EFFECT OF PLANT GROWTH REGULATORS ON GROWTH AND YIELD ATTRIBUTES OF CHILLI (*Capsicum annum L.*)

Abstract

The current work took place at an agricultural area in Peddakurapadu, Guntur district, Andhra Pradesh, in October 2021. 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 vigor and yield contributing features in chilli plants when compared to controls. The growth regulators Tricontanol 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

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. In India, Guntur, in the state of Andhra Pradesh, produces 30% of all chilli. Chilli is a tropical and subtropical crop that needs a warm, humid atmosphere. Capsasin, a phenolic acid component, is responsible for chilli's pungency. During the ripening stage, capsanthin is responsible for the brilliant red hue. Chilies are grown in all seasons in one or more parts of the country; thus, the fruits are available throughout the year. Chilli is also used as a folk remedy for toothaches, sore throats, coughs, wound healing, and parasite infections. It's also used as an antioxidant, antimicrobial, and immunological modulator, among other things.

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 fruit set 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. Chattopadhayay and Sen (1974), Minraj and Shanmugavelu (1987), Balraj *et al.,* (2002), and Joshi *et al.,* (2003) 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 (Rylski, 1973; Rylski and Halevy, 1975; and Markhart, 2001).

Materials and methods

The current study was carried out in the month of October 2021 on agricultural acreage in Pedhakurapadu, Guntur district, Andhra Pradesh, using the popular chilli cultivar 'Teja.' 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 P_2O_5, and 60 kg K_2O 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, Triacontanol(2 treatments), Ethephon(2 treatments), Aminoacid, Gibberillic acid were among the ten treatments used in our research. 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 Tricontanol0.05 percent EC@1000ml/ha (71.77cm) in T_5 results in a considerable increase in plant height, followed by Paclobutrazol(25 percent w/v) SC @1000ml/ha (62.47cm) in T_2, and the least we found in T_1 (48.44cm) that is an untreated check. Houtz RL *et al.* year 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, T_{10} (48.38cm), followed by T_4, 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 Giberrellic acid 0.01 percent L@625ml/ha in T_{10} (45.27 cm), the next highest is achieved in T_2 by applying Paclobutrazol(25 percent w/v) SC @1000ml/ha (43.33 cm), and the lowest is achieved by leaving T_1 untreated (38.33 cm). The experimental results were based on Georgia O *et al*earlier's findings (2010). Gibberellic 0.01 percent L@625ml/ha produced the maximum number of branches in T_{10}. 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.$T_9$is the highest we observed, which was achieved by applying aminoacid@1500ml/ha (65.00), followed by T_3 (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 Attoa GE *et al*earlier's findings (2002).

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 (cm)		No. of branches	Days to 25 percent flowering
				East-West	North-South		
1	T_1	**Untreated Check**	48.44	32.77	38.33	19.77	71.66
2	T_2	**Paclobutrazol(25% w/v) sc@ 1000ml/ha**	62.47	36.94	43.33	25.22	68.33
3	T_3	**Chlormequat chloride 50% SL@500ml/ha**	53.50	43.09	42.29	25.22	65.66
4	T_4	**Mepiquat chloride 5% Aqueous solution@625ml/ha**	61.36	44.99	40.44	26.66	67.33
5	T_5	**Triacontanol 0.05% EC@1000ml/ha**	71.77	44.66	42.29	25.44	67.00
6	T_6	**Triacontanol 0.05% EC@500ml/ha**	54.41	42.27	41.11	21.93	66.33
7	T_7	**Ethephon 39 SL(39%W/W)@375ml/ha**	51.58	44.16	42.21	27.44	66.33
8	T_8	**Ethephon 39 SL(39%W/W)@200ml/ha**	57.77	43.16	41.66	27.33	66.00
9	T_9	**Amino acid @ 1500ml/ha**	50.27	38.11	39.44	21.88	65.00
10	T_{10}	**Gibberelic acid 0.01% L @625ml/ha**	69.33	48.38	45.27	28.88	68.00
		S.E.m±	0.85	2.39	2.62	1.52	2.03
		C.D. at 5%	2.53	7.11	N.S.	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).T_7, which uses Ethephon 39SL (39 percent w/w) @375ml/ha (85.37 percent), is followed by T_9, 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 *etal*earlier's findings (2004). We observed the highest number of fruits per plant (806.44) after applying Gibberellic acid 0.01 percent L @ 625ml/ha as T_{10}, which is almost identical to the result seen in T_5 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 T_4 (8.18 and 4.09 cms, respectively) and was followed by aminoacid @ 1500ml/ha as T_9. The experimental results are consistent with those of Balraj *et al.* and Gutam*et al (2009)*. 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	**Triacontanol 0.05% EC@1000ml/ha**	75.14 (60.10)	789.33	7.27	3.98
6	T_6	**Triacontanol 0.05% EC@500ml/ha**	75.08 (60.21)	746.44	7.14	3.98
7	T_7	**Ethephon 39**	85.37	725.22	7.10	3.94

		SL(39%W/W)@375ml/ha	(67.53)			
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. T_4(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 goodfor higher yields. The T_5(Triacontanol 0.05% EC@1000ml/ha) treatment performs best in terms of plant height, which aids in the production of massive branching. T_7(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 T_9(Amino acid @ 1500ml/ha)treatment produces the most flowering, which is another factor that will help farmers achieve the optimum harvests. Finally, the T_{10}(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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