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Effect of Naphthalene Acetic Acid (NAA) on Blossom Drop in Chili (*Capsicum frutescens*)

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Abstract: Chili (*Capsicum frutescens*) is a significant cash crop in Bangladesh. It is very popular spices and the demand of chili is increasing day by day. To investigate the influence of Naphthalene Acetic Acid (NAA) on bloom drops in Chili cv. BARI Morich-3 from November 2020 to April 2021. These types demonstrated the optimal dosages of NAA as a foliar spray in reducing blossom drop with the application of five different concentrations of NAA at 0, 10, 20, 30, and 40 ppm, respectively. It was determined that 10ppm NAA performed the best, and it takes the fewest days (43.33) to first flowering, the fewest days (50) to 50% blooming, the fewest days (48.44) to first fruiting, and the fewest days (60.11) to 50% fruiting. It also reduces the number of bud drops (12.39), flowers drops (13.89), fruits drops (12.11), and increases the number of fruits plant-1 (41.61) and fruit plant-1 weight (70.94) when followed by 20 ppm, 30 ppm, 40 ppm, and 0 ppm NAA. For the parameter plant height 10ppm NAA was found to be optimum. The highest average plant height (72.61cm) was observed from 20ppm NAA. This result defines that NAA @10ppm is very beneficial for reducing blossom drop and increasing the growth and yield of chili.

Keywords: Naphthalene Acetic Acid; Pepper; Flower drop; BARI Morich-3.

INTRODUCTION

Chili (*Capsicum frutescens*) is one of the most important commercial vegetable and spices crop in the world (Reddy *et al*., 2002). It belongs to the genus *Capsicum* under the family Solanaceae. *Capsicum frutescens* is annual or a short-lived perennial. Although it is a self-pollinated crop, cross pollination may occur in a small percentage of cases (Rashid & Singh, 2000). For its smell, taste, flavor, and pungency, it is one of the most valued vegetable cum spice crops. It is distributed all over the world in tropical and subtropical climates (Bundela, 2016). Deep, loamy, fertile soil rich in organic matter and temperatures ranging from 18°C to 30°C are suggested for optimal growth. Well-drained soils with enough soil moisture are also essential for crop development (Faridah *et al*., 2023). It is one of the most important spice crops in Bangladesh, consumed daily by one-third of the world's population, and widely utilized in tropical regions. (Takeda *et al*., 2008). It is available in three forms: green, dried, and powdered. Green chilies are rich in vitamin A and vitamin C, carbohydrate, vitamin B6, thiamine, carotene, niacin and riboflavin (Saimbhi *et al.*, 1977). Bangladesh, chili is largely distributed in the district of Cumilla, Bogura, Rangpur, Faridpur, Jashore, Chittagong, Noakhali and Mymensingh. The area under cultivation and commercial cultivation of chili is expanding on a daily basis.

Chili genotypes may be found in abundance in Bangladesh, and the production of these genotypes is impacted by a number of variables, including crop genetic yield potential as well as environmental circumstances and growing techniques. Chili was planted on 1,96,768.37 acres of land in Bangladesh, with a total production of around 3,93,555.62 metric tons in the rabi season of 2020-2021, with an average production rate of 2,000.10 kg/acre. Bangladesh has a large variety of chili genotypes, and the production of such genotypes is influenced by a number of factors, including crop genetic potential for yield as well as environmental conditions and growing methods (Rylski, 1973). Blossom drop occurs when buds, flowers and

immature fruits drop from the plant. A few flower drop off are natural while a lot of falling off is concerned with many factors. These factors usually related to some of stresses, can cause chili plant to drop their blooms. The stress may be either environmental, nutritional or a combination of two (Lamichhane *et al.*, 2017).

Different parameters like temperature, humidity, rainfall, poor pollination, lack of nitrogen, excess application of fertilizer, cloudy days etc. The optimum temperature is 21℃ – 28℃ at day time and 16℃ – 24℃ at night time, the ideal range for better growth and development of chili (Arin, 2019). Chili has a high incidence of bloom drop in general. More than 60% of the blooms produced by a chili plant are lost (Vijayaraghavan, 2014). Farmers in Bangladesh are dealing with this issue, particularly while growing winter chilies on char land. By minimizing flower drops and boosting fruit set, there is a great deal of room to enhance chili production (Sridhar *et al.*, 2009). However, by selecting for breeding lines that keep a high proportion of flowers or by adopting physiological treatments such as spraying growth regulators on plants to minimize flower drop, production may be considerably increased. Plant growth regulators such as naphthalene acetic acid influence rooting, flowering, fruit development and fruiting, leaf or fruit abscission, control of certain metabolic processes, senescence, and plant resilience to temperature or water stress (Pargi et al., 2014). They have been shown to enhance the source-sink relation and speed up photo assimilate translocation, leading in increased flower and fruit retention (Anolisa *et al*., 2020).

Plant growth regulators have been proven to be helpful in minimizing flower and fruit drops in solanaceous fruit and vegetable crops, resulting in increased chili production unit^{-1} area and unit^{-1} time, according to research. Natural or synthetic plant growth regulators (PGRs) are biological compounds that influence the physiological processes of plants at a location other than their place of synthesis and are found in minute level (Bisht *et al.*, 2018).PGRs offer a lot of potential for crop growth, development, and yield in specific doses. NAA and Cytokinin are both of the most promising and also widely employed in fruit. Due to NAA treatment, control of blooming, improvement of growth, and production are all well-documented effect. Actual foliar spray application of NAA to reduce blossom (bud, flower, fruit) drop in chili (Bhai & Singh, 1998). In light of the above, the purpose of this study was to discover the most suitable concentration of NAA application for improved development and maximum yield of chili.

MATERIALS AND METHODS

Experimental site

The field experiment was place in the Bangladesh Agricultural Research Institute at Joydebpur, Gazipur, from November 2020 to April 2021. The site is located in the area of BARI's Regional Spices Research Centre (SRC), some 37 kilometers north of Dhaka, at Latitude 24 51N, Longitude 89 22E, and an elevation of 23 meters above sea level.

Soil and climatic condition

Experimental sites were situated in the tropical monsoon climatic zone, where temperature ranging from 16℃ - 29℃. The soil in the experiment field had a sandy clay loam texture and a pH of (6.0). It is mostly warm every month with both a wet or dry season.

Plant Materials

The study comprised one chili cultivar (BARI Morich-3) obtained from the Bangladesh Agricultural Research Institute in Joydebpur, Gazipur. Transplanted seedlings were sown directly in the field after 35-40 days of germination in the seedbed.

Treatment of the experiment

Five different concentrations of NAA (Naphthalene Acetic Acid) were used on the experiment that D_1: Control, D_2: 10ppm, D_3: 20ppm, D_4: 30ppm and D_5: 40ppm

Experimental design

The experiment was set up with two components and three replications using a Randomized Complete Block Design (RCBD). In a specific place, three blocks were constructed. There were 15 plots in each block and total 45 plots in three blocks. Each plot was 3.0m×1.0m in size and could accommodate 8 plants with a 50cm×50cm row and plant spacing. Plot to plot distance was 60cm.

Transplanting

On November 22, 2020, healthy seedlings 35-40 days old were put into the field experiments in the afternoon. Immediately after transplanting the seedlings were properly watered.

Fertilizer application

Cowdung (5t/ha), N (100kg/ha), P (52kg/ha), K (100kg/ha), and S (22kg/ha) were applied to the plots. At the time of final land preparation, the entire quantity of cowdung, P, S, and 1/3 K will be applied. N and the remaining K were administered in three equal parts 30 days, 50 days, and 70 days after transplantation.

Intercultural operation

After the seedlings were transferred, more intercultural procedures were performed according to requirements for the growth of the plants and development. To remedy the lack of water, each seedling received a little watering. Depending on the soil's moisture level and the needs of the plants, the crop was watered as needed. Healthy seedlings from the same cultivar were used to fill up any gaps left by initially planted seedlings that did not survive. Weeding was carried out 30, 50, and 80 days following transplantation. To maintain the plots free of weeds, allow for simple aeration,

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and preserve soil moisture, three weeding sessions were required. The dirt around each plant's base was ground up once all of the plants had taken root in the allotment. Taking soil from the area between the rows served as the earthing up.

Pest and disease control

To control thrips, Success 2.5SC @1.2ml/L and Vertimec 18EC @1.2ml/L of water were sprayed. Similarly, Tilt 250EC @ 0.5ml/L of water was sprayed over the crop to prevent chili anthracnose.

Harvesting

Depending on the maturity, two harvestings was done. The first harvest of chili was done on 4 April 2021 and the second harvest was done on 22 April 2021. Harvesting was done by hand at the ripening stages.

Data collection

Following variables were collected from the sample plants during the experiment.

Days from transplanting to 1st flowering: The days from the date of transplantation to the first blossoming were recorded by looking at the plant every morning.

Days from transplanting to 50% flowering: The number of days from transplanting to 50% flowering was measured when 50% of the plants in a plot reached the blooming stage.

Days from transplanting to 1st fruiting: Researchers were able to observe the number of days from transplanting to fruiting by checking on the plant every morning.

Days from transplanting to 50% fruiting: The number of days from transplanting to 50% of the plants in a plot yielding fruit was recorded.

Number of bud drop: To prevent buds from falling outside of the net, 16 mesh nylon net was placed over a few selected plants from each treatment. On a daily basis, data on the quantity of fallen buds was gathered.

Number of flower drop: To guarantee that blossoms would fall into the net, 16 mesh nylon net was placed over a few selected plants from each treatment. On a daily basis, data on the quantity of fallen blossoms was gathered.

Number of fruit drop: In order to prevent fruits from falling outside of the net, 16 mesh nylon net was placed over a few chosen plants from each treatment. Fruit dropping data was gathered on a daily basis.

Plant height (cm): The height of randomly selected plants was taken in centimeters from the ground to the highest point of the stem.

Number of fruit plant^{-1}: From five randomly chosen plants from each plot, the total number of fruits was tallied, and an average was determined.

Weight of fruit plant^{-1} (gm): The fresh fruits of five randomly chosen plants, each with eight plants, were weighed at various harvesting times, and the average was used to determine the fruit weight (red chili).

Statistical analysis

The collected data for the study's numerous parameters were statistically analyzed using SPSS software and an Excel data sheet. The mean difference was determined using the Least Significant Difference (LSD) test (5% level of significance) (Gomez & Gomez, 1984).

RESULTS AND DISCUSSION

Days from transplanting to 1st flowering

The chili plant's flowering process is an important component in its ability to expand. Regulators of plant development have a minor impact on the first blooming. According to the study, treatment D_2 (10 ppm NAA) took the fewest days (43.33) to induce first flowering, as compared to D_1 (control), and the other dosages were D_3 (20 ppm NAA), D_4 (30 ppm NAA), and D_5 (40 ppm NAA), correspondingly (Figure 1). It was found that the plant hormone NAA, when present in sufficient light, shortens the time before the first blooming of the chili plant. Sahu *et al.*,(2019) noted that the onset of blooming was about a week sooner when NAA was treated @ 20 ppm.

Days from transplanting to 50% flowering

50% flowering was counted while 50% of the plant acquired flower on a plot after transplanting. According to the experiment's findings, plant growth regulators had an impact on 50% of blooming. The research revealed that treatment D_2 (10ppm NAA) took the shortest number of days (50) to reach 50% flowering, compared to D_1 (control) and the other dosages of D_3 (20ppm NAA), D_4 (30ppm NAA), and D_5 (40ppm NAA), respectively (Figure 1). It showed that plant growth hormone NAA in light quantity lessen the days to 50% flowering in chili. Soe *et al.*, (2019) collected data on the number of days between transplantation and 50% blooming was identical to the results of this experiment.

Days from transplanting to 1st fruiting

The studied variety indicated a significant difference in the days from transplanting to 1st fruiting according to data. First fruiting was quietly influence by plant growth regulators (NAA). According to the study, treatment D_2 (10 ppm NAA) took the least amount of time (48.33 days) to cause the first fruiting, compared to D_1 (control) and the other dosages of D_3 (20 ppm NAA), D_4 (30 ppm NAA), and D_5 (40 ppm NAA), respectively (Figure 1). It revealed that plant growth hormone NAA in small quantity lessen the days to 1st fruiting in chili. The findings was also supported by Acharya, (2004)

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Days from transplanting to 50% fruiting

50% fruiting was counted while 50% of plant acquired fruit on a plot after transplanting. The study found that treatment D_2 (10 ppm NAA) required less time than D_1 (control) and the other dosages of D3 (20 ppm NAA), D_4 (30 ppm NAA), and D_5 (40 ppm NAA) for fruiting (Figure 1). It was discovered that NAA, a plant growth hormone, reduced the number of days needed for 50% of chili's fruits to ripen. Tapdiya *et al.*, (2018) found that foliar spraying NAA (40ppm) during the fruiting bud start stage boosted chili fruiting.

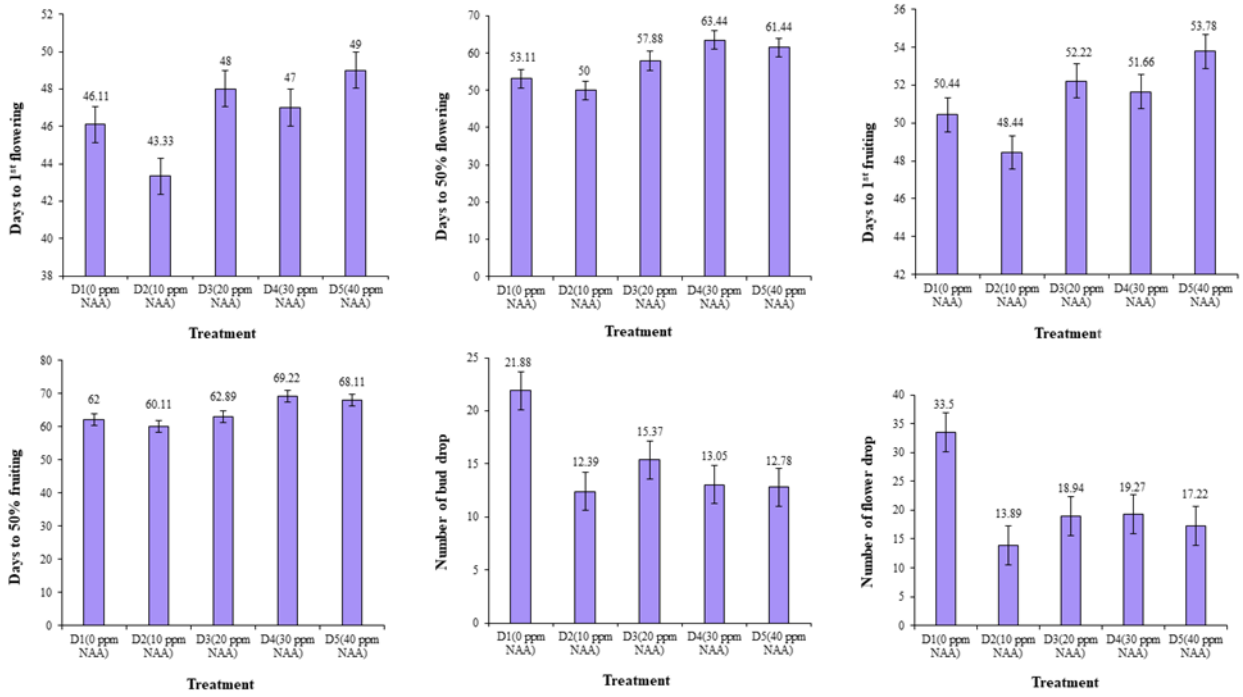

Figure 1. Comparison of 1st flowering, 50% flowering, 1st fruiting, 50% fruiting, bud drop, flower drop, among different doses of NAA in chili.

Number of bud drop

Many plant growth regulators drastically reduced the amount of chili bud drops. According to the data gathered, there was a statistically significant difference between dosages in terms of the amount of chili bud drops in each individual dose. The minimum number of bud drop (12.39) was observed from treatment D_2 (10ppm NAA) over control (D_1) and other doses D_3 (20ppm NAA), D_4 (30ppm NAA) and D_5 (40ppm NAA) respectively (Figure 1). Therefore, maximum number of bud drop observed from D_1 (control).

Number of flower drop

The number of chili flowers that dropped was found to vary significantly depending on the growth regulators' dosage. The lowest number of flower drop (13.89) observed from treatment D_2 (10ppm NAA) over D_1 (control) and other doses D_3 (20ppm NAA), D_4 (30ppm NAA) and D_5 (40ppm NAA) respectively (Figure 1). The maximum number of flower drop observed from D_1 (control). Vijayaraghavan, (2014) discovered that spraying NAA (50ppm) at the start of blooming in chili reduced flower drop compared to the control.

Number of fruit drop

Plant growth regulators had a considerable impact on the amount of chili fruit drops. According to the findings of the current investigation, there was statistically significant variance between the dosages in relation to the individual amount of chili fruit drops. The minimum number of fruit drop (12.11) observed from treatment D_2 (10 ppm NAA) over D_1 (control) and other doses D_3 (20ppm NAA), D_4 (30ppm NAA) and D_5 (40ppm NAA) respectively (Figure 2). Therefore, maximum number of fruit drop observed from (D_5).

Plant height (cm)

Plant height significantly contributes to the chili plant's ability to grow. Plant growth regulators have a considerable impact on plant height. The tallest plant (80.83cm) was acquired from the D_2 (10ppm NAA) treatment, whereas the smallest plant (54.5cm) was produced from the D_1 (control)

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treatment. The maximum average height (72.61cm) found from treatment D_3 (20ppm NAA) the minimum average height (64.44) found from D_1 (control) respectively (Figure 2). It was discovered that plant growth hormone boosted plant height. Ullah *et al.*, (2007) performed an experiment and discovered that applying NAA greatly boosted plant height. Abbasi *et al.*, (2013) conducted an experiment with tomato plants and observed that plants treated with NAA showed positive result and supported the results.

Number of fruit plant^{-1}

Several plant growth regulators resulted in a considerable difference in the amount of chili fruits produced plant^{-1}. The D_2 (10ppm NAA) treatment produced the most fruits (41.61) plant^{-1}, whereas the D_5 (40ppm NAA) treatment produced the fewest (20.89) (Figure 2). Plants treated with plant growth regulators (NAA) produced the most fruit when compared to controls. Tapdiya *et al.*, (2018) discovered that using growth regulators, specifically NAA foliar spray, during the flower bud initiation stage was beneficial for increasing the number of fruits produced plant^{-1}. Gurjar *et al.*, (2018) found a substantial NAA response in relation to plant fruit production.

Weight of fruit plant^{-1} (gm)

Fruit weight is the most important success in crop production. Nutrients are the most important factor in attaining the optimum chili fruit weight. The major goal of growing crop is to have the most and highest quality fruit weight. In the current investigation, it was discovered that there was statistically significant variance across different dosages in terms of the weight of each individual fruit plant^{-1}. The average maximum weight of each individual fruit plant^{-1} (70.94g) was found from D_2 (10ppm NAA) treatment while the average minimum weight plant^{-1} (44.05g) was recorded from D_1 (control) respectively (Figure 2). It revealed that plant growth hormone NAA promote weight of fruit in chili. According to Tapdiya *et al.*, (2018), higher average fruit weight in chili was revealed to be a benefit of growth regulators, which is NAA foliar spray during flower bud initiation stage. Chaudhary *et al.*, (2006) found that adding NAA greatly boosted the weight of chili's fruit. Sharmin, (2018) conducted a pot experiment at BARI, Joydebpur, during the rabi season of 2004-2005, to find out the influence of three growth regulators on chili yield and seed quality. The greatest fruit weight plant^{-1} on chili was dramatically increased after treatment with NAA.

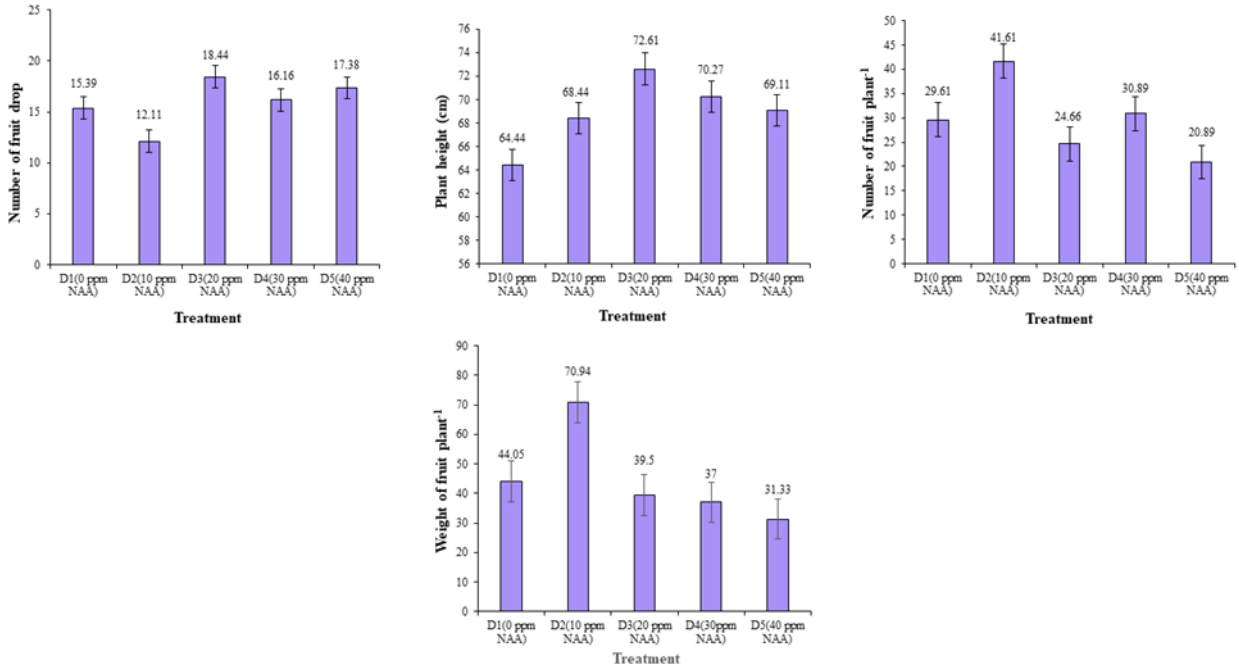

Figure 2. Comparison of fruit drop, plant height, weight of fruit plant^{-1}, number of fruit plant^{-1}, among different doses of NAA in chili

CONCLUSION

The investigated NAA concentrations, particularly the 10 ppm dose, are ideal for reducing blossom drop and boosting plant height, fruit weight plant^{-1} and number of fruits plant^{-1}. It increases the yield of chili with the higher output attributed to proper plant growth, management of the abscission layer in full bloom and acceleration of full development by beneficial hormonal effects. To compare the effect of foliar NAA treatment, data on blossom drop, growth, and yield contributing characteristics were recorded and averaged. The tallest plant (72.61cm) was observed from 20ppm NAA. Most of the cases, yield was not depended on plant height. Therefore, by implementing this treatment, this would

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enhance the productivity of chili and thus make a great impact on the economy of Bangladesh.

REFERENCES

Abbasi, N., Zafar, L., Khan, H. A., and Qureshi, A. A. (2013). Effects of naphthalene acetic acid and calcium chloride application on nutrient uptake, growth, yield and post harvest performance of tomato fruit. *Pakistan Journal of Botany*, *45*(5), 1581–1587.

Acharya, U. K. (2004). *Effect of Plant Growth Regulators on Spring-Summer Season Okra Productivity Under Chitwan Condition of Nepal*. Institute of Agriculture and Animal Science, Tribhuvan University Chitwan, Nepal.

Anolisa, M. A.-I., Hossen, R., Islam, A. T. M. R., and Das, S. K. (2020). Effect of plant growth regulators on growth and yield of chili (Capsicum annuum L.). *Journal of Phytology*, *12*, 117–120.

Arin, S. (2019). Scenario of chili production and hindrances faced by the growers of Sindh province of Pakistan. *Modern Concepts and Developments in Agronomy*, *4*(3), 436–442.

Bhai, K. L., and Singh, A. K. (1998). Effect of different levels of phosphorus, GA3 and picking on seed production of okra (Abelmoschus esculentus L. Moench). *Indian J. Sci*, *38*(3–4), 119–122.

Bisht, T. S., Rawat, L., Chakraborty, B., and Yadav, V. (2018). *A Recent Advances in Use of Plant Growth Regulators (PGRs) in Fruit Crops-A Review*.

Bundela, M. K. (2016). Selection Parameters and Genetic Divergence Analysis in Chili (Capsicum annuum L. var. acuminatum Fingerh.). *Horticulture (Vegetable Science)*.

Chaudhary, B. R., Sharma, M. D., Shakya, S. M., and Gautam, D. M. (2006). Effect of plant growth regulators on growth, yield and quality of chili (Capsicum annuum L.) at Rampur, Chitwan. *Journal of the Institute of Agriculture and Animal Science*, *27*, 65–68.

Faridah, S. N., Waris, A., Mubarak, H., and Rahmi, R. (2023). Soil moisture-based furrow irrigation scheduling on chili pepper plant. *AIP Conference Proceedings*, *2596*(1).

Gomez, K. A., & Gomez, A. A. (1984). *Statistical procedures for agricultural research*. John wiley & sons.

Gurjar, J. S., Banafar, R. N. S., Gupta, N. K., Gurjar, P. K. S., and Singh, L. (2018). Effect of NAA, GA3 on growth and yield of tomato varieties. *Journal of Pharmacognosy and Phytochemistry*, *7*(5), 3157–3160.

Lamichhane, J. R., Dürr, C., Schwanck, A. A., Robin, M.-H., Sarthou, J.-P., Cellier, V., Messéan, A., and Aubertot, J.-N. (2017). Integrated management of damping-off diseases. A review. *Agronomy for Sustainable Development*, *37*, 1–25.

Pargi, S. C., Lal, E. P., Singh, N., and Biswas, T. K. (2014). Effect of Naphthalene Acetic Acid on biochemical parameters, growth and yield of tomato (LycopersiconesculentusL. Mill). *IOSR Journal of Agriculture and Veterinary Science*, *7*(7), 16–18.

Rashid, M. A., and Singh, D. P. (2000). *A manual on vegetable seed production in Bangladesh*. AVRDC-USAID-Bangladesh Project, Horticulture Research Centre, Bangladesh ….

Reddy, K. M., Deshpande, A. A., and Sadashiva, A. T. (2002). Cytoplasmic genetic male sterility in chili (Capsicum annuum L.). *Indian Journal of Genetics and Plant Breeding*, *62*(04 SE-Research Article), 363–364. https://doi.org/.

Rylski, I. (1973). Effect of Night Temperature on Shape and Size of Sweet Pepper (Capsicum annuum L.) 1. *Journal of the American Society for Horticultural Science*, *98*(2), 149–152.

Sahu, S., Kumar, V., and Sharma, H. G. (2019). Effect of plant growth regulators on growth and yield of chili: A review. *Journal of Pharmacognosy and Phytochemistry*, *8*(6), 2122–2132.

Saimbhi, M. S., Kaur, G., and Nandpuri, K. S. (1977). Chemical constituents in mature green and red fruits of some varieties of chili (Capsicum annuum L.). *Qualitas Plantarum*, *27*(2), 171–175. https://doi.org/10.1007/BF01092357

Sharmin, I. (2018). *Growth and yield of chili as influenced by plant growth regulators and its method of application*. Department of horticulture, Sher-e-Bangla Agricultural University, Dhaka-1207.

Soe, I., Tamu, A., d Asante, M., Nyadanu, D., and Akromah, R. (2019). Genetic diversity analyses of rice germplasm using morphological traits. *Journal of Plant Breeding and Crop Science*, *11*(4), 128–136.

Sridhar, G., Koti, R. V, Chetti, M. B., and Hiremath, S. M. (2009). Effect of naphthalene acetic acid and mepiquat chloride on physiological components of yield in bell pepper (Capsicum annuum L.). *Journal of Agricultural Research (03681157)*, *47*(1).

Takeda, J., De Silva, S., Muthuraman, P., Rahman, S. M., and Kawet, L. (2008). Spices in Sri Lanka, India and Bangladesh with special reference to the usages and consumptions. *Agri Bull*, *93*, 1–25.

Tapdiya, G. H., Gawande, P. P., Ulemale, P. H., Patil, R. K., and Naware, M. S. (2018). Effect of growth regulators on quantitative characters of chili (Capsicum annuum L.). *Int. J. Curr. Microbiol. App. Sci*, *6*, 2151–2157.

Ullah, M. J., Fattah, Q. A., and Hossain, F. (2007). Response of growth, yield attributes and yield to the application of KNap and NAA in cowpea (Vigna unguiculata (L.) Walp.). *Bangladesh Journal of Botany*, *36*(2), 127–132.

Vijayaraghavan, H. (2014). Impact of plant growth regulators and formulations on growth of chili (Capsicum annuum L.). *Plant Gene and Trait*, *5*(8).