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## Behavior of Cucumber Plants under the Application of Different Growth Regulators: A Review

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**Abstract:** *Cucumber (Cucumis sativus L.) is the second most cultivated cucurbitaceous crop that is mostly used for the cooking and somewhat also for medicinal purposes. Growth regulators are the chemical substances that promote or retard the growth and are effectively used in cucumber crop. The application of salicylic acid and maleic hydrazide increase the reproductive growth in cucumber plants and also enhance the male and female flowers ratio that directly increases the yield. KNO<sub>3</sub>, Ca (NO<sub>3</sub>), Anfton, cycocel and ethrel acts as growth promoter and are useful to increase the vegetative growth of cucumber plants. Paclobutrazol, daminozide and chlormequat chloride acts as growth retardant and are useful to control the vegetative growth in tunnel production. Thus, growth regulators are very useful to control the vegetative growth and also to enhance the reproductive growth phase of cucumber plants. The precise application of these growth regulators is very necessary. So, a lot of work still needed to understand the precision application of the growth regulators on cucumber plants and also the improvement of crop under some biotic and abiotic stresses.*

**Keywords:** Cucumis sativus, growth regulators, vegetative growth, reproductive growth, plant yield.

### Introduction

Vegetables are the good source for the human nutrition because they are rich in vitamins and minerals and help to fulfill our nutritional requirement. They are of good taste, aroma, flavor and rich in color that make the food attractive and tasty for humans. Our meal has been considered incomplete without the addition of vegetables. Cucumber (*Cucumis sativus L.*) that is locally known as Khira belongs to Cucurbitaceae family which is having the largest number of summer vegetables. Chromosome number of cucumber is  $2n = 14$ . Cucumber is at the second number in widely growing vegetables in Cucurbitaceae family after watermelon. It is rich with antioxidants and vitamins K and C [1].

Area under Cucumber cultivation in Pakistan is 3482 ha and yield is 161428 kg/ha with the total production of 56204 tonnes [2]. Plant growth regulators has been used to increase the yield, enhancement of growth and development, sex expression, plants resistance to biotic and abiotic stresses and also the morphological structure of cucumber plants [3,4]. Growth regulators have positive effects on the Cucumber plants and the

responses of plants after the application of growth regulators have been reviewed in this article. This will give an idea about the importance and the need of application of these growth regulators in Cucumber production.

### Growth regulation by Salicylic acid application

Salicylic acid is a chemical phenolic in nature and considered to be a plant growth regulator. It is produced in a very small quantity in the cucumber plants. Exogenous application of Salicylic acid increases the female flowers ratio and hence increases the yield of the cucumber plants [5-7]. The pretreatment of seed with Salicylic acid before sowing is proved to be very beneficial for increasing the chlorophyll contents (Both chlorophyll a and chlorophyll b), number of leaves, diameter of stem and number of female flowers. The two concentrations of Salicylic acid 0.07 mM, 0.18 mM for seed treatment before sowing in Cucumber have been proved most valuable for increasing all above stated characteristics of Cucumber plants [8].

### KNO<sub>3</sub>, Ca(NO<sub>3</sub>) and Anfton as growth promoter and some other growth retardants

Increase of shelf life, total soluble salts and reduction in weight loss are the most important factors that are considered very important in fruits and vegetables. The application of KNO<sub>3</sub>, Ca (NO<sub>3</sub>) and Anfaton on the cucumber seedling increases the vegetative growth and number of female flowers along with the total dry weight of fruits of cucumber plants. These chemicals improve the productivity and total soluble salts of cucumber plants and also decrease the weight loss in fruits during the storage. Anfton at higher concentration along with the other two chemicals have positive effect on cucumber plants and are valuable in increasing the production [9].

The growth retardant paclobutrazol after the application to the cucumber seeds causes a significant reduction in the hypocotyl and epycotyl length of cucumber seedling. Reduction up to 74.9% is obtained in transplant heights. The height reduction in transplants increase with the raised concentrations (500 and 1000 mg/L) and prolonged soaking periods (12 and 24 hours). The activities of daminozide and chlormequat chloride are of no effect in comparison to paclobutrazol. The effects of these growth retardants are significant only after 24 h of soaking the seeds and at 15 mg/L concentrations. Growth retardants used in the studies resulted in reduction of leaf area, leaf and stem dry weight. There is no significant effect on hypocotyl and epycotyl diameters. However, paclobutrazol treated seeds show dark green color, possibly due to high chlorophyll a and b contents, in comparison to daminozide or chlormequat chloride treated seedling leaves [10].

#### **Influence of cycocel and ethrel on cucumber growth**

Cycocel and ethrel both are the plant growth regulators that are used to enhance the growth and the development of the cucumber plants. These two growth regulator have significant effect on the morphological characters of cucumber plants. The exogenous application of cycocel and ethrel cause an increase in leaf area, number of primary branches and number of nodes. Along with the significant effects on morphological characters of cucumber plants by these two growths regulators, yield characters are also enhanced after the application of these growth regulators. The exogenous application of these two growth regulators increases the average fruit length and average fruit weight. Number of fruits per vine and the yield per vine are also increased by the exogenous application of these two growth regulators [11].

#### **Effects of NAA and maleic hydrazide on plant growth and yield**

Naphthalene acetic acid and meleic hydrazide enhance the vegetative growth of cucumber plants. The influence of these two plant growth regulators on the morphological, floral and fruit yield is very significant. The foliar application of maleic hydrazide proves best for increasing fruit yield and other yield contributing parameters. The application of these growth regulators not only brought earliness, increased the sex ratio and reduced plant expansion but also give the best economic results [12].

#### **Conclusion**

It is concluded that the application of different growth regulators has a significant influence on the vegetative and reproductive growth of cucumber plants. The application of some growth regulators increase the height of plants and the length of shoots while other acts as retardants that results in the reduction of both vegetative and reproductive characters of plants. The growth regulators that enhance the growth and others which act as retardants are useful in precision crop production. Growth retardants which have effect on vegetative growth are helpful for those cucumber varieties that are grown in tunnels to make them limited up to specific height and length while growth promoters are useful for open field varieties. Uses of growth regulators that promote the reproductive growth and increase the yield are very economic and beneficial.

#### **Acknowledgements**

This review article is dedicated to our parents for their support during my entire educational career and to my siblings for all their love and encouragement.

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