J. Phytol. Res. **12**(1-2) :115-117, 1999

EFFECT OF EXTRACTED GIBBERELLINS ON ANATOMICAL AND BIOCHEMICAL PARAMETERS IN RICE

S. SUKUL and S. CHAUDHURI

Department of Botany, University of Kalyani, Kalyani - 741 235, W.B., India.

Anatomical changes were noted in rice plants treated with both extracted (from leaves of *Lantana camara*) and synthetic gibberellins. There was significant increase in the diameter of the stem, number of developing leaf primordia, total number of air spaces and number of vascular bundles in extracted gibberellins treated rice plant. Application of extracted gibberellins resulted in significant increase in total chlorophyll, protein and total soluble sugar content in rice plant.

Keywords :Anatomical; Biochemical; Extract; Gibberellins; *Lantana camara;* Synthetic.

GA treatment had been reported to bring about anatomical and biochemical changes in plants. Stimulation of cambium activity in apricot spurshoots as well as in potato and bean plants, reduction in the number of cell layer of outer and inner cortex, phloem, xylem and pith and increase in the number of vascular bundles in the internodes and petioles in *Ricinus communis* by GA_3 application had been reported[1,2]. There were reports in increase in the liberation of reducing sugar in barley endosperm, enhancement in sugar content per stem of sugarcane, changes in total soluble sugar composition of potato tubers and increase in chlorophyll synthesis in pumpkin cotyledon in reponse to GA_3 treatment[3-6].

Leaves of *Lantana camara* (variety orange-brown flower), a common weed with profuse growth, were found to contain large amounts of gibberellins, auxins and cytokinins[7]. In an earlier study, the authors had observed stimulatory effect of gibberellins extracted from the sun dried leaves of *L. camara* on rhizogenesis in callus culture of rice, regenerated rice plantlet and growth and yield of rice[8-10].

The present investigation reports stimulatory activity of extracted gibberellins (*L. camara* var. orange-brown flower) on anatomical and biochemical parameters (chlorophyll, protein, total soluble sugar content) in rice.

Stems of full grown rice plants post sprayed with extracted and synthetic gibberellins and from the control plants (without spray)[7], were cut 2 cm above the soil. The stems were then excised into several one inch pieces and preserved in 70% ethyl alcohol. Transverse sections of these stems were taken and temporary slides prepared by double staining with saffranine and light green. The sections were observed under the microscope.

Chlorophyll (total chlorophyll, chlorophyll a & b) content of rice leaves, protein content of seeds and total soluble sugar of leaves and seeds collected from treated (gibberellins) and untreated rice plant[7] were estimated[11-13].

Anatomical changes observed in the stems of extracted and synthetic gibberellins treated rice plants indicated that the stems from extracted gibberellins treated plants were thicker (0.32mm) than both synthetic gibberellins treated (0.26mm) and untreated ones (0,18mm) (Table 1). Number of leaf primordia and total number of air spaces were also higher in the extracted gibberellins treatment.

Total number of vascular bundles in 1st and 2nd leaf primordia were higher

Table 1. Anatomical changes in rice.

Treatments	*Diameter of stem (mm) Mean ± S.E.	*No. of developing leaf primordia Mean ± S.E.	* Total air spaces Mean ± S.E.	*No. of vascular bundles	
				1st primordium Mean ± S.E.	2nd primordium Mean ± S.E.
Untreated (Control)	0.18(0.42)±0.0038	1.0(1.0)±0.0	13.32(3.65)±0.0193	3.0(1.73)±0.0	3.0(1.73)±0.0
Synthetic gibberellins (GA_3)	0.26(0.51)±0.0004	2.0(1.41)±0.0	23.61(4.86)±0.0313	4.0(2.0)±0.0	4.0(2.0)±0.0
Extracted gibberellins	0.32(0.57)±0.0027	3.0(1.73)±0.0	32.26(5.68)±0.0133	5.0(2.23)±0.0	5.0(2.23)±0.0

Figures in parenthesis indicate transformed square root values.
* Mean of 4 replications.

Table 2. Chlorophyll content of rice leaves.

Treatments	* Total chlorophyll (mg/l)	*Chlorophyll a (mg/l)	*Chlorophyll b (mg/l)
Untreated (control)	1.82(1.35)	0.45(0.67)	1.37(1.17)
Synthetic gibberellins (GA_3)	1.08(1.04)	0.34(0.58)	0.76(0.87)
Extracted gibberellins	3.13(1.77)	0.83(0.91)	2.34(1.53)
S.E. ±	0.168	0.005	0.004
C.D. at 5%	0.467	0.016	0.011

Figures in parenthesis indicate transformed square root values
* Mean of 4 replications

Table 3. Protein content of rice seeds.

Treatments	*Protein content (μg/g)
Untreated (control)	19.33(4.39)
Synthetic gibberellins (GA_3)	24.33(4.93)
Extracted gibberellins	28.67(5.35)
S.E. ±	0.023
C.D. at 5%	0.064

Figures in parenthesis indicate transformed square root values
* Mean of 4 replications

Table 4. Total soluble sugar content of leaves and seeds of rice.

Treatments	* Total soluble sugar content (mg/g)	
	Leaves	Seeds
Untreated (control)	0.47(0.68)	0.55(0.74)
Synthetic gibberellins (GA_3)	0.52(0.72)	0.64(0.8)
Extracted gibberellins	0.57(0.76)	0.69(0.83)
S.E. ±	0.012	0.027
C.D. at 5%	0.035	0.076

Figures in parenthesis indicate transformed square root values
* Mean of 4 replications

than the corresponding number of vascular bundles in the plants from the other two treatments.

From the results presented in Table 2, it could be observed that both the amounts of chlorophyll a and chlorophyll b were higher in the leaves of plants treated with extracted gibberellins than those of synthetic gibberellins and untreated plants.

Seeds from extracted gibberellins treated plant showed higher protein content than those from the synthetic gibberellins treated and untreated plants. The difference in protein content was found to be statistically significant between extracted and synthetic gibberellins as well as synthetic gibberellins and control (Table 3).

Total soluble sugar in both leaves and seeds from gibberellins (extract) treated plants were higher and the difference was statistically significant in comparison with the sugar content of leaves and seeds of the untreated plants (Table 4). Increase in the total soluble sugar content was also recorded in extracted gibberellins treated plant, however, the difference in sugar content of seeds of synthetic gibberellins treated and untreated plants was not significant, while the difference in the sugar content of the leaves of the two was statistically significant.

From the study it can be concluded that exogenous application of extracted gibberellins of *L. camara* has significant role in anatomical and biochemical changes in rice.

References

1. Paleg L G 1965, *Ann. Rev. Plant Physiol.* **16** 291
2. Juneja A 1971, *Phytomorphology* **21** 235
3. Paleg L G 1960, *Plant Physiol.* **35** 293
4. Mcdavid C R and Babiker E A 1981, *Trop. Agric.* **58**(1) 73
5. Mares D J, Marschner H and Krauss A 1981, *Physiol. Plant* **52**(2) 267
6. Knypl J S 1970, *Beitr. Plafzen. Physiol.* **161** 1
7. Sukul S 1999, Ph.D. thesis (submitted), University of Kalyani, W.B.
8. Sukul S, Chatterjee P, Chaudhuri S, Bhattacharya S and Sen O 1995, *Pers. Cytol. Genet.* **8** 57
9. Sukul S and Chaudhuri S 1997, *J. Phytol. Res.* **10**(1-2) 97
10. Sukul S and Chaudhuri S 1995, *J. Phytol. Res.* **8**(1) 89
11. Mahadevan A and Sridhar R 1982, *Methods in physiological plant pathology*, 2nd ed. Sivakami Publications, Madras.
12. Lowry O H, Rosebrough J N, Fan L A and Randal J R 1951, *J. Biol. Chem.* **193** 265
13. Dubois M, Gilles K, Hamilton K J, Rebers A P and Smith F 1951, *Nature* **168** 167