

Effect of Irrigation Time and Weed Management Practices on Weeds and Wheat Yield

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ABSTRACT

Performance of irrigation time and weed management practices against weeds in wheat was evaluated. *Chenopodium album* L. and *Chenopodium murale* L. were predominating weed species and comprised about 76% of total weed population in weedy check. Pre-sowing irrigation reduced the dry weight of *C. album* and *C. murale* by 21 and 25%, respectively, and subsequently grain yield was 12% higher over post-sowing irrigation. Pre-emergence application of pendimethalin at 0.75 kg ha⁻¹ supplemented by one hand weeding or 2, 4-D, 0.50 kg ha⁻¹ at 30 DAS gave significantly higher grain yield due to better weed control. However, the higher additional net return (Rs. 8063) was also obtained with pendimethalin at 0.75 kg ha⁻¹+one hand weeding.

INTRODUCTION

Wheat is an important cereal crop of western region of Rajasthan and is grown on 1.02 m ha with total production of 2.43 mt. The low yield level (2.38 t ha⁻¹) in the region contrast to the state average yield (2.54 t ha⁻¹) is of major concern (Statistical Abstract, 2000). Poor weed management coupled with traditional method of sowing i. e. irrigation after dry seeding is considered to be an important factor contributing to this gap.

The magnitude of yield reduction due to weed infestation in wheat crop has been reported from 7 to 50% depending upon their intensity (Gill, 1979). Among many weed species, *Chenopodium album* L. and *Chenopodium murale* L. are major weeds, which infest the wheat crop. Conventional methods of weed control are being practised to manage the weeds of wheat fields in the region, but these methods are laborious and uneconomical. It was, therefore, felt to develop appropriate and economical irrigation time and weed management practices.

MATERIALS AND METHODS

Field experiment was conducted during

winter season of 1998-99 and 1999-2000 at Satheen, Jodhpur under arid zone condition of Rajasthan. The soil of the experimental field was sandy loam in texture with pH 8.1, having organic carbon 0.29%, available nitrogen 109 kg ha⁻¹, available phosphorus 17 kg ha⁻¹ and available potash 238 kg ha⁻¹. The experiment was laid out in split plot design with three replications. The treatments comprised two irrigation management (pre-sowing irrigation at four days before sowing and post-sowing irrigation at one day after sowing) and six weed management practices (pendimethalin at 1.0 kg ha⁻¹ (pre-emergence), 2, 4-D at 1.0 kg ha⁻¹ at 30 DAS, pendimethalin at 0.75 kg ha⁻¹ fb 2, 4-D at 0.50 kg ha⁻¹, pendimethalin at 0.75 kg ha⁻¹ fb one hand weeding at 30 DAS, two hand weedings at 25 and 45 DAS and weedy check). Wheat variety Raj-3077 was sown at 100 kg seed ha⁻¹ in rows 25 cm apart on 24 November and 4 December during 1998 and 1999, respectively. A uniform dose of 100 kg nitrogen and 60 kg P₂O₅ ha⁻¹ was applied in all the plots. Pendimethalin and 2, 4-D were applied with knapsack sprayer using 600 litres water ha⁻¹. Observations on weed density and weed biomass were recorded at 75 DAS.

Table 1. Effect of irrigation time and weed management practices on weeds in wheat (Mean of two years)

Treatment	<i>Chenopodium album</i>		<i>Chenopodium murale</i>		Other weeds		Total weeds	
	No. m ⁻²	Dry weight (g m ⁻²)	No. m ⁻²	Dry weight (g m ⁻²)	No. m ⁻²	Dry weight (g m ⁻²)	No. m ⁻²	Dry weight (g m ⁻²)
Irrigation time								
Pre-sowing	15	21.5	9	14.5	8	12.8	32	48.8
Post-sowing	21	27.3	13	19.3	11	16.1	45	62.8
LSD (P=0.05)	3	4.1	2	3.6	3	2.5	6	9.7
Weed management								
Weedy	48	65.0	28	39.0	22	32.0	98	136
2, 4-D 0.75 kg ha ⁻¹	16	20.0	6	14.5	10	12.5	35	47.0
Pendimethalin 1.25 kg ha ⁻¹	21	30.0	11	20.5	11	19.5	43	70.0
Pendimethalin 0.75 kg fb 2, 4-D 0.50 kg ha ⁻¹	5	11.0	4	11.0	6	8.5	16	30.5
Pendimethalin 0.75 kg ha ⁻¹ fb one hand weeding	7	11.0	4	9.0	5	8.5	16	28.5
Two hand weedings	8	9.5	5	7.5	4	6.0	17	23.0
LSD (P=0.05)	8	5.9	4	5.4	10	5.7	17	12.4

RESULTS AND DISCUSSION

Weed Flora

The field was dominated by broad leaf weeds, accounting for about 97% of total weed flora in weedy check condition. *C. album* L. (51.31%) and *C. murale* L. (24.50%) predominately infested the field and relative density of both species was by 76% of total weed population. *Melilotus indica* (6.74), *Fumaria parviflora* Lamte (5.45%), *Asphodelus tenuifolius* Cav. (4.5%), *Cynodon dactylon* (L.) Pers. (3.11%), *Convolvulus arvensis* L. (2.39%) and *Rumex dentatus* L. (1.91%) were recorded in minor dominance.

Effect of Irrigation Time

Pre-sowing irrigation proved to be better in reducing the population and dry weight of *C. album*, *C. murale* and other weeds than post-sowing irrigation. The dry matter of *C. album* and *C. murale* was reduced by 21.2 and 25% under pre-sowing irrigation compared to post-sowing

irrigation. The dry weight of other weeds was also reduced by 20.65%. However, the overall reduction in the dry weight of total weeds was recorded by 22% under pre-sowing irrigation (Table 1). The superiority of pre-sowing irrigation in comparison to post-sowing irrigation can be ascribed to the destruction of first flush of weeds during land preparation and sowing activities.

The crop sown by providing pre-sowing irrigation produced significantly higher number of spikes and grains per spike, but 1000-grain weight remained unaffected (Table 2). However, the grain yield was obtained by 12% higher under pre-sowing irrigation compared to post-sowing irrigation. The increase in grain yield could be attributed to reduced weed growth and better growth and development of crop plants.

Effect of Weed Management

All the weed management treatments significantly reduced weed population, dry weight and increased weed control efficiency over weedy check. Pre-emergence application of pendimethalin

Table 2. Effect of irrigation time and weed management on yield attributes, grain yield and economics (Mean of two years)

Treatment	Spikes m ⁻²	Grains spike ⁻¹	1000-grain wt. (g)	Grain yield (kg ha ⁻¹)	Gross returns over check (Rs. ha ⁻¹)	Net returns due to treatment (Rs. ha ⁻¹)
Irrigation time						
Pre-sowing	224	36.0	37.1	3440	2340	2340
Post-sowing	197	39.9	36.5	3050	-	-
LSD (P=0.05)	11	2.6	NS	249	-	-
Weed management						
Weedy	166	32.0	35.6	2275	-	-
2, 4-D 0.75 kg ha ⁻¹	198	35.5	36.2	3220	6870	6145
Pendimethalin 1.25 kg ha ⁻¹	195	36.4	36.4	3050	4650	3138
Pendimethalin 0.75 kg ha ⁻¹ fb	236	40.5	37.1	3810	9210	7673
2, 4-D 0.50 kg ha ⁻¹						
Pendimethalin 0.75 kg ha ⁻¹ fb one hand weeding	241	41.2	37.1	3925	9900	8063
Two hand weedings	248	41.5	37.3	3980	10230	7480
LSD (P=0.05)	20	3.2	0.9	280	-	-

NS-Not Significant.

at 0.75 kg ha⁻¹ fb 2, 4-D at 0.50 kg ha⁻¹ and pendimethalin at 0.75 kg ha⁻¹ fb one hand weeding at 30 DAS being at par, were observed to be equally effective with two hand weedings in reducing *C. album* and other weed species, but were significantly superior over remaining treatments. The highest weed control efficiency was recorded by 81.2, 75.4 and 73.4% with two hand weedings, pendimethalin+2, 4-D and pendimethalin+one hand weeding, respectively. The superiority of these treatments was because of effective control of weeds at both pre and post-emergence stages. Sukhadia *et al.* (2000) also had similar observations on the reduction of weed population and dry weight due to combination of treatments in wheat.

During both the years, combination of herbicides or followed by hand weeding and two hand weedings had significantly higher yield attributes and grain yield compared to the herbicides and weedy check. The maximum grain yield (3980 kg ha⁻¹) was obtained with two hand weedings. Integration of pendimethalin either with one hand weeding or 2, 4-D gave significantly more grain yield over herbicide alone and was at par with two hand weedings. Reduced crop-weed competition due to aforementioned treatments was

the cause for increasing yield attributes and grain yield.

Economics

The maximum net return of Rs. 8063 was obtained with pendimethalin at 0.75 kg ha⁻¹ fb one hand weeding (Table 2). Though the highest grain yield (3925 kg ha⁻¹) was recorded with two hand weedings, but additional investment with two hand weedings decreased the net return over pendimethalin+one hand weeding. Application of pendimethalin at 0.75 kg ha⁻¹ fb 2, 4-D at 0.50 kg ha⁻¹ was second best treatment for providing higher net returns (Rs. 7673).

REFERENCES

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