Indian Journal of Weed Science **49**(3): 269–271, 2017
DOI: 10.5958/0974-8164.2017.00070.3

Sequential use of herbicides for weed control in Egyptian clover

B.T. Sinare*, H.P. Pardeshi and M.G. Gavit
All India Coordinated Research Project on Forage Crops & Utilization, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra 413 722

Received: 13 July 2017; Revised: 27 August 2017

ABSTRACT

To study the effect of sequential use of herbicides for weed control in Egyptian clover (berseem) crop, a field experiment was conducted under All India Coordinated Research Project on Forage Crops and Utilization, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, during *Rabi* (winter) seasons of 2012-2013, 2013-2014 and 2014-2015. The field experiment with 10 weed control treatments was laid out in a randomized block design with three replications. Among the weed control treatments, oxyfluorfen 0.1 kg/ha *fb* imazethapyr 0.1 kg/ha applied after first cut recorded the lowest weed count and weed dry weight with higher weed control efficiency. However, it was at par with the application of imazethapyr 0.1 kg/ha after first and second cut. The green forage yield, dry matter yield, seed yield, straw yield, crude protein yield, gross monetary returns and benefit-cost ratio were significantly superior in the treatment of imazethapyr 0.1 kg/ha applied after harvest of first and second cut.

Key words: Berseem**,** Egyptian clover, Herbicides**,** Imazethapyr, Oxyfluorfen, Pendimethalin, Sequential use, Weed management

Egyptian clover (*Trifolium alexandrium* L.) or berseem is a potential winter forage legume, one of the most popular crop in North, North-West and Central parts of India. It is a well-known green forage crop to stimulate milk production in dairy animals. Due to its excellent and quick re-growing ability and long durational nutritious green fodder availability (November to April), the crop is grown under irrigated conditions. Because of its slow growth in the initial stages, a wide range in yield reduction in the crop on account of weeds is well documented in respect of competition for essential nutrients, light, moisture and space (Thakur *et al*. 1990). Weed competition substantially reduces the green forage yield and it causes reduction up to 30 to 40% besides deteriorating quality of green forage, if not controlled during critical period of crop-weed competition (Jain 1998). Therefore, there is need to create an environment that is detrimental to weeds and favourable to the crops. Hence, weed control need to be done during the initial period of crop growth. Hand weeding is traditional and an effective method of weed control but it is very costly, labour intensive and sometimes it is not possible due to non-availability of labour. Under such situations, chemical weed control offers a better alternative to manual weeding. So, this study was conducted to evaluate pre-and post-emergence herbicides alone and in combination, which could be alternative to the traditional hand weeding practices.

***Corresponding author:** sinarebt69@gmail.com

MATERIALS AND METHODS

The experiment was conducted under All India Coordinated Research Project on Forage Crops and Utilization, Mahatma Phule Krishi Vidyapeeth, Rahuri (Maharashtra) during the *Rabi* (winter) seasons of 2012-13, 2013-14 and 2014-15. The soils of the experimental field were clayey in texture, low in available nitrogen (175 kg/ha), medium in available phosphorus (16.5 kg/ha) and high in available potassium (335 kg/ha). It was moderately alkaline in reaction with 0.20 dS/m electrical conductivity. The organic carbon content was 0.38%. The field experiment was laid out in a randomized block design with three replications. The experiment comprised of 10 weed control treatments *viz.* weedy check (control), pendimethalin 0.3 kg/ha, pendimethalin 0.4 kg/ha, pendimethalin 0.5 kg/ha, oxyfluorfen 0.1 kg/ha, imazethapyr 0.1 kg/ha applied after harvest of first and second cut, oxyfluorfen 0.1 kg/ha *fb* imazethapyr 0.1 kg/ha applied after harvest of first cut, pendimethalin 0.3 kg/ha *fb* imazethapyr 0.1 kg/ha applied after harvest of first cut, pendimethalin 0.4 kg/ha *fb* imazethapyr 0.1 kg/ha applied after harvest of first cut and pendimethalin 0.5 kg/ha *fb* imazethapyr 0.1 kg/ha applied after harvest of first cut. The gross and net plot size were 4 x 3 m^2 and 3.4 x 2.4 m^2, respectively.

Herbicides were sprayed with a manually operated knapsack sprayer. Pendimethalin and oxyfluorfen were used as pre-emergence, while

imazethapyr as post-emergence. The pre-emergence herbicides were sprayed 3 days after sowing, prior to emergence of weeds as well as crop, which was irrigated immediately after sowing and the post-emergence herbicide was applied after first and second cut of fodder as per the treatment. The crop was fertilized with the recommended dose of fertilizer *i.e* 20 kg N, 80 kg P_2O_5 and 40 kg K_2O/ha and supplied through urea, single super phosphate and mutate of potash, respectively. The variety '*Wardan*' was sown at 30 cm using a seed rate of 30 kg/ha. First two cuts were taken for green forage purpose and after harvesting of second cut for fodder, crop was left for seed production and harvesting of seed was done in May. From each plot, a 250 g representative fresh plant sample was taken at each cut to estimate the dry matter content for computing dry matter yield of fodder. One quadrate of 1.0 x 1.0 m was placed randomly in each plot and weeds were recorded. Data were recorded on the plant population (per m row length), plant height (cm), weed count (m^2), dry matter of weeds (g/m^2), green forage yield (t/ha), straw yield (t/ha) and seed yield (t/ha). The weed control efficiency (%) was also calculated. The economics of various treatments was worked out in terms of `/ha. The data on weeds were subjected to square root transformation ($\sqrt{x+0.5}$) to normalize their distribution. The data were statistically analyzed following standard procedure

RESULTS AND DISCUSSION

Weed flora

Major grassy (monocot) weeds were *Cynodon dactylon, Chloris barbata, Digitaria longiflora* and *Dactyloctenium agyptium;* among broad-leaved (dicot) weeds *Amaranthus viridis, Euphorbia geniculata, Celosia argentea, Trianthema portulacastrum, Commmelina benghalensis, Corchorus aestuans, Parthenium hysterophorus, Tridax procumbens, Portulaca oleracea* and *Cichorium intybus;* and *Cyperus rotundus* from sedges.

Among the weed control treatments, 18 monocot weeds and 9 dicot weeds were recorded in the plots treated with oxyfluorfen 0.1 k*g*/ha *fb* imazethapyr 0.1 kg/ha applied after first cut but this treatment was at par with the application of imazethapyr 0.1 kg/ha applied after 1st and 2nd cut which recorded monocot weed density of 20 plants/ m^2 and dicot weed density of 12 plants/m^2 (**Table 1**).

Weed biomass

Weed dry weight of monocot (47 g/m^2) and dicot weeds (21 g/m^2) was recorded significantly lower in the plots treated with oxyfluorfen 0.1 kg/ha *fb* imazethapyr 0.1 kg/ha applied after first cut. However, it was at par with the application of

Table 1. Effect of various treatments on weed count, weed biomass and weed control efficiency in berseem (pooled mean of three years)

Treatment	Weed Count (m^2)			Dry weight of weeds (g/m^2)			Weed control efficiency (%)		
	Monocot	Dicot	Total (Monocot + dicot)	Monocot	Dicot	Total (Monocot + dicot)	Monocot	Dicot	Total (Monocot + dicot)
Pendimethalin 0.3 kg/ha	7.72 (59)	4.39 (18)	11.00 (77)	10.88(119)	6.94(48)	14.33 (167)	18	34	26
Pendimethalin 0.4 kg/ha	7.75 (59)	4.28 (18)	11.02 (77)	10.95(120)	6.67(45)	14.18 (164)	18	38.	28
Pendimethalin 0.5 kg/ha	7.50 (56)	4.58 (21)	11.03 (76)	10.65(113)	7.11(50)	13.93 (163)	23	29	26
Oxyfluorfen 0.1 kg/ha	5.33 (28)	3.78 (13)	8.30 (41)	7.95 (64)	5.69(32)	11.01 (96)	61	49	55
Imazethapyr 0.1 kg/ha after first and second cut	4.57 (20)	3.60 (12)	7.24 (33)	7.40 (54)	4.88(24)	9.61 (78)	72	56	64
Oxyfluorfen 0.1 kg/ha *fb* imazethapyr 0.1 kg/ha after first cut	4.29 (18)	3.19 (9)	6.77 (27)	6.81 (47)	4.62(21)	9.33 (68)	75	65	70
Pendimethalin 0.3 kg/ha *fb* imazethapyr 0.1 kg/ha after first cut	6.12 (37)	4.03 (15)	9.15 (52)	9.05 (82)	5.93(34)	(11.90 116)	49	44	47
Pendimethalin 0.4 kg/ha *fb* imazethapyr 0.1 kg/ha after first cut	5.69 (32)	3.96 (15)	8.70 (47)	8.78 (77)	6.10(37)	11.78 (113)	56	47	52
Pendimethalin 0.5 kg/ha *fb* imazethapyr 0.1 kg/ha after first cut	5.60 (31)	3.89 (14)	8.57 (45)	8.68 (74)	6.15(38)	11.58 (112)	57	51	54
Weedy check (control)	8.53 (72)	5.40 (29)	12.67(101)	11.85(140)	8.17(66)	15.61 (206)	0	0	0
LSD (p=0.05)	0.48	0.40	0.62	0.66	0.56	0.69	7.33	11.24	6.80

Data were subjected to square root transformation ($\sqrt{x+0.5}$); Figures in parentheses are actual values

Table 2. Growth parameters and yield and economics of berseem as influenced by different weed management treatments (pooled mean of three years)

Treatment	Plant population / meter row length	Plant height (cm)	Leaf: Stem ratio	Yield			Dry matter yield (t/ha)	Crude protein yield (kg/ha)	Gross monetary returns (x10^3`/ha)	Cost of cultivation (x10^3`/ha)	Net monetary returns (x10^3`/ha)	B:C Ratio
				Green forage (t/ha)	Seed (kg/ha)	Straw (kg/ha)						
Pendimethalin 0.3 kg/ha	91.0	46	0.7	25.51	120	669	4.10	764	60.89	40.60	20.29	1.54
Pendimethalin 0.4 kg/ha	83.3	44	0.6	24.24	116	578	3.85	734	58.22	40.43	17.79	1.47
Pendimethalin 0.5 kg/ha	81.7	43	0.7	23.14	113	561	3.63	685	56.00	41.04	14.96	1.39
Oxyfluorfen 0.1 kg/ha	91.3	44	0.7	29.56	143	858	4.81	878	71.35	42.88	28.47	1.69
Imazethapyr 0.1 kg/ha after first and second cut	118.3	49	0.6	41.61	182	1130	6.90	1278	96.52	47.56	48.97	2.09
Oxyfluorfen 0.1 kg/ha *fb* imazethapyr 0.1 kg/ha after first cut	94.3	43	0.6	33.20	162	966	5.49	1013	80.34	47.25	33.09	1.70
Pendimethalin 0.3 kg/ha *fb* imazethapyr 0.1 kg/ha after first cut	87.7	47	0.6	28.86	142	828	4.67	851	70.18	45.55	24.57	1.58
Pendimethalin 0.4 kg/ha *fb* imazethapyr 0.1 kg/ha after first cut	85.7	43	0.6	27.82	136	782	4.38	786	67.44	45.28	22.16	1.52
Pendimethalin 0.5 kg/ha *fb* imazethapyr 0.1 kg/ha after first cut	83.0	43	0.7	26.93	124	732	4.14	766	63.82	45.05	18.77	1.45
Weedy check (control)	104.3	51	0.6	30.05	148	741	4.94	894	72.66	42.74	29.92	1.70
LSD (p=0.05)	10.11	5.06	NS	3.19	14.0	92.0	0.62	114.0	5.43	--	5.75	0.15

imazethapyr 0.1 kg/ha applied after 1st and 2nd cut. The total weed control efficiency (70%) was recorded significantly higher with oxyfluorfen 0.1 kg/ha *fb* imazethapyr 0.1 kg/ha applied after first cut and was at par with the application of imazethapyr 0.1 kg/ha applied after 1st and 2nd cut (64%). The results were in accordance with the findings of Tiwana *et al*. (2002) and Pathan *et al*. (2013).

Growth parameters

Plant population was recorded significantly higher (118.3 plants/m row length) in plots treated with imazethapyr 0.1 kg/ha after 1st and 2nd cut (**Table 2**). The plant height of berseem was recorded significantly higher in weedy check (51 cm) than remaining treatments. This might be due to the weed crop competition in this treatment resulted into higher plant height. It was followed by the application of imazethapyr 0.1 kg/ha applied after 1stand 2ndcut (49 cm). The leaf-stem ratio was found non-significant among various weed control treatments on pooled mean basis.

Yield

The data pertaining to green forage yield, seed yield, straw yield, dry matter yield and crude protein yield (**Table 2**) revealed that application of imazethapyr 0.1 kg/ha after 1st and 2nd cut recorded significantly higher values of green forage yield (41.61 t/ha), seed yield (182 kg/ha), straw yield (1130 kg/ha), dry matter yield (6.90 t/ha) and crude protein yield (1278 kg/ha) than the rest of treatments. This might be due to the higher weed control efficiency and plant population in this treatment resulted into higher yield. While**,** lower green forage, seed, straw, dry matter and crude protein yield were recorded in the plots treated with pendimethalin 0.5 kg/ha than rest of the treatments.

Economics

The maximum mean gross returns (` 96,520/ ha), net returns of (` 48,970/ha) and B-C ratio (2.09) were recorded due to application of imazethapyr 0.1 kg/ha after 1st and 2nd cut. This was due to reduced crop weed competition during the crop growth period which resulted in higher uptake of nutrient ultimately resulting into more accumulation of the dry matter and the yield.

On the basis of pooled data on weed dynamics, yield and economic in berseem, it can be concluded that application of imazethapyr 0.1 kg/ha applied after 1st and 2nd cut was effective for control of weeds and obtaining higher green forage, seed and straw yield with higher remunerations in berseem.

REFERENCES

Jain KK. 1998. Effect of herbicides on weeds, crop growth and green fodder yield of berseem. pp. 211. In: *First International Agronomy Congress*, held during Nov. 23-27, 1998 at New Delhi.

Pathan SH, Kamble AB and Gavit MG. 2013. Integrated weed management in berseem. *Indian Journal of Weed Science* **45**(2): 148-150.

Thakur GS, Dubey RK and Tripathi AK. 1990. Evaluation of herbicides for weed management in berseem. pp. 55. In: *Biennial Conference of ISWS*, held during March 4-5, 1990 at JNKVV, Jabalpur.

Tiwana US, Puri KP, Tiwana MS and Walia US. 2002. Effect of butachlor, trifluralin and fluchloralin on chicory (*Cichorium intybus*) and berseem fodder. *Indian Journal of Weed Science* **34**(3&4): 251-253.