

Plant Growth Regulators Affects The Growth And Yield Of Chilli (*Capsicum Annum L.*)

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The current work was carried out at agricultural area in Dharmabad, Nanded district, Maharashtra. The experiment was set up in a randomized design with three replications and ten different growth regulator treatments. The results showed that foliar treatment had an effect on plant vigour and yield contributing features in chilli plants when compared to controls. The growth regulators Tricentanol and Gibberellic acid were foliar sprayed at flowering and bud stage and were found to be effective in increasing plant height, plant spread, number of branches, and number of fruits per plant when compared to control in terms of yield contributing characters such as days to 25% flowering, fruit set, fruit length, and fruit diameter.

Keywords: Growth regulators, Flowering, Plant height, Plant spread.

Introduction

Plant growth regulators (PGRs), also known as phytohormones, are organic substances produced spontaneously in higher plants that aren't nutrients and affect growth or other physiological activities at a location far from the source while being active in very small levels. PGRs, also known as biostimulants or bioinhibitors, work inside plant cells to stimulate or inhibit particular enzymes or enzyme systems and to control the metabolism of plants. They often only become active in plants at very low concentrations. Auxins, gibberellins, cytokinins, ethylene, growth inhibitors, and growth retardants are examples of plant growth regulators. The first hormones found in plants were auxins; later, gibberellins and cytokinins were also found.

Chilli (*Capsicum annum L.*) belongs to the solanaceae family and is India's most important commercial spice and vegetable crop. India is the world's leading producer and exporter of chilli. Chilli is a tropical and subtropical crop that demands a warm, humid atmosphere.

Chilli production is determined by the cultivars' innate genetic yield potential, which is impacted substantially by environmental conditions and cultivation practices. The abrupt rise in air temperature causes hormonal imbalance. One of the most significant issues in chilli production is temperature. Poor fruitset is one of the key bottlenecks in chilli production, with severe weather conditions such as temperature and rainfall having a direct impact on productivity. Chilli yield is sometimes boosted by reducing flower drop, and this problem is often managed by selecting breeding lines that preserve a high proportion of blooms or by

using physiological manipulation such as spraying plant growth regulators. Chattopadhyay and Sen (1974), Minraj and Shanmugavelu (1987), Balraj et al., (2002), Joshi and Singh (2001, 2003) and Mutlu and Agan (2015). all report on the different responses of chilli to plant growth regulators (1999). Plant growth regulators are known to strengthen the source-sink interaction, increase photo assimilate translocation, and aid in the retention of flowers and fruits. Plant growth regulators cause plants to develop more quickly. Plant growth regulators are the next generation of agrochemicals after fertilizer's, insecticides, and herbicides. Stem elongation, germination, dormancy, flowering, fruit development, cell division, and root expansion are all aided by plant growth regulators. Fruit and blossom drop, which is produced by physiological and hormonal imbalance in plants in unfavorable situations such as excessively low or high temperatures, reduces chilli production (Murlidharan et al., 2002).

Materials and methods

The current study was carried out in the month of October 2021 on agricultural acreage in in Dharmabad, Nanded district, Maharashtra. using the popular chilli cultivar 'Jwala.' The randomized block design was used to lay out the experimental plot, which included 10 treatments and three replications. A total of 65 plants were planted in each plot at a spacing of 65× 25 cm. At the time of field preparation, a base dose of 60 kg N, 60 kg P₂O₅, and 60 kg K₂O per hectare was sprayed. DAP was sprayed at a rate of 110 kg per acre after seven days of transplanting. Intercultural activities and plant protection measures were carried out according to crop recommendations. Untreated check, Paclobutrazol, Chlormequat chloride, Mepiquat chloride, Triaccontanol(2 treatments), Ethephon(2 treatments), Aminoacid, Gibberillic acid were among the ten treatments used in our research.

Plant Growth regulators and Retardants

Group	Examples
Auxins	IAA, NAA, IBA, 2,4-D, 4-CPA, 2,4,5-T
Gibberellins	GA3 (Gibberellic acid)
Cytokinins	Kinetin, Zeatin , Benzyladenine, BAP
Ethylene	Ethephon (Ethrel)
Abscissic acid	Dormins,Phaseic Acid
Flowering hormones	Florigen, Anthesin, Vernalin
Growth inhibitors (Antiauxins)	Clofibric acid, 2,3,5-TIBA, Mepiquat chloride
Growth inhibitors (AntiGA)	Chlormequat chloride
Ethylene inhibitors	Aviglycine (AVG), 1-methylcyclopropene
Growth retardants	Paclobutrazol, chlormequat, uniconazole
Growth stimulators	Brassinolide

The goal of the study was to find the optimum growth promoter for improving chilli growth characteristics.

Results and discussion

The following are the findings of the study to determine the optimum growth promoter for improving chilli growth character: In Table no.1 shows the influence of several plant growth regulators on plant height, spread, number of branches, and days to 25% flowering.

The height of the plant grows with the age of the seedlings. There is a big increase. The application of Tricontanol 0.05 percent EC@1000ml/ha (71.77cm) in T₅ results in a considerable increase in plant height, followed by Paclobutrazol(25 percent w/v) SC @1000ml/ha (62.47cm) in T₂, and the least we found in T₁ (48.44cm) that is an untreated check. Murlidharan et al.(2002) had previously looked into the experimental findings (1985). Plant spread in the East-West and North-South directions was the second observation we made. The maximum plant spread in the East-West condition was achieved with Gibberellic acid 0.01 percent L@625ml/ha, T₁₀ (48.38cm), followed by T₄, Mepiquatchloride 5 percent aqueous solution@625ml/ha (61.36cm), and the lowest in the untreated check (32.77 cm). In the North-South condition, the highest is achieved by applying Gibberellic acid 0.01 percent L@625ml/ha in T₁₀ (45.27 cm), the next highest is achieved in T₂ by applying Paclobutrazol(25 percent w/v) SC @1000ml/ha (43.33 cm), and the lowest is achieved by leaving T₁ untreated (38.33 cm). The experimental results were based on Desia et al (1993). Gibberellic 0.01 percent L@625ml/ha produced the maximum number of branches in T₁₀. Observing in all replications at regular time intervals yielded 28.88 branches, and the administration of Mepiquat chloride 5 percent aqueous solution @625ml/ha yielded the second (26.66). Untreated check has the smallest number of branches (19.77). We also looked into the days leading up to 25% blossoming. T₉ is the highest we observed, which was achieved by applying aminoacid@1500ml/ha (65.00), followed by T₃ (65.66), which was achieved by applying Chlormequat chloride 50 percent SL@500ml/ha, and untreated check (71.66). The experimental results are consistent with Rego et al (2009).

Table no. 1: Effect of different plant growth regulators on growth attributes of chilli

S. No	Tr. No	Treatment details	Plant height (cm)	Plant spread diameter(cm)	No. of branches	Days to 25 percent flowering
1	T ₁	Untreated Check	48.44	35.55	19.77	71.66
2	T ₂	Paclobutrazol (25% w/v) sc@ 1000ml/ha	62.47	40.135	25.22	68.33
3	T ₃	Chlormequat chloride 50% SL@500ml/ha	53.50	42.69	25.22	65.66
4	T ₄	Mepiquat chloride 5% Aqueous solution@625ml/ha	61.36	42.715	26.66	67.33
5	T ₅	Triaccontanol 0.05% EC@1000ml/ha	71.77	43.475	25.44	67.00
6	T ₆	Triaccontanol 0.05% EC@500ml/ha	54.41	41.69	21.93	66.33
7	T ₇	Ethephon 39 SL(39% W/W)@375ml/ha	51.58	43.185	27.44	66.33
8	T ₈	Ethephon 39 SL(39% W/W)@200ml/ha	57.77	42.41	27.33	66.00
9	T ₉	Amino acid @ 1500ml/ha	50.27	38.775	21.88	65.00
10	T ₁₀	Gibberellic acid 0.01% L @625ml/ha	69.33	46.825	28.88	68.00
		S.E.m±	0.85	2.505	1.52	2.03
		C.D. at 5%	2.53	6.8	4.52	6.03

The effect of plant growth regulators on fruit set %, number of fruits per plant, fruit length, and fruit diameter is indicated in (Table no. 2). T₇, which uses Ethephon 39SL (39 percent w/w) @375ml/ha (85.37 percent), is followed by T₉, which uses aminoacid@1500ml/ha (84.47 percent), and check plot has the lowest fruit set percentage (72.03 percent). The experimental results are consistent with Khurana D.S et al (2004). We observed the highest number of fruits per plant (806.44) after applying Gibberellic acid 0.01 percent L @ 625ml/ha as T₁₀, which is almost identical to the result seen in T₅ after applying Tricontanol 0.05 percent EC @1000ml/ha (789.33), and the least fruit count observed in the untreated check (480.00). In terms of fruit length and diameter, we receive similar results. The application of Mepiquat chloride 5 percent aqueous solution @ 625ml/ha resulted in the highest T₄ (8.18 and 4.09 cms, respectively) and was followed by aminoacid @ 1500ml/ha as T₉. The experimental results are consistent with those of Balraj et al.(2002) and Mutlu and Agan (2015). In this treatment, the fruit length is 8 cm and the fruit diameter is 4.07 cm. Untreated check has the shortest fruit length (6.25cm) and the smallest diameter (3.36cm).

Table no 2: Effect of different growth regulators on yield attributing parameters

S. No	Tr. No	Treatment details	Fruit set (%)	No. of fruits per plant	Fruit length (cm)	Fruit diameter (cm)
1	T ₁	Untreated Check	72.03 (58.21)	480.00	6.25	3.36
2	T ₂	Paclobutrazol(25% w/v) sc@ 1000ml/ha	74.22 (59.59)	484.66	6.72	3.90
3	T ₃	Chlormequat chloride 50% SL@500ml/ha	79.12 (63.18)	551.22	6.84	4.04
4	T ₄	Mepiquat chloride 5% Aqueous solution@625ml/ha	80.69 (63.96)	627.88	8.18	4.09
5	T ₅	Triacantanol 0.05% EC@1000ml/ha	75.14 (60.10)	789.33	7.27	3.98
6	T ₆	Triacantanol 0.05% EC@500ml/ha	75.08 (60.21)	746.44	7.14	3.98
7	T ₇	Ethephon 39 SL(39% W/W)@375ml/ha	85.37 (67.53)	725.22	7.10	3.94
8	T ₈	Ethephon 39 SL(39% W/W)@200ml/ha	77.97 (62.04)	708.55	6.98	3.94
9	T ₉	Amino acid @ 1500ml/ha	84.47 (67.66)	707.22	8.00	4.07
10	T ₁₀	Gibberelic acid 0.01% L @625ml/ha	74.31 (59.60)	806.44	7.23	4.01
		S.E.m±	2.22	15.47	0.06	0.11
		C.D. at 5%	4.66	45.98	0.18	0.32

Conclusion

The optimal treatments for enhanced plant growth and yield were proposed based on the above observations acquired from our investigation. T₄(Mepiquat chloride 5% Aqueous solution@625ml/ha) had the best outcomes among the treatments in terms of fruit length and diameter, therefore it's a good for higher yields. The T₅(Triacantanol 0.05% EC@1000ml/ha) treatment performs best in terms of plant height, which aids in the production of massive branching. T₇(Ethephon 39 SL (39% W/W)@375ml/ha) showed the best results in terms of fruit set, which will be beneficial to farmers in terms of high yields. The T₉(Amino acid @ 1500ml/ha) treatment produces the most flowering, which is another factor that will help farmers achieve the optimum harvests. Finally, the T₁₀(Gibberelic acid 0.01% L @625ml/ha) treatment is demonstrated to be the most effective in terms of plant spread, producing the most branches and fruits per plant. These treatments can be suggested for improved crop development and maximum yields.

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