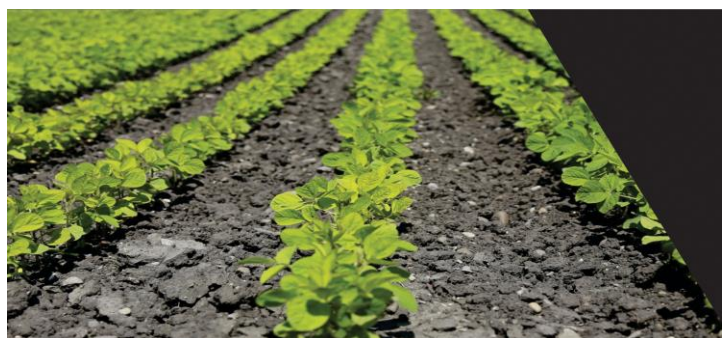




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Effect of fertilizer levels and growth retardants on growth and yield of cowpea (*Vigna unguiculata* L.)

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Abstract

A field experiment was conducted during *Kharif* 2025 at the College of Agriculture, Shivamogga, to study the effect of fertilizer levels and growth retardants on growth and yield of cowpea (*Vigna unguiculata* L.). The experiment was laid out in a Randomized Complete Block Design with eight treatments and were replicated thrice. Treatments comprised of 100% and 75% levels of the recommended dose of fertilizer (RDF: 25:50:25 kg N, P₂O₅, K₂O ha⁻¹) applied alone or combined with foliar spray of growth retardants, namely Cycocel (1000 ppm), Paclobutrazol (100 ppm) and Mepiquat chloride (500 ppm), applied at 30 days after sowing (DAS). Among the treatments, T₃ (100% RDF + Cycocel 1000 ppm) was significantly superior, recording the highest seed yield (1494 kg ha⁻¹) and haulm yield (2942 kg ha⁻¹), due to higher number of branches per plant (12.94), higher number of pods per plant (27.23), pod length (20.58 cm), pod weight (14.17 g plant⁻¹) and total dry matter accumulation (25.52 g plant⁻¹), while the lowest values were recorded in T₂ (75% RDF alone). With respect to growth, Cycocel effectively restricted vegetative growth, with T₃ recording a reduced plant height of 70.91 cm internodal length of 4.42 cm and number of tendrils of 3.93 at 60 days after sowing, compared to T₁ (100% RDF alone).

Keywords: Cowpea, fertilizer levels, growth retardants, cycocel, growth parameters

Introduction

Cowpea (*Vigna unguiculata* L.) is a multipurpose legume crop widely cultivated in tropical and subtropical regions for food, fodder and soil improvement. Globally, cowpea is cultivated over an area of 15.19 million hectares, with a production of 9.77 million tonnes (Anon., 2024a) ^[1]. In India, cowpea is grown on about 0.32 million hectares, producing 0.198 million tonnes, with an average productivity of 350 kg ha⁻¹. India accounts for 2.11 per cent of the global cowpea area and 2.03 per cent of global production (Anon., 2024b) ^[2].

Cowpea growth and productivity depend on balanced nutrient supply. N, P and K play vital roles in vegetative growth, root development, photosynthesis, enzyme activity and stress tolerance, while optimum NPK application improves productivity and soil fertility (Galindo *et al.*, 2022) ^[3]. However, excessive vegetative growth and tendril development can disturb the source-sink balance, reducing flowering and pod setting (Rahianath, 2010) ^[13].

Plant growth retardants such as Cycocel, paclobutrazol and mepiquat chloride regulate excessive growth mainly by inhibiting gibberellin biosynthesis, resulting in compact plants, improved dry matter partitioning and better reproductive development (Rademacher, 2000; Stewart, 2005) ^[12, 16].

Materials and Methods

The field experiment was conducted at College of Agriculture, Navile, Shivamogga, Karnataka, during *Kharif* 2025 in sandy loam soil, to study the “Effect of fertilizer levels and growth retardants on growth and yield of cowpea (*Vigna unguiculata* L.)”. The experiment was laid out in a randomized complete block design (RCBD) with eight treatments replicated thrice. The treatments consist of 100% RDF (25:50:25 kg N, P₂O₅, K₂O ha⁻¹) (T₁), 75% RDF (18.75:37.5:18.75 kg N, P₂O₅, K₂O ha⁻¹) (T₂), 100% RDF + Cycocel (1000 ppm) (T₃), 75% RDF + Cycocel (1000 ppm) (T₄), 100% RDF + Paclobutrazol (100 ppm) (T₅), 75% RDF + Paclobutrazol (100 ppm) (T₆), 100% RDF + Mepiquat chloride (500 ppm) (T₇), 75% RDF + Mepiquat chloride (500 ppm) (T₈).

The crop selected was cowpea variety 'KBC 9', featuring erect growth, purple flowers, grey pubescence and light-yellow seeds, with a maturity period of 80-85 days and resistant to pod borer, diseases like dry root rot. Periodical observations were recorded. The data obtained were subjected to statistical analysis by Fisher's method of analysis of variance as suggested by Panse and Sukhatme (1978) ^[10] as per the standard procedures.

Results and Discussion: Based on the observations presented in Table 1, plant height was significantly influenced by the treatments at 60 DAS. The tallest plants (95.08 cm) were recorded with 100 per cent RDF alone (T₁), followed by 75 per cent RDF alone (T₂, 88.21 cm), while the shortest plants were recorded with 75 per cent RDF + Cycocel @ 1000 ppm (T₄, 67.96 cm) and 100 per cent RDF + Cycocel @ 1000 ppm (T₃, 70.91 cm). This dwarfing effect of Cycocel might be due to restriction of gibberellin biosynthesis, thereby restricting cell elongation and apical growth. Similar findings were reported by Shinde (2010) ^[14] in soybean and Gholampour *et al.* (2012) ^[4] in ornamental brassica, who reported that CCC restricts apical elongation.

The data presented in Table 2 revealed that internodal length and number of tendrils plant⁻¹ were highest under 100 per cent RDF alone (T₁), recording 11.82 cm and 8.22, respectively, at 60 DAS. The lowest internodal length (3.59 cm) and number of tendrils plant⁻¹ (3.54) were recorded with 75 per cent RDF + Cycocel @ 1000 ppm (T₄), which remained statistically on par with T₃ (4.42 cm and 3.93, respectively). The reduction in internodal length with Cycocel might be due to inhibition of gibberellin-mediated internodal elongation, resulting in restricted vegetative growth and a compact plant architecture. The reduced tendrill formation may also be attributed to restricted vegetative elongation under growth retardant application. These findings are in accordance with the general growth-retarding effect of plant growth retardants reported by Khan *et al.* (2007) ^[6].

As per the observations recorded in Table 1, the number of branches plant⁻¹ was significantly influenced by the treatments at 60 DAS. The maximum number of branches plant⁻¹ (12.94) was recorded with 100 per cent RDF + Cycocel @ 1000 ppm (T₃), followed by 100 per cent RDF + Mepiquat chloride @ 500 ppm (T₇, 11.68) and 100 per cent RDF + Paclobutrazol @ 100 ppm (T₅, 10.82), while the lowest value was recorded with 75 per cent RDF alone (T₂, 6.28). Suppression of apical dominance by growth retardants, coupled with diversion of assimilates otherwise used for stem elongation, favours lateral bud development, resulting in increased branching. Similar findings were reported by Shinde (2010) ^[14] and Pateliya *et al.* (2014) ^[11].

The data presented in Table 1 further revealed that total dry matter accumulation was highest under 100 per cent RDF + Cycocel @ 1000 ppm (T₃), recording 25.52 g plant⁻¹ at 60 DAS, while the lowest value was recorded under 75 per cent RDF alone (T₂, 18.21 g plant⁻¹). The higher dry matter accumulation under T₃ might be due to better nutrient availability under full RDF coupled with restricted excessive vegetative elongation by Cycocel, which may have favoured efficient production and accumulation of photosynthates. Similar findings were reported by Gimhavanekar *et al.* (2017) ^[5] in pigeonpea, while the positive influence of adequate nutrient supply on dry matter accumulation was reported by Nkaa *et al.* (2014) ^[9] in cowpea.

Based on the observations presented in Table 3, the yield attributes, viz., number of pods plant⁻¹, pod length and pod weight, were significantly higher under 100 per cent RDF + Cycocel @ 1000 ppm (T₃), recording 27.23, 20.58 cm and 14.17 g plant⁻¹, respectively, followed by T₇, while the lowest values were recorded with 75 per cent RDF alone (T₂). Restriction of excessive vegetative elongation by Cycocel might have favoured greater partitioning of assimilates towards floral initiation, pod development and seed filling, while adequate nutrient availability under full RDF ensured sufficient substrate for reproductive growth. The higher branching and dry matter accumulation under T₃ might have further contributed to improved source strength and pod development. These findings agree with Krishna *et al.* (2013) ^[7] in blackgram. Mavdiya *et al.* (2023) ^[8], working directly on cowpea, also reported better yield attributes with Cycocel application.

The data presented in Table 3 further showed that seed yield and haulm yield followed the same trend, with the maximum seed yield (1494.69 kg ha⁻¹) and haulm yield (2942.47 kg ha⁻¹) recorded under T₃, significantly superior to the rest of the treatments, while the lowest values (967.95 and 1782.58 kg ha⁻¹, respectively) were recorded under T₂. The higher seed yield under T₃ might be attributed to the cumulative effect of improved branching, higher dry matter accumulation and superior yield attributes, resulting in efficient partitioning of photosynthates towards reproductive growth. The higher haulm yield may be due to greater dry matter production under optimum nutrient availability. The poor performance of T₂ may be attributed to reduced nutrient availability, which restricted vegetative growth and assimilate production, ultimately resulting in lower yield. Similar findings were reported by Singh *et al.* (2011) ^[15] in cowpea.

Table 1: Plant height (cm), number of branches plant⁻¹ and total dry matter (g plant⁻¹) of cowpea as influenced by fertilizer levels and growth retardants at 60 DAS

Treatments	Plant height (cm)	Number of branches plant ⁻¹	Total dry matter (g plant ⁻¹)
	60 DAS	60 DAS	60 DAS
T ₁ - 100% RDF (25:50:25 kg N, P ₂ O ₅ , K ₂ O ha ⁻¹)	95.08	9.96	22.33
T ₂ - 75% RDF (18.75:37.5:18.75 kg N, P ₂ O ₅ , K ₂ O ha ⁻¹)	88.21	6.28	18.21
T ₃ - 100% RDF + Cycocel (1000 ppm)	70.91	12.94	25.52
T ₄ - 75% RDF + Cycocel (1000 ppm)	67.96	9.10	21.50
T ₅ - 100% RDF + Paclobutrazol (100 ppm)	84.71	10.82	23.16
T ₆ - 75% RDF + Paclobutrazol (100 ppm)	78.71	6.98	19.04
T ₇ - 100% RDF + Mepiquat chloride (500 ppm)	83.61	11.68	24.09
T ₈ - 75% RDF + Mepiquat chloride (500 ppm)	75.51	7.84	19.87

Note: RDF (Recommended dose of fertilizer) 25:50:25 kg N: P₂O₅: K₂O ha⁻¹. Foliar spray of growth retardants was taken at 30 DAS (Days after sowing), Volume of water required for foliar spray is 500 lit ha⁻¹. FYM 7.5 t ha⁻¹ is applied for all the treatment

Table 2: Internodal length (cm) and number of tendrils plant⁻¹ of cowpea as influenced by fertilizer levels and growth retardants at 60 DAS

Treatments	Internodal length (cm)	Number of tendrils plant ⁻¹
	60 DAS	60 DAS
T ₁ - 100% RDF (25:50:25 kg N, P ₂ O ₅ , K ₂ O ha ⁻¹)	11.82	8.22
T ₂ - 75% RDF (18.75:37.5:18.75 kg N, P ₂ O ₅ , K ₂ O ha ⁻¹)	10.51	7.51
T ₃ - 100% RDF + Cycocel (1000 ppm)	4.42	3.93
T ₄ - 75% RDF + Cycocel (1000 ppm)	3.59	3.54
T ₅ - 100% RDF + Paclobutrazol (100 ppm)	9.40	7.17
T ₆ - 75% RDF + Paclobutrazol (100 ppm)	7.51	6.14
T ₇ - 100% RDF + Mepiquat chloride (500 ppm)	8.91	6.85
T ₈ - 75% RDF + Mepiquat chloride (500 ppm)	6.42	5.73
S.E.m. ±	0.39	0.17
C.D. @ 5%	1.20	0.52

Note: RDF (Recommended dose of fertilizer) 25:50:25 kg N: P₂O₅: K₂O ha⁻¹. Foliar spray of growth retardants was taken at 30 DAS (Days after sowing), Volume of water required for foliar spray is 500 lit ha⁻¹. FYM 7.5 t ha⁻¹ is applied for all the treatments

Table 3: Number of pods plant⁻¹, pod length (cm), pod weight (g plant⁻¹), seed yield (kg ha⁻¹) and haulm yield (kg ha⁻¹) of cowpea as influenced by fertilizer levels and growth retardants

Treatments	No. of pods plant ⁻¹	Pod length (cm)	Pod weight (g plant ⁻¹)	Seed yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)
	At harvest	At harvest	At harvest	At harvest	At harvest
T ₁ - 100% RDF (25:50:25 kg N, P ₂ O ₅ , K ₂ O ha ⁻¹)	20.75	16.59	10.91	1262.75	2422.38
T ₂ - 75% RDF (18.75:37.5:18.75 kg N, P ₂ O ₅ , K ₂ O ha ⁻¹)	16.00	13.28	7.55	967.95	1782.58
T ₃ - 100% RDF + Cycocel (1000 ppm)	27.23	20.58	14.17	1494.69	2942.47
T ₄ - 75% RDF + Cycocel (1000 ppm)	19.83	16.26	10.12	1190.55	2302.42
T ₅ - 100% RDF + Paclobutrazol (100 ppm)	22.89	17.18	11.70	1334.95	2542.39
T ₆ - 75% RDF + Paclobutrazol (100 ppm)	17.00	14.03	8.34	1040.15	1902.63
T ₇ - 100% RDF + Mepiquat chloride (500 ppm)	24.32	18.01	12.49	1407.15	2662.71
T ₈ - 75% RDF + Mepiquat chloride (500 ppm)	18.75	14.76	9.13	1112.35	2022.89
S.E.m. ±	0.71	0.37	0.38	24.66	68.75
C.D. @ 5%	2.16	1.15	1.17	74.80	208.55

Note: RDF (Recommended dose of fertilizer) 25:50:25 kg N: P₂O₅: K₂O ha⁻¹. Foliar spray of growth retardants was taken at 30 DAS (Days after sowing), Volume of water required for foliar spray is 500 lit ha⁻¹. FYM 7.5 t ha⁻¹ is applied for all the treatments

Conclusion: The study revealed that, application of 100 per cent recommended dose of fertilizer (25:50:25 kg N:P₂O₅:K₂O ha⁻¹) along with foliar spray of Cycocel @ 1000 ppm restricted excessive vegetative growth and improved growth and yield attributes, resulting in 18.37 per cent increase in seed yield compared to 100 per cent RDF alone.

References

- Anonymous. FAOSTAT, Food and Agriculture Organization of the United Nations, Statistics Division. 2024a.
- Anonymous. Indiastat, Area, production and productivity of cowpea in India. 2024b.
- Galindo FS, Pagliari PH, da Silva EC, Silva VM, Fernandes GC, Rodrigues WL, *et al.* Co-inoculation with *Azospirillum brasilense* and *Bradyrhizobium* sp. enhances nitrogen uptake and yield in field-grown cowpea and did not change N-fertilizer recovery. *Plants*. 2022;11(14):1847.
- Gholampour A, Hashemabadi D, Sedaghatpour S, Kaviani B. Controlling ornamental cabbage and kale (*Brassica oleracea*) growth via cycocel. *Journal of Ornamental Horticultural Plants*. 2012;2(2):103-112.
- Gimhanavekar VJ, Mane AV, Burondkar MM, Kasture MC, Desai SS. Influence of paclobutrazol on dry matter production and yield attributes of pigeonpea (*Cajanus cajan* L. Millsp.) under Konkan condition. *International Journal of Chemical Studies*. 2017;5(5):1201-1205.
- Khan NA, Singh S, Rahat N, Lone PM. The source-sink in mustard. *Asian Australasian Journal of Plant Science and Biotechnology*. 2007;1(1):10-18.
- Krishna KS, Vincent S, Mallika V, Vijayaraghavan H. Physiological effects of nitrogen and growth regulators on crop growth attributes and yield of black gram (*Vigna mungo* L.). *Bulletin of Environment, Pharmacology and Life Sciences*. 2013;2(4):70-76.
- Mavdiya V, Malam K, Patel P, Kargathiya F. Response of gibberellic acid and cycocel on both yield and quality of cowpea [*Vigna unguiculata* (L.) Walp.] cv. AVCP-1. *International Journal of Statistics and Applied Mathematics*. 2023;8(6):1120-1125.
- Nkaa FA, Nwokeocha OW, Ihuoma O. Effect of phosphorus fertilizer on growth and yield of cowpea (*Vigna unguiculata*). *IOSR Journal of Pharmacy and Biological Sciences*. 2014;9(5):74-82.
- Panse VS, Sukhatme PV. *Statistical Methods for Agricultural Workers*. New Delhi: ICAR; 1978.
- Pateliya CK, Parmar BR, Kacha HL, Patel SK. Effectiveness of various growth retardants on growth and yield of okra. *Journal of Agriculture and Crop Science*. 2014;1(2):32-35.
- Rademacher W. Growth retardants: effects on gibberellin biosynthesis and other metabolic pathways. *Annual Review of Plant Physiology and Plant Molecular Biology*. 2000;51:501-531.
- Rahianath EK. Agronomic management of tendril formation in cowpea (*Vigna unguiculata* (L.) Walp.) [Ph.D. thesis]. Bangalore: University of Agricultural Sciences, GKVK; 2010.
- Shinde RV. Influence of plant growth regulators on growth physiology, yield and quality of soybean [*Glycine max* (L.) Merrill] [M.Sc. (Agri.) thesis]. Dharwad, Karnataka, India: University of Agricultural Sciences; 2010.
- Singh A, Baoule AL, Ahmed HG, Dikko AU, Aliyu U, Sokoto MB, *et al.* Influence of phosphorus on the performance of cowpea (*Vigna unguiculata* L. Walp.) varieties in the Sudan savanna of Nigeria. *Agricultural Sciences*. 2011;2(3):313-317.
- Stewart S. Suggested guidelines for plant growth regulator use on Louisiana cotton. Louisiana Cooperative Extension Service, Publication No. 2918. 2005.