

Original Research Article

<https://doi.org/10.20546/ijcmas.2018.702.448>

## Study of Biochemical and Yield Traits with Different Growth Retardants in Cowpea cv. Kashi Kanchana

V. Madhu Suman\* and Suchit A. John

Department of Biological Sciences, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad (U.P.), India

\*Corresponding author

### ABSTRACT

#### Keywords

Maleic hydrazide, Lichocin, Cycocil, Chlorophyll content and Seed yield

#### Article Info

##### Accepted:

28 January 2018

##### Available Online:

10 February 2018

A field experiment was conducted to know the effect of growth retardants viz, Maleic hydrazide (MH), Cycocil (CCC) and Lichocin on growth characters, seed quality, yield and yield components in cowpea during the *Rabi* season 2016-17. The experiment was laid out in RBD with three replications. Results revealed that the application of growth retardant reduced the plant height. The minimum plant height was recorded in MH (500 ppm). The chlorophyll content was differed significantly at 60days it was highest in Lichocin (500 ppm) followed by CCC (1000 ppm). In the entire treatments crop growth rate were increased over control and was highest in Lichocin (1000 ppm). At 90 days after sowing relative growth rate was significantly more in CCC (500 ppm). The yield contributing characters viz, seed yield per plant, number of pods per plant, seed per pod, seed index and seed yield ( $\text{g m}^{-2}$ ) increased significantly due to growth retardants. Among the treatments Lichocin (1000 ppm) recorded significantly higher seed yield than other treatments.

### Introduction

The largest production of cowpea is with over 4.3 million metric tons of annual production while the grain is a good source of human protein while the haulms are valuable source of livestock protein. It is also source of income from many small holder farmers and contributes to the sustainability of cropping system and soil fertility improvement in marginal land through provision of ground cover by plant residue and nitrogen fixation. All part of cowpea is useful for food and is nutritious, providing protein, vitamin and mineral. The protein in cowpea seed is richer

in amino acid, lysine and others compared to cereal grain (Anon., 2015) the cowpea haulm is also great value to farmers it is also use as cover crop, green manure crop, used for feeding animals and also for soil erosion control. Weeds serve as the main constraint to its production which resulted in low yield, poor quality of the crop and also low income to the farmer.

Pulses occupy an indispensable place in our daily diet as a source of protein. India is a major pulse growing country in the world occupying an area of  $43.45 \text{ m ha}^{-1}$  producing 17.24 m tons with an average productivity of

660 kg ha<sup>-1</sup> (Anon., 2015). Cowpea (*Vigna unguiculata* (L). Walp.) is valuable warm season grain legume in tropical and sub-tropical zones of Africa, Asia and U.S.A it is widely adopted and capable of producing seeds even in lowland and semi-arid regions. However, grain yield of this legume varies widely when grown at different locations.

For normal growth and development hormones like, auxins, gibberellins, ethylene, cytokinin and abscisic acid are required in proper proportions and any imbalance leads to the shedding of reproductive organs.

One of the reasons for low productivity of this crop is due to its large scale cultivation under rainfed and low input conditions coupled with non-availability of high yielding varieties. The crop also produces excessive vegetative growth in heavy rain fall areas and under irrigated conditions resulting in to poor yield. The physiological reasons for variation in productivity may be attributed to poor source-sink relationship, poor translocation efficiency at later stages crop growth, shedding of floral parts and low harvest index. (Manivannan *et al.*, 2011)

## Materials and Methods

Field experiment were conducted at the Central Experimental field, Sam Higginbottom, University of Agriculture, Technology and Sciences, during the *Rabi* season of 2016-17 to evaluate the growth retardant in biochemical and yield traits in Kashi Kanchana varitey of cowpea. The site selected was uniform, cultivable with typical sandy loam soil having good drainage. All the package of practices was followed as per the general agronomic practices for Cowpea crop. Five randomly selected plants were tagged from each treatment for recording the observations on bio chemical and yield. Observations *viz.*, number of seed per plant,

chlorophyll and seed protein was recorded as per the standard procedures are as follows.

Estimation of chlorophyll content: The chlorophyll content was measured by following the method of Arnon, (1949). Seed Protein content was estimated by the method of Lowry *et al.*, (1951) by using BSA as standard protein.

## Results and Discussion

The yield and yield attributes *viz.*, number of seeds per pod, seed per plant seed index seed per m<sup>-2</sup> were differed significantly by the application of growth retardant. Among the treatments, lichocin 1000 ppm was recorded significantly higher seeds per pod (14.40), seed index (14.10), seed yield per plant (30.6 g) and seed weight per m<sup>-2</sup> (460 g<sup>-1</sup>) and lowest number of pods per plant and seeds per pod (13.0) was observed in maleic hydrazide 500 ppm and maleic hydrazide 250 ppm (10.8), respectively. Lowest seed yield per plant and seed yield per meter row length was observed in maleic hydrazide 250 ppm and in maleic hydrazide 500 ppm (17.4 and 29.2, respectively). Similar results were observed by Vanangamudi *et al.*, (2003). The data on total chlorophyll recorded at 30 DAS no significant differences were observed for chlorophyll content. However, at 60 DAS significantly higher chlorophyll content (2.90) was obtained lichocin 500 ppm and lower chlorophyll CCC 500 ppm (2.40) at 90 DAS significantly higher chlorophyll content (2.40) was maleic hydrazide and lower chlorophyll (1.50) lichocin 500 ppm. The maximum total chlorophyll contents were recorded in lichocin 500 ppm indicated that these chemical are effective in inducing chlorophyll synthesis compared to other chemicals. Sawan *et al.*, (2007) also reported that the application of lichocin significantly increased total chlorophyll as similar to control in sunflower.

**Table.1** Effect of growth retardants on chlorophyll content and seed protein parameters of cowpea

Treatments		Cholorophyll content (mg/g)			Seed Protein content (%)
		30 DAS	60 DAS	90 DAS	
T <sub>0</sub>	Control	3.9	1.9	0.7	21.7
T <sub>1</sub>	Maleic hydrazide (250ppm)	3.8	2.5	2.7	22.6
T <sub>2</sub>	Maleic hydrazide (500ppm)	3.0	2.8	2.4	23.1
T <sub>3</sub>	CCC (chloro choline chloride) (500ppm)	3.6	2.4	1.6	21.9
T <sub>4</sub>	CCC (chloro choline chloride) (1000ppm)	2.6	2.7	1.9	22.4
T <sub>5</sub>	Lichocin (500ppm)	3.8	2.9	1.5	22.0
T <sub>6</sub>	Lichocin (1000ppm)	3.5	2.7	1.8	21.9
Mean		<b>3.40</b>	<b>2.40</b>	<b>0.99</b>	<b>22.1</b>
SEm±		<b>0.60</b>	<b>0.10</b>	<b>0.06</b>	<b>0.34</b>
C. D. (5%)		<b>NS</b>	<b>0.36</b>	<b>0.20</b>	<b>NS</b>

**Table.2** Effect of growth retardants on yield and yield parameters of cowpea

Treatments		Number of pods	Number of seed per pod	Seed index	See yield (g plant <sup>-1</sup> )	Seed yield (g m <sup>-2</sup> )
T <sub>0</sub>	Control	13.00	10.10	12.20	16.20	244
T <sub>1</sub>	Maleic hydrazide (250ppm)	13.20	10.80	12.20	17.40	292
T <sub>2</sub>	Maleic hydrazide (500ppm)	13.00	12.10	12.10	19.40	334
T <sub>3</sub>	CCC (500ppm)	13.50	12.50	13.10	22.20	308
T <sub>4</sub>	CCC (1000ppm)	13.20	11.60	13.20	20.50	364
T <sub>5</sub>	Lichocin (500ppm)	14.50	13.30	12.40	24.20	262
T <sub>6</sub>	Lichocin (1000ppm)	14.90	14.40	14.10	30.60	460
Mean		<b>13.6</b>	<b>12.1</b>	<b>12.8</b>	<b>21.5</b>	<b>323</b>
S.Em.±		<b>0.50</b>	<b>0.24</b>	<b>0.13</b>	<b>0.74</b>	<b>11.0</b>
C. D. (5%)		<b>1.10</b>	<b>0.53</b>	<b>0.27</b>	<b>1.60</b>	<b>24.0</b>

There is increase in protein content in all the treatments as compared to control, no significant differences among the treatments were noticed, similarly Nagurjana *et al.*, (1999) observed that, MH had no effect on seed protein content in ground nut whereas,

MH significantly increased the seed oil content. Hunje *et al.*, (1991) has also reported that the growth regulators *viz.*, TIBA, CCC and MH did not show significant difference in seed protein content. Growth retardants are caused to inhibition of cell division and

initiated the development of chloroplast, as a result plants treated with growth retardants has much dark green leaves than those untreated plants, it was observed in the present study that there was an increase total chlorophyll due to application of growth retardants.

It is concluded that the application of plant growth retardants decreases the growth by alter the plant architecture appears to be an excellent tool. The effects of growth retardants vary with the plant species, variety, concentration used, frequency of application and various other factors which influence the uptake and translocation of the chemical. Moreover, growth retardants play a significant role in modifying morphology, physiology and reproductive phase of cowpea. It was observed in the present investigation that the application of growth retardants significantly increased the number of pods, number seed per pod, seed index, which are the important yield determining components in cowpea, among various treatments imposed. The per cent increase in the yield was more with lichocin 1000 ppm followed by lichocin 500 ppm and CCC 1000 ppm as compared to control. To achieve optimum vegetative growth and to effect better translocation of photosynthates in developing pods, the use of growth retardants which regulate plant growth and finally alter the plant architecture and yield improvement appears to be an excellent tool.

## References

- Albacete, A. A., Martínez-Andújar, C., Pascual, J. A., Acosta, M. and Pérez-Alfocea, F., 2008, Increasing vegetative growth, yield and seed quantity in tomato by inducing plant vigour at the earliest seedling stage. *Acta Horticulturae*, 30(7): 265-271.
- Anonymous, 2015, Ministry of Agriculture, Government of India.
- Arnon, D. I., 1949, copper enzymes in isolated chloroplasts, polyphenoxidase in beta vulgaris. *Plant physiology*, 24: 1-15.
- Carvalho, M. E. A., De Camargo Castro, P. R., De Castro Ferraz, M. V. and Mendes, A. C. C. M., 2016, are plant growth retardants a strategy to decrease lodging and increase yield of sunflower. *Comunicata Scientiae*, 7(1): 154-159.
- Hunje, R. V., Vyakaranahal, B. S., Kulkarni, G. N. and Shashidhara, S. D., 1991, Effect of growth regulators on seed quality of vegetable cowpea. *Curr. Res.*, 20(2): 236-237.
- Kumar, V., Vyakarnahal, B. S., Basavaraj, N. and Birbal, 2010, Effect of growth retardants and methods of application on growth and yield of potato. *Indian Journal of Horticulture*, 67(9): 308-313.
- Lone, N. A., Khan, N. A., Bhat, M. A., Mir, M. R., Razvi, S.M., Baht, K. A. and Rather, G. H., 2010, *International Journal of Current Research*, 6(1):001-007.
- Lowry, O. H., Rosebrough, N. J., Farr, A. L., and Randall, R. J., 1951, Total protein estimation by Lowry's method. *J. Biol. Chem.*, 193: 265.
- Manivannan Khan, A. L., Won, J. G. and Lee, I.J., 2011, Influence of prohexadione-calcium, trinexapac-ethyl and hexaconazole on lodging characteristic and gibberellin biosynthesis of rice (*Oryza sativa* L.). *African Journal of Biotechnology*, 10(61):13097-13106.
- Nagarjun, P., Radder, G. D. and Patil, V. S., 1999, Effect of foliar application of maleic hydrazide on seed quality and seedling vigour in bunch groundnut. *Seed Res.*, 8(1): 121-126.
- Oswalt, J. S., Rieff, J. M., Severino, L. S., Bednarz, C. W. and Ritchie, G. L., 2014, Plant height and seed yield of castor

- (*Ricinus communis* L.) sprayed with growth retardants and harvest aid chemicals. *Industrial Crops and Products*, 6(1): 272-277.
- Rademacher, W., 2000, Growth retardants: Effects on gibberellin biosynthesis and other metabolic pathways. *Annual Review of Plant Biology*, 51(1): 501-531.
- Reddy, B. T., Ninganur, M. B., Chetti and Hiremath, S. M., 2009 *Karnataka J. Agric. Sci.*, 22(2):289-292.
- Sawan Z. M., Hafez, S. A., Basyony, A. E., and Alkassas, A. R., 2009, Grasays y aceites, Julio sep, 58(3):0017-3475.
- Vanangamudi, K., Srimathi, P., Natarajan, N. and Bhaskaran, M., 2003, Current scenario of seed coating polymer. ICAR - Short course on seed hardening and pelleting technologies for rain fed or garden Land Ecosystems: 80-100.

**How to cite this article:**

Madhu Suman V. and Suchit A. John. 2018. Study of Biochemical and Yield Traits with Different Growth Retardants in Cowpea cv. Kashi Kanchana. *Int.J.Curr.Microbiol.App.Sci.* 7(02): 3789-3793. doi: <https://doi.org/10.20546/ijcmas.2018.702.448>