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Influence of Nipping and Hormonal Spray on Growth Parameters and Seed Yield in Cowpea Variety (*Vigna unguiculata* L.)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted to know the influence of nipping and hormonal sprays on growth and seed yield of cowpea variety at the Organic Research Farm (HRF), Karguanji, Department of Seed Science and Technology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (U.P.) India. In the present experiment, days to 50 percent flowering and no. of leaves at 30 DAS was not influenced by the combined effect of nipping and foliar sprays but the plant height, number of branches, number of leaves at 60 DAS and at harvest and dry matter production at various stages was influenced. The plant height was relatively more at all the stages of growth in non nipped plants with all the hormonal sprays GA350 ppm (N1H3), while number

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of leaves were more at 60 DAS and at harvest, number of branches per plant at all stage and dry matter at harvest were more in nipping at tendril stage combined to 1000 ppm lihocin spray (N2H2).The various seed yield traits were also higher in nipping at tendril stage and sprayed with growth hormones lihocin 1000 ppm (H2N2). The present investigation has indicated a relatively more beneficial influence of both nipping and hormonal spray on number of pods per plant, pod length, number of seeds per pod, pod wt. per plant, seed yield per plant and seed yield per hectare.

Keywords: Cowpea; variety; nipping (N); hormonal spray (H); growth parameters and seed yield.

1. INTRODUCTION

Pulses can occupy in dispensable place in our daily diet as a source of protein. India is a major pulse growing country in the world occupying an area of 34.45 m ha and producing 18.5 m tons with an average productivity of 730 kg/ha [1]. Among Cowpea (*Vigna unguiculata* L. Walp.) is a valuable warm season grain legume in tropical and sub-tropical zones of Africa, Asia and USA. It is widely adapted and capable of producing seeds even in lowland and semiarid regions. However, grain yield of this legume varies widely when grown at different locations.

Cowpea are used as vegetable and as a grain also. Dried pulses are cooked with vegetables to make a thick soup. Srilankan people used cowpeas in many different ways and famous way is with coconut milk while in Turkey cowpea is boiled covered with olive oil, salt, thyme and garlic sauce and eaten as an appetizer. Non-availability of quality seeds, absence of suitable seed production technology, heavy incidence of pest and diseases, inadequate postharvest handling operations and lack of knowledge about the varieties by the farmers lead to fall in productivity of cowpea. Lever [2] considered the influence of economic factors on the future of growth regulators in relation to their use in field crops. A plant hormone is an organic substance other than a nutrient, active in very minute amounts, which is formed in certain parts of the plant and usually transported to other sites, where it evokes specific biochemical, physiological and morphological responses. All hormones are growth regulators but converses not true. Lihocin is an inhibitor which arrests apical dominance and induces lateral buds to grow. It causes reduction in stem length which is attributed to a reduction in cell division, cell enlargement, alters osmotic solutes in the cell, restricts permeability of water, imbalances wall pressure and wall synthesis. Gibberellic acid application brings metabolic changes that affect both quality and quantity of the desired product.

2. MATERIALS AND METHODS

A field experimaent was conducted to study the influence of nipping and hormonal spray on growth and seed yield parameters in cowpea variety during *kharif*, 2023 at Organic Research Farm (HRF), Karguanji, Department of Seed Science and Technology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (U.P.) India. The seeds of cowpea variety viz., Bundel lobia gave treatment of no nipping (control), nipping at tendril stage and nipping after one week of tendril formation and also gave treatment of different growth regulators like lihocin 500 ppm, lihocin 1000 ppm, GA350 ppm, GA3100 ppm and water spray (control) and experiment was laid out in a factorial randomized block design with three replications. The gross plot size was 4.5 X 2.7 m^2 and the net plot size was 3.6 X 2.1 m^2.

3. RESULTS AND DISCUSSION

3.1 Effect of Nipping

Results presented for various growth parameters showed significant differences among the different nipping treatments. The treatment nipping at tendril stage (N2) registered significantly higher number of leaves per plant (13.53, 19.85 and 8.36), number of branches per plant (2.45, 4.92 and 6.08) for 30, 60 DAS and at harvest, respectively and dry matter at harvest (9.84 g/plant). Whereas, no nipping treatment recorded higher plant height (91.96 and 99.33 cm) at 60 DAS and at harvest, respectively and also took early days to 50% flowering (31.55). Different yield parameters were influenced by nipping treatments. Significantly higher number of pods per plant (19.55),pod length (10.11 cm), seeds per pod (9.23), pod weight per plant (18.55 g), seed yield per plant (18.11 g) and per ha (1130.80 kg) were more with nipping at tendril stage treatment. Similar reports were made by Sharma et. al. [3] in pigeon pea, Reddy [4] in cowpea, Khan et. al. [5] in chickpea and Kumar [6] in field bean.

Results presented for various seed yield parameters showed significant differences among the different decapitation treatments. This result are in accordance with the finding of Reddy [4] in cowpea, Khan et.al. [5] in chickpea, Singh and Devi [7] in pea, Kumar [6] in field bean and Olfati and Malakouti [8] in faba bean.

3.2 Effect of Plant Growth Regulators

The plant height at 30DAS growth retardant treatment lihocin 1000 ppm (H2) recorded maximum but by increasing days at 60 DAS and at harvest was significantly higher in GA3 (50 ppm) (H3) and was least in lihocin 1000 ppm (H2). The plant height at 60, 90 DAS and harvest were markedly maximum (40.47cm, 78.77cm and 85.88cm respectively) and also took early (30.52days) for 50 percent flowering with GA350 ppm spray. This is due to hormonal action enhancing cell elongation. Further, GA3 acts at the gene level influencing the translation and transcription mechanisms of protein biosynthesis [9], thus resulting in early flowering compared to other retardant and control treatment. Similar results were obtained in okra by Shrivastava and Sachan [10]. On the contrary at 60, 90 DAS and at harvest significantly higher values for number branches (2.47, 4.98and 6.09) and number of leaves (13.84, 20.34 and 8.61), respectively and dry matter production at harvest (10.59 g/plant) were recorded with lihocin 1000 ppm spray over GA3and control. These findings are similar to the findings of Hanchinmath [11] in cluster bean. The apical growth is antagonized by lihocin, which might have helped to increase accumulation of metabolites and diverted towards the axillary buds in the production of more number of branches and leaves and there by increased the spread of plants. These results are in conformity with those of Yadava and Sreenath [12] in cowpea.

The foliar spray of hormones showed significant differences on seed yield and yield attributes. The number of pods per plant (20.47),Pod length (10.04 cm), number of seeds per pod (9.46), pod weight per plant (18.42g), seed yield per plant (17.97g) and per ha (1139.79kg)were significantly more with lihocin 1000 ppm spray over other treatments. It may be due to more number of productive branches per plant, leaves per plant and pods per plant. Further, growth regulators influence carbon cycle in plant with higher CO2 fixation and efficient translocation of synthates towards developing seed. The similar result also obtained by Hanchinmath [11] and Sharma and Lashkari [13] in cluster bean and Shah and Prathapasenan [14] in mungbean.

Table 1. Effect of nipping and plant growth regulators spray on days to 50% flowering in cowpea variety ‘Bundel lobia’

Treatments		Days to 50% flowering
Nipping level (N)		
N1- No Nipping		31.55
N2- Nipping at tendril stage		31.69
N3- Nipping at one week after tendril stage		33.98
	S.Em.±	0.60
	C.D. at 5%	1.73
Hormone level (H)		
H1- Lihocin (500 ppm)		34.17
H2- Lihocin (1000 ppm)		32.49
H3- GA3 (50 ppm)		30.52
H4- GA3 (100 ppm)		33.29
H5- Control (water spray)		31.56
	S.E.m±	0.77
	C.D. at 5%	2.24
Interaction (NXH)		
	S.E.m±	1.34
	C.D. at 5%	NS
	CV%	7.14

Table 2. Effect of nipping and plant growth regulators on no. of leaves per plant in cowpea variety' Bundel lobia

Treatments	No. of leaves at 30 DAS	No. of leaves at 60 DAS	No. of leaves at harvest
Nipping level (N)			
N1- No Nipping	12.77	18.72	7.91
N2- Nipping at tendril stage	13.53	19.85	8.36
N3- Nipping at one week after tendril stage	12.27	18.21	7.22
S.Em.±	0.24	0.38	0.14
C.D. at 5%	0.71	1.09	0.41
Hormone level (H)			
H1- Lihocin (500 ppm)	12.63	18.67	7.84
H2- Lihocin (1000 ppm)	13.84	20.34	8.61
H3- GA3 (50 ppm)	12.39	18.02	7.16
H4- GA3 (100 ppm)	12.58	18.72	7.55
H5- Control (water spray)	12.84	18.86	7.99
S.E.m±	0.32	0.48	0.18
C.D. at 5%	0.91	1.40	0.53
Interaction (NXH)			
S.E.m±	0.54	0.84	0.32
C.D. at 5%	NS	2.43	0.91
CV%	7.24	7.68	6.98

Table 3. Effect of nipping and hormonal spray on number of branches per plant in cowpea variety'Bundel lobia

Treatments	No. of branches at 30 DAS	No. of branches at 60 DAS	No. of branches at harvest
Nipping level (N)			
N1- No Nipping	2.24	4.84	5.55
N2- Nipping at tendril stage	2.45	4.92	6.08
N3- Nipping at one week after tendril stage	2.23	4.59	5.57
S.Em.±	0.05	0.09	0.14
C.D. at 5%	0.16	0.26	0.39
Hormone level (H)			
H1- Lihocin (500 ppm)	2.27	4.82	5.67
H2- Lihocin (1000 ppm)	2.47	4.98	6.09
H3- GA3 (50 ppm)	2.11	4.51	5.44
H4- GA3 (100 ppm)	2.26	4.64	5.49
H5- Control (water spray)	2.42	4.96	5.98
S.E.m±	0.07	0.12	0.17
C.D. at 5%	0.20	0.34	0.51
Interaction (NXH)			
S.E.m±	0.12	0.20	0.30
C.D. at 5%	0.35	0.58	0.88
CV%	9.15	7.28	9.14

Table 4. Effect of nipping and hormonal spray on plant height (cm) in cowpea variety'Bundel lobia

Treatments		Plant height at 30 DAS	Plant height at 60 DAS	Plant height at harvest
Nipping level (N)				
N1- No Nipping		39.24	91.96	99.33
N2- Nipping at tendril stage		40.26	57.92	58.67
N3- Nipping at one week after tendril stage		34.23	71.90	74.56
	S.Em.±	0.62	1.35	1.26
	C.D. at 5%	1.79	3.91	3.65
Hormone level (H)				
H1- Lihocin (500 ppm)		37.79	71.41	74.90
H2- Lihocin (1000 ppm)		40.47	69.89	70.67
H3- GA3 (50 ppm)		37.91	78.77	85.88
H4- GA3 (100 ppm)		36.59	71.13	76.42
H5- Control (water spray)		36.79	78.44	79.72
	S.E.m±	0.80	1.74	1.63
	C.D. at 5%	2.31	5.04	4.72
Interaction (NXH)				
	S.E.m±	1.38	3.01	2.82
	C.D. at 5%	4.01	8.73	8.17
	CV%	6.32	7.06	6.30

Table 5. Effect of nipping and hormonal spray on dry matter at harvest (g/plant) in cowpea variety'Bundel lobia'

Treatments		Dry matter at harvest (g/plant)
Nipping level (N)		
N1- No Nipping		9.33
N2- Nipping at tendril stage		9.84
N3- Nipping at one week after tendril stage		8.69
	S.Em.±	0.24
	C.D. at 5%	0.71
Hormone level (H)		
H1- Lihocin (500 ppm)		9.19
H2- Lihocin (1000 ppm)		10.59
H3- GA3 (50 ppm)		8.14
H4- GA3 (100 ppm)		9.15
H5- Control (water spray)		9.37
	S.E.m±	0.32
	C.D. at 5%	0.91
Interaction (NXH)		
	S.E.m±	0.55
	C.D. at 5%	1.58
	CV%	10.18

Table 6. Effect of nipping and hormonal spray on no. of pods per plant in cowpea variety 'Bundel lobia'

Treatments		No. of pods per plant
Nipping level (N)		
N1- No Nipping		17.76
N2- Nipping at tendril stage		19.55
N3- Nipping at one week after tendril stage		18.73
	S.Em.±	0.39
	C.D. at 5%	1.12
Hormone level (H)		
H1- Lihocin (500 ppm)		18.42
H2- Lihocin (1000 ppm)		20.47
H3- GA3 (50 ppm)		17.49
H4- GA3 (100 ppm)		17.88
H5- Control (water spray)		19.16
	S.E.m±	0.50
	C.D. at 5%	1.45
Interaction (N X H)		
	S.E.m±	0.87
	C.D. at 5%	2.51
	CV%	8.04

Table 7. Effect of nipping and hormonal spray on pod length (cm)in cowpea variety 'Bundel lobia'

Treatments		Pods length (cm)
Nipping level (N)		
N1- No Nipping		9.06
N2- Nipping at tendril stage		10.11
N3- Nipping at one week after tendril stage		9.07
	S.Em.±	0.18
	C.D. at 5%	0.52
Hormone level (H)		
H1- Lihocin (500 ppm)		9.30
H2- Lihocin (1000 ppm)		10.04
H3- GA3 (50 ppm)		8.79
H4- GA3 (100 ppm)		8.93
H5- Control (water spray)		10.03
	S.E.m±	0.23
	C.D. at 5%	0.67
Interaction (N X H)		
	S.E.m±	0.40
	C.D. at 5%	1.16
	CV%	7.34

Table 8. Effect of nipping and hormonal spray on no. of seeds per pod in cowpea variety 'Bundel lobia'

Treatments		No. of seeds per pod
Nipping level (N)		
N1- No Nipping		8.40
N2- Nipping at tendril stage		9.23
N3- Nipping at one week after tendril stage		8.60
	S.Em.±	0.18
	C.D. at 5%	0.52
Hormone level (H)		
H1- Lihocin (500 ppm)		8.51
H2- Lihocin (1000 ppm)		9.46
H3- GA3 (50 ppm)		8.31
H4- GA3 (100 ppm)		8.24
H5- Control (water spray)		9.19
	S.E.m±	0.23
	C.D. at 5%	0.67
Interaction (N X H)		
	S.E.m±	0.40
	C.D. at 5%	1.16
	CV%	7.93

Table 9. Effect of nipping and hormonal spray on pod weight per plant (g) in cowpea variety 'Bundel lobia'

Treatments		Pod weight per plant (g)
Nipping level (N)		
N1- No Nipping		16.81
N2- Nipping at tendril stage		18.55
N3- Nipping at one week after tendril stage		16.85
	S.Em.±	0.33
	C.D. at 5%	0.94
Hormone level (H)		
H1- Lihocin (500 ppm)		17.02
H2- Lihocin (1000 ppm)		18.42
H3- GA3 (50 ppm)		16.70
H4- GA3 (100 ppm)		16.63
H5- Control (water spray)		18.24
	S.E.m±	0.42
	C.D. at 5%	1.22
Interaction (N X H)		
	S.E.m±	0.73
	C.D. at 5%	2.11
	CV%	7.26

Table 10. Effect of nipping and hormonal spray on seed yield per plant (g)incowpea variety'Bundel lobia'

Treatments		Seed yield per plant (g)
Nipping level (N)		
N1- No Nipping		16.15
N2- Nipping at tendril stage		18.11
N3- Nipping at one week after tendril stage		16.30
	S.Em.±	0.32
	C.D. at 5%	0.92
Hormone level (H)		
H1- Lihocin (500 ppm)		16.45
H2- Lihocin (1000 ppm)		17.97
H3- GA3 (50 ppm)		16.05
H4- GA3 (100 ppm)		16.07
H5- Control (water spray)		17.73
	S.E.m±	0.41
	C.D. at 5%	1.19
Interaction (N X H)		
	S.E.m±	0.71
	C.D. at 5%	2.06
	CV%	7.32

Table 11. Effect of nipping and hormonal spray on seed yield per ha (kg)in cowpea variety 'Bundel lobia'

Treatments		Seed yield per hector (kg)
Nipping level (N)		
N1- No Nipping		1061.89
N2- Nipping at tendril stage		1130.80
N3- Nipping at one week after tendril stage		1074.94
	S.Em.±	19.53
	C.D. at 5%	56.57
Hormone level (H)		
H1- Lihocin (500 ppm)		1065.56
H2- Lihocin (1000 ppm)		1139.79
H3- GA3 (50 ppm)		1050.99
H4- GA3 (100 ppm)		1055.47
H5- Control (water spray)		11.34.24
	S.E.m±	25.21
	C.D. at 5%	73.04
Interaction (N X H)		
	S.E.m±	43.67
	C.D. at 5%	126.50
	V%	6.94

3.3 Interaction Effect

The plant height was relatively more at all the stages of growth in non nipped plants with all the hormonal sprays and control as expected,while number of leaves were more at 60 DAS and at harvest, number of branches per plant at all stage and dry matter at harvest were more in nipping at tendril stage combined to 1000 ppm lihocin spray which was also expected with these treatments, since nipping results in arresting vertical growth and stimulates shoot axillary buds. The results are in accordance with the earlier reports made by Iyyannagouda [15] in coriander and Reddy [4] in cowpea.

Similarly, the various seed yield traits were also higher in nipping at tendril stage plants and sprayed with growth regulator lihocin 1000 ppm. The present investigation has indicated a relatively more beneficial influence of both nipping and hormonal spray on number of pods per plant, pod length, number of seeds per pod, pod wt. per plant, seed yield per plant and seed yield per hector. The present results are also in agreement with the findings of Iyyannagouda [15] in coriander and Reddy [4] in cowpea due to nipping and hormonal spray.

4. CONCLUSION

Treatment with nipping at tendril stage was found better for growth parameters and produces more branches per plant which ultimately increased all yield parameters.

Spray with growth regulator lihocin 1000 ppm gave higher result in all growth parameters and yield parameters.

In the light of results obtained from present investigation, it may be inferred that spray of lihocin @ 1000 ppm just after nipping treatment at tendril stage gave superior results for all growth and yield parameters.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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