

Original Research Article

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Effect of GA₃ and NAA on yield of Bottle Gourd (*Lagenaria siceraria*)cv (MGH-4)

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ABSTRACT

An experiment entitled "Effect of GA₃ and NAA on yield of Bottle Gourd (*Lagenaria siceraria*) cv (MGH-4)" was conducted at Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during year 2019 on bottle gourd cv. warad (MGH-4) with two growth regulators having concentration NAA (30, 40, 50, 60, 70 & 80 ppm) and GA₃ (30, 40, 50, 60 & 70 ppm). Water was used as a control. All the treatments were replicated three times in a randomized block design keeping plot size of 2m x 2m. The seed sowing was done on 30 March, 2019 maintaining a planting distance of 2x1m. The application of plant growth regulators significantly affects the vegetative as well as reproductive attributes of the crop. The growth regulators were sprayed at two leaf stage and four leaf stages. Application of 40 ppm gibberellin at 2, 4 leaf stage was found most effective in terms of number of female flowers per vine (17.08), fruit per plant (12.25), fruit yield per plant (14.61 kg), fruit yield per hectare (58.45 t/h) respectively among all the different treatments.

Keywords

Bottle gourd,
PGR, Yield

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Introduction

Bottle gourd (*Lagenaria siceraria* L. $2n = 2x = 22$) commonly known as *lauki*, *kadu*, *ghiya* or *doodhi* is grown extensively in India, might have originated in Tropical Africa. It is a vegetable with a good source of carbohydrates, vitamin A, vitamin C and minerals (7). Total area under vegetable in India during 2018-19 was 10436 thousand

hectare and the production was 187474 thousand metric tons. The total area of cultivation under vegetables in Uttar Pradesh is 1479.42 thousand hectare and the production was 28621.67 thousand metric tons. The bottle gourd was cultivated over 185 thousand hectare area and the total production was 3072 thousand metric tons (12). Efficient use of nitrogen plays a major role in successful crop production. Nitrogen is an

important determinant in growth and development of plants and has a major role in chlorophyll, protein, nucleic acid, hormones and vitamin synthesis and also helps in cell division, cell elongation (18). Plant growth regulators (PGR's) are organic compounds, other than nutrients that modify the plant physiological processes. Use of PGRs and micronutrients like boron could be a useful alternative for increasing crop production. GA₃ and NAA are important growth regulators that can modify growth, sex ratio and yield-contributing characters in a plant (14). Plant hormones are also known as phytohormones. Thimann in 1948 coined the term "Phytohormone". The five major plant hormones are auxins, gibberellins, cytokinins, abscisic acid, and ethylene(13). 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 sex (17). Due to high rise in the prices of chemical fertilizers and also to maintain the ecosystem of soil, it has become necessary to use eco-friendly PGRs like gibberellic acid, naphthalene acetic acid and salicylic acid. Foliar spray of PGRs has been recommended by various workers to control germination and growth (9). There are four types of gibberellins but gibberellic acid, GA₃ is best known. It promotes growth, cell elongation, cambial activity, stimulates nucleic acid and protein synthesis, seed germination and helps in breaking dormancy, fruit set and leaf expansion (6). Gibberellins are the most powerful growth promoters because they increase internodes spacing, induce and promote flowering in many plants and modify the flower sex expression in some plants (5). NAA is an important plant growth regulator, which stimulates cell division, cell elongation and cell enlargement in apical region of plant resulted in better plant growth of bottlegourd (8). NAA is used in chemical thinning and prevention of fruit drop or induction of

flowering, increase fruit setting, size and thus increasing yield. NAA interacts at the gene level by synthesizing enzymes required for the synthesis of cell wall and cytoplasmic components. NAA initiates uniform flowering. In cucumber the application of NAA produced the largest fruits the highest flesh (4). The physiological activity of vegetable crops regulates and after the application of growth regulator finally enhances the vegetable production. The present study was planned with use of different plant growth regulators and their application (15).

Materials and Methods

The present investigation on "Effect of GA₃ and NAA on yield of Bottle Gourd (*Lagenaria siceraria*) cv (MGH-4)" was conducted at Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj. Allahabad is situated in the eastern part of U. P. and lies in the center of North Gangetic alluvial plains, on the left side of river the Yamuna and comes under sub-tropical zones.

The average rainfall in this area is about 1100 mm per annum. Most of which generally occur during winter season. During the period of experiment, the meteorological observations were recorded during entire growth period of the crop, comprising maximum and minimum temperature, rainfall, relative humidity from the month of March to August 2019. The treatments involving plant growth regulators viz. gibberellic acid (30, 40, 50, 60 and 70 ppm) and naphthalene acetic acid (30, 40, 50, 60, 70 and 80 ppm) were imposed at 2, 4 days after sowing (DAS) in variety (Warad) of Bottle guard. The salient features of plant growth regulators used in the experiment.

Results and Discussion

The experimental results of the present investigation entitled "Effect of Plant growth regulators yield of Bottle guard (*Lagenaria siceraria* (Molina) stand) has been conducted at Horticulture Research Farm, Sam Higginbottom University of Agriculture, technology and Science, Prayagraj during the period from March to August 2019.

Number of female flowers per vine

The number of female flowers per vine data was shown in table 1. Analysis of number of female flower per vine data shows the significant results. The maximum number of female flower per vine recorded in T₉ GA₃ 40 ppm was 17.08 followed by T₇ NAA 80 ppm was 14.5 and both treatments were superior to control was 8.0. Experiment three concentrations each of GA₃, NAA, Ethrel, MH and CCC were applied at the 2-leaf and 4-leaf stages on bitter gourd (*Momordica chrantia* Linn.) cv. Priya. Its application was found to be the most effective in enhancing the number of branches per vine, number of pistillate flowers, fruit length, fruit diameter and number of fruits per vine and ultimately produced the highest fruit yield(3).

Number of fruit per plant

The data of number of fruit per plant shown in table 1 analysis of number of fruit per plant data shows the significant result. The maximum number of fruit per plant was recorded in T₇ NAA 80 ppm (12.25) followed by T₉ GA₃ 40 ppm (11.42) and minimum number of fruit was observed in T₁ control (6.08). The highest mature fruit yield per vine and per plot by spraying NAA at 50 ppm, which was higher (108%) than control. The highest number of fruits/vine in cucumber (6.2-7.2) and bottle gourd (15.4-18.7) was obtained with ethephon at 50 and 100 ppm

respectively, and in watermelon (3.0-3.4) with MH at 50 ppm (10).

Fruit yield per plant

The data of total fruit yield per plant shown in table 1. Analysis of total fruit yield per plant data shows the significant results. The maximum total fruit yield per plant was recorded in T₉ GA₃ 40 ppm (14.61 kg) followed by T₇ NAA 80 ppm (10.62 kg) as compare to T₁ control (4.21 kg). Similar result was found, Plants sprayed with GA₃ at 25 ppm or MH at 50 ppm produced the best yields (5.48 and 4.86 kg/plant, respectively) (1).

Fruit yield per hectare (t/ha)

The data of total fruit yield per hectare (t/ha) shown in Table 1. Total fruit yield per hectare varies from 16.85 t/ha to 58.45 t/ha. Analysis of total yields per hectare data shows the significant results. Maximum fruit yield recorded in T₉ GA₃ 40 ppm (58.45 t/ha) followed by T₇ NAA 80 ppm (42.49 t/ha) as compare to T₁ control (16.85 t/ha). Application of growth regulators like GA₃ (25 or 50 ppm), ethrel (Ethephon) (250 or 500 ppm) and NAA (50 or 100 ppm) in bitter gourd cv. Coimbatore long (green)(11). Among the growth regulators, NAA at 50 ppm was found to be most effective for fruit yield (18.16 t/ha). Similar result was obtained by (16) found in his studies with the cultivar Pusa summer Prolific Long the plants were treated with several growth regulators, some were applied at the 2- and 4-true leaf stages and some 35 and 45 days after sowing. Data are tabulated on growth, flowering and yields. The highest average yields were obtained with GA₃ at 50 ppm (316.8 q/ha) and with Atonik (Nitrophenolate - sodium + nitroguaincol - sodium) at 0.1% (316.2 q/ha). The control yield was 116.7 q/ha.

Table.1 Effect of plant growth regulators on yield of Bottle Gourd (*Lagenaria siceraria*) cv (MGH-4)

Treatment	Treatment combination	Number of female flowers per vine	Fruit per plant	Fruit yield per plant (kg)	Fruit yield per hectares (t/ha)
T ₁	Control	8.000	6.083	4.213	16.847
T ₂	NAA 30 ppm	11.250	9.083	6.907	27.627
T ₃	NAA 40 ppm	12.750	9.833	8.670	34.687
T ₄	NAA 50 ppm	10.917	8.250	5.537	22.140
T ₅	NAA 60 ppm	12.000	9.583	7.713	30.867
T ₆	NAA 70 ppm	10.833	6.250	5.107	20.427
T ₇	NAA 80 ppm	14.500	12.250	10.623	42.487
T ₈	Gibberellin 30 ppm	11.333	6.083	5.433	21.733
T ₉	Gibberellin 40 ppm	17.083	11.417	14.610	58.447
T ₁₀	Gibberellin 50 ppm	11.917	6.250	5.900	23.600
T ₁₁	Gibberellin 60 ppm	10.583	8.583	7.307	29.220
T ₁₂	Gibberellin 70 ppm	9.250	7.833	6.610	26.430

Based on the results on the present investigation entitled “Effect of plant growth regulators on yield of Bottle Gourd (*Lagenaria siceraria*) cv (MGH-4)” this is concluded from the investigation that the treatment T₉, i.e. application of 40 ppm gibberellin at 2, 4 leaf stage was found superior in terms of number of female flowers per vine (17.08), fruit per plant (12.25), fruit yield per plant (14.61 kg), fruit yield per hectare (58.45 t/h), among all the different treatments.

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