; (3) Pre-sowing atrazine 0.25 kg a.i/ha; (4) Pre-sowing atrazine 0.5 kg a.i/ha; (5) Pre-emergence atrazine 0.25 kg a.i/ha; (6) Pre-emergence atrazine 0.5 kg a.i/ha; and (7) Post-emergence 2,4-D 1 kg a.i/ha. The pre-sowing spray was given one day before sowing in the levelled plots and stirred. The pre-emergence spray was given 5 days after sowing. Post-emergence spray was given 10 days after sowing.

RESULTS AND DISCUSSION

Results of the crop-weed competition experiment presented in Table 1, showed linear increase in grain yield upto 35 days weed free condition. Weed free condition upto 28 days was significantly superior than 21 days weed free condition and on par with the higher levels. Labour energy required for 28 and 35 days weed free condition were 420 and 490 man hours respectively. The produce obtained in 35 days weed free condition was profitable than 28

days weed free condition. A weed free condition upto 35 days was sufficient for getting economically higher yield in direct sown irrigated bajra (Var. HB. 3) crop.

The yield data presented in Table 2 reveal that pre-emergence spray of atrazine 0.5 kg a.i/ha plus one hoeing and hand weeding (labour energy 70 hr/ha) recorded the maximum yield and

TABLE 2. Economics of weed control in irrigated Bajra (var HB-3)

Treatment	Weed count No /0 25m ²		Weed wt. nt harvest kg/0m ²	Grain yield (kg/ha)	Straw yield (kg/ha)	Cost of weeding			Loss expenditure over Handweeding	Difference over hand weeding		Profit Rs/ha
	Dicot	Monocot				Labour required in No.	chemical cost in Rs.	Total Rs.		Yield kg/ha	Value Rs/ha	
1	117	3	2.87	643	1519	..	..	..	..	..	..	..
2	18	3	1.50	1820	6709	50	..	150	..	..	..	-
3	68	9	1.47	872	4470	..	37	37	113	..	..	-
4	44	8	1.34	1341	5985	30	37	127	23	..	..	..
5	22	7	1.45	1641	5722	..	64	64	86	-179	-129	-39
6	39	13	0.87	1579	6795	15	64	109	41	..	..	-
7	7	5	1.33	1413	6438	..	37	37	113	..	..	..
8	11	11	0.79	1749	7743	30	37	127	23	-71	-50	-27
9	2	9	0.62	1727	7332	..	64	64	86	-93	-65	+21
10	4	6	0.35	1897	8226	15	64	109	41	+77	+54	+95
11	48	15	1.89	708	3398	..	35	35	115	..	..	-
12	69	16	1.05	933	4469	30	35	125	25	..	..	..
S. E.	14	..	0.38	74	773	..	..	..	..	..	..	..
C.D. at 5%	41	..	1.12	217	22694	..	..	..	..	..	..	..

1. Control. 2. Hoeing and hand weeding once (21st day). 3. Pre - sown Atrazine 0.25 kg a. i/ha, 4. Pre - sown Atrazine 0.25 kg a. i/ha + one hoeing and hand weeding. 5. Pre - sown atrazine 0.5 kg a. i/ha, 6. Pre - sown atrazine 0.5 kg a. i/ha + one hoeing and weeding. 7. Pre-em. atrazine 0.25 kg a i/ha, 8. Pre - em atrazine 0.25 kg a. i/ha + one hoeing and weeding, 9. Pre - em. atrazine 0.5 kg a. i/ha, 10. Pre - em. atrazine 0.5 kg a. i/ha + one hoeing and weeding 11. Post - em. 2, 4 - D 1 kg a. i/ha, 12. Post - em - 2, 4 - D 1 kg a. i/ha + one hoeing and weeding

TABLE 3. Economics of weed control in irrigated Bajra (var. HB-3)

Treatment	Weed count No./0.25m ²		Weed wt. at harvest kg/0.25m ²	Grain yield (kg/ha)	Straw yield (kg/ha)	Cost of weeding			Less expenditure over Handweeding	Difference over hand weeding		Profit Rs/ha
	Dicot	Monocot				Labour required in No.	Chemical cost in Rs.	Total Rs.		Yield kg/ha	Value Rs/ha	
1	57	10	0.39	105	1025	...	...	...	...	...	...	...
2	2	5	0.23	183	2018	20	...	60	...	...	...	...
3	22	12	0.29	198	1775	...	37	37	+23	15	11	34
4	b	7	0.15	298	2523	...	64	64	-4	115	83	79
5	7	13	0.26	216	2550	...	37	37	+23	33	23	46
6	...	8	0.23	270	2400	...	64	64	-4	87	61	57
7	64	5	0.34	100	1133	...	35	35	+25	-83	-58	-33
S. E.	6	...	0.03	27	156							
C.D at 5%	18	...	0.08	82	481							

1. Control, 2. Hoeing and hand weeding once, 3. Pre-sown atrazine 0.25 kg a. i/ha, 4. Pre-sown atrazine 0.5 kg a. i/ha, 5. Pre-em. atrazine 0.25 kg a. i/ha, 6. Pre-em. atrazine 0.5 kg a. i/ha 7. Post-em 1, 4-D 1 kg/ha

it was on par with manual weeding, atrazine 0.5 kg, and atrazine 0.25 kg a.i/ha plus one hoeing and handweeding. The above treatments were significantly superior over control. The weed count data recorded on 30th day after sowing supports the reason for increase in yield in the former treatments. All the above treatments show equal or higher profit than one hoeing

and hand weeding. For effective chemical control in direct sown irrigated bajra (Var. HB. 3) pre-emergence application of atrazine 0.5 kg a.i/ha seems to be the best. It has prolonged residual effect for controlling weeds. The succeeding crop ragi planted on 21-12-73 have established well and no residual toxicity was noticed. Trials conducted by Tomer and Singh

(1973) in sandy loam soil also showed that atrazine 0.5 kg a.i/ha was found to be superior over the manual weeding treatment.

Among the methods of application pre-emergence application of atrazine 0.5 kg a.i/ha was found to be better and post emergence application of 2, 4-D 1 kg a.i/ha had no effect either in controlling weeds or increasing the yield. Work at Hebbal in red sandy loam showed that atrazine at concentration ranging from 0.5 to 3 kg a.i/ha significantly reduced the fresh weight of weeds as compared to 2, 4-D at 1 kg/ha indicating that even 0.5 kg a.i/ha of atrazine was sufficient to check the weed population in bajra (Hosmani *et al.*, 1973).

Results of the dry land bajra (Table 3) indicated that pre-sowing spray of atrazine 0.5 kg a.i/ha registered maximum yield than hand weeding. It was, however, on par with the pre-emergence application of 0.5 kg a.i/ha. The weed count recorded on 30th day after sowing also indicated that pre-sowing or pre-emergence application of atrazine 0.5 kg a.i/ha have effective control on weeds. Atrazine 0.25 kg a.i/ha as a pre-sowing or pre-emergence spray recorded higher yield than post-emergence application of 2, 4-D 1.0 kg a.i/ha which was on par with

control. Application of atrazine 0.25 kg a.i/ha or 0.5 kg a.i/ha whether pre-sowing or pre-emergence is profitable than hand weeding. Under dryland conditions, application of atrazine 0.5 kg a.i/ha as pre-sowing can be recommended for effective weed control and economic yield.

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