

Weed Management in Shaftal (*Trifolium resupinatum*) Under Mid Hill Conditions of Himachal Pradesh

Naveen Kumar and Naleeni Ramawat

Department of Agronomy

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

ABSTRACT

Pendimethalin at 1.25 kg ha⁻¹ gave better control of weeds with weed control efficiency of 92.9% and produced significantly higher green forage yield (19.7 t ha⁻¹) and remained at par with butachlor at 1.50 kg ha⁻¹ (19.1 t ha⁻¹). Higher doses of herbicides gave better control of weeds but proved toxic to crop and caused significant reduction in forage yield. Butachlor at 1.50 kg ha⁻¹ resulted in highest net return of Rs. 11,511 ha⁻¹ and remained at par with pendimethalin at 1.25 kg ha⁻¹ (Rs. 10,983 ha⁻¹).

INTRODUCTION

Shaftal (*Trifolium resupinatum*), a leguminous, nutritious, succulent and palatable forage crop, is recent introduction in Himachal Pradesh (Stockdale, 1993). This crop has higher production potential than berseem under frost prone conditions of the region (Annual Report, 1998). However, poor weed control measures resulting in severe weed infestation cause a significant reduction in the productivity of this crop. Dinitroanilines including fluchloralin and pendimethalin are commonly used to control weeds in many legume crops. Therefore, the present study was undertaken to find out the most suitable weed control measure in shaftal under mid hill conditions of Himachal Pradesh.

MATERIALS AND METHODS

The experiment was conducted during rabi (winter) seasons of 2001-02, 2002-03 and 2003-04 at Research Farm of Fodder Production and Grassland Management Centre, CSK HPKV, Palampur to test the efficacy of butachlor, pendimethalin and fluchloralin for the control of weeds in shaftal. The soil of experimental field was silty clay loam (Typic Hapludalf) having pH 5.9, organic carbon 1.1%, medium in available nitrogen (292.0 kg ha⁻¹) and phosphorus (9.5 kg ha⁻¹) and high in potassium (332.0 kg ha⁻¹). The experiment was conducted in

randomised block design with 12 treatments replicated thrice. Treatments were comprised of pre-emergence application of butachlor (1.0, 1.50 and 2.0 kg ha⁻¹), pendimethalin (1.0, 1.25 and 1.50 kg ha⁻¹), pre-plant incorporation of fluchloralin (0.67, 0.90 and 1.12 kg ha⁻¹), one hand weeding at 60 days after sowing (DAS), two hand weedings at 60 and 100 DAS and weedy check. The variety SH-48 of shaftal was sown in last week of October using recommended package of practices. Herbicides as per treatments were sprayed with knapsack sprayer fitted with flat fan nozzle with a spray volume of 600 l ha⁻¹. In all, two cuts of shaftal in each season were taken and the yield of each season was presented as total of two cuts. The weed population and dry matter yield were analysed after subjecting the original data to $\sqrt{x+1}$ transformation.

RESULTS AND DISCUSSION

Effect on Weeds

The predominant weeds in experimental field were *Poa annua* (60.5%), *Lolium temulentum* (21.50%), *Anagallis arvensis* (9%), *Chenopodium album* (5.8%) and *Phalaris minor* (3.2%). All the herbicide and hand weeding treatments reduced the weed population and weed dry matter over weedy check (Table 1). The magnitude of reduction in weed population and dry matter varied

Table 1. Effect of treatments on weeds in shaftal

Treatment	Dose (kg ha ⁻¹)	Total weed population m ⁻²				Total weed dry matter (g m ⁻²)				Mean
		2001-02	2002-03	2003-04	Mean	2001-02	2002-03	2003-04	Mean	
Butachlor	1.00	8.12 (65)	7.7 (58)	7.64 (58)	7.81 (60)	8.7 (74.5)	8.3 (68.0)	8.3 (67.6)	8.4 (70.3)	
Butachlor	1.25	6.51 (41)	6.3 (39)	6.12 (37)	6.31 (39)	6.9 (46.4)	6.8 (45.0)	6.7 (44.1)	6.8 (48.0)	
Butachlor	1.50	4.56 (19)	4.3 (17)	4.08 (16)	4.31 (18)	5.4 (28.9)	4.5 (19.7)	4.5 (19.3)	4.9 (22.7)	
Pendimethalin	1.00	8.05 (64)	8.1 (64)	8.17 (66)	8.10 (65)	8.6 (73.2)	8.8 (77.5)	8.9 (79.7)	8.8 (76.0)	
Pendimethalin	1.25	5.81 (33)	4.9 (23)	4.73 (22)	5.12 (25)	6.2 (37.1)	5.3 (27.3)	4.3 (18.1)	5.3 (27.3)	
Pendimethalin	1.50	3.65 (13)	3.4 (11)	3.08 (9)	3.38 (11)	3.8 (13.7)	3.7 (12.7)	3.6 (11.7)	3.7 (15.0)	
Fluchloralin	0.67	8.27 (68)	8.0 (63)	7.97 (63)	8.08 (65)	8.9 (77.9)	8.7 (74.3)	8.8 (76.2)	8.8 (76.3)	
Fluchloralin	0.90	6.81 (45)	6.7 (44)	5.61 (33)	6.72 (44)	7.3 (51.6)	7.3 (52.7)	7.3 (51.9)	7.3 (52.0)	
Fluchloralin	1.12	3.89 (14)	3.8 (13)	3.76 (13)	3.82 (47)	4.1 (15.4)	4.1 (16.0)	4.1 (16.2)	4.1 (16.0)	
HW 60 DAS	-	9.31 (86)	11.8 (92)	9.28 (85)	10.23 (104)	9.9 (38.6)	10.0 (99.7)	10.5 (109.4)	10.2 (102.6)	
HW 60 & 100 DAS	-	4.10 (16)	4.2 (17)	3.78 (13)	4.33 (17)	4.3 (17.6)	4.6 (20.3)	4.3 (17.5)	4.4 (18.7)	
Weedy	-	11.06 (122)	12.2 (148)	12.57 (157)	11.96 (142)	11.8 (139.9)	13.3 (174.7)	13.7 (187.8)	13.0 (167.3)	
LSD (P=0.05)	-	1.20	1.25	1.16	0.61	0.68	0.74	0.78	0.5	

Data subjected to $\sqrt{x+1}$ transformation and original values are given in parentheses.

Table 2. Effect of treatments on crop and net returns of shaftal

Treatment	Dose (kg ha ⁻¹)	Shoots (No. m ⁻²)				Green fodder yield (t ha ⁻¹)				Dry matter yield (t ha ⁻¹)				Mean net returns (Rs. ha ⁻¹)
		2001-02	2002-03	2003-04	Mean	2001-02	2002-03	2003-04	Mean	2001-02	2002-03	2003-04	Mean	
Butachlor	1.00	191.50	188.8	180.0	186.8	17.2	18.0	18.3	17.8	3.6	4.2	4.4	4.0	10552
Butachlor	1.25	213.5	212.0	200.1	208.5	17.7	19.2	20.4	19.1	3.7	4.5	4.9	4.4	11511
Butachlor	1.50	172.7	168.8	155.1	165.5	14.2	15.3	15.9	15.1	3.0	3.5	3.7	3.4	7518
Pendimethalin	1.00	187.8	186.2	182.1	185.4	15.8	15.5	15.7	15.7	3.3	3.6	3.8	3.6	7431
Pendimethalin	1.25	214.7	209.0	209.5	201.9	19.0	19.6	20.6	19.7	4.0	4.6	4.9	4.5	10983
Pendimethalin	1.50	136.8	134.5	123.0	131.4	13.3	13.3	13.0	13.2	2.8	3.2	3.0	2.9	4425
Fluchloralin	0.67	182.0	182.3	175.6	180.0	14.8	15.3	15.5	15.2	3.1	3.6	3.7	3.5	7401
Fluchloralin	0.90	202.7	205.3	203.5	203.8	17.7	18.3	19.5	18.5	3.7	4.3	4.7	4.2	10339
Fluchloralin	1.12	135.5	123.3	120.3	126.4	12.7	13.2	13.4	13.1	2.6	3.1	3.0	2.9	4262
HW 60 DAS	-	161.2	151.2	119.1	143.8	14.9	15.2	18.4	15.0	3.1	3.6	4.5	3.4	7136
HW 60 & 100 DAS	-	174.3	169.2	170.8	171.8	16.5	17.9	18.3	17.6	3.5	4.2	4.4	4.1	8974
Weedy	-	98.2	84.8	72.1	85.0	12.4	11.2	14.9	11.2	2.6	2.6	3.6	3.4	4271
LSD (P=0.05)	-	13.7	18.7	22.6	17.8	0.9	1.4	0.5	0.7	0.2	0.3	0.4	0.2	-

depending upon respective weed control treatments and thereby weed control efficiency (WCE) varied between 38.0 to 92.2% (Table 1). Pendimethalin at 1.50 kg ha⁻¹ resulted in better control of weeds followed by fluchloralin at 1.12 kg ha⁻¹. Average data of three seasons indicated that total weed population and weed dry matter decreased significantly with increase in doses of each herbicide. Similarly, WCE increased from 57.1 to 86.9%, 53.9 to 92.9% and 53.7 to 90.3% with increase in dose of butachlor, pendimethalin and fluchloralin, respectively. Highest WCE of 92.9% was observed with pendimethalin at 1.50 kg ha⁻¹. Pendimethalin had an edge over fluchloralin in reducing weed population and dry matter production.

Effect on Crop and Economics

All the treatments increased the green and dry matter yields of shaftal over weedy check. Application of pendimethalin at 1.25 kg ha⁻¹ resulted in production of significantly higher green forage yield of 19.7 t ha⁻¹ (Table 2) and remained at par with butachlor at 1.50 kg ha⁻¹ (19.1 t ha⁻¹). The highest doses of herbicides caused a significant reduction in shoot number of shaftal, which indicated phytotoxic effect of highest doses of each herbicide on shaftal crop (Table 2). Because of this, a

significant reduction in shaftal forage yields was noticed at higher doses of each herbicide. Increase in the phytotoxicity with increase in the concentration of dinitroanilines in clusterbean has also been reported by Pratibha (1994). Green and dry fodder yields obtained with butachlor at 1.00 kg ha⁻¹ were statistically comparable with two hand weedings done at 60 and 100 DAS. One or two hand weedings were significantly better than highest doses of all the herbicides with respect to green and dry fodder yields. Butachlor at 1.50 kg ha⁻¹ resulted in highest net returns of Rs. 11,511 ha⁻¹. Pendimethalin at 1.25 kg ha⁻¹ proved next alternative in terms of monetary income (Rs. 10,983 ha⁻¹) and was comparable with butachlor at 1.00 kg ha⁻¹ (Rs. 10,552 ha⁻¹) and fluchloralin at 0.90 kg ha⁻¹ (Rs. 10,339 ha⁻¹).

REFERENCES

- Annual Report, 1998. Department of Agronomy, CSK HPKV, Palampur.
- Pratibha, A. 1994. Performance and persistence of fluchloralin and pendimethalin applied in clusterbean. *Indian J. Weed Sci.* **26** : 139-142.
- Stockdale, C. R. 1993. The nutritive value of Persian clover (*Trifolium resupinatum*) herbage grown under irrigation in northern Victoria. *Aust. J. agric. Res.* **44** : 1557-1576.