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## Effect of integrated weed management on the growth and yield of cowpea

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### Abstract

A field experiment was conducted at Research Farm of Suresh Gyan Vihar University, Jaipur (Rajasthan) during *kharif* 2023 on sandy loam soil, which consisted 10 treatments of different weed management practices (hand weeding, mulching and herbicides) were laid out in randomized block design with three replication and variety RC-19 was used for experiment.

Results clearly showed that treatment weed free significantly increased plant height, dry matter accumulation, number of branches plant<sup>-1</sup>, number of nodules plant<sup>-1</sup>, number of pods plant<sup>-1</sup>, number of seeds pod<sup>-1</sup>, seed, straw and biological yield over control. The overall results indicated that weed infestation significantly affected yield in cowpea and integrated weed management especially during the critical period of crop weed competition in cowpea is inevitable for getting an economic yield and could reduce yield loss.

**Keywords:** Cowpea, straw, herbicide, mulching, weed

### Introduction

Cowpea (*Vigna unguiculata* L. Walp), belonging to the family Fabaceae is an important *kharif* pulse crop grown in India for vegetable pods, grain, forage and for green manure purpose. Cowpea is grown both for its tender pods and also for its dry seeds used as pulse for culinary purpose. Cowpea is also called as vegetable meat due to high amount of protein in grain with better biological value on dry weight basis. Cowpea grain contains 23.4% protein, 1.8% fat and 60.3% carbohydrates on dry weight basis and it is rich source of calcium and iron. Apart from this, cowpea forms excellent forage and it gives a profused vegetative growth and covers the ground so well that it checks the soil erosion. Cowpea pods are good source of protein, fibre, minerals, calcium and vitamins particularly vitamin A and vitamin C. It contains 8 g carbohydrates, 43 g proteins and 0.6 g fat, 2 g fiber per 100 g of edible portion. Tender fruits contain 80 mg calcium, 74 mg phosphorus and 2.5 mg iron per 100 g fresh pod, amino acid profile is particularly high in cowpea which greatly improves the protein quality of pulses (Gopalakrishnan, 2007) [2]. The weeds are ubiquitous in nature but their presence in cropped area especially in rainy season crops like cowpea act as major limiting factor in achieving the potential yield. The dominated weed flora in cowpea comprises *Cynodon dactylon*, *Cyperus rotundus*, *Echinochloa colona*, *Commelina benghalensis* and *Echinochloa crusgalli* among monocot weeds and *Commelina benghalensis*, *Parthenium hysterophorus* and *Trianthema portulacastrum* among dicot weeds. The critical period of crop-weed competition is 20-30 DAS. The one hand weeding at about 25-30 days after sowing is usually followed by farmers in this crop. Pendimethalin is a herbicide that belongs to the dinitroaniline group and is widely applied to control annual grasses and broad-leaved bushes when growing vegetables. Imazethapyr [5-ethyl-2-(4-isopropyl-4-methyl-5-oxo-4,5-dihydro-1H-imidazol-2-yl) nicotinic acid] is an imidazolinone herbicide and it has soil and foliar activity. Quizalofop p-ethyl [ethyl (R)-2-{4-(6-chloroquinoxanlin-2-yloxy)-phenoxy}propionate], a very effective post-emergence herbicide, belongs to the aryloxy phenoxy propionate group. Integration of different weed management techniques rather than depending on a single method has resulted in better management of

weeds.

### Materials and Methods

The field experiments were carried out during *kharif* season (2023) to study the “Effect of integrated weed management on growth and yield of cowpea [*Vigna unguiculata* (L.) Walp.]” in randomized block design with 9 treatments and 3 replications at Research Farm, Suresh Gyan Vihar University- Jaipur, Rajasthan. The experimental farm is geographically located at 75° 51'44" E longitude, 26°48'35" N latitude and an altitude of 432 m above mean sea level (AMSL). The soil experimental field was sandy loam and the soil fertility status contained available nitrogen (137.8 kg ha<sup>-1</sup>) by Subia and Asija 1996, available phosphorus (16.3 kg ha<sup>-1</sup>) by Olsen *et al.* 1954 and available potassium (250.12 kg ha<sup>-1</sup>) by Jackson, 1973. The organic carbon content was from 0.34-0.38%. The mean maximum temperatures go as high as 48 °C during summers and minimum temperature falls as low as -1.0 °C during winters. The mean relative humidity fluctuated from 63 to 91% during the crop season. The average rainfall is 400-500 mm per annum, which is mostly received during July to September. The sporadic showers during winters are also common, which are probably observed during this period. The experiments were laid out in randomized block design with three replications and nine treatments. The following treatments were included in the study, weedy check-T<sub>0</sub>, Pendimethalin @ 0.75kg/ha (PE)-T<sub>1</sub>, Imazethapyr @100g/ha (PoE)-T<sub>2</sub>, Quizalofop-ethyl @40 g/ha (PoE)-T<sub>3</sub>, Pendimethalin @ 0.75kg/ha (PE) + Imazethapyr @100g/ha (PoE)-T<sub>4</sub>, Pendimethalin @ 0.75kg/ha (PE) + Quizalofop-ethyl @40g/ha (PoE)-T<sub>5</sub>, Pendimethalin @ 0.75kg/ha (PE) + one hand weeding-T<sub>6</sub>, Pendimethalin @ 0.75kg/ha (PE) + Straw mulch (3 t/ha)-T<sub>7</sub> and Pendimethalin @ 0.75kg/ha (PE) + Straw Mulch (5 t/ha)-T<sub>8</sub> and Two-hand weeding (20-25 DAS, 40-45DAS) (Weed free)-T<sub>9</sub>.

The herbicidal observations were recorded upto harvest and

were analysed by Statistical methods (Fisher, 1950) [1].

### Result and Discussion

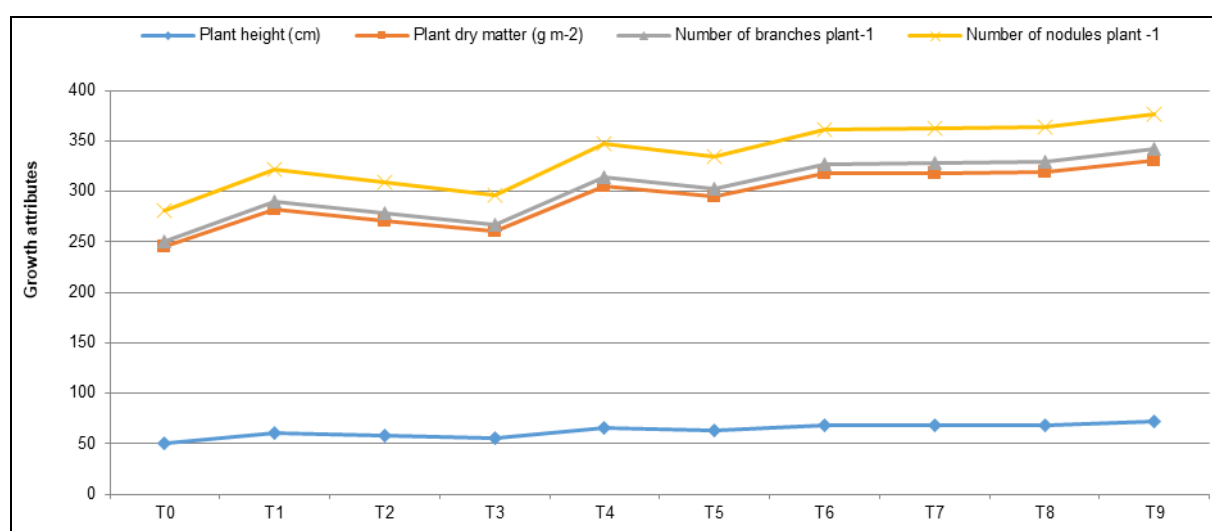
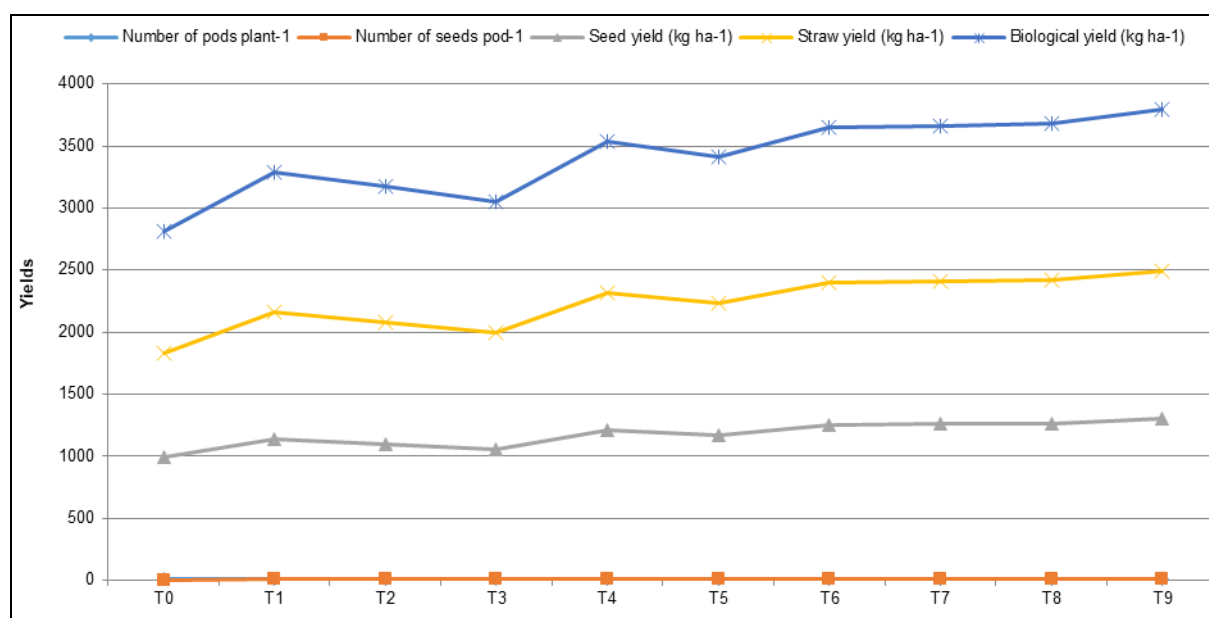
It is clear from the results of present study that, integrated weed management had significantly affected the growth and yield parameters of cowpea. Treatment (T<sub>9</sub>) *i.e.* weed free plot recorded the highest growth attributes like plant height (71.90 cm), dry matter accumulation (259.55 g m<sup>-2</sup>) at harvest, number of branches plant<sup>-1</sup> (10.76) and number of nodules plant<sup>-1</sup> (35.02) at 40 DAS (Table 1). Plant height and dry matter accumulation increased with the treatment T<sub>9</sub> due to reduction in weed competition through integrated weed management practices not only favoured crop growth with abundant availability of moisture, light and space but also reduced the weed interference, facilitating vigorous growth and development of crop plants. None of the weed management practices proved superior over the weed free treatment. It is well established fact that weed free plot has not weed crop competition that's why it was superior to all other treatments. These results are in close conformity with the findings of Sheoran *et al.*, (2013) and Mirjha *et al.*, (2014). Further yield attributes and yields like number of pods plant<sup>-1</sup> (13.89), number of seeds pod<sup>-1</sup> (7.49), seed yield (1300 kg ha<sup>-1</sup>), stover yield (2497 kg ha<sup>-1</sup> kg ha<sup>-1</sup>) and biological yield (3797 kg ha<sup>-1</sup>) (Table 2) were recorded under weed free plot (T<sub>9</sub>). However, test weight and harvest index (Singh and Stoskopt, 1971) was found non-significant by integrated weed management in cowpea. Higher attributes were due to lesser weed competition which provided better environment for crop growth and development. In these treatments weed population and their growth were controlled due to control of weed flush by herbicides and hand weeding. Significantly lower yield attributes were shown by Mirjha *et al.*, (2013) and Singh *et al.*, (2013) [9] due to weed competition.

**Table 1:** Effect of integrated weed management on growth attributes of cowpea

Treatments	Plant height (cm)	Plant dry matter (g m <sup>-2</sup> )	Number of branches plant <sup>-1</sup>	Number of nodules plant <sup>-1</sup>
T <sub>0</sub> : Weedy Check	50.30	195.29	5.42	29.91
T <sub>1</sub> : Pendimethalin @ 0.75kg/ha (PE).	60.86	222.24	7.51	31.08
T <sub>2</sub> : Imazethapyr @100g/ha (PoE)	57.8	213.49	6.89	31.27
T <sub>3</sub> : Quizalofop-ethyl @40 g/ha (PoE)	55.52	204.78	6.27	30.27
T <sub>4</sub> :Pendimethalin @ 0.75kg/ha (PE) + Imazethapyr @100g/ha (PoE)	65.59	240.31	8.72	33.04
T <sub>5</sub> :Pendimethalin @ 0.75kg/ha (PE) + Quizalofop-ethyl @40g/ha (PoE)	63.3	231.61	8.13	32.13
T <sub>6</sub> :Pendimethalin @ 0.75kg/ha (PE) + one hand weeding	67.97	249.79	9.31	33.94
T <sub>7</sub> :Pendimethalin @ 0.75kg/ha (PE) + Straw mulch (3 t/ha)	68.28	250.35	9.55	34.03
T <sub>8</sub> :Pendimethalin @ 0.75kg/ha (PE) + Straw Mulch (5 t/ha)	68.83	250.84	9.74	34.17
T <sub>9</sub> :Two-hand weeding (20-25 DAS, 40-45DAS) (Weed free)	71.90	259.55	10.76	35.02
SEM±	0.34	2.89	0.17	0.27
CD at (p= 0.05)	1.04	8.67	0.52	0.81
CV (%)	10.35	8.61	9.27	8.20

**Table 2:** Effect of integrated weed management on yield attributes and yields of cowpea

Treatments	Number of pods plant <sup>-1</sup>	Number of seeds pod <sup>-1</sup>	Test weight (g)	Seed yield (kg ha <sup>-1</sup> )	Straw yield (kg ha <sup>-1</sup> )	Biological yield (kg ha <sup>-1</sup> )	Harvest index (%)
T <sub>0</sub> : Weedy Check	10.28	5.46	85.69	989	1828	2816	35.10
T <sub>1</sub> : Pendimethalin @ 0.75kg/ha (PE).	12.20	6.34	85.53	1133	2159	3293	34.42
T <sub>2</sub> : Imazethapyr @100g/ha (PoE)	11.80	6.04	85.43	1092	2079	3172	34.44
T <sub>3</sub> : Quizalofop-ethyl @40 g/ha (PoE)	11.38	5.77	85.84	1051	1995	3047	34.51
T <sub>4</sub> :Pendimethalin @ 0.75kg/ha (PE) + Imazethapyr @100g/ha (PoE)	12.96	6.88	85.71	1214	2320	3534	34.35
T <sub>5</sub> :Pendimethalin @ 0.75kg/ha (PE) + Quizalofop-ethyl @40g/ha (PoE)	12.60	6.61	87.02	1173	2239	3413	34.38
T <sub>6</sub> :Pendimethalin @ 0.75kg/ha (PE) + one hand weeding	13.32	7.13	88.07	1253	2400	3653	34.31
T <sub>7</sub> :Pendimethalin @ 0.75kg/ha (PE) + Straw mulch (3 t/ha)	13.36	7.18	89.41	1258	2408	3665	34.32
T <sub>8</sub> :Pendimethalin @ 0.75kg/ha (PE) + Straw Mulch (5 t/ha)	13.50	7.21	89.78	1260	2418	3677	34.25
T <sub>9</sub> :Two-hand weeding (20-25 DAS, 40-45DAS) (Weed free)	13.89	7.49	85.37	1300	2497	3797	34.23
SEm <sub>±</sub>	0.12	0.08	0.74	13	25	38	0.56
CD at (p= 0.05)	0.36	0.23	NS	38	75	113	NS
CV (%)	8.36	7.89	10.20	9.26	9.78	9.01	8.87

**Graph 1:** Effect of integrated weed management on growth attributes of cowpea**Graph 2:** Effect of integrated weed management on yield attributes and yields of cowpea

## Conclusion

In light of the results obtained from the present investigation, it may be concluded that the treatment weed free was found effective in increasing plant height, plant dry matter, number of branches plant<sup>-1</sup>, number of pods plant<sup>-1</sup>, seed, straw and biological yield of cowpea as compared to control and other herbicidal treatments. In case sufficient labour is not available, application of pendimethalin 0.75 kg a.i. ha<sup>-1</sup> + one hand weeding at 25 DAS is recommended dose to maximum production and profitability from cowpea under semi-arid condition of Rajasthan.

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