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SYNERGETIC EFFECT OF CULTURAL PRACTICES AND HERBICIDES ON WEED MANAGEMENT IN COWPEA

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SUMMARY

A field experiment was planned to evaluate the performance of herbicides for weed control in cowpea cultivars during *Kharif* season 2018-19 to 2020-21 at the Research Farm of Vegetable Science, CCS Haryana Agricultural University, Hisar, India. Three years data (2018-19 to 2020-21) on weed management in cowpea cv P-263 revealed that the pre-emergence application of pendimethalin @ 6 ml/L+ One hand weeding 25 DAS (T4) resulted maximum green pod yield of 80.5 q/ha with maximum B:C ratio of 2.2 excluding fruit yield of 84.6 q/ha under weed free check (T2). However, these both treatments (T2 and T4) were statistically at par in terms of pod yield/ ha. Although, the weed free check (2-3 hand weeding) (T2) recorded highest pod yield but the net return of this treatment is less (B:C ratio 1.3) due to higher cost of cultivation.

Key words: Cowpea, variety, sowing time, climate change, growth, yield

Cowpea [*Vigna unguiculata* L.Walp] is very important pulse crop and cultivated in tropical and sub-tropical region of the developing nations (Nguyen *et al*., 2019a&b). In India, cowpea is mainly grown for green fodder, green vegetable, pulse seed, green manure and soil-improving cover crop during rainy and summer seasons (Panchta *et al*, 2021 & 2022). An excellent response was observed with the application of irrigation and other agronomic practices. Its green tender plants and leaves are used for feeding domestic animals as green fodder. Being a leguminous crop, it is also used for improving the soil fertility (Lal *et al*., 2017; Arya *et al*., 2019 & 2021). It's green tender pods are used as vegetable and mature dry seed used as whole grain pulse for human consumption (Oo *et al*., 2022 & 2023). It is a nutritive crop and rich source of protein both for animals as well as human beings (Vu *et al*., 2016; Lal *et al*., 2018). It is well known truth that the high yielding variety of cowpea is the primary requirement for a flourishing farmer (Majoka *et al*., 2021). But, to get full potential of new variety, it is a pre-requisite to identify the best promising planting of a particular variety, which provides a better yield production for the same variety just manipulating in sowing dates under specific climatic conditions (Panghal *et al*., 2021; Ankita *et al*., 2023). The assessment of available crop varieties gives essential and effective information on yield production (Vu *et al*., 2017; Oo *et al*., 2023). During rainy season weeds are the major limiting factor in cowpea yield production (Tripathi and Singh, 2001). A herbicide may cause an adverse effect on cowpea while controlling the weeds, thus, there is urgent to test its adverse effect on the crop (Usman, 2013) Therefore, keeping in view the importance of the weed control in cowpea, present study was planned to recommend the suitable herbicide to minimize the losses caused by weeds in cowpea.

MATERIALS AND METHODS

A field experiment was planned to evaluate the performance of herbicides for weed control in cowpea cultivars during *Kharif* season 2018-19 to 2020-21 at the Research Farm of Vegetable Science, CCS Haryana Agricultural University, Hisar, India. The experimental site in Hisar was located at latitude : 29º 10' N, the longitude : 75º46' E and at an altitude : 215.2 m above mean sea level. This area has semi-arid climate along with dry and hot winds during summer and dry severe cold in winter season (Majoka *et al*., 2021). Highest rainfall in this area is received during the months of July to September with showers in the month of January to late spring. In the present

experiment cowpea variety, P-263, six treatments namely, T1: Weedy Check (control), T2 : Weed free check (2-3 hand weeding) (first HW at 25 DAS), T3: Pre-emergence application of Pendimethalin @ 6 ml/ L, T4 : Pre-application of Pendimethalin @ 6 ml/L + one HW, T5 : Pre-application of Pendimethalin @ 6 ml/L + Quizalofopehtyl 40-50 g/ha at 25 DAS, and T6 : Pre-emergence application of Metribuzin @ 525 g/ ha at 25 were applied during kharif season in RBD with three replications having plot size of 1.50m x 1.50m with spacing 30cm x 15 cm. The observations were recorded on five competitive plants in each treatment for number of pods per plant, fresh weight of weeds, dry weight of weeds and fruit yield per plant (kg). The data was subjected to the RBD statistical analysis as per standard procedure.

RESULTS AND DISCUSSION

In any crop, weed infestation mainly depends upon tillage operations, soil moisture regime and the soil tilth of the feild that makes the field situation more favourable for cowpea growth and yield production. Generally, weeds compete with crop plants for nutrients, moisture and sunlight and causes significant yield losses. Today, the weeds in cowpea are controlled manually, mechanically or chemically. In India is the world's largest cowpea cultivator, producer as well as consumer, commonly using the manual and/or mechanical methods for weeding. Now-a-days, manual/ mechanical weeding become difficult due to non-availability of labor at right time (Yadav *et al.,* 2017).

The results on cowpea are presented in table 1-3 revealed the significant differences among the treatments. During 2018-19, among the six treatments were tested and the maximum number of pods per plant (28.50) was recorded in T2 followed by T4 (27.60), T3 (23.80), T5 (23.40) and T6 (22.10). Minimum number of pod per plant (16.20) was observed in T1. Out of the six treatments tested during 2019-20, in T2 the maximum number of pods per plant (31.20) was recorded in T2 followed by T4 (29.60), T3 (26.50), T5 (24.10) and T6 (21.30). Minimum number of pod per plant (17.80) was recorded in T1. During 2020-21, among the six treatments tested the maximum number of pods per plant (34.40) recorded in T2 followed by T4 (32.10), T3 (27.30), T5 (25.50) and T6 (23.50). Minimum number of pod per plant (17.30) was observed in T1. On the basis of average of three years, the maximum 31.37 pods per plant was recorded in T2 followed by T4 (29.77), T3 (25.87), T5 (24.33) and T6 (22.30). Minimum number of pod per plant (17.10) was observed in T1. The three years of investigation on weed control in cowpea revealed the same treads of weed control under different treatments, although slight variation was recorded in the formation of number of pods per plant, it may be due the variations in climatic conditions.

TABLE 1
Average Number of pods/plant under different treatments of weed control in cowpea

Treatment	Number of pods/plant			
	2018-19	2019-20	2020-21	Mean
T1	16.20	17.80	17.30	17.10
T2	28.50	31.20	34.40	31.37
T3	23.80	26.50	27.30	25.87
T4	27.60	29.60	32.10	29.77
T5	23.40	24.10	25.50	24.33
T6	22.10	21.30	23.50	22.30
CD (5%)	2.10	3.2	2.4	
CV%	4.30	7.8	6.7	

During 2018-19, among the six treatments were tested, the minimum dry weight of weeds at 60 DAS was recorded 4.10g/m^2 in T2 followed by T4 (10.20 g/m^2), T3 (23.20 g/m^2), T5 (18.30 g/m^2) and T6 (20.40 g/m^2). Maximum number of dry weight of weeds (28.40 g/m^2) was observed in T1.Out of the six treatments tested during 2019-20, the minimum dry weight of weeds at 60 DAS was recorded 5.40g/ m^2 in T2 followed by T4 (13.40 g/m^2), T5 (19.10 g/ m^2), T3 (25.60 g/m^2) and T6 (32.50 g/m^2). Maximum dry weight of weeds (43.20 g/m^2) was observed in T1. During 2020-21, among the six treatments tested, the minimum dry weight of weeds at 60 DAS was recorded 1.20g/m^2 in T2 followed by T4 (12.80g/m^2), T5 (21.30 g/m^2), T3 (23.40 g/m^2) and T6 (36.20 g/ m^2). Maximum dry weight of weeds (54.10 g/m^2) was observed in T1. On the basis of average of three years, among the six treatments tested, the minimum dry weight of weeds at 60 DAS was recorded 3.57g/m^2 in T2 followed by T4 (12.13g/m^2), T5 (19.57 g/m^2), T3 (24.07 g/m^2) and T6 (29.70 g/m^2). Maximum dry weight of weeds (41.90 g/m^2) was observed in T1. The treads of all the weed control treatments was found same during all the three years of investigation, although slight variation was noticed in accumulation of dry weight of weeds at 60 DAS (g/m^2) may be due the variations in climatic conditions.

During 2018-19, among the six treatments were tested the maximum pod yield (69.60 q/ha) was

TABLE 2
Dry weight of Weeds at 60 DAS (g/m^2) under different treatments of weed control in cowpea

Treatment	Dry weight of Weeds at 60 DAS (g/m^2)			
	2018-19	2019-20	2020-21	Mean
T1	28.40	43.20	54.10	41.90
T2	4.10	5.40	1.20	3.57
T3	23.20	25.60	23.40	24.07
T4	10.20	13.40	12.80	12.13
T5	18.30	19.10	21.30	19.57
T6	20.40	32.50	36.20	29.70
CD at 5%	9.6	7.3	8.7	-
CV %	1.1	8.4	6.9	-

recorded in T2, which was statistically at per with T4 (65.80 q/ha) and lowest pod yield (31.20 q/ha) was observed in T1. Out of the six treatments tested during 2019-20, the maximum pod yield (82.40 q/ha) was observed in T2, which was statistically at per with T4 (78.60 q/ha) and lowest pod yield (34.60 q/ha) was recorded in T1. During 2020-21, among the six treatments tested the maximum pod yield (101.80q/ ha) was found in T2 which was statistically at per with T4 (97.10 q/ha) and T6 (62.70 q/ha) and lowest pod yield (41.30 q/ha) was observed in T1. On the basis of average of three years, the maximum pod yield (84.60 q/ha) was recorded in T2 followed by T4 (80.50 q/ha), T3 (66.90 q/ha), T5 (59.20 q/ha) and T6 (50.00 q/ha) and lowest pod yield (35.70 q/ha) was found in T1. The treads of all the weed control treatments was found same during all the three years of investigation, although slight variation was noticed in production of pod yield (q/ha) may be due the variations in climatic conditions.

TABLE 3
Mean performance of yield under different treatments of weed control in cowpea

Treatment	Yield (q/ha)				B:C ratio
	2018-19	2019-20	2020-21	Mean	
T1	31.20	34.60	41.30	35.70	0.89
T2	69.60	82.40	101.80	84.60	1.3
T3	55.10	59.50	86.20	66.90	1.9
T4	65.80	78.60	97.10	80.50	2.2
T5	50.40	53.10	74.20	59.20	1.7
T6	42.10	45.20	62.70	50.00	1.4
CD at 5%	6.10	5.30	8.10	-	-
CV %	7.80	7.10	7.60	-	-

Three years data (2018-19 to 2020-21) on weed management in cowpea cv P-263 revealed that the pre-emergence application of Pendimethalin @ 6ml/ L+ One hand weeding 25 DAS (T4) resulted maximum green pod yield of 80.5 q/ha with maximum B:C ratio of 2.2 excluding pod yield of 84.6 q/ha under weed free check (T2). However, these both treatments (T2 and T4) were statistically at par in terms of pod yield/ ha. Although, the weed free check (2-3 hand weeding) (T2) recorded highest pod yield but the net return of this treatment is less (B:C ratio 1.3) due to higher cost of cultivation. Similar finding were also reported by Sunday and Udensi (2013), Yadav et al. (2016 & 2017) while working on pre-emergence herbicide for weed control in cowpea.

CONCLUSION

In Cowpea, Pre-emergence application of pendimethalin @ 6 ml/L + one hand weeding gave maximum pod yield (80.5 q/ha) with highest B:C ratio (2.2). It can be recommended for weed management in cowpea under Hisar conditions.

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REFERENCES

Ankita, Neelam, Satpal and Anil Kumar, 2023: Evaluation of cowpea varieties under different irrigation schedules. *Forage Res*., **49**(3): 310-314. *http:// forageresearch.in.*

Arya R. K., R.Panchta, N. N. Vu, S. K. Pahuja, 2019: Meteroglyph Analysis of Cowpea (*Vigna unguiculata* L.Walp) Elite Genotypes. *Ekin J.* **5**(2): 97-102.

Arya, R. K., Ravish Panchta and Nguyen Ngoc Vu, 2021: Morphological characterization of cowpea genotypes and its utility for DUS testing. *Range Mgmt. & Agroforestry,* **41**(1): 49-58 .

Lal, H., B. R. Reddy and V. Nath, 2018: Biometrical studies of yield and related traits in advance breeding lines of bush type vegetable cowpea [*Vigna unguiculata* (L.) Walp.]. *Legume Research* **41**: 867-872.

Lal, H., N. Rai and V. Nath, 2017: Biometrical approaches for selection of parents in vegetable cowpea

(*Vigna unguiculata*) breeding programme. *Indian Journal of Agricultural Sciences* **87**: 61-66.

Majoka, M.,V. P. S. Panghal and D. S. Duhan, 2021: Effect of nipping and plant spacing on seed production of cowpea in Haryana condition. *Forage Res*., **46**(4) : 343-347. *http://forageresearch.in.*

Nguyen, N. V., R. K. Arya and R. Panchta, 2019b: Studies on genetic parameters, correlation and path coefficient analysis in cowpea. *Range Management and Agroforestry,* **40**: 49-58.

Nguyen, N. V., R. K. Arya, R. Panchta and J. Tokas, 2019a: Studies on genetic divergence in cowpea (*Vigna unguiculata*) by using D^2 satistics under the semi-arid conditions. *Forage Res.,* **43**: 197-201.

Oo, P. P., R. Panchta, S. Nimbal, D. P. Singh, N. Kharor, S. Arya and Sonu L., 2022: Morphological characterization of leaf, flower, pod and seed traits of cowpea [*Vigna unguiculata* (L.) Walp] genotypes. *Forage Res.,* **48**: 50-56.

Oo, P. P., R. Panchta, S. Nimbal, N. Kharor, S. Arya R.K Arya and Sonu L., 2023: Variability, character association and genetic divergence studies in cowpea [*Vigna unguiculata* (L.) Walp] genotypes. *Range Management and Agroforestry,* **44**(2): 288-297.

Panchta, R., Preeti and S. Arya, 2020: Variability, correlation and path analysis studies in grain cowpea [*Vigna unguiculata* (L.) Walp]. *International Journal of Pure and Applied Bioscience,* **8**: 169-172.

Panchta, R., R. K. Arya, N N Vu and R.K. Behl, 2021: Genetic Divergence in Cowpea (*Vigna unguiculata* L.Walp) - an Overview. *Ekin J.,* **7**(1): 1-20.

Panghal, V. P. S., M. Majoka, Raj Hans, D. S. Duhan and Malik Jagat Singh, 2021: Cowpea varieties evaluation of for growth and yield under Haryana conditions. *Forage Res*., **47**(3): 288-291.

Sunday, O. and U. E. Udensi, 2013: Evaluation of pre-emergence herbicides for weed control in cowpea (*Vigna unguiculata* (L.) *American J. Experimental Agri.,* **3**(4): 767-779.

Tripathi, S.S. and Singh, 2001:. Critical period of weed competition in summer cowpea (*Vigna unguiculata* L.). *Indian J. Weed Sci.,* **33**: 67-8.

Usman, I., 2013: Effect of pre emergence herbicides on weed control and performance of cowpea in Samaru. J. Agricultural Sci., (Sri Lanka) **8**(2): 76-81.

Vu Nguyen Nagoc, R. K. Arya, R. Panchta and S. K. Pahuja, 2016: Studies on meteroglyph analysis in cowpea [*Vigna unguiculata* (L.) Walp] *Forage Res*., **41**(4) : 255-258. http:// forageresearch.in.

Vu Nguyen Ngoc, R. K. Arya, R. Panchta and Jayanti Tokas, 2017: Studies on genetic divergence in cowpea (*Vigna unguiculata*) by using D2 Statistics under semi-arid conditions. *Forage Res*., **43**(3) : 197-201.

Yadav, T., Chopra, K. Nisha, N. K. Chopra, Rakesh Kumar, M. Singh, C. Datt, P. G. Soni, D. K. Rathore and S. Kumar, 2016: Influence of Weed Control Methods on Yield and Quality of Cowpea Fodder. *Indian J. Animal Nutri.,* **33**(1): 70-74.

Yadav, Taramani, K. Nisha, N. K. Chopra, M. R. Chopra, Rakesh Kumar Yadav, D. K. Rathore, P. G. Soni, G. Makarana, A. Tamta, M. Kushwah, H. Ram, R. K. Meena, M. Singh, 2017: Weed Management in Cowpea– A Review. *Int. J. Curr. Microbiol. App. Sci.* **6**(2): 1373-1385. *doi: http://dx.doi.org/10.20546/ijcmas.2017.602.156.*