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Integrated weed management in forage lucerne (*Medicago sativa*)

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ABSTRACT

An experiment was conducted to study the efficacy of herbicides with and without hand-weeding in lucerne (*Medicago sativa* L.) during winter season of 1991–92 and 1992–93 at Navasari. Application of oxadiazon, fluchloralin and pendimethalin was found significantly superior to manual weeding for weed control; however, oxadiazon showed some phytotoxic effects on emerging seedlings of lucerne. Pre-emergence spray of pendimethalin @ 0.5 kg a.i./ha along with hand-weeding at 6 days after first cut was found the best and recorded maximum weed-control efficiency, but remained at par with fluchloralin @ 0.75 kg a.i./ha and oxadiazon 0.5 kg a.i./ha. The highest green-fodder yield was obtained with fluchloralin applied @ 0.5 kg a.i./ha along with hand-weeding at 6 days after first cut.

Lucerne (*Medicago sativa* L.) is an important fodder crop but due to its slow growth up to first-cut stage, weeds pose a serious problem in this crop. Hand-weeding is an effective method of weed control, but cannot be easily applicable as this crop is sown by broadcasting. Chemical weed control is only the solution to overcome this problem, and in recent past, number of herbicides are available in the market. The present investigation was therefore undertaken to study the efficacy of some herbicides with or without hand-weeding.

MATERIALS AND METHODS

A field experiment was conducted during the winter (*rabi*) season of 1991–92 and 1992–93 at the Instructional Farm, Gujarat Agricultural University, Navasari. Twelve treatments (Table 1) were tested in randomized block design, with 3 replications. The soil of the experimental field was clayey in texture (Vertisol), low in nitrogen (0.059 kg/ha), medium in phosphorus (21 kg/ha), high in potassium (232 kg/ha) and neutral in reaction (pH 7.6). Lucerne cv. 'Anand 2' was broadcast in previously prepared flat bed at a seed rate of 20 kg/ha after seed inoculation. The crop was fertilized with 20 kg N + 80 kg P_2O_5/ha as a basal application. The crop was irrigated as per requirement. The crop was harvested in 4 cuttings at 25-day intervals. Air-dry weight (g/m^2) of weeds was recorded 120 days after sowing. All the herbicides were applied mixed with 600 litres of water as pre-emergence.

RESULTS AND DISCUSSION

Effect on plant stand

Plant stand of lucerne was affected significantly due to different weed-control treatments (Table 1). The maximum plant stand was recorded under treatment of hand-

Table 1. Plant stand, weed dry weight, weed-control efficiency and green-fodder yield as affected by different weed-control treatments in forage lucerne

Treatment	Plant stand (plants/m^2)			Weed dry weight (g/m^2) at 120 DAS			Weed-control efficiency (%)			Green-fodder yield (q/ha)		
	1991–92	1992–93	Pooled	1991–92	1992–93	Pooled	1991–92	1992–93	Pooled	1991–92	1992–93	Pooled
T_1, Unweeded control	410.0	388.3	399.2	273	265	268				151.3	149.7	150.5
T_2, HW at 30 DAS + and 6 DAC	506.0	463.3	484.2	105	100	103	61.6	62.0	60.6	183.9	180.2	182.1
T_3, HW at 30 DAS	508.3	396.7	452.5	120	113	117	56.1	56.9	55.2	167.8	172.4	170.1
T_4, Pendimethalin @ 0.5 kg a.i./ha pre-emergence	373.3	466.7	420.0	205	195	200	25.0	25.9	23.2	191.8	187.0	189.4
T_5, Pendimethalin @ 0.75 kg a.i./ha pre-emergence	173.3	156.7	165.0	215	212	213	21.3	19.6	18.1	188.9	191.4	190.2
T_6, Fluchloralin @ 0.5 kg a.i./ha pre-emergence	501.7	376.7	439.2	88	87	88	67.7	67.1	66.4	187.3	197.2	192.3
T_7, Fluchloralin @ 0.75 kg a.i./ha pre-emergence	305.0	301.7	303.3	65	67	66	76.2	74.7	74.7	173.4	177.5	175.4
T_8, Oxadiazon @ 0.5 kg a.i./ha pre-emergence	103.3	104.3	103.8	65	67	66	76.2	74.8	74.7	176.7	183.8	180.3
T_9, Oxadiazon @ 0.75 kg a.i./ha pre-emergence	26.7	21.0	23.8	72	73	73	73.8	72.2	72.2	99.2	101.5	100.4
T_{10}, T_4 + HW at 6 DAC	368.7	376.7	372.5	60	60	60	78.1	77.2	76.9	190.5	196.7	193.7
T_{11}, T_6 + HW at 6 DAC	491.7	400.0	445.8	75	75	75	72.6	71.5	71.2	204.9	208.6	206.8
T_{12}, T_8 + HW at 6 DAC	121.7	105.7	113.7	70	73	72	74.4	72.2	72.5	185.6	186.7	186.2
CD (P = 0.05)	24.1	22.6	92.6	9.4	10.2	6.7				15.5	12.5	9.0

HW, Hand-weeding; DAS, days after sowing
DAC, days after first cut

weeding at 30 days after sowing (DAS), pendimethalin 0.5 kg a.i./ha and hand-weeding at 30 days and 6 days after first cut. Significantly the lowest plant stand was recorded under the treatment oxadiazon @ 0.75 kg a.i./ha, showing phytotoxic effect on emerging seedlings of lucerne.

Effect on weeds

The unweeded experimental plots (weedy check) were severely infested by number of weed species. The predominant weeds were *Echinochloa colonum* (L.) Link, *Dactyloctenium aegyptium* (L.) Willd., *Digitaria sanguinalis* (L.) Scop. and *Sorghum halepense* (L.) Pers. among monocots; *Trianthema portulacastrum* L., *Euphorbia hirta* L. *Alternanthera sessilis* DC., *Digera arvensis* Forsskal, *Physalis minima* L. among dicots; and *Cyperus rotundus* L. among sedge. All the weed-control treatments were obviously found more effective in controlling the weeds except sedges, compared with unweeded check. The lowest air-dried weight of weeds and maximum weed-control efficiency (Table 1) were recorded with pendimethalin @ 0.5 kg a.i./ha as pre-emergence, supplemented with hand-weeding at 6 days after first cut, but was found on a par with fluchloralin @ 0.75 kg a.i./ha and oxadiazon @ 0.5 kg a.i./ha during both the years as well as in pooled data. Similar results were reported by AICRPWC (1987). Orr *et al.* (1986) also reported good weed control by pendimethalin. Wilson (1988) also reported effective weed control by herbicides.

Effect on green-fodder yield

Green-fodder yield of lucerne was affected significantly due to different weed-control treatments. The maximum green-fodder yield was recorded under the treatment of fluchloralin @ 0.5 kg a.i./ha supplemented with hand-weeding 6 days after first cut, but was found at par with 2 treatments in 1991 and 1992 (Table 1). In pooled data the same treatment recorded significantly the highest green-fodder yield. The lowest green-fodder yield was obtained under oxadiazon @ 0.75 kg a.i./ha, probably due to phytotoxic effect on emerging seedlings of lucerne. Fluchloralin and pendimethalin @ 0.5 kg a.i./ha supplemented with hand-weeding at 6 days after the first cut were found more effective for controlling weeds and to enhance the green-fodder yield of lucerne. Similar findings were reported by AICRPWC (1987).

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