

**MANAGEMENT SPONSORED  
MINOR RESEARCH PROJECT**

**Effect of GA3 and NAA on growth of Chilli**

*By*

**M.THRIVENI**

**Lecturer in Horticulture**



**Submitted to**

**The Research Committee**

**HINDU COLLEGE, GUNTUR**

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## DECLARATION

We hereby declare that the **Management, Hindu College, Guntur** sponsored Minor Research Project titled **Effect of GA3 and NAA on growth of Chilli** comprises of our own and original work. It has not been submitted fully or partially to any other institution or organization and is not published.



**(M. THRIVENI)**

**Lecturer in Horticulture**

Hindu College, GUNTUR

## CERTIFICATE

Certified that this is a genuine and bonafide work done by **M. THRIVENI**  
Lecturer in Horticulture with the Minor Research Project titled **Effect of GA3**  
**and NAA on growth of Chilli** sanctioned by **Management, Hindu College,**  
**Guntur.**

A handwritten signature in green ink, appearing to read 'P.M. B. A.', is written on a light-colored rectangular background.

Principal

Hindu College, Guntur

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(M. THRIVENI)

## **PREFACE**

The present investigation was conducted during summer season of 2020-2022 at the experimental field. The study revealed that the foliar application influenced on the yield character of Chilli over control. NAA and GA3 when applied as foliar spray during flower bud initiation stage increased the plant height, number of branches per plant compared to control with regards to yield characters i.e. fruit length, fruit width, number of fruits and fruit yield per plant. NAA 40ppm is the best treatment than all other treatment including control in terms of plant height, number of fruits/ plants, fruit width. The plant sprayed with growth regulators remained physiologically more active to build up sufficient food reserve for developing flowers and fruits. NAA might be responsible for increase in photosynthetic activities within the plant which might be resulted in more production of carbohydrates and related products responsible for increase in growth, fruit size, fruit weight of chilli, ultimately responsible for increased yield of chilli.

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**CHAPTER – 1**  
**INTRODUCTION**

# **EFFECT OF GA<sub>3</sub> AND NAA ON GROWTH OF CHILLI**

## **ABSTRACT:-**

The present investigation was conducted during summer season of 2020-2022 at the experimental field. The study revealed that the foliar application influenced on the yield character of Chilli over control. NAA and GA<sub>3</sub> when applied as foliar spray during flower bud initiation stage increased the plant height, number of branches per plant compared to control with regards to yield characters i.e. fruit length, fruit width, number of fruits and fruit yield per plant. NAA 40ppm is the best treatment than all other treatment including control in terms of plant height, number of fruits/ plants, fruit width. The plant sprayed with growth regulators remained physiologically more active to build up sufficient food reserve for developing flowers and fruits. NAA might be responsible for increase in photosynthetic activities within the plant which might be resulted in more production of carbohydrates and related products responsible for increase in growth, fruit size, fruit weight of chilli, ultimately responsible for increased yield of chilli.

## **INTRODUCTION:**

Chilli (*Capsicum annuum* L.) is an important vegetable and spice crop belongs to the family solanaceae. Chilli fruits are good source of vitamin A and C. Fresh and ripe Chillies are used to make all kinds of pickles different sauces and paste. Dried fruits are used to make universal curry powder and paste. India is the largest producer of chilli in the world (Athameria *et al.*, 2011). But the major problem in Chilli production is immature flower and fruit drop, which is caused by physiological and hormonal imbalance in the plants particularly under unfavourable environments such as extremes of temperature i.e. too low or high temperature (Erickson and Makhart, 2001; Joshi and Singh, 2003). This can be



done either by breeding lines which retain large proportion of flowers or through physiological manipulations by spraying of plant growth regulators which reduces the flower drop (Tamilselvi and Vijayraghvan, 2014). Guntur in Andhra Pradesh produces 30% of Chilli particularly in India. Even though Chilli is a high value commodity, which has the potential for improving the income and the livelihood of thousands of small holder farmers. It is one of the most valuable commercial annual spice crop grown in India, also it is an important vegetable crop. Being a crop of tropical and sub-tropical region, it requires a warm humid climate. Fruits are available in the market throughout the year, since chillies are produced in all the season in one or other part of the country. India grows the largest number of vegetable in the world and it is the second largest producer next only to China. India is the only country rich in many varieties of Chilli with different quality factors. The fresh and dried fruits of Chilli contain phenolic acid compound “capsaicin” in the placenta which is responsible for the pungency in Chilli. The bright red colour at the ripening stage is due to the pigment capsanthin. Chilli fruits having deep red colour, without pungency are used as paprika. A group of chemical known as plant growth regulators, plant hormones and growth inhibitors have found many practical controlling implication in growth and many other physiological activities and metabolic processes of the plants. The growth regulators or promoters like GA<sub>3</sub> and NAA stimulate vegetative growth and are involved in the initiation of cell division in the cambium. The plant growth regulators are known to enhance the source sink relationship and stimulate the translocation of photo assimilates thereby helping in better retention of flowers and fruits. Besides this, the growth regulators have the ability to cause accelerated growth in plants. The Plant growth regulators play important role in increasing production of vegetables. The great potential of plant growth regulators for reduces the flower and fruit drops and maximizing yield and quality of Chilli. There is no spice probably so popular as chilli and no other spice has become such an indispensable ingredient of the daily food of majority people of the world.

Chilli is famous for its pleasant aromatic flavour, pungency and high colouring substance. It is used widely in culinary, pharmaceutical and beverages industries. Hence, Chilli finds diverse utility as spice, condiment, culinary supplements, medicine and vegetable, besides it is an important commercial crop. Chilli fruit is mainly used as a food additive. In addition, it is also used as traditional medicine, like for the treatment of cough, toothache, sore throat, parasitic infection, wound healing, and also utilized as an antiseptic, antioxidant, and immune-modulator etc. Gibberellic acid ( $GA_3$ ) is a phytohormone that is needed in small quantities at low concentration to accelerate plant growth and development.  $GA_3$  also increases the plant height, weight of shoot and root of the plant. Chemically speaking, gibberellins are actually acids. They are produced in the plant cell's plastids or the double membrane-bound organelles responsible for making food and are eventually transferred to the endoplasmic reticulum of the cell, where they are modified and prepared for use. The growth regulators or promoters like  $GA_3$  and NAA stimulate vegetative growth and are involved in the initiation of cell division in the cambium. Barai and Sarkar (1999) reported that NAA and  $GA_3$  showed encouraging effects on the retention of flowers and increased fruit set in Chilli cultivars. Improved fruit set was noticed with NAA and  $GA_3$  treatments in Chilli according to the report by Lyngdon and Sanyal (1992). So present investigation is done with following objectives.

## **OBJECTIVES:**

- To find the effect of  $GA_3$  and NAA on growth of chillies.
- To find the optimum concentration of  $GA_3$  and NAA on chillies.

**CHAPTER – 2**  
**LITERATURE CITED**

**REVIEWS:**

- ❖ Revanappa *et al.*, 1998 reported that fruit yield per plant was increased when 20ppm NAA was sprayed after transplanting.
- ❖ Joshi *et al.*, 1999 reported that application of NAA 40ppm at flower bud initiation and 20days later produced maximum plant height (74.80cm) in chilli.
- ❖ Biradar *et al.*, 1999 reported that in chilli the height number of fruits per plant (131.74) were noticed with 20ppm NAA was sprayed twice at flower initiation and 50% flowering compared to control (92.54).
- ❖ Natesh *et al.*, 2005 in chilli found that application of GA<sub>3</sub> 100ppm recorded maximum plant height (85.7cm).
- ❖ Sultana *et al.*, 2006 reported that the plant height of chilli was maximum in 10 ppm NAA (44.0 cm). Number of branches per plant was found maximum with NAA @ 10 ppm (12.0).
- ❖ Kannan *et al.*, 2009 reported that fruit girths (7.26 and 6.68cm) were significantly influenced by NAA 50ppm during summer season.
- ❖ Arora *et al.*, 2014 reported that among different concentration of NAA 45 ppm of NAA gave significantly maximum plant height (68.6 cm), primary branches (7.80) and number of leaves per plant (2193.20).
- ❖ Kiranmayi *et al.*, 2014 obtained maximum plant height (83.33 cm), plant spread (137.33cm) and number of primary branches (17.0) in chilli variety Lam-353 when plant sprayed with 20 ppm NAA .
- ❖ Kumari *et al.*, 2016 reported that the NAA 50 ppm produced highest plant height (68.72 cm) and number of primary branches (12.21) when NAA spayed first at 35 days after transplanting and second at the time of flowering.
- ❖ Kar *et al.*, 2016 reported that spraying of GA<sub>3</sub> @ 50 ppm at resulted in maximum plant height (62.35 cm) followed by NAA @ 40 ppm (58.86 cm).
- ❖ Shil and Nath *et al.*, reported that the NAA has positively effect on the plant height was 39.45 cm and number of branches per plant was 18.0 when the

plants were sprayed with NAA 20ppm at 75 days after transplanting whereas lowest was found in the control plot.

- ❖ Shankhwar *et al.*, 2017 reported that application of plant growth regulators significantly influenced the plant height (56.39 cm) number of branches per plant and number of leaves per plant. The highest plant height was observed with spray of NAA @ 40 ppm.
- ❖ Singh *et al.*, 2017, revealed that the maximum plant height (120.59 cm), plant spread (92.57 cm) and number of branches per plant (16.05) was found in NAA @ 60 ppm treated plot of chilli.
- ❖ Tapdiya *et al.*, 2018 investigated that foliar spray of NAA @ 40 ppm at flower bud initiation stage of chilli and recorded maximum plant height (54.67 cm) followed by GA<sub>3</sub> @ 50 ppm (54.33 cm) the maximum number of branches per plant was observed in NAA @ 40 ppm (3.17) followed by NAA @ 30 ppm (3.10).
- ❖ Mahindre *et al.*, 2018 observed that the spraying of NAA @ 50 ppm at 30, 60 and 90 days after transplanting (DAT) produced maximum plant height (64.10 cm), plant spread (53.13 cm) with application of GA<sub>3</sub> @ 25 ppm (63.27 cm plant height and 52.80 cm plant spread) in chilli.

**CHAPTER – 3**  
**MATERIALS AND METHODS**

## **MATERIALS AND METHODS:-**

The present study was undertaken at the experimental field of Hindu college, Guntur. To study the effect of GA<sub>3</sub> and NAA on growth of Chilli. Locally grown Chilli seedlings were used as plant materials in the present experiment. The spacing of 60cm between rows and 60cm between plants during the crop growth required package of practices were given as per the recommendation to experimental plot. Interculture operations were followed timely . The growth regulators NAA with concentration of 10ppm, 20ppm , 30ppm, 40ppm, 50ppm and GA<sub>3</sub> 50ppm,100ppm,150ppm were applied as foliar spray at 15 days after transplanting in Chilli. The observation taken on six different characters along with yield contributing parameters in field.



**Land preparation of Chilli plot**



**Adding of FYM (Farmyard manure)**



**Chilli seedlings**





**Sowing of Chilli seedlings**



**Irrigation of Chilli plot**



**Foliar spraying of NAA and GA<sub>3</sub>**



**Intercultural operations**



**Fertilizer application**



**Chilli flowering**



**Counting of Fruits**



**Harvesting of Chilli**



## **Yield of Chilli**

### **THE FOLLOWING PARAMETERS TAKEN ARE :-**

**Plant height:-** The plant height is measured from the bottom of the plant to tip of the plant with the help of scale and expressed in centimetres (cm).

**Number of Branches:-** The number of branches arised from the main stem are counted and expressed in numbers.

**Days to Flowers:-** The number of days taken from transplanting to appearance of flowers was noted.

**Number of Fruits:-** The number of fruits arised from the branches are counted and expressed in numbers.

**Fruit Length:-** The fruit length is measured with the help of the scale and expressed in centimetres (cm).

**Fruit Width:-** The fruit width is measured with the help of the paper scale and expressed in centimetres (cm).

**CHAPTER – 4**  
**RESULTS AND DISSCUSSION**

## RESULTS AND DISCUSSION:

### EFFECT OF DIFFERENT TREATMENTS ON PARAMETERS OF CHILLI

Treatments	Plant height (cm)	Number of branches	Days to flowering	Number of fruits	Fruit length (cm)	Fruit width (cm)
T <sub>1</sub> -NAA 10 ppm	44.5	3	45	43	<b>4.8</b>	0.79
T <sub>2</sub> -NAA 20 ppm	45.2	5	40	57	3.5	0.81
T <sub>3</sub> -NAA 30 ppm	49.7	<b>6</b>	<b>35</b>	59	4.7	0.82
T <sub>4</sub> -NAA 40 ppm	<b>55.5</b>	4	38	<b>65</b>	4.1	<b>0.83</b>
T <sub>5</sub> -NAA 50 ppm	41.2	3	41	48	3.5	0.81
T <sub>6</sub> -GA <sub>3</sub> 50 ppm	46	4	52	39	3.8	0.80
T <sub>7</sub> - GA <sub>3</sub> 100ppm	43.5	3	56	33	3.1	0.80
T <sub>8</sub> -GA <sub>3</sub> 150 ppm	38.2	2	60	31	3.3	0.79
T <sub>9</sub> -Control	36	2	65	27	2.9	0.78

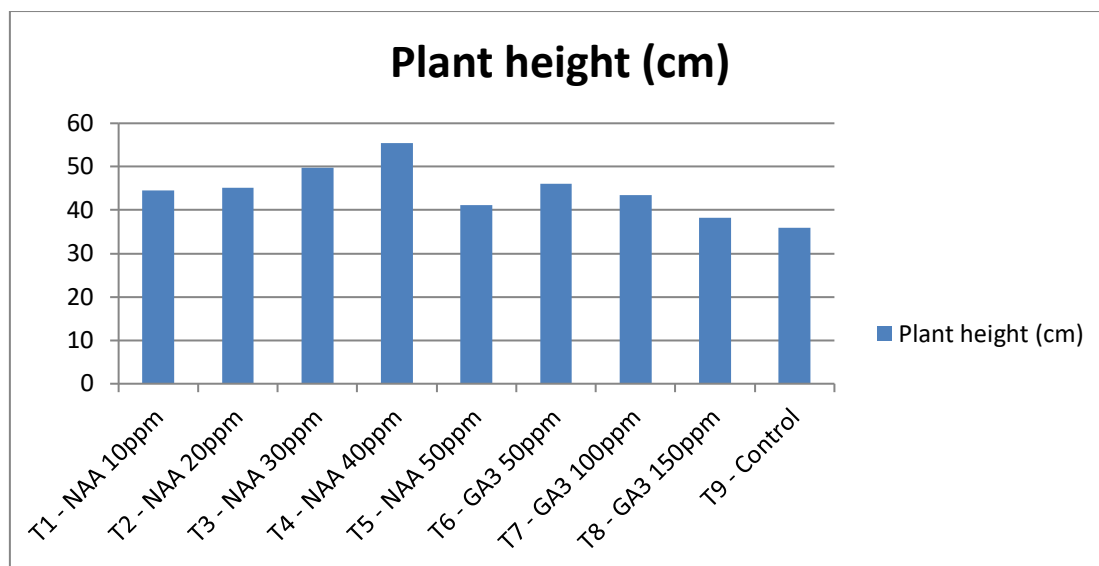
❖ Bold value indicates maximum values.

#### Plant Height:

The Chilli plants treated with T<sub>4</sub> NAA 40ppm recorded the maximum plant height (55.5cm) and the recorded as best treatment followed by T<sub>3</sub> NAA 30ppm (49.7cm) followed by T<sub>6</sub> GA<sub>3</sub> 50ppm (46cm) followed by T<sub>2</sub> NAA 20ppm (45.2cm) which is followed by T<sub>1</sub> NAA 10ppm (44.5cm) followed by T<sub>7</sub> GA<sub>3</sub> 100ppm (43.5cm) followed by T<sub>5</sub> NAA 50ppm (41.2cm).

The least plant height showed by the T<sub>9</sub> control (36cm) followed by T<sub>8</sub> GA<sub>3</sub> 150 ppm (38.2cm). Similar effect of growth regulators on plant height per plant were reported in Chill by Tapdiya (2018), Tamilselvi and Vijayaraghavam (2014).

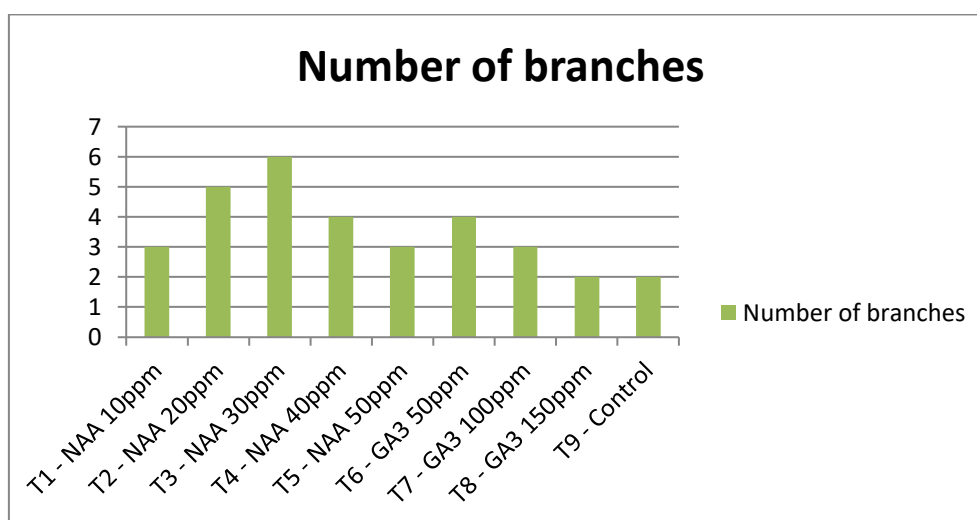




### Number of Branches:-

The Chilli plants treated with T<sub>3</sub> NAA 30ppm (6 branches) recorded the maximum number of branches followed by T<sub>2</sub> NAA 20ppm (5 branches) followed by T<sub>4</sub> NAA 40ppm (4 branches) on par with T<sub>6</sub> GA<sub>3</sub> 50ppm (4 branches) which is followed by T<sub>1</sub> NAA 10ppm (3 branches) on par with T<sub>5</sub> NAA 50ppm (3 branches) on par with T<sub>7</sub> GA<sub>3</sub> 100ppm (3 branches).

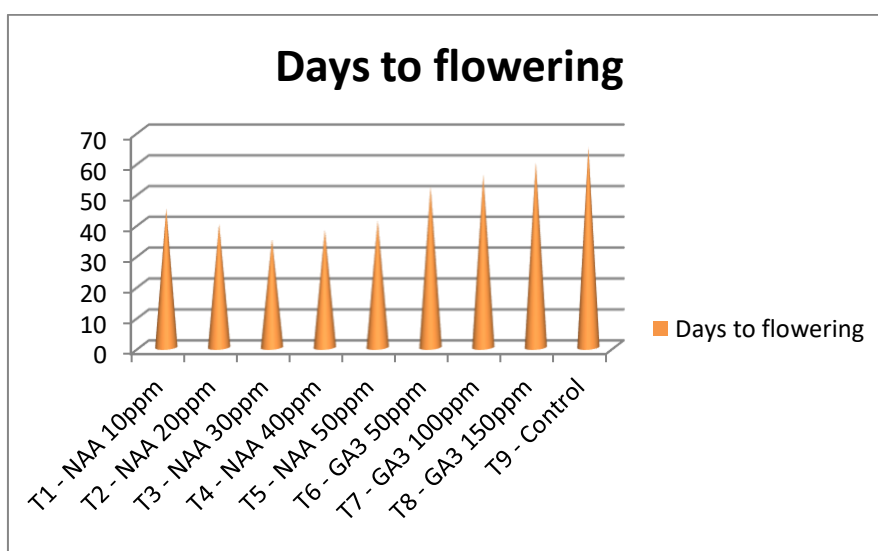
The least Number of branches showed by the T<sub>9</sub> control (2 branches) followed by T<sub>8</sub> GA<sub>3</sub> 150ppm (3 branches). Similar effect of growth regulators on number of branches per plant were reported in Chilli by Natesh (2015), Sultana (2006), and Shankhwar (2017).



## Days to Flowering:-

The Chilli plants treated with T<sub>3</sub> NAA 30ppm (35 days) recorded the maximum days to flowering followed by T<sub>4</sub> NAA 40 ppm (38 days ) followed by T<sub>2</sub> NAA 20 ppm (40 days) which is followed by T<sub>5</sub>NAA 50ppm (41 days) followed by T<sub>1</sub> NAA 10ppm (45 days ) followed by T<sub>6</sub> GA<sub>3</sub> 50ppm (52days) which is followed by T<sub>7</sub> GA<sub>3</sub> 100ppm (56 days).

T<sub>8</sub> GA<sub>3</sub> 150ppm showed the least days to flowering (60days) followed by T<sub>9</sub> control (65 days). Similar effect of growth regulators on days to flowering per plant were reported in Chilli by Kannan (2009), Singh (2017), Shil and Nath (2016).

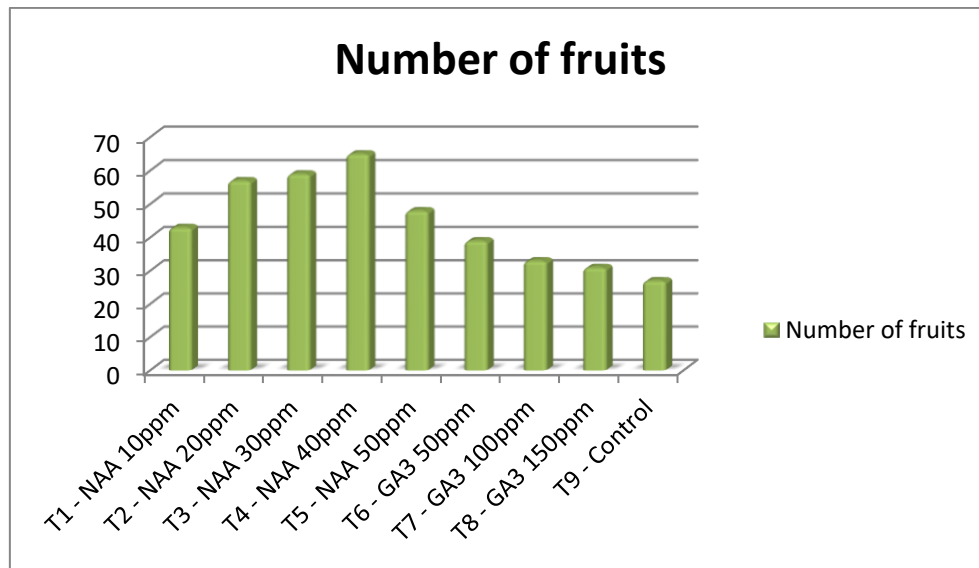


## Number of Fruits:-

The Chilli plants treated with T<sub>4</sub> NAA 40 ppm (65 fruits) recorded the maximum number of fruits followed by T<sub>3</sub> NAA 30 ppm ( 59 fruits ) followed by T<sub>2</sub> NAA 20ppm (57 fruits )which is followed by T<sub>5</sub> NAA 50 ppm (48 fruits) followed by T<sub>1</sub> NAA10 ppm (43 fruits ) followed by T<sub>6</sub> GA<sub>3</sub> 50 ppm (39 fruits ) followed by T<sub>7</sub> GA<sub>3</sub> 100ppm (33 fruits ).

The least number of fruits showed by T<sub>9</sub> control (27 fruits ) followed by T<sub>8</sub> GA<sub>3</sub>150ppm (31 fruits ). Similar effect of growth regulators on

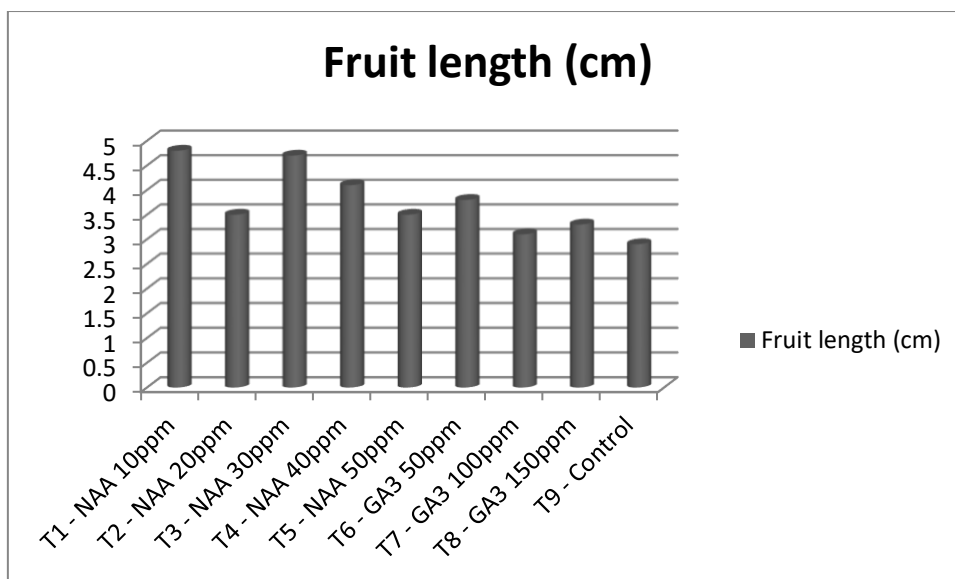
number of fruits per plant were reported in Chilli by Revanappa (1998), Natesh (2005), Sultana (2006) and Gare (2017) .



### **Fruit Length :-**

The Chilli plants treated with T<sub>1</sub> NAA 10ppm (4.8cm) recorded the maximum fruit length followed T<sub>3</sub> NAA 30ppm (4.7cm) followed by T<sub>4</sub> NAA 40ppm (4.1cm) followed by T<sub>6</sub> GA<sub>3</sub> 50ppm (3.8cm) which is followed by T<sub>2</sub> NAA 20ppm (3.5cm) on par with T<sub>5</sub> NAA 50ppm (3.5cm) followed by T<sub>8</sub> GA<sub>3</sub> 150ppm (3.3cm).

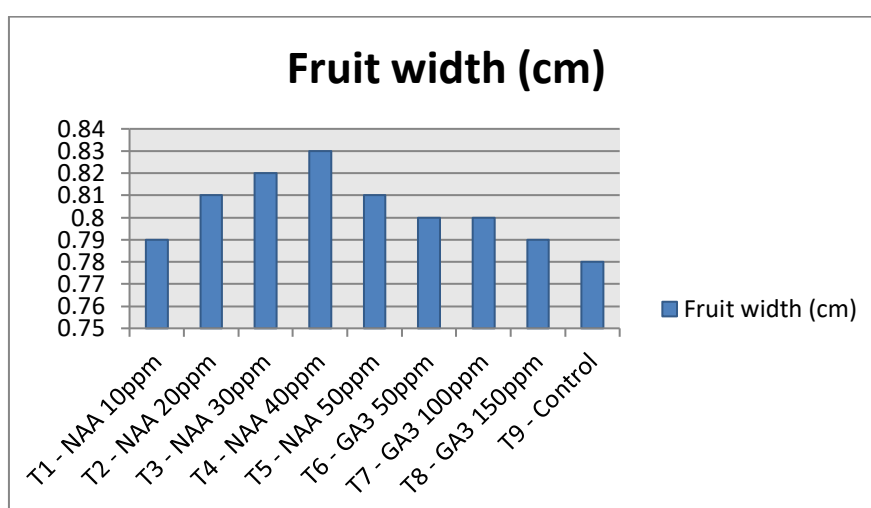
The least fruit length shown by T<sub>9</sub> control (2.9cm) followed by T<sub>7</sub> GA<sub>3</sub> 100ppm (3.1cm). Similar effect of growth regulators on fruit length per plant were reported in Chilli by Shil (2016), Nath (2016), Gare (2017) and Singh (2017).



### Fruit Width:-

The Chilli plants treated with T<sub>4</sub> NAA 40ppm (0.83cm) recorded maximum fruit width followed by T<sub>3</sub> NAA 30 ppm (0.82 cm) followed by T<sub>2</sub> NAA 20 ppm (0.81 cm) on par with T<sub>5</sub> NNA 50ppm (0.81cm) followed by T<sub>6</sub> GA<sub>3</sub> 50 ppm (0.80 cm) on par with T<sub>7</sub> GA<sub>3</sub> 100 ppm (0.80 cm).

T<sub>9</sub> control showed least fruit width (0.78cm) followed by T<sub>1</sub> NAA 10ppm (0.79cm) on par with T<sub>8</sub> GA<sub>3</sub> 150 ppm (0.79cm). Similar effect of growth regulators on fruit width per plant were reported in Chilli by Patil, patel (2010) and Kannan (2009).



**CHAPTER – 5**  
**CONCLUSION**

## **CONCLUSION:-**

The major problem in Chilli production is immature flower and fruit drop, which is caused by physiological and hormonal imbalance in the plants. This can be done by physiological manipulations by spraying of plant growth regulators which reduces the flower drop. So the present investigation is done to find out the effect of growth regulators. The plant spray with GA<sub>3</sub> and NAA increased the number of fruits per plant, plant height over the control. NAA 40ppm and NAA 30ppm is consider to be optimum concentration in terms of plant height (55.5), number of fruits (65 fruits) and fruit width (0.83cm) and followed by NAA 30ppm in terms of plant height (49.7cm), number of branches (6 branches), days to flowering (35 days), number of fruits (59 fruits) and fruit width (0.82cm). Increase in yield of chilli due to application of NAA may be attributed to enhanced photosynthetic activity and increased production and accumulation of carbohydrates and favourable effect on vegetative growth and retention of flowers and fruits which increased number of fruits per plant besides increase in size.

**CHAPTER – 6**  
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