Indian Journal of Weed Science 42(1&2) : 91-94,2010 **Short communication**

Identification of threshold level of horse purslane in irrigated cowpea

C. Chinnusamy, A. Senthil, G. Prabu Kumar and N.K. Prabhakaran
Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu)
E-mail : chinnusamy@hotmail.com

ABSTRACT

A field experiment was conducted during *kharif* 2007 at Tamil Nadu Agricultural University, Coimbatore to study the effect of different densities of *Trianthema portulacastrum* on growth and yield of cow pea. Plant height, leaf area and dry matter production of cow pea was reduced with increase in weed density from 0 to 64 weeds/m^2 in all growth stages. The infestation of 16 weeds/m^2 of *Trianthema portulacastrum* significantly decreased the dry matter production of cow pea (36.3 g/plant) compared to zero weeds/m^2 (64.5 g/plant). The maximum yield reduction (34.8%) was observed with 64 weeds/m^2. It was concluded that the population of 8 weeds/m^2 of *T. portulacastrum* is the threshold value for cow pea.

Key words: Cow pea, *Trianthema portulacastrum*, Threshold value, Yield reduction

Trianthema portulcastrum and *Cynodon dactylon* are the most economically important weeds of rainy season crops in India (Balyan 1985). *Trianthema portulacastrum* generally emerges before soybean or along with soybean eventually growing faster than soybean and mungbean (Balyan and Malik 1989). It is a fast growing prostrate, somewhat succulent herb with ovate green leaves and small white flowers with high fecundity. Competition of green gram crop with *Trianthema monogynae* upto 40 DAS and throughout crop period resulted 34.5% and 47.7% yield loss, respectively (Anonymous 2002). The carpet weed and barnyard grass weeds competed severely with soybean and can cause yield reductions from 29 to 87% (Mishra *et al.*1990).

Cowpea is a warm-season, annual, herbaceous legume. Heavy weed infestation during early stages is a major constraint for the productivity of cowpea during the *kharif* season **(**Gracy Mathew *et al.* 1995). Shade effectively inhibits the growth of many weeds especially spreading type like *Trianthema portulacastrum* which rarely grows taller than cowpea to compete directly for incoming radiation. Patel and Saraf (1996) reported that the optimum moisture and phosphorus application in combination with proper weed management are most important agro techniques to raise the yield level of summer cowpea. An important part of an integrated weed management system is the economic weed threshold level in a particular crop. The threshold level varies from one weed species to another because some weeds are more competitive than others. The information on the economic threshold level population of weeds is very much lacking in crops like vegetables and pulses. Keeping this in view, the present study was undertaken to determine the effects of different densities of *Trianthema portulacastrum* on growth and yield of cowpea.

The experiment was conducted at the Tamil Nadu Agricultural University, Coimbatore during *kharif*, 2005 under irrigated conditions. The experimental field was sandy loam in texture with pH 8.53. Available soil nitrogen, phosphorus and potassium were 203.84, 34.16 and 686.6 kg/ha respectively. The experiment was laid out in randomized block design with four replications. Cowpea seeds were dibbled at spacing of 30 x 15 cm and thinned to one seedling per hill on the 15th day after sowing. The crop was fertilized with 25 : 50 : 0 kg N, P and K through urea, single super phosphate and muriate of potash respectively. A plot of one square metre was marked before applying first irrigation to the cowpea crop. The *T. portulacastrum* population was maintained to the levels of 0, 4, 8, 16, 32 and 64/m^2 as per treatment by thinning after applying first irrigation to cowpea crop. Recounting was also done at 15 days after maintaining the variable population levels and desirable population was ensured by uprooting the second flush of weeds. The uniform population of cowpea was also maintained in all the plots. Five plants were marked at random in each plot and observations on biomass production, number of seeds/ flowers and numbers of seeds/plant were recorded on different growth stages.

Effect *Trianthema portulacastrum* on growth and yield of cowpea

The competitive impact of various plant densities of *Trianthema portulacastrum* (0, 4, 8, 32 and 64/m^2) was observed on vegetative (30 DAS), flowering (60 DAS) and maturity stages of irrigated cowpea. The observations on growth and yield parameters clearly indicated that there was a linear decrease in plant height, leaf area, dry matter production and yield characters of cowpea. Plant height of cowpea showed a reduction in all the stages of observation

with increasing densities of *T. portulacastrum* from 0 to 64 weeds/m^2. But a significant reduction was observed beyond the density of 8 weeds/m^2. The maximum redu-ction was observed with 64 weeds/m^2 (16.4 and 30.6 cm) compared to 23.0 and 57.5 cm for zero weed density at 30 DAS and harvest stages, respectively. Maximum plant height was recorded at 60 DAS in all the treatments (Table 1).

Leaf area and dry matter production of cowpea was decreased with increase in weed density from 0 to 64 weeds/m^2 in all the growth stages. Maximum leaf area of 3159 cm^2/plant was recorded with zero weeds/m^2 and minimum was with 64 weeds/m^2 at 60 DAS. There was a significant reduction in leaf area in all the growth stages with 16 weeds/m^2 onwards compared to lesser densities of weeds/m^2. The increase in leaf area over stages was observed up to 60 DAS, after which there was a significant reduction in leaf area development. This may be due to higher partition of assimilates to reproductive parts than to vegetative parts. Dry matter accumulation of cowpea was increased over stages but the values decreased linearly if the population of weeds increased. The infestation of 16 weeds/m^2 of *T. portulacastrum* significantly decreased the dry matter production (36.3 g/plant) compared to zero weeds/m^2 (64.5 g/plant) and 4, 8 weeds/m^2 (64.7 and 58.5 g/plant), respectively) at the harvest stage. The maximum reduction in dry matter production was recorded with 64 weeds/m^2 in all the stages of observation followed by 32 weeds/m^2. The results of growth parameters of cowpea revealed that there was a significant reduction in all the parameters beyond the density of 8 weeds/m^2 of *T. portulacastrum* (Table 1).

The effect of *T. portulacastrum* on yield and yield attributing parameters was not apparent when the population of *T. portulacastrum* was in between 0-8 weeds/m^2, beyond which the yield was reduced significantly. The competition due to 16 weeds/m^2 reduced the grain yield (982 kg/ha) significantly compared to zero weeds/m^2 (1230 kg/ha) and 4, 8 weeds/m^2 (1211 and 1156 kg/ha, respectively). This was in conformity with the results of *Digera arvensis* grown with green gram (Anonymous 2003). The maximum yield reduction was observed with 64 weeds/m^2 (34.8%) followed by 32 weeds/m^2 (26.3%) and 16 weeds/m^2 (20.2%) (Table 2). This was in conformity with the findings of Punia *et al. (*1995) in *T. portulacastrum* grown with mungbean.

Table 1. Effect of increasing densities of *Trianthema portulacastrum* on growth parameters of cowpea

Treatments	30 DAS			60 DAS			Harvest stage		
	Plant height (cm)	Leaf area (cm^2/plant)	Dry matter production (g/plant)	Plant height (cm)	Leaf area (cm^2/plant)	Dry matter production (g/plant)	Plant height (cm)	Leaf area (cm^2/plant)	Dry matter production (g/plant)
0 weeds/m^2	23.0	1367	13.4	59.8	3159	30.7	57.5	1750	64.5
4 weeds/m^2	22.1	1353	13.0	58.3	2807	25.5	50.9	1601	64.0
8 weeds/m^2	19.5	1157	12.2	53.1	2555	24.1	48.7	1578	58.5
16 weeds/m^2	17.2	1000	10.3	50.3	1920	22.1	40.1	1034	36.3
32 weeds/m^2	16.6	935	9.1	42.5	1572	19.9	36.7	953	30.0
64 weeds/m^2	16.4	805	8.5	40.5	1160	17.8	30.6	884	23.0
LSD (P=0.05)	3.9	26	2.0	5.7	76	4.2	5.3	53	6.8

Table 2. Effect of increasing densities of *Trianthema portulacastrum* on yield and yield parameters of cowpea

Treatments	Yield and yield parameters			% reduction over weed free
	No. of pods/plant	No.of seeds/pod	Yield (kg/ha)	
0 weeds/m^2	12.0	14.5	1230	-
4 weeds/m^2	12.0	14.5	1211	1.5
8 weeds/m^2	11.5	13.0	1156	6.0
16 weeds/m^2	9.0	10.3	982	20.2
32 weeds/m^2	7.3	9.8	907	26.3
64 weeds/m^2	6.0	9.0	801	34.8
LSD (P=0.05)	2.2	2.9	47	-

From the data on yield parameters, it was observed that there was a progressive decline in yield of cowpea due to increased competition of *T. portulacastrum* population beyond 8 weeds/m^2. Because of fast, profuse growth and ground covering canopy of cowpea crop, it can withstand up to the weed stress of 8 weeds/m^2 without reduction in its yield potential. Hence, the population of 8 weeds/m^2 of *T. portulacastrum* is the threshold level value for cowpea crop. Beyond this limit, significant yield reduction will be occurred.

Growth and reproductive potential of *Trianthema portulacastrum*

The observation on the growth and reproductive parameters of *T. portulacastrum* revealed that there was a linear increase with increase in densities of *T. portulacastrum* up to the density of 34 weeds/m^2 after that there was a decline in all the growth parameters. This was in conformity with the reports of Umarani and Jacqueline Selvaraj (1995) in *T. portulacastrum* grown with soybean. However the increase in plant height, leaf area and dry matter production over stages was proportionate up to 60 DAS (Table 3). The maximum plant height, leaf area and dry matter production was recorded with the weed density of 32/m^2 at all the stages of observation (Table 4). This was in conformity with the reports of Hagood *et al.* (1980) in velvet leaf *(Abutilon theophrasti)* grown with soybean. The reduction in plant height, leaf area, dry matter production and number of flowers and seeds/plant in 64 weeds/m^2 is due to the interspecies competition and also competition with crop. But the reduction of all these parameters in lower densities is mainly due to the suppressing ability of cowpea crop with quick canopy coverage. This was in conformity with the reports of Murthy and Devendra (1995) in *Cyperus rotundus* with cowpea**.**

Table 3. Growth parameters of *Trianthema portulacastrum* on 30 and 60 days after sowing of cowpea

Treatments	30 DAS			60 DAS		
	Plant height (cm)	Leaf area (cm^2/plant)	Dry matter production (g/plant)	Plant height (cm)	Leaf area (cm^2/plant)	Dry matter production (g/plant)
0 weeds/m^2	0.0	0.0	0.0	0.0	0.0	0.0
4 weeds/m^2	9.8	30.6	0.35	23.2	145	7.3
8 weeds/m^2	9.9	32.7	0.39	24.5	167	7.6
16 weeds/m^2	10.6	36.8	0.42	35.7	198	9.2
32 weeds/m^2	12.2	42.8	0.47	51.7	231	10.8
64 weeds/m^2	12.5	40.1	0.45	44.1	204	10.2
LSD (P=0.05)	1.7	3.9	0.14	4.2	14.0	1.4

Table 4. Growth and reproductive parameters of *Trianthema portulacastrum* at harvest stage of cowpea

Treatments	Harvest Stage					
	Plant height (cm)	Leaf area (cm^2/plant)	Dry matter production (g/plant)	No. of flowers/plant	No. of seeds/flower	Total seeds/plant
0 weeds/m^2	0.0	0.0	0.0	0.0	0.0	0.0
4 weeds/m^2	19.8	51.0	7.8	25.0	5.0	125.0
8 weeds/m^2	22.7	57.2	8.1	29.0	5.0	145.0
16 weeds/m^2	36.2	70.6	9.6	33.0	5.0	165.0
32 weeds/m^2	41.5	103.5	11.7	41.0	5.0	205.0
64 weeds/m^2	41.4	96.6	9.8	36.0	5.0	180.0
LSD (P=0.05)	4.5	6.4	1.4	2.9	-	7.3

REFERENCES

Anonymous. 2002. AICRP WC *Annual report.* National Research Centre of weed Science, Maharajpur, Adhartal, Jabalpur (M.P). : 33.

Balyan RS. 1985. *Studies on the biology and competitive behaviour of carpet weed Trianthema portulacastrum* Linn. Ph.D.Thesis, Chaudhary Charan Singh Haryana Agric. Univ., Hisar, India. :2

Balyan RS and Malik RK. 1989. Control of horse purslane and barnyard grass with post-emergence herbicides in mungbean (*Vigna radiata*). *Indian Journal of Weed Science* **37**: 695-699.

Gracy Mathew, Sreenivasan E and Jose Mathew. 1995. Integrated weed management in grain cowpea. *Indian Journal of Weed Science* **27** (1&2): 42-44.

Hagood ES, Banman TT, Williams IL and Schreiber M. 1980. Growth analysis of soybean (*Glycine max*) in competition with velvet leaf (*Abutilon theophrasti*). *Indian Journal of Weed Science* **28**: 729 -834.

Mishra OP, Tiwari S and Ram K. 1990. Study on the effect of butachlor and thiobencarb on soybean and associated weeds under two dates of planting In. *Proceedings of Indian Society of Weed Science, Annual Meeting,* Jabalpur, India. : 80.

Murthy MM and Devendra R. 1995. Growth suppression of *Cyperus rotundus* L. by cowpea and allelochemicals from crop and tree species leaf litter. *Indian Journal of Weed Science* **27** (3&4): 170-173.

Patel CL and Saraf CS. 1996. Effect of irrigation, phosphorus and weed control on yield and weed growth in summer cowpea. *Indian Journal of Weed Science* **28** (3&4): 191-193.

Punia SS, Malik RS, Ashok Yadav and Rinwa RS. 2004. Effect of varying density of *Cyperus rotundus*, *Echinochloa colona* and *Trianthema portulacastrum* on mungbean. *Indian Journal of Weed Science* **36** (3&4) : 280-281.

Umarani R and Jacqueline Selvaraj A. 1995. Studies on the growth and yield of carpet weed *Trianthema portulacastrum* as influenced by Soybean (*Glycine max* (L.). Merrill). *Indian Journal of Weed Science* **27** (3&4): 209 210.