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

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Abstract
The present investigation was carried out at Department of Horticulture, UAS, GKVK, Bengaluru during 2020-21 to study the influence of mepiquat chloride on yield and quality of chilli (*Capsicum annuum* 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 MC (T_1, T_2 and T_3, respectively), 50, 75 and 100 g a.i. ha^{-1} 45 MC DAT (T_4, T_5 and T_6, respectively), 50, 75 and 100 g a.i. ha^{-1} MC 30 and 45 DAT (T_7, T_8 and T_9, respectively) and control the treatment were replicated thrice. The results revealed that MC treatment at 100 g a.i. ha^{-1} sprayed at 30 DAT and 45 DAT has recorded significantly higher fruit length (10.35 cm), average fruit weight (6.55 g), number of fruits per plant (154.71), yield per plant (1013.34 g), fresh yield per hectare (27.84 tons), total soluble solids (6.16B^o) and ascorbic acid content (137.84mg/100g). This treatment was on par with the 100 g a.i. ha^{-1} MC sprayed at 30 DAT with respect to fruit length (10.15 cm), average fruit weight (6.54 g), number of fruits per plant (154.16), yield per plant (1008.87 g), fresh yield per hectare (25.72 tons), total soluble solids (6.08B^o) and ascorbic acid content (134.95 mg/100 g).

Keywords: Chilli, Arka Meghana, mepiquat chloride (MC) and active ingredient (A.I)

Introduction
Chilli (*Capsicum annuum* L.) belongs to Solanaceae family and is native to South America. It is 3rd most important among solanaceous vegetables only next to potato and tomato in the world (Naz, 2006) [10]. 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-arthritic, analgesic, anti-obese, antimicrobial and anticancerous (Prasad *et al.*, 2005) [11]. Chilli extract is used in the pharmaceutical industry for colouring 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) [9].
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% 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) (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), accounting for 35, 17, 12, 11 and 6% 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) [13].

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 12º 58' North latitude and 77º 35' East longitude, at an altitude of 830 m above Mean Sea Level (MSL). The pH of the soil was 6.87, site nutrient status were 325.46 kg ha^{-1}, 142.3 kg ha^{-1} and 34.4 kg ha^{-1} nitrogen, phosphorus and phosphorus. The total experimental area (300 m^2) experiment design was produced in Randomized Complete Block Design (RCBD) with 3 replications, there were 10 treatments *viz.* 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 (T_1, T_2 and T_3), 45 days after translating (T_4, T_5 and T_6) and 30 and 45 days after transplanting (T_7, T_8 and T_9) and the control (T_{10}).

The data recorded for various yield and quality parameters in each replication of the treatment 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 yield parameters

Fruit length (cm): Influence of mepiquat chloride on fruit length is presented in Table 1, observed significant difference among different treatments. Significantly highest fruit length was recorded in T_9 (10.35 cm) followed by T_3 (10.15 cm) and T_8 (10.06 cm) while significantly minimum fruit length was recorded in control (9.46 cm).

The fruit length differed significantly due to different treatments. It increased with the application of growth retardants. This may be attributed to greater accumulation of carbohydrates owing to greater photosynthesis which increased the fruit length and fruit width. Similar results were obtained by Laddha *et al.* (2018) [8] in brinjal and Sivappa (2003) [14] in okra when applied with mepiquat chloride, increased the fruit length and fruit diameter.

Average fruit weight (g)

The observations on average weight (five fruits) of fruit by application of mepiquat chloride and their interaction on average weight of fruits is presented in Table 1. The average fruit weight varied significantly between the treatment. Among them, significantly the highest average fruit weight was recorded in T_9 (6.55 g) followed by T_3 (6.54 g) and T_8 (6.28 g) while it was significantly low in T_{10} (5.45 g).

The application of plant growth retardant increases the fruit weight, this might be due to improved physiological activity like photosynthesis and translocation of food material that supports better fruit development. A similar result was recorded by Hidayatullah *et al.* (2009) [5] in cucumber.

Number of fruits per plant

Influence of mepiquat chloride on number of fruits is presented in Table 1, observed significant difference among different treatments. Significantly highest number of fruits per plant were observed in T_9 (154.71) followed by T_3 (154.16) and T_8 (148.98) and significantly lowest number of fruits per plant noticed in control (134.83).

The number of fruits per plant differed significantly due to different treatments. It increased with the application of growth retardants. This might be due to an inhibition of vegetative growth and thus making availability of food reserves for developing fruits which was evident from significantly increased number of fruits per plant and higher concentration treated plants had higher number of internodes *i.e.,* short internodal length, which resulted to produce more number of fruits. Similar results were obtained by Laddha *et al.* (2018) [8] in brinjal and Sridhar *et al*. (2009) [15] in chilli.

Yield per plant (g)

The influence of different concentration of mepiquat chloride on fruit yield per plant is presented in Table 1, indicates there was a significant difference during entire harvest.

Significantly highest yield per plant was observed in T_9 (1013.34 g) followed by T_3 (1008.87 g) and T_8 (935.59 g) and significantly lowest yield per plant noticed in control (734.82 g).

Fresh fruit yield (t ha^{-1})

The influence of different concentration of mepiquat chloride on fruit yield per ha presented in Table 1.

The significantly highest fresh fruit yield per hectare was recorded in T_9 (27.84 tons) followed by T_3 (27.78 tons) and T_8 (25.72 tons), significantly lowest fruit yield per hectare was recorded in control (20.21 tons).

The yield per plant, yield per plot and yield per hectare differed significantly due to different treatments. It increased with the application of growth retardants. It might be due to higher concentration treated plants had higher number of internodes *i.e.,* short internodal length, which resulted to produce more number of fruits, yield per plant, yield per plot and yield per hectare. The yield increases may be attributed to the promoting effect of mepiquat chloride on numerous physiological processes, leading to improvement of all yield components (Elkoca and Kantar, 2006) [3]. The results are conformity with the findings of (Prasad and Shrihari, 2008) [12] in okra.

Table 1: Influence of mepiquat chloride on average fruit weight, fruit length, number of fruits per plant, yield per plant and per hectare cv. Arka Meghana

Treatment	Average fruit weight (g)	Fruit length (cm)	Number of fruits per plant	Yield per plant (g)	Fresh Yield (t ha^{-1})
T_1	6.09	9.77	146.15	890.05	24.47
T_2	6.22	9.94	148.02	920.68	25.31
T_3	6.54	10.15	154.16	1008.87	27.78
T_4	5.76	9.55	136.63	768.98	21.14
T_5	5.84	9.76	137.31	801.89	22.05
T_6	5.93	9.81	141.04	836.36	22.99
T_7	6.14	9.85	147.32	904.54	24.87
T_8	6.28	10.06	148.98	935.59	25.72
T_9	6.55	10.35	154.71	1013.34	27.84
T_{10}	5.45	9.46	134.83	734.82	20.21
F test *Significant @ 5% level	*	*	*	*	*
S.Em.+	0.173	0.168	1.764	7.900	0.337
C.D.@5%	0.514	0.498	5.240	23.473	1.000

Effect of mepiquat chloride on Quality parameters

The data pertaining to the quality parameters such as total soluble solids and ascorbic acid is presented in Table 2.

Total Soluble Solids (°B)

There were marked variations in TSS due to different treatments. The data on total soluble solids (°B) presented in Table 2 and there was significant difference in TSS among different treatments. Among all the treatments, significantly higher total soluble solids was observed in T_9 (6.16 °B) followed by T_3 (6.08 °B), T_8 (5.93 °B) and T_2 (5.76 °B), while it was significantly least in control (4.42 °B). Increase in TSS of fruit by application of growth retardant is due accumulation of photosynthates and carbohydrates in fruit (increased chlorophyll content). This study was in agreement with the study conducted by Ganie and Solanki (2010) [4] in onion.

Ascorbic acid content (mg/100g)

There were marked variations in Ascorbic acid content due to different treatments. The data on Ascorbic acid content (mg/100 g) was presented in Table 2 indicates that there was significant difference among treatments. Among them, significantly higher ascorbic acid content (137.84 mg/100 g) observed in T_9 followed by T_3 (134.95 mg/100 g), T_8 (129.82 mg/100 g) and T_2 (128.24 mg/100 g), while it was significantly low in control (113.97 mg/100 g).

The ascorbic acid significantly increased with the application of growth retardants. Sridhar *et al*. (2009) [15] found that spray of mepiquat chloride at 1000 ppm increased ascorbic acid content in chilli. Identical results were obtained by Kumar *et al*. (2012) [7] with CCC in tomato and Chutichudet *et al*. (2007) [2] with PBZ on okra.

Table 2: Influence of mepiquat chloride on TSS and Ascorbic acid content in chilli cv. Arka Meghana

Treatment	TSS (°Brix)	Ascorbic acid (mg/100 gm)
T_1	5.24	125.23
T_2	5.76	128.24
T_3	6.08	134.95
T_4	4.18	115.43
T_5	4.61	119.87
T_6	4.74	122.33
T_7	5.41	125.57
T_8	5.93	129.82
T_9	6.16	137.84
T_{10}	4.42	113.97
f-test *Significant @ 5% level	*	*
C.D. @ 5%	0.621	9.132

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