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EFFECT OF PLANT GROWTH REGULATORS ON FRUIT-SET, GROWTH AND DEVELOPMENT OF BRINJAL

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ABSTRACT

Mahmood S, Uddin MK, Rashid AKMB (2016) Effect of plant growth regulators on fruit-set, growth and development of brinjal. *Int. J. Sustain. Crop Prod.* 11(2), 4-6.

Plant growth regulators: β-NOA (60 ppm), NOA (60 ppm) + BA (30 ppm), and BA (30 ppm), were applied to emasculated flowers at anthesis to set parthenocarpic fruit of brinjal cv. Kajla, while fruit set was achieved by natural pollination in control treatment. The application of NOA alone and combined with BA effectively promoted parthenocarpic brinjal but BA alone failed to set parthenocarpic fruit. Fruits set by NOA or NOA + BA had a higher mean weight than naturally pollinated fruit due to increased fruit length and diameter, but percentage of dry matter of parthenocarpic fruit was lower than that of naturally pollinated fruit. Plant growth regulators did not affect the length of the calyx or the peduncle.

Key words: *plant growth regulators, fruit-set, growth, development, brinjal*

INTRODUCTION

Brinjal (*Solanum melongena* L.) is a popular vegetable crop of Solanaceae family. It is believed to have originated in the Indo-Burma region (Vavilov 1931). Fruits of brinjal have a great nutritive potential due to the presence of ascorbic acid and phenolics, both of which are powerful antioxidants (Vinson *et al.* 1998). In Bangladesh, the total area under brinjal cultivation is 48 thousand ha with a production of 348 thousand tons, and it took 2nd place after potato in the top-10 list in terms of vegetable production in 2009 (BBS 2010). Brinjal likes hot climates (Romano and Leonardi, 1994) and requires relatively high temperatures for growth and development compared with other Solanaceous crops, e.g., tomato (*Solanum lycopersicon* L.) and pepper (*Capsicum annum* L.). Brinjal is self-pollinated vegetable crop and fruit-set occurs normally during the summer, but during the winter season fruit-set and development is hampered because of reduced style length as well as poor germination of pollen (Nothmann and Koller, 1975). So, in winter, plant growth regulators (PGR) can be used to set parthenocarpic fruit in brinjal (Olympios 1976; Kowalska 2006). As the parthenocarpic brinjal have no seeds so they will be appreciated much by consumers because the seeds are harden and impart a bitter taste. So far, information on the effect of PGR on fruit-set and its role on the morphological and physiological characteristics of eggplant fruit during growth and development is meager. Therefore, the aim of this work was to examine the effect of PGRs on fruit-set and morphological changes during the growth and development of brinjal.

MATERIALS AND METHODS

The experiment was conducted with Brinjal cv. Kajla in the farmer's field of Jaldhaka, Nilphamari from November 2015 to February 2016.

The fruit of this cultivar is long, cylindrical and the seeds were obtained from Lal Teer Seeds Pvt. Ltd., Bangladesh. Seeds of brinjal were sown in a well prepared seedbed (3 m × 1 m). Thirty days old seedlings were transplanted in the main field. The size of the each experimental plot was 4.05 m^2 and, plot to plot and block to block distances was 60 and 75 cm, respectively. In each experimental plot, there were 4 rows and each plot consisted 12 plants. Crop husbandry and crop protection measures were taken according to Bangladesh Agricultural Research Institute (BARI) recommendation.

Two plant growth regulators either singly or mixture: β-NOA (60 ppm), NOA (60 ppm) with BA (30 ppm), and BA (30 ppm) were applied to set parthenocarpic eggplant fruits, while naturally pollinated fruits formed the control. The experiment was arranged in the randomized complete block design with four replications.

To obtain parthenocarpic fruits, anthers were emasculated approximately 24 h before anthesis to prevent self-pollination, and flowers were then sprayed with the PGR to ensure fruit set. After applying PGR, individual flower was tagged and in the absence of hormone application the fruits were considered as naturally pollinated fruit. Application of PGR was performed in the morning between 8 to 9 am.

After fruit-set, the diameter and length of the individual fruit were recorded at 5, 10 and 15 days after anthesis (DAA), and also at harvest. The fruits were harvested at their harvest maturity stage when those were dark in color and soft in texture. Fruits were harvested at 21 DAA and then the individual fruit weight, length of peduncle and length of calyx were recorded.

One factor analysis of variance (ANOVA) was conducted for all variables using the Statgraphics Plus Version 2.1 statistical program (STSC Inc. 1987). The means were compared using Fisher's Least Significant Difference (LSD), while the Student t-test was used to compare pairs of means.

RESULTS AND DISCUSSION

In the present study, the application of BA (30 ppm) alone failed to set brinjal fruit, therefore, the results discussed here only to treatments with NOA (60 ppm), NOA (60 ppm) BA (30 ppm), and the control.

Length and diameter of fruit

The length and diameter of brinjal fruit were recorded at different DAA. Both the length and diameter of fruit increased with time and did not differ significantly ($P \leq 0.05$) at different DAA by the application of plant growth regulators (Fig. 1). However, at 5 DAA the length of NOA-induced fruits was higher than those of NOA + BA and naturally pollinated fruit and this difference continued until harvest (Fig. 1). On the other hand, although the diameter of fruits was similar at 5 DAA but from 10 DAA up to harvest the diameter of PGR treated fruits were higher than the naturally pollinated fruit, but not to a statistically significant level ($P \leq 0.05$). At harvest, the maximum length and diameter of fruit was recorded from the NOA-induced fruit (24.07 cm and 4.74 cm) followed by NOA + BA treatment fruit (21.85 cm and 4.61 cm) and naturally pollinated fruit (18.44 cm and 4.12 cm). From the results, it is observed that the pattern of development of naturally pollinated and PGR treated fruit was similar, but the PGR treated fruits showed faster growth than the naturally pollinated fruit. The present results support the findings of Nakansha (2000) who also observed that the application of auxin increased the size of fruit in eggplant.

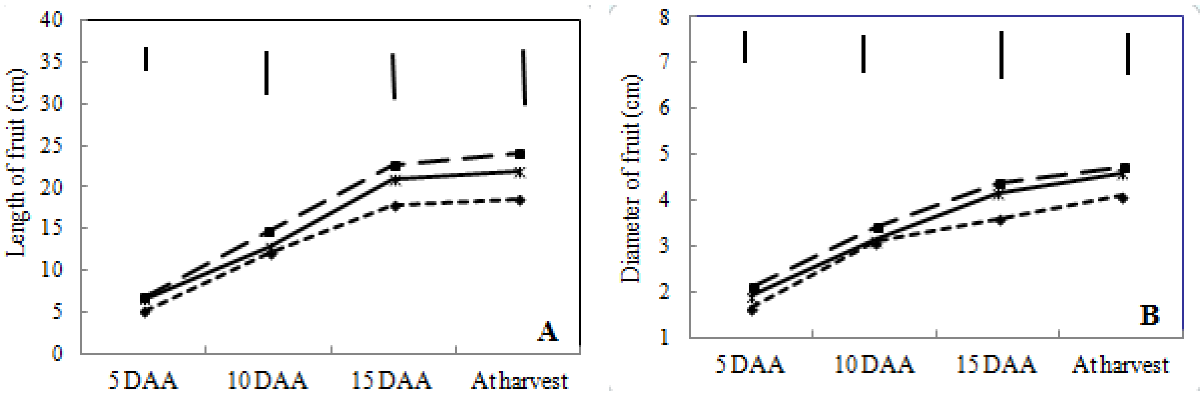

Fig. 1. Length (A) and diameter (B) of fruit of brinjal cv. Kajla at 5, 10, 15 DAA and at harvest as influenced by natural pollination (···♦···), 60 ppm NOA (--■--) and 60 ppm NOA + 30 ppm BA (—✳—). Vertical bars indicate LSD value according to Fisher's least significant difference test ($P \leq 0.05$).

Individual fruit weight

The weight of individual fruit was measured at harvest and PGRs were found to have a significant effect on fruit weight. The highest mean fruit weight of Kajla was 241.45 g in NOA-induced fruit, whereas the lowest mean fruit weight was 180.61 g found in naturally pollinated fruit. However, the difference between NOA alone or NOA mixture with BA was not statistically significant ($P \leq 0.05$) (Table 1) The highest fruit weight might be from the synergistic effect of NOA on fruit growth and development by securing maximum length and diameter compared with the other treatments. Earlier, Olympios (1976) also indicated that exogenous application of NOA increased the fruit weight in eggplant. It was also observed that BA reduced the effect of NOA when those applied in mix-formulation, possibly presence of BA reduced the effect of NOA on cell expansion.

Table 1. Length of calyx (cm), length of peduncle (cm), mean fruit weight (g) and percentage dry matter as influenced by natural pollination, 60 ppm NOA and 60 ppm NOA + 30 ppm BA

Treatments	Length of calyx (cm)	Length of peduncle (cm)	Mean fruit weight (g)	% dry matter
Control	3.0	7.51 a	180.61 b	9.35 a
NOA	3.48 a	8.39 a	241.45 a	8.27 b
NOA + BA	3.59 a	8.16 a	217.86 a	8.39 b
Lsd $_{(0.05)}$	0.27	0.90	22.37	0.19

Length of peduncle and calyx

The peduncle length of fruit of brinjal was recorded at harvest. Although the length of peduncle of plant growth regulators treated fruit was higher than the naturally pollinated fruit but did not vary significantly ($P \leq 0.05$) (Table 1). But Owen and Aung (1990) observed that the application of gibberellic acid (GA) elongated the length of peduncle in tomato. Species as well as plant growth regulators differences might be responsible for this variation. The calyx length of naturally pollinated fruit, NOA alone and combined with BA was 7.51 cm, 8.39 cm and 8.16 cm, respectively. From the results, it is revealed that although the application of PGR increased the length of calyx of brinjal fruit but this effect was statistically insignificant.

Percentage (%) dry matter

The dry matter content of fruits of brinjal cv. Kajla was calculated at harvest. The results presented in Table 1 shows that the naturally pollinated fruit accumulated significantly higher ($P \leq 0.05$) percentage dry matter than the fruit obtained from PGRs treatment (NOA and mixture of NOA and BA). However, no difference in the percentage dry matter accumulation was observed between the PGR treatments. The results from the present study showed that the application of NOA alone or in a mixture with BA caused a reduction in the percentage dry matter content of brinjal fruit. Similarly, Picken and Grimmett (1986) and Al-Madhagi *et al.* (2011) reported earlier that application of exogenous auxin reduces the dry matter content of tomato and strawberry, respectively.

CONCLUSION

The application of β-NOA alone and mixed with BA to emasculated flower at the time of anthesis is beneficial for obtaining parthenocarpic brinjal fruit, but BA alone was failed for this purpose. The length and diameter of parthenocarpic fruit was higher than that of naturally pollinated fruit, which ultimately increased the mean weight fruit, thus enhanced potential yield and marketability; however, growth regulators reduced the percentage of fruit dry matter. No significant differences were observed in the length of calyx and peduncle of fruit between parthenocarpic and naturally pollinated seeded fruit. The parthenocarpic brinjal has no seeds so this fruit will be appreciated much more by the consumers. Further experiment is needed for selection of appropriate PGR at optimum concentration to set parthenocarpic fruit in different cultivars of brinjal.

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