EFFECT OF PLANT GROWTH REGULATORS ON PAPRIKA- A REVIEW

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ABSTRACT
The commercial importance of paprika both as a spice and a vegetable with large scale cultivation in both tropical and sub tropical regions are increasing. High temperature, low humidity and other relative ill effects of tropical climate frequently disturbs the crop husbandry of paprika, with relevance to their plant growth, development and yield. The increased fruit drop and decreased percentage of fruit set, delay in flowering are the major issues lead to low productivity in paprika. Auxins especially NAA positive effect on plant growth, early flowering, yield and quality attributes. Application of GA3 also had significant effect on growth and yield attributes.

Key words: Fruit drop, NAA, Paprika.

Paprika (Capsicum annuum var. longum), belonging to the family Solanaceae, has its origin from Western Hemisphere of the world. International spices traders use the term “paprika” for non-pungent red Capsicum powder. Besides being used as colourant, it is also used for flavouring and garnishing of eggs, cheese, meat dishes, sea foods, salads etc. The commercial importance of paprika both as a spice and a vegetable with large scale cultivation in both tropical and sub tropical regions are increasing. In India Byadagi, Warangal chilli, Arka Abir and KtPl-19 are the important types in paprika under cultivation. The increased fruit drop and decreased percentage of fruit set, delay in flowering are the major issues leading to low productivity in paprika. Based on this background, the present review was compiled to study the problems associated with delay in flowering and higher rate of flower drop through foliar application of different growth regulators in paprika.

Effect of environmental factors
Cultivation of bell peppers is mostly confined to cooler seasons (26 ± 3°C maximum and 15 ± 2.8°C minimum) in plains of South India (Anand and Deshpande, 1986). The optimum 24 hours mean temperature for vegetative growth was found to be between 21°C and 23°C for winter grown sweet pepper conducted by Bakker (1989). Capsicum does not thrive in the 5°C - 16°C range, and grows better near average daily temperature of 23.5°C. Temperature above 32°C can prevent fruit set (Anonymous, 2001c). Summer is practically a lean period for sweet pepper production because of high temperature (Deepa and Abu, 1996). However, the microclimatic conditions that normally occur inside the greenhouse i.e., relevant thermal exertion, and low light intensity in winter can greatly affect the quality of fruits, plant height, leaf area, number of leaves and transpiration rate (Abou-Hadid et
Leaf area was highest in sweet pepper cv. California Wonder grown under 30 per cent light intensity at AVRDC, Taiwan, when compared to that under 50, 70 and 100 per cent light intensity (Anon., 1997a). When light intensity was reduced, the plant height, number of nodes and leaf size were increased in Capsicum frutescens (Anon., 1997b). Under normal growing conditions, without artificial pollination, fruit set of sweet pepper is improved by high humidity (Bakker, 1989). Capsanthin content in tomato-shaped paprika varieties was favourably influenced by the temperature and sunshine hours (Harmath, 1984).

**Growth attributes**

Application of GA$_3$ at 50 ppm had significant effect on plant height in sweet pepper according to Singh and Vashist, (1984). The results with NAA treatment suggested that it would be effective in preventing stress induced abscission of pepper flower buds and flowers (Wien and Turner, 1989). However, Taborda and Silveira (1994) have been unsuccessful in improving fruit set with NAA treatment of pepper flowers. In bell pepper cultivars HC- 201 and California Wonder two foliar sprays of NAA 10 ppm after 22 days of transplanting and 15 days after the first spray showed reduced flower drop and improved fruit set (Sharma et al., 1999). Taborda and Silveira (1994) observed that Mepiquat chloride promoted advanced flowering and fruiting in Paprika. The number of days from sowing to flowering and maturity were species specific, such that ‘Ca Bell’ and ‘Ca Round’ tend to flower earlier (74 days) than ‘Ca Slim’ with a mean of 83 days to flowering in Capsicum (Olufolaji and Makinde, 1994).

**Yield attributes**

Foliar application of Mepiquat chloride at the time of transplanting in paprika had no effect on total yield and fruit quality (Taborda and Silveira, 1994). Pelt and Popham (2002) pointed out that the application of plant growth regulators and plant growth enzymes improved yield of paprika or cayenne peppers. The consistent increase in yield was occurred without reduction in quality. In pepper (Capsicum annuum) minimal beneficial effects were observed with auxin application (Stover et al., 2000). Verma and Joshi (2000) recorded the dry weight of KtPl-19 as 9.5 g on the basis of 1 kg fruit weight. Spraying of NAA at 25 ppm significantly increased the number of flowers and fruits per plant and fruit set percentage in winter season, where as spraying of NAA at 50 ppm showed increased in fruit weight, fresh and dry fruit yield per plant in winter season and all the above parameters in summer season in paprika cv. KtPl-19 (Kannan et al., 2008).

**Quality attributes**

The quality of paprika products is based on visual and extractable red colour, and to a lesser degree of nutrition value (Bosland, 1993). Govindarajan (1986) reported that the major colouring pigments in paprika are capsanthin and capsorubin comprising 60 per cent of the total carotenoids. Other pigments noticed in paprika are betacarotene, zeaxanthin, violaxanthin, neoxanthin and lutein. Paprika oleoresin is a natural food colourant used to obtain a deep red colour in any food that has a liquid or fat phase. It is derived from the liquid extract of the (dried ripe) fruits of Capsicum annuum obtained by extraction with hexane (Anonymous, 2001a). Jaren-Galen et al. (1999) reported that paprika oleoresin extraction with superficial carbondioxide with increasing extraction pressures and use of co-solvents such as one per cent ethanol or acetone resulted in greater pigment (capsorubin, capsanthin, zeaxanthin,
and beta-cryptoxanthin) yield. The aromatic and colour components of paprika extracted using high superficial carbon dioxide had high CU (Colour Unit) value (1,80,000) and a yield of 1.9 per cent (Skerget et al., 1998). The extract chiefly contains pigments namely capsanthin and carotene, which is responsible for the red colour. Besides used as a colouring agent in food products, it is also used as an antioxidant (Anon., 2001b). The pigment content of paprika powder can range from 0.1 to 0.8 per cent and the colour value is usually expressed in terms of ASTA (American Spice Trade Association) colour value. This is the extractable colour present in paprika. The ground powder can be used freely for seasoning. In powdered form, paprika also adds consistency as flavor (Anon., 2001d). Paprika oleoresins are available in various standardised forms in which 1 kg of oleoresin is equal to 10-30 kg of paprika (Sampathu et al., 1981). Cells of Capsicum annuum immobilized in reticulate polyurethane foam produced higher yield of capsaicin in chilli fruits. The accumulation of capsaicin was increased by supplementing the medium with precursors of capsaicin such as phenyl alanine and isocapric acid and by reducing the growth rate of immobilized cells by omitting growth regulators like 2, 4-D from the medium (Lindsey and Yeoman, 1984).

Sinha (1975) stated that GA3 positively influenced the vitamin C content in chilli and the significant effect of 50 ppm GA3 was coincides with the findings of Mehrotra et al. (1970). Foliar application of 2,4-D at 10 ppm shows increased ascorbic acid and TSS content in paprika cv. KtPl-19 in both winter and summer season. Oleoresin, capsaicin and capsanthin content were highest in the plants sprayed with NAA at 50 ppm in both winter and summer season (Kannan et al., 2008).

REFERENCES
Anonymous. (2001a) [www.indianspices.com](http://www.indianspices.com)
Anonymous. (2001b) [www.asianherbex.com](http://www.asianherbex.com)
Anonymous. (2001c) [www.cookbook.hu](http://www.cookbook.hu)