

Effect of Weed Management and Fertility Levels on Rajmash (*Phaseolus vulgaris*) and Associated Weeds under Dry Temperate High Hills in Himachal Pradesh

M. C. Rana, G. D. Sharma, Akhilesh Sharma and S. S. Rana

Department of Agronomy

CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur-176 062 (H. P.), India

ABSTRACT

Field experiment was conducted during the summer of 1999 and 2000 at Kukumseri (2872 m above msl) on sandy loam soil to find out viable fertility level in relation to weed control in rajmash. All the herbicide treatments being statistically at par among themselves produced significantly lower weed number and dry matter, thus resulting in significantly higher seed yield of rajmash over weedy check. The minimum weed number and dry matter accumulation were recorded following the application of pendimethalin 0.9 kg+alachlor 0.75 kg ha⁻¹ and resulted in weed control efficiency of 71.7% as compared to weedy check. This was followed by alachlor 1.5 kg ha⁻¹ and pendimethalin 1.2 kg ha⁻¹. The highest benefit : cost ratio was resulted following the application of alachlor at 1.50 kg ha⁻¹. Weed population was not influenced by increase in fertility levels. Significantly highest weed biomass was recorded when crop was fertilized with 150% of recommended fertility level (40 kg N, 60 kg P₂O₅ and 30 kg K₂O ha⁻¹). Increase in fertility level did not bring significant increase in the yield attributes and grain yield. The benefit : cost ratio was highest (5.14) following 100% recommended dose.

INTRODUCTION

Dry temperate regions of north-western Himalayas are ideally suited for quality seed production of Frenchbean (*Phaseolus vulgaris* L.). The high yielding varieties are relatively of recent introduction in the high hills, therefore, agronomic research information is lacking. Weeds pose serious problem in Frenchbean like in most of the pulses during early stages of growth. The role of phosphatic fertilizers in pulses is well documented, and, therefore, working out of optimum dose for new high yielding varieties is imperative. The present study was carried out to investigate the effect of fertility levels and weed management on the growth and yield of Frenchbean under these conditions.

MATERIALS AND METHODS

Field experiment was conducted during summer 1999 and 2000 at Regional Research Station, Kukumseri (2872 m above msl) of Himachal Pradesh

Krishi Vishvavidyalaya, Palampur. The soil of the experimental field was sandy loam in texture, rich in organic matter (2.5%) with pH 6.7. The soil had 375, 32.0 and 298 kg available N, P₂O₅ and K₂O ha⁻¹, respectively. The crop was sown on June 3 and 4 during 1999 and 2000, respectively. Rajmash variety 'Triloki' was sown. Four weed control treatments (Pendimethalin 1.2 kg ha⁻¹, alachlor 1.5 kg ha⁻¹, pendimethalin 0.9 kg+alachlor 0.75 kg ha⁻¹ and weedy check) and three fertility levels (50, 100 and 150% of the recommended) were tested in a randomized block design with three replications. The recommended dose of fertilizer was 40 kg N, 60 kg P₂O₅ and 30 kg K₂O ha⁻¹. The crop was fertilized as per treatment through calcium ammonium nitrate, single superphosphate and muriate of potash, respectively. The recommended package of practices was adopted to raise the crop. Pre-emergence application of pendimethalin and alachlor was done immediately after sowing the crop with manually operated knapsack sprayer fitted with flat fan nozzle using 800 l water ha⁻¹. Weed density and dry weight were recorded at the harvest. Seed

Table 1. Effect of treatments on density (No. m⁻²) and dry weight (g m⁻²) of weeds in rajmash

Treatment	Weed population (m ⁻²)				Weed dry matter (g m ⁻²)				
	<i>Amaranthus</i> spp.*	<i>Cheno-podium</i> spp.*	<i>Digitaria</i> spp.*	<i>Poa</i> spp.*	<i>Amaranthus</i> spp.*	<i>Cheno-podium</i> spp.*	<i>Digitaria</i> spp.*	<i>Poa</i> spp.*	Total
Fertility levels									
F50**	7.0	12.6	14.6	7.4	25.4	26.6	21.9	9.0	83.8
F150	6.6	14.4	14.4	7.1	27.3	24.6	25.7	9.8	88.3
F150	5.8	13.4	14.5	8.8	26.6	25.5	27.1	12.0	93.2
LSD (P=0.05)	NS	NS	NS	NS	NS	NS	2.2	1.2	4.6
Weed control methods									
Pendimethalin 1.2 kg ha ⁻¹	6.8	12.5	4.0	7.3	22.6	24.6	10.1	11.3	70.0
Alachlor 1.5 kg ha ⁻¹	3.3	9.0	11.0	4.0	14.2	19.9	27.6	8.3	69.8
Pendimethalin 0.9 kg+ alachlor 0.75 kg ha ⁻¹	4.3	11.3	9.7	5.5	20.4	24.3	18.9	10.1	74.4
Weedy check	11.3	21.0	33.3	14.2	48.4	33.5	43.0	11.4	139.5
LSD (P=0.05)	1.2	2.2	1.7	0.9	2.8	2.1	2.5	1.5	5.3
				1.48	1.48	1.48			5.8

*Mean of 1999 and 2000, **50% of the recommended.

NS-Not Significant.

Table 2. Effect of treatments on yield attributes and yield of rajmash

Treatment	Plant population ('000 ha ⁻¹)		Pods plant ⁻¹		Grains pod ⁻¹		Test weight (g)		Seed yield (kg ha ⁻¹)		Straw yield (kg ha ⁻¹)	Net returns	Benefit: cost ratio	
	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000				
Fertility levels														
F50	257	259	9.5	9.6	3.7	3.9	401.1	403.1	2365	2513	2350	2470	80965	4.77
F100	259	261	12.1	12.3	4.3	4.5	412.0	414.0	2638	2763	3110	3250	94424	5.14
F150	260	261	12.2	12.3	4.6	4.7	413.2	415.2	2693	2858	3140	3260	96025	4.85
LSD (P=0.05)	NS	NS	0.33	0.29	0.1	0.1	1.7	1.8	273	258	105	98	-	-
Weed control methods														
Pendimethalin 1.2 kg ha ⁻¹	260	261	12.1	12.3	4.3	4.5	412.6	414.6	2847	2977	3150	3290	102077	5.31
Alachlor 1.5 kg ha ⁻¹	259	260	11.0	11.1	4.2	4.3	408.2	410.2	2840	2927	2800	2930	100002	5.49
Pendimethalin 0.9 kg + alachlor 0.75 kg ha ⁻¹	259	260	11.0	11.1	4.2	4.4	407.3	409.3	2793	3050	2740	2850	100765	5.24
Weedy check	259	260	10.9	11.0	4.0	4.2	407.0	409.0	1780	1890	2770	2900	60795	3.61
LSD (P=0.05)	NS	NS	0.38	0.33	0.16	0.13	2.02	2.11	314	299	122	113	-	-

NS-Not Significant.

and straw yields were harvested from net plot. Economics of the treatment was computed based upon prevalent market prices.

RESULTS AND DISCUSSION

The predominant weeds of the experimental area were *Digitaria sanguinalis* (41.0%), *Chenopodium* sp. (*C. album* and *C. bonus-Henricus*, 25.86%), *Poa annua* (17.49%) and *Amaranthus* sp. (13.92%).

Effect on Weeds

Alachlor at 1.50 kg ha⁻¹ resulted in significantly lower weed density and dry matter accumulation by *Amaranthus* sp., *Chenopodium* sp. and *Poa annua* (Table 1). Pendimethalin at 0.90 kg ha⁻¹ + alachlor at 0.75 kg ha⁻¹ was as effective as alachlor at 1.50 kg ha⁻¹ in reducing the number of *Amaranthus* sp. Pendimethalin at 1.20 kg ha⁻¹ recorded significantly lowest density and dry weight of *D. sanguinalis*. The next best herbicide treatment in reducing the number and dry weight of *D. sanguinalis* was pendimethalin at 0.90 kg ha⁻¹+alachlor at 0.75 kg ha⁻¹.

The minimum total weed number and dry matter accumulation were recorded with pendimethalin at 0.9 kg + alachlor at 0.75 kg ha⁻¹. This was followed by alachlor at 1.5 kg ha⁻¹ and pendimethalin at 1.2 kg ha⁻¹, both being statistically similar to each other during 2000 resulted in weed control efficiency of 71.7%.

Weed population was not influenced by increase in fertility levels. Significantly highest total weed biomass was recorded when crop was fertilized with 150% of recommended fertility level (40 kg N, 60 kg P₂O₅ and 30 kg K₂O ha⁻¹).

Effect on Crop

All the herbicide treatments being statistically at par among themselves produced significantly higher seed yield of rajmash over weedy check (Table 2). A reduction of 59.2% in grain yield of rajmash was recorded, when weeds were allowed to grow undisturbed till harvest to pre-emergence application of pendimethalin at 0.9 kg + alachlor at 0.75 kg ha⁻¹. The increase in yield was owing to increase in yield attributes due to effective weed control. Due to higher seed and straw yields, all weed control treatments brought about appreciable increase in net returns and benefit : cost ratio over weedy check. The highest benefit : cost ratio was resulted following the application of alachlor at 1.50 kg ha⁻¹.

Increase in fertility level did not bring significant increase in the yield attributes and grain yield. The yield attributes and yield were higher due to 100% recommended fertility level. Similar were the observations given by Saxena and Verma (1995). The 50% higher fertility could increase the net returns by only 1.7% over the recommended dose. The benefit : cost ratio was highest (5.14) following 100% recommended dose.

The study clearly showed that the rajmash under agro-climatic conditions of high-hills temperate zone should be fertilized with 100% of the recommended fertilizer and weeds could be managed with herbicide mixture, pendimethalin+alachlor or pendimethalin or alachlor.

REFERENCE

- Saxena, K. K. and V. S. Verma, 1995. Effect of nitrogen, phosphorus and potassium on the growth and yield of Frenchbean (*Phaseolus vulgaris*). *Indian J. Agron.* **40** : 249-252.