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RESPONSE OF PLANT GROWTH RETARDANT (MEPIQUAT CHLORIDE 5% AS) FOR GROWTH AND YIELD TRAITS IN CHILLI CV. PUSA JWALA

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ABSTRACT

Chilli is a very important crop which has nutrients and biochemical benefits that protect the human body from free radicals and also act as medicinal properties. The present investigation was undertaken to evaluate the “Response of plant growth retardant (Mepiquat Chloride 5% AS) for growth and yield traits in chilli cv. Pusa Jwala” at Vegetable Research Centre of G. B. Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar (Uttarakhand) during *kharif* season of 2021. The research employed a Randomized Block Design for the experiment, which included three replications and seven treatments. The experiment included monitoring growth of plant height on 30, 45 and 60 days after transplanting (DAT), number of branches per plant, leaf area, number of fruits per plant and the yield per plant. Two of the tests in this study relate to previous studies about whether different volumes of plant growth retardant would influence the cultivar’s performance. Among all the treatments, T₆ (Mepiquat Chloride 5% AS @ 1500 ml/ha applied 15 days before the onset of flowering, followed by a second spray at the start of flowering) was found to be the most effective in terms of overall plant growth and yield parameters, resulting in a yield per plant of 505.64 g.

Keywords : Chilli, Plant growth retardant, Mepiquat Chloride, Yield

Introduction

Chilli (*Capsicum annuum* L.) is one of the most important warm season vegetable-cum-spice which is known as miracle spice since it is used worldwide as commercial spice crop. Chilli belongs to family Solanaceae and genus Capsicum. Green pepper fruits are used for culinary purposes, furthermore, ripe dried fruits are also used as spices due to their pungency and great taste (Hassan *et al.*, 2014). Chilli has superfluous nutritional and medicinal value (Hunziker, 2001; Knapp *et al.*, 2004). It is a good source of vitamin C (111mg) used in different food and beverage industries (Bosland and Votava, 2000), energy (29 Kcal), protein (2.9 g), vitamin A (292 IU), riboflavin (0.39mg), thiamine (0.19 mg), iron (1.2 mg), phosphorus (80 mg), calcium (30mg) (Fageria *et al.*, 2016). It is an herbaceous annual plant with glabrous, hairy,

lanceolate leaves, white flowers and green fruits. Chilli is distinguished from other vegetables by a number of characteristics, including shape, size, colour, and flavour. In terms of pigment composition and content, it experiences significant morphological, physiological, and metabolic changes throughout ripening. In Indian subcontinent, chilli is grown all year. Two crops are produced in *kharif* and *rabi* seasons in the country.

Plant growth regulators are a class of plant growth retardants which lower the growth level of plant tissues and tend to follow normal growth patterns without causing any phytotoxic effects. They do this mostly by reducing the rate of cell division and the expansion of cellular volume. A growth retardant as used in horticulture relates or counteracts the manipulatory nature of the gibberellins (GAs) and the auxins, which mainly promote the elongation and development of

shoots. Headspace differences are often overlooked, and therefore recording whenever possible the formulation, volume used, time, means and/or method of application, and whether it was in a liquid or powder form can be useful in comparative studies involving PGRs. There are numerous chemicals available in various commercial formulations, along with different application strategies for PGRs. The objective of this study is to look into the response of plant growth retardant (Mepiquat Chloride 5% AS) on the quantitative characteristics of chilli.

Materials and Methods

The present experiment was conducted to evaluate the "Response of plant growth retardant (Mepiquat Chloride 5% as) in chilli cv. Pusa Jwala" at Vegetable Research Centre of G. B. Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand during *kharif* season of 2021. The experiment was laid out in Randomized Block Design with three replications and seven treatments {(T₁) Mepiquat Chloride 5% AS @ 250 ml/ha at 15 days before initiation of flowering, T₂ (Mepiquat Chloride 5% AS @ 500 ml/ha at 15 days before initiation of flowering), T₃ (Mepiquat Chloride 5% AS @ 750 ml/ha at 15 days before initiation of flowering), T₄ (Mepiquat Chloride 5% AS @ 1000 ml/ha at 15 days before initiation of flowering), T₅ (Mepiquat Chloride 5% AS @ 1250 ml/ha at 15 days before initiation of flowering), T₆ (Mepiquat Chloride 5% AS @ 1500 ml/ha at 15 days before initiation of flowering) and T₇ - control (No application of Mepiquat Chloride 5 % AS)}. During the study, observation on plant height at 30, 45, 60 DAT, number of branches per plant, leaf area, number of fruits/plant and yield per plant were recorded in five tagged plants. The software STPR3, designed and developed by the Department of Mathematics and Statistics, College of Basic Sciences and Humanities, G. B Pant University of Agriculture and Technology Pantnagar and OPSTAT developed by the Department of Mathematics Statistics, CCS HAU, Hisar Haryana was used to analyse the data collected during the experiment.

Results and Discussion

The yield and quality characteristics affected by different concentrations of plant growth inhibitory treatments are presented in Table 1 and depicted in Figures 1 and 2. The seven different treatments used in this research significantly affected the following characteristics under the given headings:

Plant height (at 30, 45 and 60 DAT)

The maximum height at 30, 40 and 60 DAT was recorded in treatment T₇ - control (42.06 cm, 49.06 cm

and 54.51 cm), whereas, minimum plant height was recorded in T₅ - Mepiquat Chloride 5% AS @ 1250 ml/ha at 15 days before initiation of flowering (30.80 cm, 32.42 cm and 34.16 cm, 32.42 cm and 34.16 cm), respectively. A critical analysis of the data indicated a negative relation between the concentration of Mepiquat Chloride and plant growth. So that the plant height at 30, 45 and 60 days after transplanting decreased significantly due to the foliar application of Mepiquat Chloride at different concentration as compared to control. The plant height is reduced due to a delay in transverse cell division, especially in the steeler cambium, which is the meristem activity zone near the internode's base (Grossman, 1990). Decreased in plant height was also demonstrated by Chhonkar *et al.* (1997), Sridhar *et al.* (2009), Sayed *et al.* (2012) and Pal *et al.* (2017).

Number of branches per plant

Number of branches per plant as significantly affected by different treatments of plant growth retardant. The maximum number of branches was recorded in treatment T₆ - 1500 ml/ha at 15 days before initiation of flowering followed by 2nd spray at initiation of flowering (25.40) and T₅ - 1250 ml/ha at 15 days before initiation of flowering (23.10). Whereas, the minimum number of branches per plant was recorded in T₇ - control (13.08). It indicated a significant relation between the concentration of Mepiquat Chloride and number of branches per plant at final picking stage. It is also evident that the trait at final picking stage was positively increased due to the foliar application of Mepiquat Chloride at different concentration as compared to T₆ (control). The increase in branch number could be related to a decrease in auxin activity caused by the application of growth retardant PGR (Mepiquat Chloride), which acts as an antiauxin. This could possibly be because apical dominance is suppressed, causing polar auxin transport to be diverted to the basal nodes, leading to increase in branching. The result in higher branches in plants was also demonstrated by Mahindre *et al.* (2018), Paikra *et al.* (2018), Bhavana *et al.* (2019) and Singh *et al.* (2020).

Leaf area (cm²)

Leaf area significantly affected by different treatments of plant growth retardant Mepiquat Chloride. The highest leaf area was observed in treatment T₇ - control (22.04 cm²) which was and T₁ - 250 ml/ha at 15 days before initiation of flowering (20.16 cm²) which was significantly higher than rest of the treatments. Whereas, the lowest leaf area was recorded in T₆ - 1500 ml/ha at 15 days before initiation

of flowering followed by 2nd spray at initiation of flowering (14.29 cm²). The analysis of the leaf area data observed a negative relation between the concentration of plant growth retardant and leaf area. The trait decreases due to the foliar application at different concentration as compared to control. The Mepiquat Chloride inhibits the cell elongation resulting in reduced leaf expansion without any anatomical changes in leaf thereby increasing the leaf thickness (Lovette and Campbell, 1973). The result in reduction of leaf area was also demonstrated by Raut *et al.* (2019).

Number of fruits per plant

The maximum number of fruits per plant was recorded in treatment T₆ - Mepiquat Chloride 5 % AS @ 1500 ml/ha at 15 days before initiation of flowering (79.77) and T₅ - Mepiquat Chloride 5% AS @ 1250 ml/ha at 15 days before initiation of flowering (76.64) while, the minimum total number of fruits per plant was recorded in T₇ - control (65.52). A positive relation observed between the different concentration of Mepiquat Chloride and number of fruits per plant give better results due to the foliar application of Mepiquat Chloride in all treatments as compared to control. The similar result in increasing of number of fruits per plant was also demonstrated by Kanthaswamy (2006), Laddha *et al.* (2018), Gondar (2019) and Morgeri (2019).

Yield per plant (g)

The highest yield per plant was recorded in treatment T₆ - Mepiquat Chloride 5 % AS @ 1500

ml/ha at 15 days before initiation of flowering (505.64 g) and T₅ - Mepiquat Chloride 5% AS @ 1250 ml/ha at 15 days before initiation of flowering (478.92 g). While, the lowest yield per plant was recorded in T₇ - control (439.34 g). The positive association between trait and growth retardant indicated best results in different concentration of all treatments as compared to control. The significant improvement in yield may be due to reduction in plant height and increasing in number of branches resulting in diversion of food material for improving flowering and fruiting (Kuraisi and Muir, 1963). The result in increase in yield per plant was also demonstrated by Laddha *et al.* (2018) and Gondar (2019).

Conclusion

The growth retardant Mepiquat chloride is an essential growth agent among the plant growth retardants. It is an active component that suppresses gibberellic acid production, accelerates maturity, reduces internode length and is easily absorbed by green plant parts and subsequently redistributed throughout the plant since it is a water-soluble organic molecule. From all performance evaluations, it has been concluded that in the current climatic conditions of the Uttarakhand *Tarai* region, the application of Mepiquat Chloride 5% AS @ 1500 ml/ha, 15 days before the flowering followed with second spray at the onset of flowering stage is best suited for obtaining higher yields. This treatment is therefore useful in the *Tarai* region of Uttarakhand for commercial farming.

Table 1 : Response of plant growth retardant (Mepiquat Chloride 5% AS) on growth and yield traits in Chilli cv. Pusa Jwala.

Treatments	Plant height (cm)			Number of branches per plant	Leaf area (cm ²)	Number of fruits per plant	Yield per plant (g)
	30 DAT	45 DAT	60 DAT				
T ₁	35.90	38.02	40.41	15.82	20.16	67.56	444.84
T ₂	35.01	36.80	39.24	17.60	19.43	69.65	457.20
T ₃	34.02	35.30	37.33	19.14	18.46	71.11	464.08
T ₄	32.08	34.36	36.27	21.65	16.91	74.49	470.03
T ₅	31.30	33.51	35.15	23.10	15.31	76.64	478.92
T ₆	30.80	32.42	34.16	25.40	14.29	79.77	505.64
T ₇	42.06	49.06	54.51	13.08	22.04	65.52	439.34
SEm ±	0.72	0.56	1.21	0.54	0.85	1.32	9.13
C.D. at 5 %	2.24	1.74	3.78	1.60	2.66	4.12	28.45

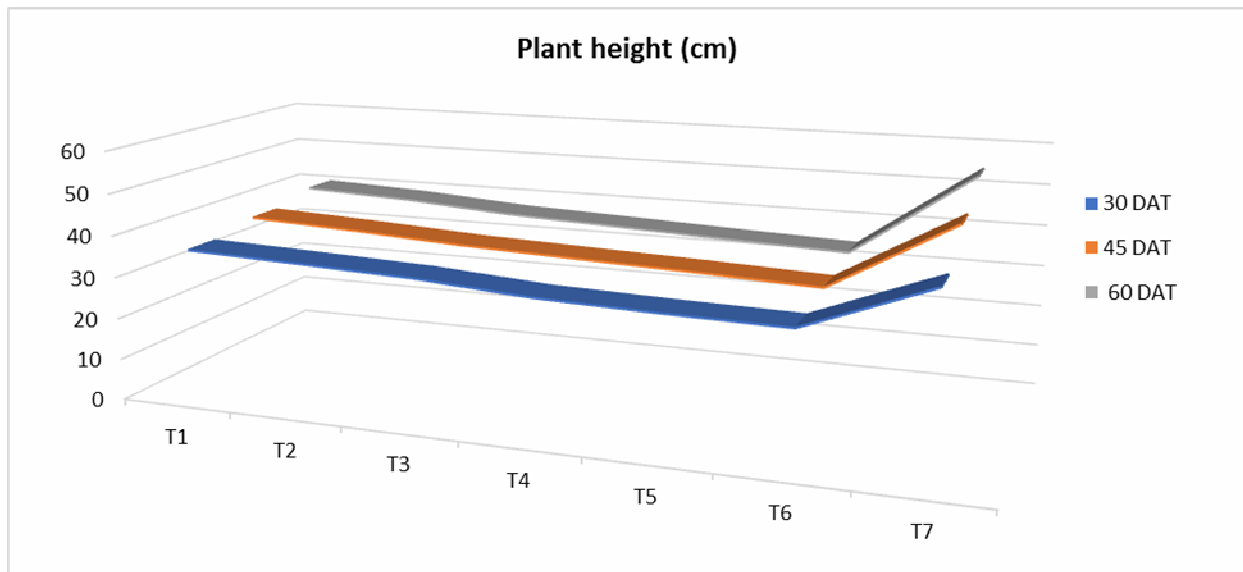


Fig. 1 : Response of plant growth retardant (Mepiquat Chloride 5% AS) on plant height at 30, 45 and 60 DAT in chilli cv. Pusa Jwala.

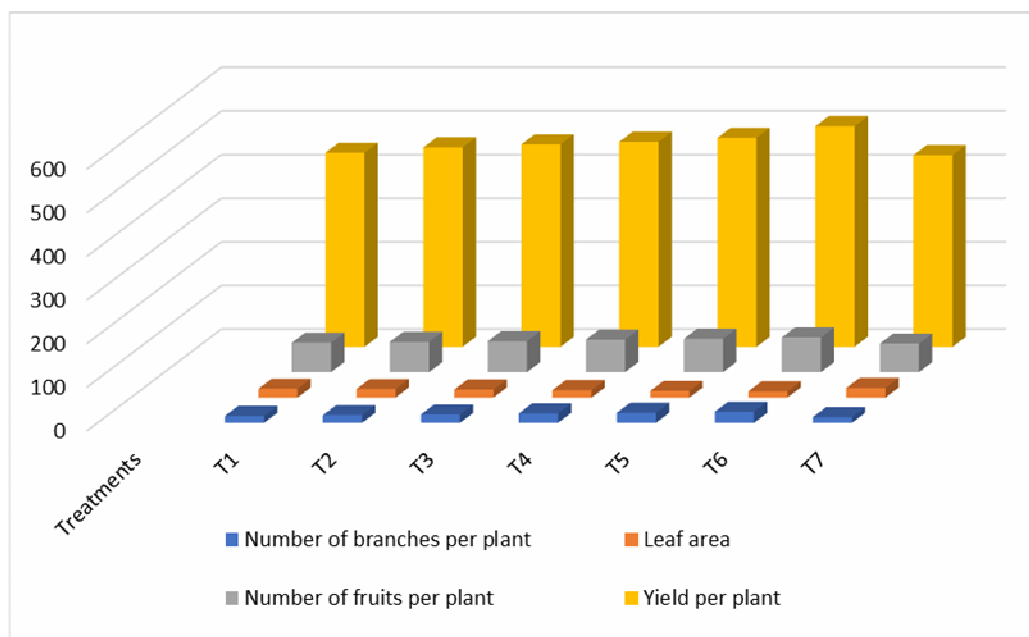


Fig. 2 : Response of plant growth retardant (Mepiquat Chloride 5% AS) on number of branches, leaf area, number of fruit and yield per plant in chilli cv. Pusa Jwala.

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