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Weed management in rainfed cowpea (*Vigna unguiculata*) and greengram (*Phaseolus radiatus*) under North-Western Agroclimatic Zone of Tamil Nadu

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ABSTRACT

In a 2-year field experiment an application of herbicide either pendimethalin or fluchloralin 3 days after sowing was found effective in controlling weeds and recorded lower weed population and dry matter of weed. Application of pendimethalin (1.5 or 2.0 litres/ha) or fluchloralin (1.0 or 1.5 litres/ha) at 3 days + 1 hand-weeding at 30 days caused significant reduction in weed population and weed dry metter and marked increase in crop yield and were comparable with hand-weeding twice at 15 and 30 days in rainfed cowpea [*Vigna unguiculata* (L.) Walp.] and greengram (*Phaseolus radiatus* L.). In places where labour availability was not a problem hand-weeding twice at 15 and 30 days could fetch higher net returns in rainfed cowpea and greengram under North-Western Agroclimatic Zone of Tamil Nadu.

Key words : Weed management, Rainfed, Cowpea, Greengram, Alfisol

Pulses are grown as rainy-season crops under rainfed conditions in North-Western Agroclimatic Zone of Tamil Nadu as pure and intercrops with millets. Season-long competition by weeds causes severe yield reduction ranging from 20 to 70% (Boyd and Murray, 1980). Early growth stage (initial 30–45 days) of pulses is more critical (Singh *et al.*, 1996). Hence it is essential to keep the land free of weeds during early stages of crop growth. Due to non-availability of sufficient labour for intercultivation, the other alternative to control weeds is the use of herbicides. An information on use of fluchloralin and pendimethalin weed control in rainfed pulses, i.e. greengram and cowpea, is scanty. Hence a study was conducted to know the influence of herbicides on these rainfed pulses.

MATERIALS AND METHODS

The experiment was conducted during the rainy season of 1994 and 1995 at Regional Research Station, TNAU, Paiyur. The treatment combination comprised 2 herbicides, 2 doses and 3 times of application with 2 hand-weedings and

unweeded check (Table 1). The treatments were tested in randomized block design replicated thrice. The soil was sandy loam (Ustochrept) in texture, with pH 8.2 and electrical conductivity 0.37 dS/m with low available N, medium available P and high available K. Fertilizer dose of 12.5 : 25 kg N : P/ha was given at the time of sowing. The seeds of cowpea and greengram 'Paiyur 1' were sown during the second week of August 1994 and second week of July 1995. The herbicides were applied sand mix (50 kg sand/ha). The data on weed population and weed dry matter were recorded at 30 days after sowing

RESULTS AND DISCUSSION

Weed population

Significantly reduced weed population was recorded under the weed control treatments compared to unweeded check. In cowpea, T_{11}, T_5, T_{13} and T_2 treatments recorded low weed population ranging from 15 to 19/m^2 (Table 1). These treatments were comparable to each other in both the years, while the weed population in unweeded check was 77.5 and 80.0/m^2 in 1994 and 1995 respectively. Similarly, in greengram the reduced weed population was observed under T_{11}, T_{13}, T_2 and T_5 treatments, whereas in both the years and were found comparable to each other. The weed number ranged from 17.5 to 22.5/m^2 under treatments and the unweeded plots recorded the weed population of 86.5 and 92.5/m^2 in 1994 and 1995 respectively.

Weed dry-matter

In both the years, the highest weed dry matter was observed in unweeded check but significantly lower with various weed-control treatments. In cowpea, T_{11}, T_{13}, T_2 and T_5 treatments recorded the lowest weed dry matter and were comparable with each other, the range of weed dry matter was 26.2–32.9 kg/ha. In greengram, weed dry matter was significantly lowest under T_{13} (hand-weeding twice), followed by T_{11}, T_5 and T_2. No significant difference existed among these treatments. Unweeded check registered significantly higher weed dry matter compared to the rest of the treatments. Similar reduction in weed dry matter in summer greengram with pendimethalin and fluchloralin was reported by Singh *et al.* (1996).

Seed yield

In both the years the seed yield of cowpea was found maximum in T_{11}. The reduction in unweeded check was 79 and 64% in 1994 and 1995 respectively. The next best treatment was T_8, followed by T_2. The lowest seed yield was recorded under T_{14} in both the years.

In greengram, the highest seed yield was observed under T_{13} and was comparable with the yield obtained under T_2, T_8 and T_5 treatments. The reduction in yield under unweeded check was 90 and 72% in 1994 and 1995 respectively. The findings confirm the results of findings of Boyd and Murray (1980).

Economics

Net returns varied with weed-control treatments in both years and in both cowpea and greengram. In cowpea, the highest net returns were realized in fluchloralin 1.5

Table 1. Effect of weed-control treatments on weeds, yield and economics of cowpea

Treatment	Weed population (No./m²)		Weed dry matter (kg/ha)		Seed yield (kg/ha)		Net return (Rs/ha)	
	1994	1995	1994	1995	1994	1995	1994	1995
T_1, Pendimethalin 1.5 at 0 DAS + hand-weeding at 30 DAS	22.0	23.5	37.5	38.5	758	815	1.332	1,654
T_2, Pendimethalin 1.5 at 3 DAS + hand-weeding at 30 DAS	17.5	19.0	31.0	32.9	1,055	1,072	3,104	3,253
T_3, Pendimethalin 1.5 at 5 DAS + hand-weeding at 30 DAS	18.5	20.0	29.5	31.2	827	885	1,730	2,090
T_4, Pendimethalin 2.0 at 0 DAS + hand-weeding at 30 DAS	19.5	21.0	34.5	35.9	912	939	2,069	2,226
T_5, Pendimethalin 2.0 at 3 DAS + hand-weeding at 30 DAS	16.0	17.5	26.5	28.4	1,009	1,080	2,649	3,101
T_6, Pendimethalin 2.0 at 5 DAS + hand-weeding at 30 DAS	19.5	21.0	36.0	39.4	855	847	1,720	1,653
T_7, Fluchloralin 1.0 at 0 DAS + hand-weeding at 30 DAS	21.0	22.5	35.5	37.2	901	960	2,347	2,736
T_8, Fluchloralin 1.0 at 3 DAS + hand-weeding at 30 DAS	18.0	19.5	33.0	35.0	1,094	1,120	3,534	3,732
T_9, Fluchloralin 1.0 at 5 DAS + hand-weeding at 30 DAS	19.0	20.5	32.0	34.8	884	930	2,270	2,550
T_{10}, Fluchloralin 1.5 at 0 DAS + hand-weeding at 30 DAS	20.5	22.0	33.5	36.0	889	950	2,126	2,484
T_{11}, Fluchloralin 1.5 at 3 DAS + hand-weeding at 30 DAS	15.0	16.5	26.5	26.2	1,140	1,220	3,622	4,164
T_{12}, Fluchloralin 1.5 at 5 DAS + hand-weeding at 30 DAS	18.5	20.0	30.0	32.2	889	930	2,111	2,357
T_{13}, Hand-weeding twice	16.5	18.0	28.0	29.6	1,015	1,140	2,893	3,727
T_{14}, Unweeded check	77.5	80.0	136.5	140.4	234	440	–750	566
CD (P = 0.05)	2.7	2.5	2.9	3.7	224	103	NA	NA

DAS, Days after sowing; HW, hand-weeding

Table 2. Effect of weed-control treatments on weeds, yield and economics of greengram

Treatment	Weed population (No./m²)		Weed dry matter (kg/ha)		Seed yield (kg/ha)		Net return (Rs/ha)	
	1994	1995	1994	1995	1994	1995	1994	1995
T_1, Pendimethalin 1.5 at 0 DAS + hand-weeding at 30 DAS	23.0	25.5	40.5	42.5	661	713	1,394	3,879
T_2, Pendimethalin 1.5 at 3 DAS + hand-weeding at 30 DAS	19.0	21.5	31.0	33.0	856	888	2,765	5,670
T_3, Pendimethalin 1.5 at 5 DAS + hand-weeding at 30 DAS	19.5	21.5	31.0	33.0	856	888	2,765	5,670
T_4, Pendimethalin 2.0 at 0 DAS + hand-weeding at 30 DAS	19.5	23.0	32.0	34.5	677	725	1,495	4,002
T_5, Pendimethalin 2.0 at 3 DAS + hand-weeding at 30 DAS	21.0	23.5	34.0	36.5	726	777	1,644	4,334
T_6, Pendimethalin 2.0 at 5 DAS + hand-weeding at 30 DAS	19.0	22.5	30.5	33.0	846	907	2,412	4,160
T_7, Fluchloralin 1.0 at 0 DAS + hand-weeding at 30 DAS	22.0	24.5	38.0	39.5	781	840	2,412	4,160
T_8, Fluchloralin 1.0 at 3 DAS + hand-weeding at 30 DAS	19.0	21.5	32.0	33.5	846	920	2,874	6,177
T_9, Fluchloralin 1.0 at 5 DAS + hand-weeding at 30 DAS	20.5	23.5	32.0	38.5	640	720	1,412	4,131
T_{10}, Fluchloralin 1.5 at 0 DAS + hand-weeding at 30 DAS	25.0	28.5	42.0	40.5	813	870	2,452	5,476
T_{11}, Fluchloralin 1.5 at 3 DAS + hand-weeding at 30 DAS	17.5	20.5	30.0	32.5	726	870	1,830	5,476
T_{12}, Fluchloralin 1.5 at 5 DAS + hand-weeding at 30 DAS	21.0	22.5	33.5	34.5	591	670	859	3,429
T_{13}, Hand-weeding twice	18.0	20.5	30.0	29.5	900	927	3,231	6,119
T_{14}, Unweeded check	86.5	92.5	161.0	170.5	87	260	–1,539	493
CD (P = 0.05)	1.9	2.1	3.4	3.6	173	68	NA	NA

DAS, Days after sowing; HW, hand-weeding

litres/ha at 3 days + 1 hand-weeding during 1994 and 1995 respectively. The net returns were found to be negative under unweeded check. In greengram, the highest net returns were realised under T_{13} treatment during 1994 while under T_8 during 1995. The unweeded check showed similar trend as that of the net return observed in cowpea.

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