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Integrated Weed Management in Pigeonpea (*Cajanus cajan* L. Millsp.)

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ABSTRACT

A field experiment 'Effect of integrated weed management in pigeonpea (*Cajanus cajan*)' was conducted at Junagadh on medium black soil during *kharif* 1992-93, 1993-94 and 1996-97 with 12 weed management treatments. Weedfree (3 hand weeding and interculturing) treatment recorded the lowest weed density, their dry weight and the highest weed control efficiency (100%), seed yield (1646 kg h $^{-1}$) and net economic return (Rs. 17192 ha $^{-1}$). However, integration of either pendimethalin or fluchloralin @ 0.900 kg ha $^{-1}$ as pre-emergence with one hand weeding and interculturing at 40-45 days after sowing proved next best for efficient weed management in pigeonpea.

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INTRODUCTION

Pigeonpea (*Cajanus cajan* L. Millsp.) is the important kharif pulse crop of India and Gujarat. Recently its cultivation popularized due to higher remunerative price and usage. The corp suffers from severe weed infestation during early establishment stage due to slow crop growth coupled with wider spacing. The yield losses due to weeds ranged from 32 to 65 per cent in the crop (Vaishya and Khan, 1989). The present investigation was conducted to find out efficient and cost effective weed management method for pigeonpea under South Saurashtra conditions.

MATERIALS AND METHODS

A field experiment 'Effect of integrated weed management in pigeonpea (*Cajanus cajan*)' was carried out at Weed Control Research Scheme, Department of Agronomy, Gujarat Agricultural University, Junagadh during rainy (*kharif*) season of 1992-93, 1993-94 and 1996-97. The soil of the field was medium black and calcareous in nature with pH 8.2, Electrical Conductivity 1.1 dSm^{-1}, low available nitrogen (216.4 kg ha^{-1}), medium phosphorus (34.4 kg P ha^{-1}) and high potash (481.6 kg K ha^{-1}). There were nine herbicidal treatments comprising pre-emergence applications of pendimethalin, fluchloralin and butachlor at lower and higher rates and inclusion of one HW & IC at 40-45 DAS with lower rate, HW & IC at 30 & 60 DAS, weedfree and control makes total twelve treatments (Table-1). The treatments were designed into randomized blocks with four replications. All the standard and recommended practices were followed to grow the crop. The data on seed yield and dry weight of weed were observed at harvest and subjected to statistical analysis and then interpreted with the help of Duncan's New Multiple Range Test.

RESULTS AND DISCUSSION

Weed Flora

The experimental plots were mainly infested with *Echinochloa crusgalli Beauv., Indigofera glandulosa, Digera arvensis* and *Cyperus rotundus* through out the crop season. *Commelina nudiflora, Leucas aspera, Phyllanthus niruri* and *Physilis minima* in *kharif. Eluropus villosus, Celsia coromandelian, Alysicarpus rugosus* and *Euphorbia sp.* in semi rabi season.

Weed density

The mean data of three year (Table 1) showed that hundred per cent reduction in weed density was observed in weedfree treatment as compared to control plot which recorded the heighest weed density (185.03 weeds/m^2) while pre-emergence application of either pendimethalin, fluchloralin or butachlor reduced weed density ranging from 51 to 72% over control at 30 DAS. At 60 DAS, either cultural operation alone or its inclusion with herbicides proved effective to reduced weed density as compared to sole herebicide. There was fluctuation in weed density recorded at harvest which might be due to varying life period of weed-species and emergence of rabi weed during later stage. Similar effect of herbicides like pendimethalin, oxadiazon, butachlor and trifluralin on weed density has been reported in pigeonpea (Reddy *et al., 1990;* Tripathi and Vivek, 1995).

TABLE 1

Effect of integrated weed management on weed density, their dry weight and weed control efficiency.

Treatment	Rate (kg/ha)	Weed density (No/m^2)*			Dry weed weight (kg/ha)				Weed Control efficiency (%)*
		30 DAS	60 DAS	Harvest	1992-93	1993-94	1996-97	Pooled	
A : Pendimethalin. Pre	0.900	51.86	38.81	35.79	3345 bc	1188 f	4268 c	2934 b	40.7
B : Pendimethalin. Pre	1.200	56.00	41.92	41.56	3241 bc	1624 ef	3660 f	2808 b	43.2
C : Pendimethalin. Pre+ 1 HW & IC at 40-45 DAS	0.900	51.56	38.81	49.33	1543 de	162 g	810 i	838 c	83.1
D : Fluchloralin. Pre	0.900	89.92	60.30	65.78	3106 c	2738 d	3458 g	3114 b	37.0
E : Fluchloralin. Pre	1.350	61.03	44.30	45.33	3279 bc	1949 e	4123 d	3117 b	37.0
F : Fluchloralin. Pre + 1 HW & IC at 40-45 DAS	0.900	75.70	36.44	55.11	1640 d	200 g	941 h	927 c	81.3
G : Butachlor. Pre	1.000	76.89	42.97	37.33	3491 b	4136 c	4529 b	4052 ab	18.1
H : Butachlor. Pre	1.500	70.08	40.75	39.11	3310 bc	3638 c	3877 e	3609 ab	27.0
I : Butachlor. Pre + 1 HW & IC at 40-45 DAS	1.000	63.86	30.97	36.00	1516 de	231 g	723 i	824 c	83.3
J : 2 HW & 2 IC at 30 & 60 DAS	–	167.41	25.19	40.23	1331 e	112 g	116 j	520 c	89.5
K : Weed free	–	0	0	0	f	0 g	0 k	0 c	100.0
L : Control	–	185.03	113.64	92.68	4128 a	5806 g	4905 a	4946 a	–
C. V. %	–	–	–	–	5.97	15.01	2.25	7.92	–

Pre = Pre emergence. HW = Hand weeding. IC = Interculturing. DAS = Days After Sowing

* Pooled data of 3 years

Dry Weed Weight

Significantly, the lowest dry weed weight at harvest (0 kg ha^{-1}) was observed under the weedfree treatment in 1992-93 and 1996-97 (Table-1). The same treatment recording the lowest dry weed weight, remained at par with the treatment J, C and I in 1993-94 and treatment J,I,C and F in the pooled result. These findings are in accordance with those of Chauhan *et al.* (1995).

Weed Control Efficiency

Maximum weed control efficiency (100%) was recorded under weedfree condition (pooled data) and closely followed by treatments J (89.5%), I (83.3%), C(83.1%) and F (81.3%). This indicates integration of herbicides at lower rate with one handweeding and interculturing at 40-45 days after sowing proved its efficiency over sole herbicide application and remained comparable to weedfree condition.

Seed Yield

Effect of integrated weed management on seed yield (Table-2) was found significant in all the years as well as in pooled result. Highest seed yield was produced under the weedfree treatment in all the years and remained at par with the treatments F, A, C, D, J and B in 1993-94 and treatment C and F in the pooled, respectively. Integration of either

TABLE 2

Seed yield and economics of pigeonpea as affected by integrated weed management.

Treatment	Rate (kg/ha)	Seed yield (kg/ha)				Net return (Rs./ha)*	Additional income over control (Rs./ha)*
		1992-93	1993-94	1996-97	Pooled		
A : Pendimethalin. Pre	0.900	1265 bc	1973 ab	758 g	1332 bcd	14844	2844
B : Pendimethalin. Pre	1.200	920 ef	1869 abc	805 f	1198 de	12886	886
C : Pendimethalin. Pre+ 1 HW & IC at 40-45 DAS	0.900	1360 b	1915 abc	1131 b	1469 ab	15558	3558
D : Fluchloralin. Pre	0.900	865 fg	1912 abc	907 e	1228 cd	13946	1946
E : Fluchloralin. Pre	1.350	1145 cd	1782 bcd	909 e	1279 bcd	14383	2383
F : Fluchloralin. Pre + 1 HW & IC at 40-45 DAS	0.900	1359 b	1981 ab	1009 c	1449 abc	15408	3408
G : Butachlor. Pre	1.000	958 def	1674 cd	741 g	1124 de	12798	798
H : Butachlor. Pre	1.500	1106 cde	1732 bcd	893 e	1243 bcd	13926	1926
I : Butachlor. Pre + 1 HW & IC at 40-45 DAS	1.000	1302 bc	1772 bcd	946 b	1340 bcd	14050	2050
J : 2 HW & 2 IC at 30 & 60 DAS	–	1117 cd	1910 abc	887 e	1305 bed	13880	1880
K : Weed free	–	1653 a	2107 a	1178 a	1646 a	17192	5192
L : Control	–	709 g	1560 d	732 g	1000 e	12000	–
C. V. %	–	9.99	8.33	2.09	8.56	–	–

Pre = Pre emergence. HW = Hand Weeding. IC = Interculturing. DAS = Days After Sowing

* Pooled data of 3 years

pendimethalin, fluchloralin or butachlor at lower rate with one hand weeding and interculturing at 40-45 days after sowing produced more seed yield as compared to single herbicide application either at lower or higher rates. The seed yield produced with combinations of either pendimethalin or fluchloralin with one hand weeding and interculturing at 40-45 days after sowing were comparable to the seed yield of weedfree plot. On the other hand, the lowest seed yield of 709, 1560, 732 and 1000 kg ha^{-1} was obtained under the control treatment in the above periods respectively. Chuhan *et al.* (1995) from Hissar also reported similar results.

Economics

The data on economics (Table-2) indicated that highest net return of Rs. 17192 ha^{-1} was obtained with the weedfree treatment resulting an increase of Rs. 5192/ ha over control. This was followed by the treatments C (pendimethalin 0.9 kg/ha, pre-emergence + one hand weeding and interculturing at 40-45 days after sowing) and F (Fluchloralin 0.9 kg/ha, pre-emergence + one hand weeding and interculturing at 40-45 days after sowing) recording net returns of Rs. 15558 ha^{-1} and Rs. 15408 ha^{-1}, respectively. The lowest net return of Rs. 12000 ha^{-1} was obtained under control treatment.

Thus, it can be concluded that pigeonpea field should be keep weedfree. However, under shortage of labourers, application of either pendimethalin or fluchloralin @ 0.900 kg/ha as pre emergence with one hand weeding and interculturing at 40-45 days after sowing is recommended for effective weed control in pigeonpea in south Saurashtra conditions.

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