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Gibberellic Acid and Genetic Dwarfism in Dwarf French Bean (*Phaseolus vulgaris*)

KEYWORDS: Cell division, elongation, increase, growth, development, upper internode, leaves, plant height.

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ABSTRACT *The present experiment was carried out to study the effects of exogenous gibberellic acid on growth and development of dwarf French bean plants. The observation was made on treated as well as on the untreated (control) plants. Four physiological characters were observed and recorded at different stages of plant growth. Application of exogenous Gibberellin on French bean plants at 7, 14, and 21 DAS results in increase in plant height, Number of internodes, size of upper internodes and number of leaf with increase the concentration of the Gibberellin solution (10 ppm, 50 ppm and 100 ppm) in contrast to control. These results reveal that Gibberellic acid induces both cell elongation and cell division.*

INTRODUCTION

Gibberellic acid, C19H2206, was first isolated by Cross (1954) from the *Gibberella fujikuroi* (imperfect stage: *Fusariutm moniliforme*). It is a tetracyclic dihydroxy lactonic acid, identical to gibberellin X (Stodola *et al.*, 1955) and distinct from gibberellin A, isolated by Yabuta and Hayashi (1939). Both gibberellic acid and gibberellin A markedly stimulate stem and leaf elongation in a number of higher plants (Yabuta & Hayashi, 1939; and Brian & Hemming, 1955).

In certain genetic dwarfs, however, evidence is accumulating that the mutant form can be brought within the normal phenotypic range by treatment with gibberellic acid. This substance increases the length of leaves and internodes in normal plants of many species (Brian *et al.,* 1954), and Brian and Hemming (1955) report that in the pea (*Pismn sativum*), broad bean (*Vicia faba*) and French bean (*Phaseolus vulgaris*) the dwarf varieties show a greater response than the tall varieties, the different genotypes producing similar phenotypes after treatment. In the present study the main objective is to see the effect of gibberellic acid on plant growth habit.

MATERIALS AND METHODS

Plant materials and crop management

The present experiment was carried out during the season of 2013 in the Department of Crop physiology, Assam Agricultural University, Jorhat-13. To conduct the experiment French bean seeds were brought from Jorhat town. To sow the seeds all total four pots with full of soil are used as a growing media while 10 ppm, 50 ppm and 100 ppm Gibberellic solution were made in the laboratory.

Three to four well filled and healthy French bean seeds were sown in the pot. Regular irrigation was provided for good germination and to raise the plants. Among the four pots that were used, three was for treatment and one was used as a control. To see the effect of gibberellic acid, 10 ppm, 50 ppm and 100 ppm Gibberellic solution were individually applied to the growing plants at 7 days interval i.e. at 7 DAS, 14 DAS and 21 DAS.

Evaluation of the genotype at different growth stages

The observation was made on treated as well as on the untreated (control) plants. All together four physiological characters such as number of leaves, plant height, number of internodes, length of the upper most internode were observed and recorded at different stage of plant growth. The sample data were mean and used to analyses the effect of gibberellic acid.

RESULT AND DISCUSSION

The mean value for various characters under different treatment that obtained from the present investigation is presented in Table 1. Application of exogenous Gibberellin to French bean plants at 7, 14, and 21 DAS (10 ppm, 50 ppm and 100 ppm) results in increase in plant height, Number of internodes, size of upper internodes and number of leaf in contrast to control (Plate 1). It was clearly observed that all the characters under study are increased in size and or number with increase the concentration of the gibberellin solution as presented in a graphical form (Figure 1-3). This result is in agreement with typical properties of gibberellin i.e. it induces elongation of stem which is due to both increase in cell division and expansion of cell. In submergence variety also Gibberellin increase stem growth that tends to deplete carbohydrate reserve in plant, and decrease their survival after flooding subsides. Submergence tolerant varieties elongate less and will survive and this is linked to the persistence of DELLA protein.

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Table 1: Mean value for various traits under different treatment at 7 day Interval

TREATMENT	OBSERVATION											
	NUMBER OF LEAVES			NUMBER OF INTER-NODES			PLANT HEIGHT			LENGTH OF UPPER INTERNODE		
	7 DAS	14 DAS	21 DAS	7 DAS	14 DAS	21 DAS	7 DAS	14 DAS	21 DAS	7 DAS	14 DAS	21 DAS
T_0	2.33	4.00	4.00	2.33	4.00	4.33	11.67	19.13	19.13	2.73	4.50	4.50
T1 (10 ppm)	2.00	5.33	6.33	2.00	4.00	4.67	13.50	23.80	24.33	2.83	5.87	6.77
T2 (50 ppm)	2.00	6.00	7.00	2.00	4.00	5.00	14.83	28.83	29.27	3.45	12.47	12.47
T3 (100 ppm)	2.30	7.00	8.33	2.00	4.67	5.00	15.67	40.63	44.33	4.50	16.50	18.13

Plate 1: Observation at 21 DAS

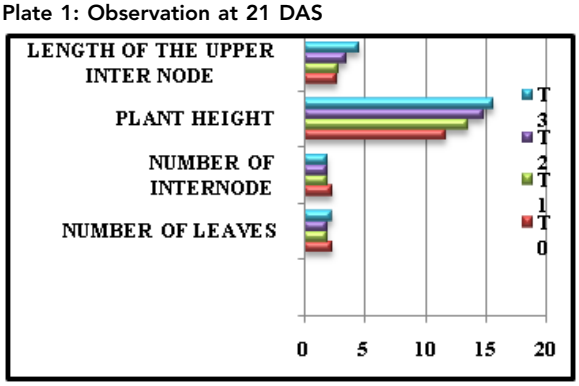

Figure 1: Observation at 7 Das

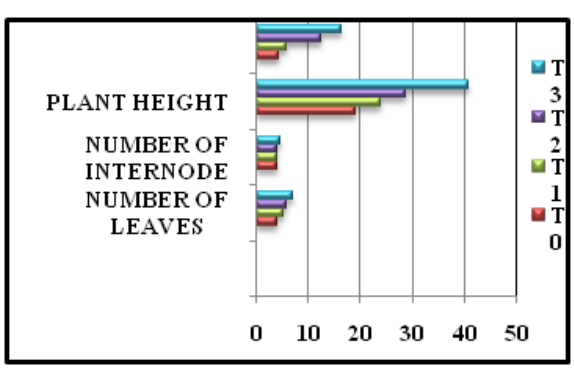

Figure 2: Observation at 14 DAS

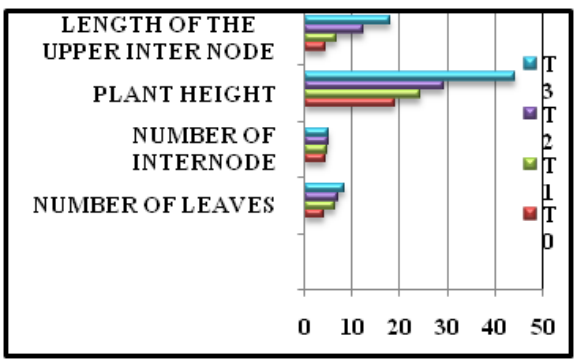

Figure 3: Observation at 21 DAS

CONCLUTION

`From the present investigation it can be concluded that Gibberellin induces both cell elongation and cell division, in some cases permitting rapid but unsustainable stem elongation under stress condition. Our finding is in line with similar established findings.

REFERENCE Cross, B. E. (1954), "Gibberellic acid Part I". J. Chem. Soc., pp. 4670-4676. | Brian, P. W. & Hemming, H. G. (1955), "The effect of gibberellic acid on shoot growth of pea seedlings". Physiol. Plantarum, 8, 669-81. | Stodola, F. H., Raper, K. B., Fennell, D. I., Conway, H. F., Sohns, V. E., Langford, C. T. and R. Jackson, W. (1955), Arch. Biochem. and Biophys., 54, 240-245. | Yabuta, T. & Hayashi, T. (1939), "Biochemical studies on the 'bakanae' fungus of rice. II. isolation of 'gibberellin', the active principle which makes the rice seedlings grow slenderly'. J. Agric. Chem. Soc. Jpn., 15, 257-266. | Brian, P. W., Elson, G. W., Hemming, H. G. & Radley, M. (1954), "The plant-growth-promoting properties of gibberellic acid, a metabolic product of the fungus Gibberella fujikuroi". J. Sci. Fd. Agric., 5, 602-12. |