Agriculture Update
Volume **9** | Issue 1 | February, 2014 | 124-127

Research Article

Efficacy and economics of integrated weed management in vegetable cowpea [*Vigna unguiculata* (L.) Walp]

■ **B.C. PATIL, LAXMAN A. PADANAD, K.H. YASHVANTKUMAR, SOUMYA SHETTY AND RAVI LAXMIGUDI**

ARTICLE CHRONICLE :
Received :
18.12.2013;
Revised :
16.01.2014;
Accepted :
23.01.2014

SUMMARY : A field experiment was carried out to formulate an economic weed management stratergy in vegetable cowpea during *Kharif* 2012-13 and 2013-14 at the All India Co-ordinated Vegetable Improvement Project in the Regional Horticultural Research and Extension Center, Dharwad. The results based on two years pooled data revealed that, weed control treatments mulching with black polythene and pendimethaline @1 kg/ha + one hand weeding 30 DAS, provided effective control of weeds and significantly increased pod yield of vegetable cowpea over weedy check. The highest net returns (Rs.36211ha^{-1}) and B:C ratio (1.75) was registered with pendimethaline at 1 kg/ha+ One hand weeding 30 DAS. Profit, with mulching with black polythene were less due to higher cost of black polythene.

How to cite this article : Patil, B.C., Padanad, Laxman A., Yashvantkumar, K.H., Shetty, Soumya and Laxmigudi, Ravi (2014). Efficacy and economics of integrated weed management in vegetable cowpea [*Vigna unguiculata* (L.) Walp]. *Agric. Update*, **9**(1): 124-127.

KEY WORDS :
Cowpea, Weeds, Integrated weed control, Yield, Dry matter

Author for correspondence :
B.C. PATIL
All India Coordinated Research Project on Vegetables, Regional Horicultural Research Extension Centre, DHARWAD (KARNATAKA) INDIA

See end of the article for authors' affiliations

BACKGROUND AND OBJECTIVES

Cowpea (*Vigna unguiculata* L.) is one of the most important legumes which serves as vital source of protein in the diet of people of developing countries. Cowpea is grown primarily in third word for its cheap source of dietary protein, lysine (Bresami, 1985). In India young pods are eaten as vegetable. Cowpea sown in summer season is infested by a number of weed species that compete with the crop right from germination to harvest, affecting the crop yield adversely (Yadav *et al.*, 1998). Thus, to enhance crop yield and its effect on soil fertility, the control of weeds in summer crop is very important. Therefore, the use of herbicides in cowpea to control weeds appears to be useful (Dadari, 2003 and Silva *et al.*, 2003). In general herbicides are effective only against few weed species, which results in serious infestation of other weeds. Weeds are of negative values, which lower the input efficiency. Apart from increasing the production cost, they also intensify disease and insect pest problem by serving as alternative hosts. Besides quantitative effects on yield, weeds deteriorate the quality of produce through the physical presence of their seeds and debris. Weed density, type of the weeds, their persistence and crop management practices determine the magnitude of yield loss. Yield loss in cowpea due to weeds was 12.7 - 60.0 per cent (Li *et al.*, 2004). Tripathi and Singh (2001) reported that presence of weeds in cowpea reduced yield by 82 per cent and significant increase in pod yield was noted by controlling weeds up to 45 days of sowing. In Dharwad areas of Karnataka state, none of the weed control methods is best under all conditions. So, there is a need to make a comparative study of different weed management techniques in cowpea and to develop an integrated

weed management approach, which should be efficient and cost effective and environmentally safe. The postulation that integration of different weed control methods may be useful to provide better weed control in cowpea can be assessed .Keeping these facts in view, a comprehensive study was planned to integrate different weed control methods in rainfed cowpea crop methods was studied on yield, yield attributing characters and economics of cowpea during 2012-13 and 2013-14.

RESOURCES AND METHODS

The present investigation was carried out for two years at the All India Coordinated Vegetable Improvement Project (AICVIP), Regional Horticultural Research and Extension Centre, Dharwad. (Karnataka) during *Kharif* 2012-13 and 2013-14 on cowpea variety CP-4. The soil was shallow red embedded with small sand and gravel with pH 6.5-6.9 with medium available nitrogen, phosphorus and potash contents. The experiment was laid out with randomized blocked design with four replications and seven weed control methods included in the study. These were T_1-Weedy check, T_2-Weed free (Hand weeding at 25 and 40 DAS), T_3-Mulching with black polythene, T_4-Pendimethaline at 1 kg/ha, T_5-Pendimethaline at 1 kg/ha + one hand weeding 30 DAS, T_6- Metolachlor at 0.75 kg/ha and T_7-Metolachlor at 0.75 kg/ha +one hand weeding 30 DAS. The crops were sown at a spacing of 45 cm x 20 cm in a gross plot size of 3m x 3m. The recommended dose of NPK @ 25:75:60 kg/ha was applied uniformly in all the plots. The herbicides were applied as pre-emergence spray with manual knapsack sprayer using 500 litre of water/ha. Treatment-Mulching of black polythene was done after bed preparation, polythene sheet was mulched and seeds were sown with 2 inch diameter holes made with iron pipe. Weed population and dry matter were recorded at 60 days after sowing (DAS) as per treatments by randomly placing a quadrate of 0.5m x 0.5m at two places in each plot. The weed density was expressed in number/m^2 and were subjected to vx+0.5 transformation. The data on growth parameters and yield attributes were recorded and was analyzed statistically with the method advocated by Panse and Sukhatme (1978). The economics of different weed control treatments were also worked out by using the prevailing market price of the produce and inputs used.

OBSERVATIONS AND ANALYSIS

The results of the present study as well as relevant discussions have been presented under following sub heads:

Effect on weeds:

Weed density/m^2:

The field was infested mainly with *Cyperus rotundus* (14%), *Cynodon dactylon* (5%), *Echinochloa colona* (20%), *Parthenium hysterophorus* (24%), Grasses and

Table1: Effect of different weed management treatments on weed density and dry weight of weeds on vegetable cowpea (Pooled data of two years)

Treatments	No of weeds/M^2 area at 60 DAS			weeds dry weight/M^2 in grams at 60 DAS			weeds dry weight in kg/ha at 60 DAS		
	2012-13	2013-14	pooled	2012-13	2013-14	pooled	2012-13	2013-14	pooled
T_1-Weedy check	33.25(5.81)	36.75(6.10)	35.00(5.96)	192.85	209.48	201.16	1928.50	2094.75	2011.63
T_2-Weed free (Hand weeding at 25 and40 DAS)	7.75(2.87)	7.00(2.74)	7.38(2.79)	54.25	38.50	46.38	542.50	385.00	463.75
T_3-Mulching with black polythene	4.50(2.24)	4.25(2.18)	4.38(2.21)	27.95	21.68	24.83	279.90	216.75	248.33
T_4-Pendimethaline @1 kg./ha	10.50(3.32)	9.25(3.12)	9.88(3.22)	75.60	50.88	63.24	756.00	508.75	632.38
T_5-Pendimethaline @1 kg/ha +one hand weeding 30 DAS	5.00(2.35)	4.50(2.24)	4.75(2.29)	29.40	23.40	26.40	294.00	234.00	264.00
T_6- Metolachlor @0.75 kg./ha	15.00(3.94)	14.00(3.81)	14.50(3.85)	111.00	81.20	96.10	1110.00	812.00	961.00
T_7-Metolachlor @0.75 kg/ha +one hand weeding 30 DAS	9.50(3.16)	11.25(3.43)	10.38(3.24)	62.70	65.25	63.98	627.00	652.50	639.75
S.E.±	1.718	2.212	1.362	10.963	12.622	8.369	109.635	126.228	83.696
C.D. @ 5%	5.106	6.574	4.048	32.574	37.504	24.867	325.744	375.043	248.674
C.V.%	28.139	35.609	22.117	27.716	36.037	22.443	27.716	36.037	22.443

DAS = Days after sowing, Figures in the parentheses are the $\sqrt{x+0.5}$ transformed values.

Sedges (30%) and broad leaved weeds (7%). Different weed control treatments significantly reduced weed population and their dry weight at 60 DAS as compared to weedy check (Table 1). Data depicted that maximum (35.00)weed density/ m^2 recorded in the weedy check,while the minimum (4.38 and 4.75) weed density/m^2 was recorded in mulching with black polythene and pendimethaline at 1kg/ha +one hand weeding 30 DAS, respectively. All the remaining treatments produced statistically similar results.

Weed dry matter accumulation(DMA):

The lowest weed dry matter accumulation (DMA) was observed in case of mulching with black polythene (T_3) which was followed by, pendimethaline at 1 kg/ha+one hand weeding 30 DAS (T_5).The DMA values were 248.33 and 264.00 kg/ ha, respectively. The highest weed DMA (2011.63 kg/ha) followed by Metolachlor at 0.75 kg./ha treatment (T_6) which recorded 961.00 kg/ha (Table 1).

Effect on crop:

Pooled data over two year revealed that, all the weed control treatments significantly, recorded higher number of pods/plant, ten pods weight (g), pod yield/plant (g), pod yield/ plot (kg)and pod yield (q./ha) were significantly influenced by the weed control treatments (Table 2). Number of pods/ plant (21.25 and 20.34), ten pods weight (g) (134.26 g and 126.21g), pod yield/plant (g) (283.95 g and 249.89 g) and pod yield/plot (kg) (7.03 kg and 6.35 kg) were found significantly higher in mulching with black polythene and pendimethaline at 1 kg./ha+one hand weeding 30 DAS treatments, where as minimum (14.13) number of pods/plant, (96.83) ten pods weight (g), (135.14) pod yield/plant (g), (3.71) pod yield/plot (kg), were observed in weedy check. The greater number of pods/plant, ten pods weight (g), pod yield/plant (g) and pod yield/plot (kg) in mulching with black polythene (T_3) and pendimethaline at 1 kg/ha + one hand weeding 30 DAS (T_5) treatments were due to good weed management by these treatments as compared to rest of treatments. The results of James *et al.* (2006) also supported our findings stating that black polythene is more effective in controlling weeds.

Pod yield (q/ha):

Analysis of variance of the data revealed that pod yield was significantly affected by different weed control treatments (Table 2). The data depicted that maximum 78.09 q/ha yield was observed in mulching with black polythene. However, it was statistically at par with pendimethaline at 1

Table 2 : Effect of different weed management treatments on yield and yield attributing characters of vegetable cowpea (Pooled data of two years)

	No. of pods/plant			Ten pods weight(g)			Pod yield /plant (g)			Pod yield (kg/plot)			Pod yield(q/ha)		
Treatments	2012-13	2013-14	pooled	2012-13	2013-14	pooled	2012-13	2013-14	pooled	2012-13	2013-14	pooled	2012-13	2013-14	pooled
T_1	15.67	12.58	14.13	104.60	89.05	96.83	159.98	110.30	135.14	4.21	3.20	3.71	46.81	35.56	41.18
T_2	21.00	15.75	18.38	141.00	110.00	125.50	294.94	180.65	237.80	6.60	5.68	6.14	73.33	63.06	68.20
T_3	21.83	20.67	21.25	144.88	123.65	134.26	321.72	246.18	283.95	7.66	6.40	7.03	85.06	71.11	78.09
T_4	21.08	15.17	18.13	130.50	108.28	119.39	272.88	160.54	216.71	6.48	4.60	5.54	71.94	51.11	61.53
T_5	20.17	20.50	20.34	129.65	122.78	126.21	259.78	240.00	249.89	6.38	6.33	6.35	70.89	70.28	70.59
T_6	19.67	15.00	17.34	127.63	100.60	114.11	254.33	145.71	200.02	5.31	4.05	4.68	58.97	45.00	51.99
T_7	19.75	14.25	17.00	127.93	101.85	114.89	254.93	150.40	202.67	5.73	5.00	5.36	63.61	55.56	59.59
S.E. ±	0.744	0.614	0.457	5.362	6.918	5.079	8.542	6.358	5.541	0.355	0.363	0.226	3.949	4.039	2.510
C.D.@5%	2.212	1.825	1.358	15.933	20.557	15.092	25.379	18.891	16.465	1.056	1.080	0.671	11.734	12.002	7.458
C.V.%	7.490	7.553	5.058	8.284	12.809	8.555	6.576	7.214	5.083	11.749	14.438	8.155	11.748	14.439	8.150

T_1-Weedy check, T_2-Weed free (Hand weeding at 25 and40 DAS) , T_3-Mulching with black polythene, T_4-Pendimethaline @1 kg./ha, T_5-Pendimethaline @1 kg./ha+ one hand weeding 30 DAS and, T_6- Metolachlor @0.75 kg./ha and T_7-Metolachlor @0.75 kg./ha +one hand weeding 30 DAS

Table 3: Effect of different weed management treatments on economics of vegetable cowpea (Pooled data of two years)

Sr. No.	Treatments	Pod yield q/ha	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net returns (Rs./ha)	B:C Ratio
1.	T_1-Weedy check	41.18	44082.50	48859.50	4777	1.11
2.	T_2-Weed free (Hand weeding at 25 and40 DAS)	68.20	49932.50	81320.50	31388	1.63
3.	T_3-Mulching with black polythene	78.09	75832.50	93004.50	17172	1.23
4.	T_4-Pendimethaline @1 kg./ha	61.53	45747.50	72788.50	27041	1.59
5.	T_5-Pendimethaline @1 kg./ha + one hand weeding 30 DAS	70.59	48460.00	84671.50	36211.5	1.75
6.	T_6- Metolachlor @0.75 kg/ha	51.99	45647.50	61683.50	16036	1.35
7.	T_7-Metolachlor @0.75 kg/ha + one hand weeding 30 DAS	59.59	48747.50	71099.50	22352	1.46
	S.E.±	2.510				
	C.D. @ 5%	7.458				

kg/ha + one hand weeding 30 DAS and weed free (T_2) treatments (70.59 and 68.20 q/ha, respectively). Minimum (41.18 q/ha) cowpea pod yield was recorded in weedy check; however, it was statistically similar with pendimethaline at 1 kg /ha, metolachlor @ 0.75 kg/ha and metolachlor at 0.75 kg /ha +one hand weeding at 30 DAS (61.53, 51.99 and 59.59 q/ha), respectively. Maximum yield was recorded in mulching with black polythene due to better suppression of weeds by mulch. Results are in line with those reported by Singh (2010).

Economics:

The data on economics of influenced by integrated weed management practices are presented in Table 3. Among the different weed control treatments, treatment (T_5) integration of pre-emergence application of pendimethaline at 1kg/ha + one hand weeding 30 DAS resulted in highest net returns (Rs.36211ha^{-i}) and B:C ratio (1.75) followed by weed free (Hand weeding at 25 and 40 DAS) and pendimethaline at 1 kg a.i./ha (Rs. 31388 and 27041 ha^{-i}) with B:C ratio 1.63 and 1.59, respectively, over mulching with black polythene in spite of statistically higher yields (Table 2). Lower profit in case of mulching with black polythene can be ascribed to additional expenditure of about Rs.30,000/ha as compared other treatments. From the two year study, it can be concluded that integration of pendimethaline @ 1 kg/ha +one hand weeding at 30 DAS was found to be effective and economical in controlling weeds problem in vegetable cow pea cultivation. The results are in agreement with the findings of Mathew *et al*. (1995).

Acknowledgement:

The authors are greatful to the University of Horticultural Sciences Bagalkot and AICRP (Veg.),Varanasi. for providing land and financial assistance to conduct experiments.

Authors' affiliations :

LAXMAN A. PADANAD, K.H. YASHVANTKUMAR, SOUMYA SHETTY AND RAVI LAXMIGUDI, All India Coordinated Research Project on Vegetables, Regional Horticultural Research and Extension Centre, DHARWAD (KARNATAKA) INDIA Email: aicviphrsd@gmail.com

REFERENCES

Bresami, S.F. (1985). Nutririve value of cowpea. In: Singh S.R. and Rachie KO(eds.) *Cowpea research and utilization*, John Wiley and Sons**,** New York, pp.353-359.

Dadari, S.A. (2003). Evaluation of herbicides in cotton/cowpea mixture in the Northern Guinea Savanah.*J.Sustain. Agric. Environ.*, **5** (1) :153–159.

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

James, E.B., Andy, M., Delmar, S., Robert, D.W. and Srinivas, C.R. (2006). Weed control in a pigeonpea-wheat cropping system. *Field Crops Res.*, **96** (1) : 63-70.

Li, R., Guidong, Z., Yumei, Z. and Zhanzhi, X. (2004). Damage loss and control technology of weeds in cowpea field. *Weed Sci.*, **2**:25–26.

Panse,V.G. and Sukhatme, P.V. (1978). *Statistical methods for agricultural workers*. Indian council of Agricultural Research, NEW DELHI, INDIA.

Silva, J.B.F., Pitombeira, J.B., Nunes, R.P. and Pinho, J.L.N. (2003). Weed control in cowpea under no till system. *Planta Daninha*, **21** (1) : 151–157.

Singh, Moolchand (2010). Evaluation of different mulches for weed management in pea (*Pisum sativum* L.) *Indian J. Weed Sci*., **42** (1&2): 60–62.

Tripathi, S.S. and Singh, G. (2001). Critical period of weed competition in summer cowpea (*Vigna unguiculata* L.). *Indian J. Weed Sci*., **33**: 67–68.

Yadev, B.D., Joon, R.K. and Singh, J.V. (1998). Contribution of production factors on growth and seed yield of cowpea under rain-fed conditions. *Forage Res*., **24** (3) : 157–158.