SYNOPSIS

DISSERTATION-I

Effect of Plant Growth Regulators on Physiological Parameters, Yield and Quality of Bitter Gourd (*Momordica charantia L.*)

in partial fulfilment of requirements for the Award of Degree of

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In
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DECLARATION

Certified that this synopsis of Gurnoor Singh Sidhu, registration number 11718747, entitled "**Effect of Plant Growth Regulators on Physiological Parameters, Yield and Quality of Bitter Gourd (*Momordica charantia L.*)**" has been formulated and finalized by the student himself on the subject.

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Introduction

Bitter gourd (*Momordica charantia L.*) is a tropical and subtropical vine of the family Cucurbitaceae. It is widely grown for edible fruit, which is among the most bitter of all vegetables. The original home of the species is not known, other than that it is a native of the tropics. It is widely grown in South and Southeast Asia, China, and Africa. The herbaceous tendril-bearing vine grows to 5 m. It bears simple, alternate leaves 4-12 cm across, with 3-7 deeply separated lobes. Each plant bears separate yellow male and female flowers. (Rashid, 2004)

Bitter gourd is usually grown under kitchen garden as a summer vegetable. But at present it is also being grown as commercial crop near the urban areas. Moreover, it can also be grown in any type of soil having good drainage system. From nutritional point of view, bitter gourd can be considered as nutrition rich fruit vegetable. It contains considerable amount of water (83-92%), carbohydrates (4.0-10.5%), protein (1.5-2.0%), fat (0.2-1.0%), minerals (0.5-1.0%) and fiber (0.8-1.7 %) (Gopalan *et al.*, 1982). Ripe fruits are rich in vitamin- A. Among all cucurbits vegetables bitter gourd contains maximum amount of minerals and vitamins. Due to high keeping quality (Banerjee and Mangal, 1986), it has also export potentiality.

The principle in sex modification in cucurbits lies in altering the sequence offlowering and sex ratio. Besides the environmental factors, endogenous levels of auxins, gibberellin, ethylene and ascorbic acid, at the time and the seat of ontogeny determine the sex ratio and sequence of flowering. Exogenous application of plant growth regulators can alter the sex ratio and sequence, if applied at 2 or 4 leaf stage which is the critical stage for suppression or promotion of either sexes. Hence, modification of sex to desired direction has to be manipulated by exogenous application of plant growth regulators. Gibberellins play a key role in promoting male sex expression and are antagonistic to that of ethylene and abscisic acid (Rudich, 1983).

Plant growth regulators are the chemical substances, when applied in small amounts modify the growth of plant usually by stimulating part of the natural growth regulatory system. About sixty plant growth regulators are now commercially being used and several of them have reached considerable importance in crop production. The growth

regulators include both growth promoters and retardants which have been shown to modify the canopy structure and other yield attributes.

Problem Background

Plant growth regulators (PGRs) are used extensively in horticulture to enhance plant growth and improve yield by increasing fruit number, fruit set and size. Several researche workers have studied the effect of plant growth substances on vegetable crops. Among them, gibberellins particularly GA3 and naphthalene acetic acid (NAA) and Etheral have been reported to show promising effect on bitter gourd crop. Thus, it is imperative to determine their concentration, Gibberellic acid, Naphthalene acetic acid and etheral are one of the most important growth stimulating substance used in horticulture.

Objectives:

1. To find out the effect of plant growth regulators on growth and development in bittergourd.
2. To find out the effect of plant growth regulators on physiological parameters and productivity potential in bittergourd.
3. To find out the influence of plant growth regulators on quality in bittergourd.

REVIEW OF LITERATURE

The application of ethrel (400 ppm) in cucumber cv. Poinsettee was found to be superior with respect to yield with maximum number of fruits per plant (12.65) and yield (25.83 t/ha) than Beigaum Local (Vadigeri *et al*., 2001).

Marbhal *et al*. (2005) reported that the maximum fruit yield was observed by spraying of NAA (50 ppm) which was higher than control.

Dostogir *et al*. (2006) reported that the application of GA3 at 25 ppm recorded maximum number fruits per plants (15.8).

Ghani *et al*. (2013) conducted an experiment on threePGRs i.e. GA3, Ethrel , and NAA. Results revealed that application of GA3 @ 25 ppm significantly reduced number of days to first flower and first harvest. Similarly male to female flower ratio was lowest in plants sprayed with GA3 @ 75 ppm. Number of fruits and seed yield per vine was significantly higher among all the PGRs (GA3, ethrel and NAA) when plants were sprayed with NAA @ 100 ppm. Overall results revealed that application of NAA proved to be better for different yield and yield related traits in bitter gourd.

Geeta *et al*. (2014) studied the effect of plant growth regulators on leaf biochemical parameters (chlorophyll pigments, sugars, nitrate reductaseactivity, total phenols) and fruit yield bitter gourd (*Momordicacharantia* L.) was studied. Results revealed significant difference between treatments on chlorophyll, sugar, total phenol content as also on nitrate reductase activity. Application of GA3 (20ppm) recorded maximum chlorophyll content.

Hirpara *et al*. (2014) revealed that the application of GA3 @ 50 ppm exerted significantly the maximum vine length, number of matured fruit per vine, fruit yield per plant , seed yield per plant and 100 seed weight. Among three different stages, application of plant growth regulators at two to four leaf stagesis found effective.

Mia *et al*. (2014) revealed that application of plant growth regulators significantly influenced over the flower initiation and fruit setting.

Dalai *et al*. (2015) revealed that a dose of GA3 20 ppm + NAA100 ppm was found significantly superior in terms of growth parameters i.e. Vine length per plant, Number of primary branches per plant, Number of leaves per plant, as compared to control and other

applied treatment. Similarly, a positive effect was also reported in various flowering, yield and yield attributing characters with GA3 20 + NAA100 ppm in cucumber.

Nagamani *et al*. (2015) conducted an experiment on effect of plant growth regulators on vegetative growth, sex expression, fruit setting, seed yield and quality of bittergourd. Results revealed that the plants sprayed with growth regulators showed induction of female flowers at lower nodes with 3-5 more pistillate flowers per vine and higher sex ratio as compared to unsprayed control. In manually pollinated flowers, plants sprayed with GA3@ 50 ppm had higher fruit and seed setting, fruit weight and hybrid seed yield. All the growth regulators had positive influence on vegetative, flowering and fruit traits

Mangave *et al*. (2016) conducted an investigation to study the effect of different chemicals as a foliar spray on bitter gourd. Results revealed that all the treatments improved the flowering and yield characters over control. However, among different treatments, foliar spray of NAA 75 mg/l followed by, putrescine @ 40 mg/l were found most significant in influencing parameters like no. of branches per vine, no. of days taken for first male and female flower, number of male flowers, no. of female flowers with highest yield.

Barholia *et al*. (2017) in cucumber revealed that influence of the plant growth regulators was variable on the morphological traits of cucumber but the floral and yield traits were significantly affected by a combined application of maleic hydrazide @ 200 ppm and ethephon 200 ppm. This treatment induced early development and maximized yield. This treatment also produced best economic results for the production of cucumber.

MATERIAL AND METHODS

Experimental Site:- The experiment proposed to be conducted at main agriculture field of school of agriculture, Lovely Professional University, Phagwara (Punjab) 144411.

Methodology:- An experiment will be carried out at main agriculture field of school of agriculture, Lovely Professional University, District Kapurthala (Punjab). The Kapurthala District is separate in two non-contiguous parts about 32 KM apart-Kapurthala and SultanpurLodhi tehsils forming one piece and the Phagwara Tehsil the other. The former lie between north latitude 31 0-07' and 31 0-39' and east 740-57' and 750- 36', while the Phagwara tehsil lies between north latitude 31 0-10' and 31 0- 22' and east longitude 750-40' and 75-55'.The entire area of the district 167000 Hectares. The driest month is November with 5 mm precipitation and the most precipitation falls in July with average 247 mm. June is warmest month with average temperature 33.4^{0}C and the January is coolest month with average temperature 12.4 ^{0}C. The average annual temperature is 23.8 ^{0}C and the average annual rainfall is 719 mm.

Treatment Details;-

No of treatments;-7

T1 – Foliar application of GA3 (20 ppm) at pre flowering
T2 - Foliar application of GA3 (40 ppm) at pre flowering
T3 - Foliar application of GA3 (60 ppm) at pre flowering
T4 - Foliar application of at NAA (50 ppm) at pre flowering
T5 - Foliar application of NAA (200 ppm) at pre flowering
T6 - Foliar application of Etheral (50 ppm) at pre flowering
T7 – Control

Design and layout

The experiment was laid out in factorial randomized block design with three replications

Variety	: Punjab Kareli-1
Design	: RBD (Randomized Block Design)
Treatments	: 7
Number of Replication	: 3
Plot size	: 2 m x 2 m (=4 m^2)
Total number of plots	: 21
Total Area	: 23 x 11 = 253 m^2

Spacing : 1.5 m x 50 cm

Seed rate : 2 kg/acre

Sowing time : April

Layout of RBD:-

Replication 1	Replication 2	Replication 3
T_1	**T_2**	**T_4**
T_2	**T_6**	**T_5**
T_3	**T_4**	**T_1**
T_4	**T_1**	**T_6**
T_5	**T_3**	**T_2**
T_6	**T_5**	**T_3**
Control	**Control**	**Control**

Observations

Morphological characters

- Vine length (cm)
- No. of leaves per plant
- Female flower per plant
- Fruit set %
- Seed germination%
- No. of branches per plant
- Leaf area
- First flowering
- 50% flowering
- Fruit maturity
- Male and female flowers

Yield parameters

- Fruit yield
- No of fruit per plant
- Diameter of fruit
- Length of fruit

Quality Parameters

- TSS
- Chlorophyll content
- Ascorbic acid

References

Barholia, A.K., Gurjar, P.K.S. Singh, L., Lekhi, R., Vasure, N., Haldar, A. and Jatav, R. 2017. Effect of plant growth regulators on cucumber (*Cucumis sativus* L.) under protected cultivation in Madhya Pradesh, India. Ecology, Environment and Conservation Paper.23.85-90.

Dalai, S., Singh, M.K., Singh, K.V., Kumar, M., Malik, S. and Kumar, V. 2015. Effect of Foliar Application of GA 3 and NAA on Growth, Flower-Ing Yield and Yield Attributes of Cucumber (*Cucumis Sativus* L.). *Annals of Horticulture*. 8 (2) : 181-194.

Dostogir, H, Abdul Karim, M., Habibur Rahman Pramanik, M., SyedurRahman, A. A. M. 2006. Effect of gibberellic acid (GA3) on flowering and fruit development of Bittergourd (*Momordica charantia* L.). *Intl. J. Bot.*, 2 (3) : 329-332.

Geeta, B.,Chetti, M.B. and Navalgatti, C.M. 2014. Effect of plant growth regulators on leaf biochemical characters and fruit yield components of bittergourd (*Momordica charantia* L.) cvs. MHBI-15 and Chaman Plus.*J. Hortl. Sci*., 9.1:43-47.

Ghani , M.A., Amjad, M., \Iqbal,Q., Aami r Nawaz , Ahmad ,T., Hafeez, O.S.A. and Abbas, M. 2013.Efficacy of plant growth regulators on sex expression, earliness and yield components in bitter gourd. *Pak. J. of Life Sciences*.11.3.1-7.

Hirpara.,Anjita.J., Vaddoria, M. A., Jivani, L. L., Patel, J. B. and Polara, A. M. 2014. Seed yield and quality as influence by plant growth regulators and stages of spray in bitter gourd (*Momordica charantia* L.). *AGRES*, 3. 3: 282-287.

Mangave, B.D., Dekhane, S. S. And Patel, D.J. 2016. Effect of plant growth regulators on growth and sex expression of bitter gourd. *International Journal of Development Research*.6.4.7310-7312.

Mia, B.M., Islam, M.S., Miah, M.Y. , Das, M.R. and Khan, H.I. 2104. Flower synchrony, growth and yield enhancement of small type bitter gourd (*Momordica charantia* L.) through plant growth regulators and NPK fertilization. *Pak J. Bio. Sci*., 17.3.408-413.

Marbhal, S. K., Musmade, A. M., Kashi, N. V., Kamble, M. S.and Kamthe, P. V. 2005. Effect of growth regulators and picking sequence on seed yield of bittergourd. *Haryana J. Hort. Sci*., 34 (3-4): 323-326.

Nagamani, S., Basu, S., Singh, S., Lal, S.K. Behera, B.K., Chakrabarty, S.K. 2015 and Talukdar, A. 2015. Effect of plant growth regulators on sex expression, fruit setting, seed yield and quality in the parental lines for hybrid seed production in bitter gourd (*Momordica charantia*). *Indian Journal of Agricultural Sciences* 85 (9): 1185–1191.

Rudich, J., 1983. *Proceedings of Conference on the Biology and Chemistry of Cucurbitaceae* Cornell University, Ithaca. New York August,1980.