



Integrated weed management in berseem

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Berseem or Egyptian clover (*Trifolium alexandrinum* L.), a potential winter forage legume, is one of the most popular crops in north, north-west and central parts of India. Because of its slow growth in the initial stages, crop suffers heavily due to weed infestation. Weeds particularly *Cichorium intybus* found associated with berseem and give more competition stress by robbing the crop of essential nutrients, light, moisture and space (Thakur *et al.* 1990). Weed competition reduces the green forage yield up to 30-40% besides deteriorating quality of green forage (Jain 1998). The present investigation was undertaken to evaluate the bioefficacy of herbicide alone or in combination with mechanical methods in berseem.

An experiment was conducted at MPKV, Rahuri situated between 19° 48' and 19° 49' N latitude and between 74° 32' E and 76° 19' E longitude during Rabi season 2011-12. The altitude varied from 395 to 565 m above mean sea level. The soils of the experimental field were clayey in texture, low in available nitrogen (201.4 kg/ha), medium in available phosphorus (18.4 kg/ha) and high in available potassium (495 kg/ha). It was moderately alkaline in reaction (pH 8.01) with 0.23 dS/m electrical conductivity. The organic carbon content was 0.38 per cent.

The experiment consisting of 10 treatments (Table 1) was laid out in a randomized block design replicated thrice. The gross and net plot size employed was 4.0 x 3.0 m and 3.4 x 2.4 m, respectively. The maximum and minimum temperature during the crop growth period was ranging from 29.1-33.8°C and 10.1-15.9°C, respectively. Herbicides were sprayed with the manually operated knapsack sprayer fitted with flat-fan nozzle at spray volume of 500 l/ha. The pre-emergence herbicides were sprayed 3 days after sowing prior to emergence of weed. The crop was fertilized with the recommended dose of fertilizer, 20 kg N, 80 kg P₂O₅ and 40 kg K₂O/ha. The variety 'Wardan' was sown at 30 cm apart by using seed rate of 30 kg/ha. First two cuts were taken for green forage purpose there after crop was left for seed production purpose and harvesting of seed was done in the month of May. From each plot, 250 g representative fresh plant sample was taken in

each cut to estimate the dry matter content for computing dry matter yield of fodder. The weed density and its dry weight were recorded from each plot by using a quadrat method (1.0 x 1.0 m) at harvest of last cut for seed. The weed control efficiency (WCE) and weed index (WI) was calculated as per the standard formula suggested by Gautam *et al.* (1975) and Gill and Vijaykumar (1969), respectively.

Major monocot weeds were: *Cynodon dactylon* (28.5%), *Chloris barbata* (7.1%), *Digitaria longiflora* (10.7%), *Dactyloctenium aegyptium* (10.7%) and *Cyperus rotundus* (42.9%). Major dicot weeds were: *Amaranthus viridis* (16.7%), *Euphorbia geniculata* (8.3%), *Celosia argentea* (4.2%), *Trianthema portulacastrum* (4.2%), *Commelina benghalensis* (12.5%), *Corchorus aestuans* (4.2%), *Parthenium hysterophorus* (33.3%), *Tridax procumbens* (4.2%), *Portulaca oleracea* (4.2%), *Cichorium intybus* (4.2%). Out of these, *P. hysterophorus*, *E. geniculata*, and *C. rotundus* were most dominated weeds.

Weedy check recorded significantly higher total weed density at harvest (51.8/m²). Significantly minimum weed count at harvest was found with weed free treatment followed by oxyflourfen 0.10 kg/ha as pre-emergence (PE) and imazethapyr 0.10 kg/ha as post-emergence (PoE), immediately after 1st cut and it was found at par with one hoeing at 3 week after sowing and one hand weeding at 5 week after sowing (Table 1).

The minimum weed dry weight at harvest was observed under weed free check which was followed by treatment oxyflourfen PE 0.10 kg/ha *fb* imazethapyr POE 0.10 kg/ha (immediate after harvest of 1st cut) and one hoeing at 3 week after sowing and one HW at 5 week after sowing both were found at par with each other. The results were in accordance with the findings of Jain (1998) and Tamrakar *et al.* (2002).

Significantly highest WCE was noticed in weed free check. Among the other weed control treatments, it was significantly maximum and at par with treatments oxyflourfen PE 0.10 kg/ha *fb* imazethapyr POE 0.10 kg/ha (immediate after harvest of 1st cut) and one hoeing at 3 week after sowing and one HW at 5 week after sowing as compared to weedy check (Table 1). This observation was in agreement of Tiwana *et al.* (2002).

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Table 1. Weed count and dry weight as influenced by integrated weed management

Treatment	Total weed density (no./m ²)	Total weed dry weight at harvest (3 cuts) (g/m ²)	Weed control efficiency (%)	Weed index for GFY (%)	Weed index for seed yield (%)
T ₁ - One hoeing at 3 week after sowing and one HW at 5 week after sowing	4.4 (18.5)	5.1 (25.3)	72.4	7.3	13.6
T ₂ - Pendimethalin PE 1.0 kg/ha	6.2 (37.3)	7.1 (50.1)	45.4	59.4	46.3
T ₃ - Pendimethalin PE 1.0 kg/ha <i>fb</i> one HW at 5 week after sowing	5.7 (31.5)	7.0 (48.4)	47.2	49.4	46.8
T ₄ - Oxyflourfen PE 0.10 kg/ha	5.3 (27.4)	6.3 (38.2)	58.3	26.7	33.8
T ₅ - Oxyflourfen PE 0.10 kg/ha <i>fb</i> one HW at 5 week after sowing	5.0 (24.0)	6.2 (36.7)	64.6	21.8	25.5
T ₆ - Pendimethalin PE 1.00 kg/ha <i>fb</i> imazethapyr POE 0.10 kg/ha (immediate after harvest of I st cut)	5.5 (29.3)	6.8 (44.7)	51.2	27.9	38.0
T ₇ - Oxyflourfen PE 0.10 kg/ha <i>fb</i> imazethapyr POE 0.10 kg/ha (immediate after harvest of I st cut)	3.9 (14.2)	4.9 (23.0)	75.0	4.1	7.7
T ₈ - Imazethapyr POE 0.10 kg/ha (immediate after harvest of I st and II nd cut)	4.9 (22.7)	5.4 (28.5)	69.0	11.7	27.7
T ₉ - Weedy check (control)	7.3 (51.8)	9.6 (91.7)	-	62.4	53.2
T ₁₀ - Weed free check	1.0 (0.0)	1.0 (0.0)	100.0	0.0	0.0
LSD (P=0.05)	0.9	0.91	7.5	9.9	15.6

*PE- Pre-emergence, POE- Post-emergence, HW- Hand weeding, *fb*- followed by; GFY - Green forage yield

** Original values given in parentheses are square root transformed $\sqrt{X + 1}$ for statistical analysis.

Among the weed control treatments, significantly minimum weed index (4.08) for green fodder yield (GFY) was with treatment oxyflourfen 0.10 kg/ha followed by imazethapyr 0.10 kg/ha immediate after harvest of Ist cut and it was at par with one hoeing at 3 week after sowing and one HW at 5 week after sowing and imazethapyr POE 0.100 kg/ha. Whereas, in respect to weed index of seed yield, it was significantly minimum with treatment oxyflourfen PE 0.10 kg/ha *fb* imazethapyr POE 0.10 kg/ha and found at par with treatment one hoeing at 3 week after sowing and one HW at 5 week after sowing (Table 1). These results were in conformity with findings of Jain (1998) and Tiwana *et al.* (2002).

Weed free check was significantly superior with respect to green forage yield (GFY) (47.27 t/ha), dry fodder yield (DFY) (7.13 t/ha), seed yield (0.35 t/ha), straw yield (1.34 t/ha) and crude protein yield (1.22 t/ha) as compared to rest of the treatment except treatment oxyflourfen *fb* imazethapyr and imazethapyr applied after harvest of Ist and IInd cut, which were found at par (Table 2). The per cent increase over control with respect to GFY, DFY, seed yield, straw yield and crude protein yield

in oxyflourfen PE 0.100 kg/ha *fb* imazethapyr POE 0.10 kg/ha (immediate after harvest of Ist cut) were 59.38, 57.95, 45.85, 49.37 and 57.70, respectively. These results were in agreement with the findings of Tamrakar *et al.* (2002) and Tiwana *et al.* (2002).

Weed free check fetched maximum and significantly higher gross monetary (₹ 1,33,031/ha) and net monetary returns (₹ 64,812/ha) over rest of the treatment except treatment one hoeing at 3 week after sowing and one HW at 5 week after sowing and oxyflourfen PE 0.100 kg/ha *fb* imazethapyr POE 0.10 kg/ha (Table 2). The maximum B:C ratio (2.01) was registered by treatment oxyflourfen PE 0.10 kg/ha *fb* imazethapyr POE 0.10 kg/ha (immediate after harvest of Ist cut) which was followed by weed-free check (1.95).

SUMMARY

Weed-free check treatment recorded significantly lowest total weed count/m² and its dry weight at harvest followed by oxyflourfen pre-emergence 0.10 kg/ha *fb* imazethapyr post-emergence 0.10 kg/ha (immediate after harvest of Ist cut) and one hoeing at 3 week after sowing

Table 2. Effect of integrated weed management treatments on yield and economics of berseem

Treatment	Green forage yield (t/ha)	Dry matter yield (t/ha)	Seed yield (t/ha)	Straw yield (t/ha)	Crude protein yield (t/ha)	Gross monetary returns (x10 ³ ₹/ha)	Cost of cultivation (x10 ³ ₹/ha)	Net monetary returns (x10 ³ ₹/ha)	B:C ratio
T ₁	46.55	6.69	0.32	1.33	1.13	127.64	64.05	59.42	1.87
T ₂	20.57	4.52	0.20	0.82	0.76	80.59	52.06	28.53	1.55
T ₃	25.69	3.66	0.20	0.78	0.62	74.33	52.11	22.22	1.43
T ₄	37.17	5.30	0.25	1.03	0.91	100.39	56.06	44.32	1.79
T ₅	39.66	5.81	0.28	1.19	1.03	108.98	60.09	48.88	1.81
T ₆	36.57	5.33	0.23	0.83	0.93	96.46	56.65	39.81	1.70
T ₇	47.04	6.77	0.32	1.34	1.14	128.71	59.09	64.65	2.01
T ₈	43.30	6.29	0.27	1.30	1.12	110.79	59.59	51.20	1.86
T ₉	19.10	2.84	0.18	0.68	0.48	60.13	52.11	8.01	1.15
T ₁₀	47.27	7.13	0.35	1.39	1.22	130.31	68.22	64.81	1.95
LSD (P=0.05)	5.27	0.96	0.07	0.20	0.13	16.62	-	16.62	-

Selling rate of berseem: Green forage (₹ 1.50/kg), seed (₹ 175.00/kg), straw (₹ 1.00/kg)

and one hand weeding at 5 week after sowing which were at par with each other. The weed control efficiency was highest in weed free check and significantly superior to all the treatments. Significantly minimum weed index of berseem, green forage yield and seed yield were observed in treatment oxyflourfen pre-emergence 0.10 kg/ha fb imazethapyr post-emergence 0.10 kg/ha and it was at par with treatment one hoeing at 3 week after sowing and one hand weeding at 5 week after sowing and imazethapyr post-emergence 0.10 kg/ha. The economic studies indicatedes that oxyflourfen pre-emergence 0.10 kg/ha fb as post-emergence imazethapyr 0.10 kg/ha immediate after harvest of Ist cut was most cost effective and remunerative. The maximum net monetary returns of ₹ 64,658/- with B:C ratio of 2.01 was fetched by the treatment oxyflourfen pre-emergence 0.10 kg/ha followed by imazethapyr as a post-emergence application 0.10 kg/ha immediate after harvest of Ist cut was found effective and remunerative followed by treatment one hoeing at 3 week after sowing and one hand weeding at 5 week after sowing.

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