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ROLE OF GROWTH HORMONES IN CHILLIES - A REVIEW

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ABSTRACT

The discovery of plant growth substances has proved revolutionary in increasing the production of horticultural crops. The great potentialities of various plant growth substances for maximizing vegetative growth, yield and quality of chilli have been emphasized. Further, these can also be used for the production of polyploidy and male sterility to overcome interspecific incompatibilities and for economic hybrid seed production. This paper reviews the research work done in India on the use of various plant growth substances in chilli production.

Chilli (*Capsicum annum* L.) is an important solanaceous vegetable crop and is widely grown in India. In hot regions, there is a great problem of premature flower and fruit drop in chilli due to hormonal imbalance and this becomes more problematic when there is sudden rise in atmospheric temperature. The use of plant growth substances in optimum concentration regulates growth, fruitfulness and yield. Moreover, the use of these substances improves the quality traits like capsaicin, ascorbic acid, carbohydrate and protein content.

Therefore, the use of plant growth substances in chillies, has proved as a boon for improving the growth, yield and quality. The research work conducted on these aspects has been reviewed as under.

Vegetative Growth: The application of plant growth substances through foliar application has been found effective in promoting the vegetative growth in chilli and capsicum. Plant height, number of branches per plant, stem diameter and leaf area have been found to be enhanced with NAA 50 ppm (Maurya and Lal, 1975), NAA 125 ppm (Sinha and Pal, 1980), NAA 50 and 100 ppm (Maurya and Lal, 1987), NAA 50 or 100 ppm (Dod *et al.*, 1989), NAA 40 ppm (Katwale and Saraf, 1990 and Singh *et al.*, 1993) in chilli and capsicum. Foliar application of 2, 4-D at 1 ppm have also been resulted in greatest increase in plant height and fresh weight of shoot and root (Singh *et al.*, 1993).

Sharma *et al.* (1994) noticed that a spray of 5 ppm triacontanol at 4 weeks after transplanting has resulted in maximum plant height and number of branches per plant. Application of 1000 ppm cycocel (CCC) at 30 days after planting resulted in the highest number of branches and leaves in pepper (Deka and Shadeque, 1996).

Fruit-set: Poor fruit setting is one of the major bottleneck in the production of chillies as it directly effects the fruit yield. It is frequently caused by adverse weather conditions especially low or high temperature. The use of plant growth substances especially auxins has been reported to enhance fruit-set and consequently yield under both normal and adverse weather conditions.

Double sprays of NAA 10 ppm at flowering and 5 weeks later decreased flower shedding and results in maximum yield in chillies (More *et al.*, 1975; Chandra *et al.*, 1976; Pandita *et al.*, 1985 and Yamgar *et al.*, 1986). Maurya and Lal (1975) obtained maximum fruit-set with 50 ppm NAA in chillies. Doddamani and Panchal (1989) found increased fruit set with 100 ppm NAA and Singh *et al.* (1993) with 40 ppm NAA as foliar spray. Whereas, Singh and Murty (1991) obtained reduced fruit abscission with increasing BA concentrations (from 1 to 50 ppm).

Foliar applications of triacontanol 2

ppm or atonic 0.08% at 30 days after transplanting and again at flowering stage were found effective in reducing flower drop and increasing fruit set (Srinivas *et al.*, 1986 and Usha and Peter, 1988). Rao *et al.* (1990) reported decreased flower bud shed with two sprays of NAA 20 ppm, IAA 10 ppm and 2,4-D 2 ppm at flower initiation and peak flowering in chillies. Whereas, Lyngdon and Sanyal (1992) obtained highest fruit set and retention per plant with 75 ppm NAA, 10 or 20 ppm GA_3 or 50 ppm kinetin and 100 or 150 ppm ethrel. Foliar application of 20 ppm NAA promoted fruit set in chilli (Singh and Lal, 1995), 1000 ppm CCC at 30 days after planting in capsicum (Deka and Shadeque, 1996). Singh and Mukherjee (2000) recorded maximum fruit set and minimum fruit drop in chilli with the spray of 75 ppm NAA.

Fruit Ripening : Little work has been done on the fruit ripening of chillies with the application of plant growth substances. However, the application of ethephon has been reported to enhance ripening in pepper. Garcha (1990) induced the uniform ripening of fruits with pre-harvest foliar spray of ethephon at 500 ppm and with post-harvest dip of the mature green fruits of chillies in ethephon at 2000-2500 ppm for 2 minutes.

Fruit yield: Plant growth substances have been reported to increase the yield of sweet and hot peppers. The increase in yield is might be due to the increased vegetative growth, reduced flower and fruit drop, increase in fruit length and fruit thickness with the application of plant growth substances.

Foliar spray of GA_3 50 ppm at fruit setting (Sinha, 1975) or NAA 10 ppm either single or double spray at flowering and 5 week later increased the fruit yield in chillies (Sharma *et al.*, 1971; More *et al.*, 1975; Chandra *et al.*, 1976; Menon, 1979; Pandita *et al.*, 1980; Patil *et al.*, 1985; Yamgar *et al.*, 1986 and Doddamani and Panchal, 1989). The maximum fruit yield was obtained with NAA at 50 ppm (Maurya and Lal, 1975), 20 ppm (Sinha and Pal, 1980), 40 ppm (Katwale and Saraf, 1990), 50 ppm (Nimje and Shyam, 1991), 75 ppm (Lyngdon and Sanyal, 1992) and 40 ppm (Singh and Lal, 1994) as foliar spray (Single or double spray) in chillies and capsicum. Two foliar spray of triacontanol 2 ppm or atonic 0.08% at 30 days after transplanting and again at flowering stage were also found effective in boosting the fruit yield of chillies (Srinivas *et al.*, 1986 and Usha and Peter, 1988).

Garcha (1990) obtained the increased fruit yield with foliar applications of ethephon (500 ppm) when about 90 per cent of fruits start turning colour it also help in the ripening of fruits. Spray of 250 ppm ethephon at 10 days after transplanting gave highest fruit yield in pepper (Kabir *et al.*, 1991). Singh and Murty (1991) found maximum fruit yield with BA treatments, the effect increases with increasing concentrations of BA from 1 to 50 ppm. Lyngdon and Sanyal (1992) observed highest number of fruits per plant, fruit weight and yield with 75 ppm NAA. They also found increased yield with GA_3 10 or 20 ppm, kinetin 25-50 ppm and ethrel 100 or 150 ppm.

Singh *et al.* (1993) obtained highest fruit yield with 2, 4-D 1 ppm and NAA 40 ppm as foliar spray. A single spray of 5 ppm triacontanol at four weeks after transplanting had recorded the highest fruits per plant and yield (Sharma, 1994). Increased fruit yield was recorded by foliar spray of 2, 4-D 1 ppm and NAA 40-80 ppm (Singh and Lal, 1994). Singh and Lal (1995) obtained highest yield with the spray of 1 ppm 2,4-D followed by 40 ppm NAA. Application of 1000 ppm CCC at 30 days after planting resulted in the highest fruits per plant and fruit yield in pepper (Deka and Shadeque, 1996). Singh and Mukherjee (2000) found maximum fruit weight, yield per ha and per cent dry yield with the foliar application of 75 ppm NAA in chilli.

Fruit Quality : Plant growth substances have also been found to affect fruit quality (Chhonkar and Sen Gupta, 1972). Foliar application of GA_3 50 ppm at fruit setting tended to lower ascorbic acid content (Sinha, 1977) but seed treatment with NAA at 50-70 ppm increased ascorbic acid content in chillies (Mishra and Khatai, 1969). Patil *et al.* (1985) recorded highest capsaicin, ascorbic acid, carbohydrates and protein content in chillies with foliar application of NAA 30 ppm. Seed treatment with GA_3 or IBA improved ascorbic acid content in pepper (Srivastava and Srivastava, 1964 and Rao *et al.*, 1972).

Kabir *et al.* (1991) obtained highest ascorbic acid content in sweet peppers with 250 ppm ethephon, sprayed at ten days after planting. Application of NAA at 10 or 20 ppm promoted the accumulation of ascorbic acid in chilli fruits (Singh and Lal, 1995).

Gametocides : The role of plant growth substances in vegetable crops has been reviewed by Saimbhi and Brar (1978). Some plant growth substances possess the gametocidal action to produce male sterility which can be used in economic hybrid seed production. The use of MH 100 to 500 ppm has been found to cause male sterility in pepper. Foliar spray of GA_3 100 ppm was found effective in inducing male sterility in pepper (Kohli *et al.*, 1982).

CONCLUSION

The literature available reveals that application of growth substances help in better vegetative growth, seedling stand, induction of early flowering, enhanced flowers and fruit retention, ripening, improved yield and quality of chillies. Thus, it can be concluded that plant growth substances can be effectivley used for improving growth, yield and quality of chillies if applied at proper time and manner in suitable doses or concentration.

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