Indian Journal of Weed Science 41(1&2) : 102-105, 2009

Short communication

Integrated weed management in pigeonpea

M.B. Dhonde, S.R. Kate, B.S. Pandure and A.D. Tambe
Department of Agronomy, Mahamta Phule Krishi Vidyapeeth, Rahuri (Maharashtra)
E-mail : balasahebpandure2@gmail.com

ABSTRACT

An experiment was conducted during *kharif* 2003 at Post Graduate Institute Farm, Mahatma phule Krishi Vidyapeeth, Rahuri in randomized block design with three replications and nine treatments. Weed intensity and weed dry matter at harvest was significantly less in weed free treatment followed by fluchloralin as pre-planting incorporation (PPI) 1.0 kg/ha plus glyphosate at 45 days after sowing (DAS) were in second order. Whereas, weed intensity and weed dry matter was maximum in weedy check treatment (206.57 m^2 and 12.22 q/ha respectively). Dicot weeds were found higher in proportion than monocot weed. The weed control efficiency and weed index were influenced by various treatment. It was higher (75.64%) weed control efficiency and lower (14.06%) weed index in pendimethalin PE 1.0 kg/ha plus glyphosate 1.0 kg/ha at 45 DAS as compared to other treatments except weed free treatment. Beneficial effect due to above treatments on growth characters resulted in enhanced yield. Maximum values of yield attributes were observed in weed free treatment followed by IWM treatments *viz.,* pendimethalin PE 1.0 kg/ha plus hand weeding at 45 DAS, two hand weeding at 20 and 45 DAS and pendimethalin PE 1.0 kg/ha plus glyphosate 1.0 kg/ha at 45 DAS. The seed yield of pigeonpea (22.98 q/ha) and stick (65.03 q/ha) was maximum in weed free treatment followed by IWM treatment *viz.,* pendimethalin 1.0 kg/ha plus hand weeding at 45DAS

Key words : Weed intensity, Weed index, Yield, Weed control efficiency

In Maharashtra, about 85 per cent of total cultivable area is rainfed which is characterized by occurrence of more or less drought condition, where rainfall is uncertain and ill distributed and hence cropping pattern plays an important role for stabilizing food production. Agriculture of today needs maximising and stabilising the production per unit area per unit time. It is to follow the practices of crop production coupled with soil, water and weed management that aims at optimizing the production without degradation of soil health by keeping cost at minimum for fulfilling future requirement of rapidly growing population. Pulses constitute an important ingredient in predominantly vegetarian Indian diet. For the poor people major source of energy is cereals, however, addition of pulses which are the main source of vegetable protein in their diet becomes nutritionally to some extent balanced.

India has the world's largest hectareage of pigeonpea and contributes about 90 per cent of global production. The area under pigeonpea in India is 3.50 million ha with production of 2.79 million tonnes (Anonymous 2003). The major pigeonpea growing states in India are Maharashtra, Madhya Pradesh, Uttar Pradesh, Karnataka and Gujarat. These states together contribute 86.1 per cent of total growing area and 84.5 per cent of total production (Asthana and Chaturvedi 1999). In Maharashtra pigeonpea is grown on an area of 10.96 lakh ha with production of 6.60 lakh tonnes (Anonymous 2003). This clearly indicates that there is not much increase in yield and it stagnated over a period of time with substantial fluctuations in spite of availability of number of disease resistant varieties. It seems that the yield of these varieties has not been fully realized and stabilized. It is possible to enhance the productivity of pigeonpea when grown as sole or as intercrop by adopting various efficient management practices.

In *kharif* season, because of favourable climatic conditions, weeds have become a major problem. Weeds cause great losses than either insects or plant diseases. Tewari (1989) reported that 68 per cent yield losses caused in *Cajanus cajan* L. Millsp. in Peninsular zone were due to weeds. It is, therefore, necessary to control weeds so as to reduce the competition for nutrients, moisture, radiant energy and to obtain maximum fertilizer and water use efficiency.

Unavailability of timely and cheap labour has caused the problem of weed competition in crops and further it is aggravated making it imperative to develop cheaper methods of weed control with herbicides alone or in combination with other mechanical methods. Integrated weed management helps in reducing the weed population without much adverse effect on the crop.

The experiment was laid out in randomized block

design (RBD) with nine treatments replicated three times during *kharif*, 2003 at Post Graduate Institute farm. The soil of the experimental field was clay loam, low in available N, medium in available P and very high in K content and slightly alkaline in reaction.

The total rainfall received during crop growth period was 193 mm in 14 rainy days. Seeds of pigeonpea variety BSMR-736 sown on 22nd July, 2003 as per treatment by dibbling method. Recommended dose of fertilizer 25 kg N and 50 kg P_2O_5 was applied through urea and single super phosphate before dibbling.

The experimental findings regarding integrated weed management on crop growth, yield attributes of pigeonpea under *kharif* condition and on weed studies is given in (Table1). It was observed that at 30 days, weed intensity in unweeded control was significantly more (176.3/m^2) as compared to rest of the treatments. Lowest weed intensity was observed in treatment of two hand weedings at 20 and 45 DAS which was at par with weed free upto 90 DAS. At 60 days, weed intensity in unweeded control was significantly more as compared to rest of the treatments. The IWM treatment, *viz.,* pendimethalin 1.0 kg/ ha PE plus one hand weeding at 45 DAS and it was significantly superior over rest of the treatments. At 90 and 120 DAS weed intensity in un weeded control was significantly more as compared to rest of the treatments. Lowest weed intensity was observed in weed free treatment followed by pendimethalin 1.0 kg/ha PE plus glyphosate 1.0 kg/ha and pendimethalin 1.5 kg/ha PE plus hand weeding at 45 DAS. The lowest weed intensity in IWM treatments like fluchloralin 1.0 kg/ha PPI plus hand weeding at 45 DAS and pendimethalin 1.0 kg/ha PE plus hand weeding at 45 DAS was noticed at harvest and the highest weed intensity (189.3/m^2) was observed in un weeded control. Use of only herbicide and integrated weed control treatment were having very low weed intensity at different stages of crop growth because there was no chance of emergence of weed seedling and if emerged they were not grown in herbicide and integrated system of weed control. These results are in close conformity with those reported by Ali (1991) and Patel *et al.* (1993).

The monocot weeds such as *Cynodon dactylon, Commelina benghalensis, Panicum ischami, Digitari sanguinali, Convolvulus arvensis, Acalypha indica, Parthenium hysterophorus, Amaranthsu polygamus, Xanthium strumarium, Argimone mexicana, Phyllanthus niruri and Portulaca oleracea* were observed in experimental plot (Table 2). The major weeds in experimental plots were *Acalypha indica, Cynodon dactylon* and *Commelina benghalensiss*. Dicot weeds were found higher in proportion than monocot weeds. These results are similar to those obtained by Kolar and Sandhu (1989) and Tiwari *et al.* (1992).

Table 1. Mean weed intensity at various crop growth stages.

Treatments	Mean weed intensity/m^2				
	30 DAS	60 DAS	90 DAS	120 DAS	At harvest
T_1 : Weedy check	176.3	195.4	206.6	203.0	189.3
T_2 : Weed free upto 90 DAS	57.5	63.6	17.3	0.0	0.0
T_3 : Two hand weedings (20 and 45 DAS)	54.0	67.3	79.0	71.3	66.3
T_4 : Pendimethalin 1.5 kg/ha PE	121.9	144. 6	151.8	151.1	125.4
T_5 : Pendimethalin 1.0 kg/ha PE + one hand weeding (45 DAS).	129.4	37.8	62.6	56.4	46.1
T_6 : Flu chloralin 1.5 kg/ha PPI	116.3	145.0	150.1	143.7	133.5
T_7 : Fluchloralin 1.5kg/ha PPI+ one hand weeding at (45 DAS).	121.1	39.6	64.2	55.8	44.6
T_8 : Pendimethalin 1.0 kg ha PE+ Glyphosate 1.0 kg/ha at POE	120.9	90.7	48.2	49.4	47.7
T_9 : Pendimethalin 1.0 kg ha PE + Paraquat 1.0 kg/ha at POE	122.6	84.2	87.2	76.3	64.4
LSD (P=0.05)	4. 8	3.7	4.8	4.9	4.4

PE-Pre-emergence, POE- Post-emergence , PPI- Pre plant incorporation, DAS- Days after sowing

Table 2. Weed composition of monocot and dicot weeds/m^2 at 120 days after sowing (DAS) in different treatment.

Sr. No.	Weed species	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9
	Monocot									
1.	*Cynodon dactdylon*	18.2	0	8.8	10.3	8.5	14.4	18.8	4.8	10.2
2.	*Commelina benghalensis*	21.4	0	11.5	12.3	13.3	7.4	8.8	10.8	8.4
3.	*Panicum ischami*	18.9	0	4.8	9.3	5.0	4.0	4.0	3.8	2.0
4.	*Digitari sanguinalis*	12.1	0	3.0	6.5	5.5	9.5	8.0	2.0	5.4
5.	*Helandi latibrosa*	23.0	0	3.0	6.0	-	10.0	2.0	2.9	14.6
6.	*Leucas aspera*	9.0	0	-	-	2.5	-	3.5	2.5	4.0
	Total monocot	102.6	0	34.5	44.3	34.8	45.3	45.0	26.6	44.6
	Dicot									
1.	*Convolvul us arvensis*	-	0	-	1.3	0.5	12.2	1.8	3.0	8.0
2.	*Acalypha indica*	4.6	0	9.0	17.8	7.0	7.4	11.3	8.0	6.2
3.	*Parthenium hysterophouus*	11.8	0	3.5	5.5	4.3	14.4	3.0	7.3	8.6
4.	*Amaranthus polygamus*	7.9	0	6.8	4.5	8.0	1.0	9.5	4.0	7.6
5.	*Xanthium strumarium*	22.6	0	-	10.5	3.3	-	2.0	3.1	12.3
6.	*Argimone mexicana*	9.7	0	3.1	4.5	6.3	8.0	17.5	2.0	-
7.	*Phyllanthus niruri*	8.7	0	1.3	9.8	5.0	10.0	5.3	1.3	7.0
	Total dicot	101.2	0	23.5	53.8	34.3	56.9	44.3	28.7	49.7
	Grand total	203.8	0	58.0	98.0	69.0	102.3	89.3	55.3	94.3

DAS - Days after sowing; T_1 to T_9 - Different treatment of details are given in Table 1

The dry matter of weeds in unweeded control was maximum which was significantly more than other treatments, while differences between fluchloralin 1.5 kg/ha PPI, pendimethalin 1.5 kg/ha PE, pendimethalin 1.0 kg/ha PE plus paraquat 1.0 kg ha POE and fluchloralin 1.0 kg/ha PPI plus hand weeding at 45 DAS were at par with each other (Tabal 3). The dry matter in weed free up to 90 DAS was lower (3.08 q/ha) which was at par with IWM treatmenht, viz., pendimethalin 1.0 kg/ha PE plus hand weeding at 45 DAS. The dry matter of weeds in weedy check was maximum (12.22 q/ha) because of higher weed intensity and its dominance in utilizing the sunlight, nutrients, moisture, CO_2 *etc.* These results are in conformity with those reported by Kumar *et al.* (1994) and Chauhan *et al*. (1995).

Data regarding the seed yield weed control efficiency and weed index as influenced by various treatments in (Table 3), revealed that at 90 days after sowing, the maximum weed control efficiency was due to weed free treatment i.e. 91.61 per cent which was significantly superior to those observed in rest of the treatment. The next highest weed control efficiency was due to pendimethalin 1.0 kg/ha PE plus hand weeding at 45 DAS and fluchloralin 1.0 kg/ha PPI plus hand weeding at 45 DAS. At harvest, significantly higher weed control efficiency (100%) was observed in weed free treatment followed by pendimethalin 1.0 kg/ha PE plus glyphosate 1.0 kg/ha POE (75.64%). These results are in conformity with those reported by Brar *et al.* (1990).

The weed index was lowest in weed free treatment and it was significantly higher in weedy check (34.20%). It was 2.94% in IWM treatment viz., pendimethalin 1.0 kg/ha PE plus hand weeding at 45 DAS.The differences in seed yield of pigeonpea were significant due to various weed control treatments. The weed free upto 90 DAS produced significantly higher seed yield (22.98 q/ha) than those observed in rest of the treatments under study which might be due to weed free condition, crop grows without competition for moisture, nutrient, sunlight,etc. It was at par with those of pendimethalin 1.0 kg/ha PE plus hand weeding at 45 DAS(22.30 kg/ha) and two hand weedings at 20 and 45 DAS (22.06 kg/ha).The lowest yield (15.12 q/ha) was obtained due to weedy check. These results were in agreement with results of Kolar and Sandhu (1989) and Chauhan *et al.* (1995).

Table 3. Effect of different treatments on dry matter of weed control efficiency, weed index and seed yield of pigeonpea

Treatment	Dry weight of weeds (q/ha)	Weed control efficiency (%)		Weed index (%)	Seed yield (q/ha)
		90 DAS	At harvest		
T_1 : Weedy check	12.2	0.0	0.0	34.2	15.1
T_2 : Weed free up to 90 DAS	3.1	91.6	100.0	0.0	22.9
T_3 : Two hand weedings (20 and 45 DAS)	6.2	52.6	64.9	3.9	22.1
T_4 : Pendimethalin 1.5 kg/ha PE	9.5	26.5	25.5	27.1	16.7
T_5 : Pendimethalin 1.0 kg/ha PE + one hand weeding (45 DAS)	4.9	69.7	72.2	2.9	22.3
T_6 : Fluchloralin 1.5 kg/ha PPI	9.6	27.3	29.2	22.3	17.8
T_7 : Fluchloralin 1.5 kg/ha PPI + one hand weeding at (45 DAS).	8.2	68.9	72.5	18.7	18.7
T_8 : Pendimethalin 1.0 kg/ha PE+ glyphosate 1.0 kg/ha at POE	7.2	76.7	75.6	14.0	19.7
T_9 : Pendimethalin 1.0 kg /ha PE + paraquat 1.0 kg/ha at POE	9.2	57.8	62.4	22.8	17.5
LSD(P=0.05)	2.5	8.3	2.2	2.9	0.7

DAS - Days after sowing

Conclusively, it was observed that weed free up to 90 DAS treatment was found to be significantly superior in controlling weeds compared to all other treatments. Weedy check treatment recorded maximum weed intensity (206.6/m^2) at 90 DAS. The dry matter of weeds in weed free upto 90 DAS was lower (3.08 q/ha) which was at par with IWM treatment, *viz.*, pendimethalin 1.0 kg/ha PE plus hand weeding at 45 DAS. The dry matter of weeds in weedy check treatment was maximum (12.22 q/ha). Weed control efficiency was maximum in weed free upto 90 DAS treatment. Weed free upto 90 DAS treatment recorded the highest seed yield followed by IWM treatment viz., pendimethalin 1.0 kg/ha PE + hand weeding at 45 DAS. Among the herbicide treatments pendimethalin 1.0 kg/ha PE plus glyphosate 1.0 kg/ha POE at 45 DAS, recorded the highest yield. Based on the present study, it might be concluded that some of the herbicidal combinations as discussed before though proved very effective against weeds in pigeonpea and resulted in grain yield similar to some extent in weed free check treatment. This warrants for careful planning well in advance regarding use of suitable herbicides or herbicide combination keeping in mind the crop rotation under given situations.

REFERENCES

Ali M. 1991. Weed management in pigeonpea under rainfed conditions in India. *Tropical Pest Management* **37**(4) : 345-348.

Anonymous. 2003. *Economic survey of Maharashtra*- 2002-03.

Asthana AN and Chaturvedi SK. 1999. *A little impetus needed*. The Hindu Survey of Indian Agriculture : 61-65.

Brar HS, Chander V and Kundra HC. 1990. Weed control studies in pigeonpea *Journal of Research. Punjab Agriculture University* **27** (2) : 213-217.

Chauhan DR, Balyan RS, Kataria OP and Dhankar RS. 1995.Weed management studiesin pigeonpea. *Indian Journal Weed Science* **27** (1&2) : 80-82.

Kolar JS and Sandhu KS. 1989. Weed management in pulse Crops. *Indian Farming* **34**(6) **:** 17-18.

Kumar S, Phogat SB and Karwasra RS. 1994. Effect of dose, time of application of herbicides and cultural practices on weed flora and pigeonpea yield. *Annals of Agricultur Research* **15** (1) : 65-68.

Patel ZG, Raj VC and Pate HC. 1993. Integrated weed management in pigeonpea. *Indian Journal Weed Science* **24** (1&2) 17-21.

Tewari AN. 1989. Weed management in Arhar. *Indian Farming*. **38**(11) : 13-14.

Tiwari RB, Parihar SS and Tripathi RS. 1992. Weed management in pigeonpea based intercropping system. *Indian Journal Agronomy* **37**(1) : 145-147.