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Effect of mepiquat chloride on growth of chilli (*Capsicum annum* L.) cv. Arka Meghana

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Abstract

The present study was carried out at Department of Horticulture, GKVK, Bengaluru during 2020-21 to study the influence of mepiquat chloride on growth of chilli (*Capsicum annum* L.) cv. Arka Meghana. This experiment was laid out in Randomised Complete Block Design (RCBD) comprising of ten treatments viz, 50, 75 and 100 g a.i. ha⁻¹ 30 DAT (T₁, T₂ and T₃ respectively), 50, 75 and 100 g a.i. ha⁻¹ 45 DAT (T₄, T₅ and T₆ respectively), 50, 75 and 100 g a.i. ha⁻¹ 30 and 45 DAT (T₇, T₈ and T₉ respectively) and control the treatment were replicated thrice. The results revealed that treatment 100 g a.i. ha⁻¹ MC sprayed at 30 DAT and 45 DAT has recorded significantly least plant height (63.02 cm), internodal length (6.32 cm), and maximum number of branches per plant (12.63), number of leaves (199.92), leaf area (2267.31 cm²), chlorophyll content (31.53). This treatment was on par with the 100 g a.i. ha⁻¹ MC sprayed at 30 DAT with respect to plant height (63.21 cm), internodal length (6.34 cm), number of branches (12.57), number of leaves (199.33), leaf area (2244.98 cm²), chlorophyll content (30.30).

Keywords: Chilli, Arka Meghana, mepiquat chloride and plant height

Introduction

Chilli (*Capsicum annum* L.) belongs to Solanaceae family native to South America. It is 3rd most important among solanaceous vegetables only next to potato and tomato in the world (Naz, 2006) [12]. Chilli is used as a spice and as a vegetable, where both red and green fruits are used for culinary, salad and processing purposes.

Chilli is known for its extreme hotness or pungency due to presence of capsaicin (8-methyl-N-vanillyl-6-enamide) and dihydrocapsaicin, the predominant forms of capsaicinoids (Hoffman *et al.*, 1983) [6]. The capsaicinoids have pharmaceutical properties viz., antioxidant, anti-arthritis, analgesic, anti-obese, antimicrobial and anticancerous (Prasad *et al.*, 2005) [14]. Chilli extract is used in the pharmaceutical industry for coloring drugs. It is an abundant source of vitamin A and C. Every 100 g of dried pod yields about 160 calories of energy through 36 g carbohydrates, 18 g proteins, 16 g fat, 480 mg calcium, 3.1 mg phosphorus, 31 mg iron, 2.5 mg niacin, 640 I.U. vitamin 'A' and 40 mg of vitamin 'C' (Narayana *et al.*, 1999) [11].

India is the leading producer, consumer and exporter of chilli in the world with an area of 7.33 lakh ha accounting for 42.81 per cent of the world area. India leads in chilli production with 17.64 lakh tonnes followed by China (3.21 lakh tonnes), Ethiopia (2.94 lakh tonnes), Thailand (2.47 lakh tonnes) and Pakistan (1.48 lakh tonnes) in 2018-19 (Anon., 2019) [1]. In 2018-19, around 4-5 lakh tonnes of chilli were exported from India to other countries like China, Sri Lanka, Bangladesh, UAE, Malaysia, Vietnam and Thailand. India's major chilli producing states are Andhra Pradesh (6.30 lakh tonnes), Telangana (3.04 lakh tonnes), Madhya Pradesh (2.18 lakh tonnes), Karnataka (1.95 lakh tonnes) and West Bengal (1.06 lakh tonnes), accounts for 35, 17, 12, 11 and 6 per cent of India's production respectively (Anon., 2019) [1].

Mepiquat chloride is an anti-gibberellin compound that controls vegetative growth and accelerates the development of reproductive parts by reducing the length of the vine and the spread of the plant, thus reducing the distance between the source and the sink in order to improve the translocation of photosynthates for fruit development (Rademacher, 2000) [15].

Materials and Method

The field experiment was conducted during the *rabi* season 2020-21 at the Department of Horticulture, College of Agriculture, UAS, GKVK Bengaluru. The area is at 12° 58' North latitude and 77° 35' East longitude, at an altitude of 830 m above Mean Sea Level (MSL). The experimental site nutrient status were 325.46 kg ha⁻¹, 142.3 kg ha⁻¹ and 34.4 kg ha⁻¹ nitrogen, phosphorus and phosphorus.

Land preparation/Experimental design

The total experimental area (300 m²) was thoroughly ploughed to a depth of 30 cm and the soil was brought to a fine tilth. Farm Yard Manure (FYM) at a rate of 25 tons per hectare applied 2-3 weeks prior to sowing. The raised beds, 30 cm in height, 23 m in length and 100 cm in width, were prepared leaving a space of 45 cm between two beds as a path for easy cultural operations. Drip irrigation laterals were laid after field preparation while at bed preparation, a basal dose of 75:75:75 kg of nitrogen, phosphorus and potash per hectare was added and mixed well in the soil. After preparation of beds, a bicolored polythene sheet of 30-micron size used as a mulching sheet to control weeds. Arka Meghana seeds were obtained from the Indian Institute of Horticulture Research, Bengaluru (IIHR) and 30 days old seedling were transplanted with the spacing of 60 cm x 60 cm and the experiment design was produced in Randomized Complete Block Design (RCBD) with 10 treatments and 3 replications.

Treatment details of experiment

The experiment consisted of 10 treatments replicated three times. Mepiquat chloride was taken at three concentrations of 50, 75 and 100 g a.i. Ha⁻¹, which was used at the three growing stages of the crop, namely the 30 days after transplanting (T₁, T₂ and T₃), 45 days after translating (T₄, T₅ and T₆) and 30 and 45 days after transplanting (T₇, T₈ and T₉) and the control (T₁₀).

Data collected

The data pertaining to various vegetative growth (30, 45, 60 and 90 Days After Transplanting) parameters from five randomly selected and labelled plants in each replication of the treatment.

Growth parameters

1. Plant height (cm): The height of five randomly selected plants from each plot were measured at 30, 45, 60 and 90 DAT. The plant height was measured from the ground level to the tip of the growing point. The average was worked out and expressed as plant height in cm.

2. Internodal length (cm): Average of distance between 2nd and 3rd node from the base of the plant was taken for measuring the internodal length at three stages viz, 30, 45, 60 and 90 DAT and expressed in cm.

3. Number of leaves per plant: Five randomly selected chilli plants in each plot were used to count the numbers of leaves on each plant at 30, 45, 60 and 90 DAT and average of total number of leaves was calculated in plot and in each replication.

4. Number of branches per plant: Five chilli plants randomly selected from each plot were used to record the number of branches at 30, 45, 60 and 90 DAT. The mean of the data in each plot and replication was recorded.

5. Leaf area (cm²): The leaf area was measured at 30, 45 and 60 days after transplanting by using leaf area meter. Five matured leaves were collected from the selected plants of all the treatments and placed on leaf area meter and observations were recorded, averaged them, multiplied with number of leaves to get average leaf area of the plant.

6. Chlorophyll content (SPAD meter): Leaf chlorophyll content was measured through SPAD meter. All SPAD-values were recorded from plants at 30, 45, 60 and 90 days after sowing from each treatment.

Data Analysis

Data was collected and subjected to analysis of variance and significant means using XLSTAT software, then they were separated using least significant difference (LSD) at 5% level of probability

Results and Discussion

Effect of mepiquat chloride on growth parameters

There was marked variations in the plant height, number of leaves, internodal length, leaf area, number of branches and chlorophyll content at different stages of growth due to different treatments.

1. Effect of mepiquat chloride on plant height

The information on the plant height presented in Table 1 clearly shows that all the treatments significantly reduced the plant height compared to the control. The highest reduction in plant height was observed in T₉ with an application of 100 g a.i. ha⁻¹ mepiquat chloride at 30 and 45 days after transplanting.

Table 1: Influence of mepiquat chloride on plant height (cm) in chilli cv. Arka Meghana

Treatment	30 DAT	45 DAT	60 DAT	90 DAT
T ₁ : MC 50 g a.i ha ⁻¹ at 30 DAT	28.69	44.16	63.48	70.54
T ₂ : MC 75 g a.i ha ⁻¹ at 30 DAT	28.57	41.39	61.82	68.21
T ₃ : MC 100 g a.i ha ⁻¹ at 30 DAT	27.59	39.55	58.96	63.21
T ₄ : MC 50 g a.i ha ⁻¹ at 45 DAT	27.39	47.96	66.19	75.97
T ₅ : MC 75 g a.i ha ⁻¹ at 45 DAT	26.97	46.57	65.88	75.17
T ₆ : MC 100 g a.i ha ⁻¹ at 45 DAT	29.37	46.42	64.91	74.39
T ₇ : MC 50 g a.i ha ⁻¹ at 30 DAT and 45 DAT	29.67	43.98	63.14	69.91
T ₈ : MC 75 g a.i ha ⁻¹ at 30 DAT and 45 DAT	28.20	41.25	61.63	67.88
T ₉ : MC 100 g a.i ha ⁻¹ at 30 DAT and 45 DAT	29.10	38.48	58.87	63.02
T ₁₀ : Control	28.28	52.11	73.07	82.31
F test *Significant @ 5% level	NS	*	*	*
S.Em.±	-	0.866	1.191	1.108
C.D.@5%	-	2.573	3.538	3.292

MC – Mepiquat chloride, a.i. – Active ingredient, DAT – Days after transplanting

2. Effect of mepiquat chloride on internodal length

The analysis of the internodal length data presented in Table 2 clearly shows that all treatments significantly reduced the internodal length compared to the control. The highest

reduction in internodal length was observed in T₉ with the application of 100 g a.i. ha⁻¹ mepiquat chloride at 30 and 45 days after transplanting.

Table 2: Influence of mepiquat chloride on internodal length (cm) in chilli cv. Arka Meghana

Treatment	30 DAT	45 DAT	60 DAT	90 DAT
T ₁ : MC 50 g a.i ha ⁻¹ at 30 DAT	5.06	6.31	6.99	7.37
T ₂ : MC 75 g a.i ha ⁻¹ at 30 DAT	4.74	5.98	6.60	7.04
T ₃ : MC 100 g a.i ha ⁻¹ at 30 DAT	5.09	5.59	6.10	6.34
T ₄ : MC 50 g a.i ha ⁻¹ at 45 DAT	5.10	6.53	7.28	7.87
T ₅ : MC 75 g a.i ha ⁻¹ at 45 DAT	5.24	6.46	7.21	7.71
T ₆ : MC 100 g a.i ha ⁻¹ at 45 DAT	5.09	6.41	7.16	7.68
T ₇ : MC 50 g a.i ha ⁻¹ at 30 DAT and 45 DAT	5.30	6.29	6.87	7.31
T ₈ : MC 75 g a.i ha ⁻¹ at 30 DAT and 45 DAT	4.88	5.95	6.53	6.94
T ₉ : MC 100 g a.i ha ⁻¹ at 30 DAT and 45 DAT	4.99	5.58	6.03	6.32
T ₁₀ : Control	5.16	7.11	7.78	8.30
F test *Significant @ 5% level	NS	*	*	*
SE m+	-	0.172	0.249	0.221
CD@5%	-	0.510	0.739	0.657

3. Effect of mepiquat chloride on number of branches

The number of branches per plant as influenced by mepiquat chloride foliar spray recorded at 30, 45, 60 and 90 days after transplanting (DAT) and presented in Table 3 show a

significant difference in all treatments compared to control and a maximum number of branches was observed by the use of mepiquat chloride 100g a.i.ha⁻¹ at 30 and 45 days after transplanting.

Table 3: Influence of mepiquat chloride on number of branches in chilli cv. Arka Meghana

Treatment	30 DAT	45 DAT	60 DAT	90 DAT
T ₁ : MC 50 g a.i ha ⁻¹ at 30 DAT	4.27	5.84	7.67	10.28
T ₂ : MC 75 g a.i ha ⁻¹ at 30 DAT	4.45	5.91	8.21	10.77
T ₃ : MC 100 g a.i ha ⁻¹ at 30 DAT	4.50	6.58	9.14	12.57
T ₄ : MC 50 g a.i ha ⁻¹ at 45 DAT	4.37	4.89	6.19	9.12
T ₅ : MC 75 g a.i ha ⁻¹ at 45 DAT	4.27	4.96	6.56	9.37
T ₆ : MC 100 g a.i ha ⁻¹ at 45 DAT	4.23	4.91	6.81	9.45
T ₇ : MC 50 g a.i ha ⁻¹ at 30 DAT and 45 DAT	4.10	5.93	7.77	10.35
T ₈ : MC 75 g a.i ha ⁻¹ at 30 DAT and 45 DAT	3.97	6.01	8.39	10.91
T ₉ : MC 100 g a.i ha ⁻¹ at 30 DAT and 45 DAT	4.21	6.65	9.26	12.63
T ₁₀ : Control	4.80	4.97	5.67	8.91
F test *Significant @ 5% level	NS	*	*	**
S.Em.±	-	0.192	0.284	0.170
C.D.@5%	-	0.571	0.843	0.506

4. Effect of mepiquat chloride on number of leaves per plant

The number of leaves per plant as influenced by mepiquat chloride foliar spray recorded at 30, 45, 60 and 90 days after transplanting (DAT) and presented in Table 4 show a

significant difference in all treatments compared to control and a maximum number of leaves was observed by the use of mepiquat chloride 100g a.i. ha⁻¹ at 30 and 45 days after transplanting.

Table 4: Influence of mepiquat chloride on leaf area (cm²) in chilli cv. Arka Meghana

Treatments	30 DAT	45 DAT	60 DAT
T ₁ : MC 50 g a.i ha ⁻¹ at 30 DAT	291.64	1235.79	2009.43
T ₂ : MC 75 g a.i ha ⁻¹ at 30 DAT	299.96	1281.72	2072.58
T ₃ : MC 100 g a.i ha ⁻¹ at 30 DAT	301.47	1320.21	2244.98
T ₄ : MC 50 g a.i ha ⁻¹ at 45 DAT	296.33	1088.65	1842.33
T ₅ : MC 75 g a.i ha ⁻¹ at 45 DAT	286.64	1093.84	1871.56
T ₆ : MC 100 g a.i ha ⁻¹ at 45 DAT	299.49	1114.71	1897.64
T ₇ : MC 50 g a.i ha ⁻¹ at 30 DAT and 45 DAT	295.59	1266.45	2054.87
T ₈ : MC 75 g a.i ha ⁻¹ at 30 DAT and 45 DAT	302.48	1317.12	2097.52
T ₉ : MC 100 g a.i ha ⁻¹ at 30 DAT and 45 DAT	296.26	1348.69	2267.31
T ₁₀ : Control	298.68	982.13	1789.14
F test *Significant @ 5% level	NS	*	*
S.Em.±	-	23.705	59.133
C.D.@5%	-	70.430	175.693

5. Effect of mepiquat chloride on chlorophyll content

The data recorded on the chlorophyll content as influenced by the mepiquat chloride foliar spray recorded 30, 45, 60 and 90 days after transplanting (DAT) and presented in Table 5 show

a significant difference in all treatments compared to control and the maximum chlorophyll content was observed when mepiquat chloride was applied 100g a.i. ha⁻¹ at 30 and 45 days after transplanting compared to control.

Table 5: Influence of Mepiquat chloride on chlorophyll content in chilli cv. Arka Meghana

Treatments	30 DAT	45 DAT	60 DAT
T ₁ : MC 50 g a.i ha ⁻¹ at 30 DAT	25.54	28.09	28.82
T ₂ : MC 75 g a.i ha ⁻¹ at 30 DAT	25.33	28.57	29.09
T ₃ : MC 100 g a.i ha ⁻¹ at 30 DAT	25.84	29.85	30.30
T ₄ : MC 50 g a.i ha ⁻¹ at 45 DAT	24.55	25.81	26.95
T ₅ : MC 75 g a.i ha ⁻¹ at 45 DAT	24.52	26.64	27.23
T ₆ : MC 100 g a.i ha ⁻¹ at 45 DAT	25.21	26.78	27.85
T ₇ : MC 50 g a.i ha ⁻¹ at 30 DAT and 45 DAT	25.93	28.21	28.97
T ₈ : MC 75 g a.i ha ⁻¹ at 30 DAT and 45 DAT	24.61	29.19	30.18
T ₉ : MC 100 g a.i ha ⁻¹ at 30 DAT and 45 DAT	24.06	30.14	31.53
T ₁₀ : Control	24.44	26.32	26.83
F test *Significant @ 5% level	NS	*	*
S.Em.±	-	0.426	0.552
C.D.@5%	-	1.234	1.640

6. Effect of mepiquat chloride on leaf area

The data recorded on the leaf area (cm²) as influenced by the mepiquat chloride foliar spray recorded 30, 45, 60 and 90 days after transplanting (DAT) and presented in Table 6 show

a significant difference in all treatments compared to control and the maximum leaf area was observed when mepiquat chloride was applied 100g a.i. ha⁻¹ at 30 and 45 days after transplanting compared to control.

Table 6: Influence of mepiquat chloride on leaf area (cm²) in chilli cv. Arka Meghana

Treatments	30 DAT	45 DAT	60 DAT
T ₁ : MC 50 g a.i ha ⁻¹ at 30 DAT	291.64	1235.79	2009.43
T ₂ : MC 75 g a.i ha ⁻¹ at 30 DAT	299.96	1281.72	2072.58
T ₃ : MC 100 g a.i ha ⁻¹ at 30 DAT	301.47	1320.21	2244.98
T ₄ : MC 50 g a.i ha ⁻¹ at 45 DAT	296.33	1088.65	1842.33
T ₅ : MC 75 g a.i ha ⁻¹ at 45 DAT	286.64	1093.84	1871.56
T ₆ : MC 100 g a.i ha ⁻¹ at 45 DAT	299.49	1114.71	1897.64
T ₇ : MC 50 g a.i ha ⁻¹ at 30 DAT and 45 DAT	295.59	1266.45	2054.87
T ₈ : MC 75 g a.i ha ⁻¹ at 30 DAT and 45 DAT	302.48	1317.12	2097.52
T ₉ : MC 100 g a.i ha ⁻¹ at 30 DAT and 45 DAT	296.26	1348.69	2267.31
T ₁₀ : Control	298.68	982.13	1789.14
F test *Significant @ 5% level	NS	*	*
S.Em.±	-	23.705	59.133
C.D.@5%	-	70.430	175.693

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