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Effect of integrated weed management practices on weed dynamics and weed control efficiency in lucerne

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ABSTRACT

A field experiment was conducted to study the effect of integrated weed management practices on forage quality in lucerne (*Medicago sativa* L.) during 2008-09. The treatments consisted of salt (10%) treatment to seeds of lucerne + hand weeding at 30 DAS and after each cut, salt (10%) treatment to seeds + imazethapyr 75 g/ha at 12 DAS, salt (10%) treatment to seeds + pendimethalin 0.5 kg/ha at 12 DAS, stale seed bed + hand weeding at 30 DAS, pendimethalin 0.5 kg and 0.75 kg/ha as PE, imazethapyr 75 g and 100 g/ha at 12 DAS, pure seed of lucerne + hand weeding at 30 DAS and after each cut, hand weeding at 30 DAS and after each cut (farmers practice), weedy check and weed free check. experiment was laid in RBD with three replications. The results indicated that the density and dry weight of weeds (excluding cuscuta) were significantly lower with weed free check. Higher weed control efficiency and green fodder yield of lucerne at each cut and total was significantly higher with application of imazethapyr 75 g/ha at 12 DAS and was at par with selection of pure seed + hand weeding at 30 DAS and after each cut. *Cuscuta* control efficiency was maximum with application of pendimethalin and imazethapyr and their combination with salt treatment (10%) to seed and selection of pure seed of lucerne + hand weeding at 30 DAS and after each cut.

Key words: *Cuscuta*, Imazethapyr, Lucerne, Pendimethalin, Weed density, Weed dry weight

In India, lucerne is cultivated in an area of 1.0 m ha with a productivity of 60-130 t /ha/yr as green fodder (Hazra and Sinha 1996). It is also called as "Green gold of forage crops' as it is rich in protein (18-22%), amino acids and vitamin 'A' content. However, the area under lucerne is fluctuating and the perennial nature of this fodder crop is not fully exploited by farmers. All this is attributed mainly to the problem related to weeds infestation. Weeds in lucerne are reported to cause yield losses as high as 95 per cent (Dawson and Rincker 1982). Apart from other weeds that interface with crop growth, lucerne has specific problem of *Cuscuta* or dodder (*Cuscuta chinensis*). *Cuscuta* is a complete stem parasite and survives on the host plant and ultimately reduces the forage yield and quality of lucerne. Severe infestation of *Cuscuta* completely devastates the lucerne crop. Many farmers of Andhra Pradesh and also of the country are growing the crop only for few months in a year due to cuscuta problem inspite of its potential to remain productive on field for three years. In recent years, the use of herbicides appears to be more effective approach for control of weeds including *Cuscuta*. The efficacy of pendimethalin (Shivadhar *et al*. 2005) and imazethapyr (Mahadevappa and Bhanumurthy 2005) was established to certain extent on control of weeds in lucerne. However, the optimum dose and time of application of herbicides like pendimethalin and imazethapyr were not standardised for lucerne crop. Further it was observed that cultural methods like 10 per cent salt floatation to berseem seed eliminated infestation of *Chicorium intybus* in berseem crop (Tiwana *et al*. 2002) and the same principle can be practised to remove *Cuscuta chinensis* from lucerne seed as the light weight seed of *Cuscuta* float on the salt solution. Keeping all the above points in view, different integrated weed management practices were evaluated in lucerne for management of weeds in general and *Cuscuta* in particular.

MATERIALS AND METHODS

Field experiment was conducted at Student's Farm, College of Agriculture, Rajendranagar, ANGRAU, Hyderabad during *Rabi*, 2008-09. The soil of the experimental field was sandy loam in texture, slightly alkaline in reaction (pH of 8.5) with low organic carbon content (0.5%), low available nitrogen (240.0 kg/ha), phosphorus (23.5 kg/ha) and potassium (326.5 kg/ha). Treatments ware laid out in randomized block design with three replications having plot size of 4.2 x 4 m. The treatments consisted of salt (10%) treatment to seeds of lucerne + farmers practice (hand weeding at 30 DAS and after each cut), salt (10%) treatment to seeds +

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imazethapyr 75 g/ha at 12 DAS, salt (10%) treatment to seeds + pendimethalin 0.5 kg/ha at 12 DAS, stale seed bed + hand weeding at 30 DAS, pendimethalin 0.5 kg and 0.75 kg/ha as PE, imazethapyr 75 g and 100 g/ha at 12 DAS, pure seed of lucerne + farmers practice, farmers practice (hand weeding at 30 DAS and after each cut), weedy check and weed free check. A seed rate of 15 kg/ hawas used. Pendimethalin 0.50 and 0.75 kg/ha. Uniform dose of N, P_2O_5 and K_2O 30, 80, 40 kg/hawas applied to all the treatments.Nitrogen in the form of urea was applied as split dose after each cut whereas, P_2O_5 and K_2O were applied as basal in the form of single super phosphate and muriate of potash. Prophylactic spraying of acephate 1.0 g/lit was done against sucking pest complex at 20 DAS and 10 days after I cut. Three cuts of forage were taken. The first cut was taken at 68 DAS, II cut at 36 days after I cut and III cut at 32 days after II cut. Density and dry weight of weeds and yield was measured at each cut. Control efficiency of weeds and cuscuta were calculated based on dry weight of weeds and cuscuta respectively.

RESULTS AND DISCUSSION

The weed species found in experimental field were *Cyperus rotundus*, *Cynodon dactylon* and *Dactylacteniuma aegyptium* among sedges and grasses*; Trianthema portulacastrum, Parthenium hysterophorus, Chicorium intybus, Digera arvensis, Euphorbia hirta, Trichodesma indicus* and parastic weed *Cuscuta chinensis* among broad leaved weeds at early stages of crop growth *i.e.* up to 30 DAS. After 30 DAS, *Trianthema portulacastrum, Digera arvensis, Euphorbia hirta, Trichodesma indicus* could not compete with other weeds and slowly vanished. After first cut, the predominant weeds were *Chicorim intybus* and *Parthenium hysterophorus*, *Cynodon dactylon*, *Cyperus rotundus* and parastic weed (*Cuscuta chinensis*).

Integrated weed management practices were found effective in reducing weed density that varied between1.91 to 11.56 No/m^2 among the treatments (Table 1). The lowest weed density and dry weight and highest weed control efficiency was recorded in weed free check whereas the highest weed density, dry weight and lowest weed control efficiency was recorded with weedy check at all three cuts. At first cut, pure seed of lucerne followed by hand weeding at 30 DAS and after each cut registered lower weed density and dry weight and higher weed control efficiency and was significantly at par with stale seed bed + hand weeding at 30 DAS, farmers practice (hand weeding at 30 DAS and after each cut), Salt (10%) treatment to seeds *fb* hand weeding at 30 DAS and after each cut and with imazethapyr 75 g/ha at 12 DAS. At II cut, density and dry weight of weeds and weed control efficiency was significantly at par with all treatments except pendimethalin 0.75 kg/ha as PE and weedy check. At third cut, density of weeds was lower with farmers practice (hand weeding at 30 DAS and after each cut) and was at par with Imazethapyr 75 and 100 g/ha at 12 DAS and Salt (10%) treatment to seeds + pendimethalin 0.5 kg/ha at 12 DAS. Whereas lower weed dry weight and higher weed control efficiency was recorded with pure seed of lucerne + farmers practice, imazethapyr 75 and 100 g/ha at 12 DAS, salt (10%) treatment to seeds + pendimethalin 0.5 kg/ha at 12 DAS and with farmers practice (hand weeding at 30 DAS and after each cut). The efficacy of imazethapyr in reducing weed density was reported by Faghihi *et al*. (1998).

Average weed control efficiency (over the three cuts) was highest with weed free check (91.1%) followed by imazethapyr 100 g/ha at 12 DAS (79.17%), sowing pure seed of lucerne + farmers practice (78.0%),farmers practice (77.68%) and imazethapyr 75 g/ha at 12 DAS(72.0%) respectively (Table 2). Average weed control efficiency was low with application of pendimethalin 0.75 kg/ha as PE than 0.5 kg/ha as PE though the above treatment effectively reduced weed density and dry weight of weeds at 30 DAS but at later stages, both the weed density and dry weight was increased because of gaps created in the field due to phytotoxic effect on the lucerne crop. Stale seed bed method controlled the weeds at 30 DAS with average weed control efficiency of 64.05% but after 30 DAS did not controlled weeds and resulted in less weed control efficiency (58.47 and 58.0%) at II and III cut respectively. Green fodder yield of lucerne at each cut and also total was significantly higher with application of Imazethapyr 75 g/ha at 12 DAS and was at par with pure seed of lucerne + hand weeding at 30 DAS and at each cut at all cuts. Salt (10%) treatment to seeds + imazethapyr 75 g/ha at 12 DAS and only imazethapyr 100 g/ha was significantly at par with above treatments at II and III and also at total.

The effect of different treatments on dry weight of *Cuscuta* and its control efficiency was more conspicuous (Table 2). Dry matter production of *Cuscuta* was higher at I cut and reduced with increase in the number of cuts. Application of pendimethalin 0.5 and 0.75 kg/ha as PE, imazethapyr 75 and 100 g/haat 12 DAS or these herbicides in combination with salt (10%) treatment to seeds and selection of pure seed of lucerne + hand weeding at 30 DAS and after each cut completely eliminated the infestation of *Cuscuta*. It clearly showed that herbicides disturbed mitosis, cytokinensis and production of microtubules on shoot tips and effectively controlled cuscuta in lucerne. Among cultural treatments, selection of pure seed (*Cuscuta*

Table 1. Density, dry weight and control efficiency of weeds (excluding *Cuscuta*) as influenced by integrated weed management practices in lucerne

Treatments	Weed density (No/m^2)			Weed dry weight (g/m^2)			Weed control efficiency(%)			Mean
	I cut (68 DAS)	II cut (103 DAS)	III cut (135 DAS)	I cut (68 DAS)	II cut (103 DAS)	III cut (135 DAS)	I cut (68 DAS)	II cut (103 DAS)	III cut (135 DAS)	
Salt (10%) treatment to lucerne seeds before sowing *fb* farmers practice (T_{10})	5.52 (30.00)	5.68 (32.33)	7.19 (51.34)	41.50	44.90	81.80	67.50	70.09	59.13	68.39
Salt (10%) treatment to seeds + imazethapyr 75 g/ha at 12 DAS	5.84 (33.66)	7.10 (50.34)	6.39 (41.34)	42.50	47.80	52.20	66.71	68.15	73.92	71.98
Salt (10%) treatment to seeds + pendimethalin 0.5 kg/ha at 12 DAS	7.56 (57.00)	5.96 (35.34)	5.17 (26.34)	78.8	45.80	97.90	38.61	69.48	51.00	58.79
Stale seed bed + hand weeding at 30 DAS	4.89 (24.00)	7.84 (65.00)	6.91 (49.00)	45.90	62.00	152.20	64.05	58.47	58.00	63.92
Pendimethalin 0.5 kg/haas PE	7.28 (52.67)	5.38 (30.00)	6.42 (42.67)	53.00	45.90	69.40	58.48	74.97	65.32	67.74
Pendimethalin 0.75 kg/haas PE	7.16 (51.67)	5.85 (34.34)	6.53 (44.00)	85.46	77.36	143.06	33.09	57.81	28.52	49.47
Imazethapyr 75 g/haat 12 DAS	5.95 (37.00)	5.66 (32.67)	5.81 (33.34)	56.30	59.98	42.80	55.90	67.29	79.61	72.00
Imazethapyr 100 g/haat 12 DAS	7.79 (60.34)	6.53 (46.00)	6.06 (37.00)	57.20	35.08	41.25	55.20	80.87	77.66	79.17
Pure seed of lucerne*fb* farmers practice	4.88 (23.34)	6.46 (41.67)	6.97 (48.34)	28.64	48.80	35.00	77.56	66.30	82.51	78.00
Farmers practice (hand weeding) at 30 DAS and after each cut)	7.70 (39.00)	5.66 (35.00)	4.55 (20.34)	41.70	51.50	54.50	67.34	88.82	72.77	77.68
Weedy check	10.57 (111.34)	10.09 (102.00)	10.41 (108.34)	128.34	150.06	200.16	0.0	0.0	0.0	0.0
Weed-free check	2.94 (8.66)	1.91 (3.97)	4.94 (7.20)	19.40	9.20	23.80	84.88	93.86	88.11	91.15
LSD (P = 0.05)	0.90 (12.9)	2.48 (31.0)	1.60 (21.8)	20.13	20.93	23.24				

Table 2. Dry weight and control efficiency of *Cuscuta chinensis* and green fodder yield of lucerne as influenced by integrated weed management practices

Treatment	*Cuscuta* dry weight (g/m^2)			*Cuscuta* control efficiency (%)			Green fodder yield (t/ha)			Total
	I cut (68 DAS)	II cut (103 DAS)	III cut (135 DAS)	I cut (68 DAS)	II cut (103 DAS)	III cut (135 DAS)	I cut (68 DAS)	II cut (103 DAS)	III cut (135 DAS)	
Salt (10%) treatment to lucerne seeds before sowing *fb* farmers practice (T_{10})	71.5	10.2	5.7	35.9 (34.47)	57.80 (71.64)	64.75 (81.83)	6.66	6.15	5.79	18.61
Salt (10%) treatment to seeds + imazethapyr 75 g/ ha at 12 DAS	0.0	0.0	0.0	90.00 (100.00)	90.00 (100.00)	90.00 (100.00)	9.87	10.80	8.90	29.58
Salt (10%) treatment to seeds + pendimethalin 0.5 kg/ha at 12 DAS	0.0	0.0	0.0	90.00 (100.00)	90.00 (100.00)	90.00 (100.00)	8.45	8.66	8.92	26.04
Stale seedbed + hand weeding at 30 DAS	72.45	12.60	6.60	35.43 (33.60)	53.79 (65.14)	62.80 (79.14)	5.16	4.24	4.58	13.98
Pendimethalin 0.5 kg/ha as PE	0.0	0.0	0.0	90.00 (100.00)	90.00 (100.00)	90.00 (100.00)	6.35	6.40	6.95	19.69
Pendimethalin 0.75 kg /ha as PE	0.0	0.0	0.0	90.00 (100.00)	90.00 (100.00)	90.00 (100.00)	6.59	8.49	8.25	23.33
Imazethapyr 75 g/ha at 12 DAS	0.0	0.0	0.0	90.00 (100.00)	90.00 (100.00)	90.00 (100.00)	11.57	12.20	9.76	33.54
Imazethapyr 100 g/haat 12 DAS	0.0	0.0	0.0	90.00 (100.00)	90.00 (100.00)	90.00 (100.00)	8.01	10.13	8.93	27.67
Pure seed of lucerne *fb* farmers practice (T_{10})	0.0	0.0	0.0	90.00 (100.00)	90.00 (100.00)	90.00 (100.00)	11.07	9.80	9.52	30.39
Farmers practice (hand weeding) at 30 DAS and after each cut	78.15	14.44	11.52	32.20 (28.38)	50.83 (60.06)	52.89 (63.60)	5.20	3.51	3.70	12.37
Weedy check	128.12	36.15	31.65	0.57 (0.0)	0.57 (0.0)	0.57 (0.0)	4.26	2.42	1.94	8.57
Weed-free check	59.62	12.72	7.62	42.36 (45.36)	53.61 (64.81)	60.6 (75.92)	5.75	6.23	5.10	17.08
LSD (P=0.05)							1.68	3.59	2.33	5.95

Figures in parentheses are actual values. Presented in angular transformation

free) followed by hand weeding at 30 DAS and after each cut is free from cuscuta infestation and this cultural method is helpful when soil is free from cuscuta infestation. Salt (10%) treatment to seeds and stale seed bed *fb* hand weeding at 30 DAS and after each cut effectively controlled cuscuta by registering lower dry weights with high cuscuta control efficiency than farmers practice and weed free check. This might be due to the removal of cuscuta from seed (10% salt treatment) and soil (stale seed bed). Tiwana *et al*. (2002) reported that 10% salt treatment effectively removed chicory from berseem due to floatation of chicory seed due to difference in density. The same principle was tested to separate cuscuta from lucerne and was found effective.

Total green fodder yield of lucerne over three cuts was significantly higher with application of imazethapyr 75 g/ha at 12 DAS and was found on par with pure seed of lucerne + hand weeding at 30 DAS and after each cut, salt (10%) treatment to seeds + imazethapyr 75 g/ha at 12 DAS (Table 2). Total green fodder yield of lucerne with application of imazethapyr 100 g/ha at 12 DAS was significantly at par with above treatments. The higher yield recorded in these treatments could be attributed to better control of weeds right from crop emergence up to critical period of crop weed competition *i.e.*, 30 DAS which lead to efficient utilization of growth resources by the crop plants. The efficacy of imazethapyr in controlling the weeds in general and cuscuta in particular, thereby increasing green fodder yield of lucerne was supported by Mahadevappa and Bhanu Murthy (2005).

Weed free treatment and farmers practice (hand weeding at 30 DAS and after each cut) though found effective to control other weeds but found ineffective to control complete stem parasitic weed on lucerne i.e *Cuscuta cheninsis*. Hence green fodder yield in these treatment was significantly less than herbicide treatments.

Hence, it was suggested that application of imazethapyr 75 g/ha at 12 DAS or selection of pure seed (*Cuscuta* free) *fb* farmers practice (hand weeding at 30 DAS and at first cut) was found effective in controlling all types of weeds and resulted in higher green fodder yield of lucerne.

REFERENCES

Dawson JH and Rincker CM. 1982. Weeds in new seedlings of alfalfa (*Medicago sativa*) for seed production; computation and control. *Weed Science* **30**: 20-25.

DimitrovaTS. 1998. Study of the herbicide pivot 100 k for *Cuscuta* spp. control in alfalfa stand establishment. *Rasteniev Dni-Nauki* **35**(8) : 651-655.

Hazra CR and Sinha WC. 1946. *Forage seed production. A technological development*. Indian Council of Agricultural Research: 25p.

Mahadevappa SG and Bhanu Murthy VB. 2005. Studies on the efficacy of trifluralin and imazethapyr for weed control in lucerne. *Indian Journal of Weed Science* **37**(1&2): 135-136.

Shivadhar Gupta SD and Das SK. 2005. Productivity and plant stand of perennial lucerne (*Medicago sativa*) under different weed control measures during establishment year. *Indian Journal of Agronomy* **50**(3) : 243-246.

Tiwana US, Puri KP, Tiwana MS and Walia S. 2002. Effect of butachlor, trifluralin and fluchloralin on chicory (*Chicorium intybus*) and berseem fodder. *Indian Journal of Weed Science* **34**(3&4) : 251-252.