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RESEARCH ARTICLE

APPLICATION OF BRASSINOLIDE ENHANCES THE VEGETATIVE PARAMETERS OF *CURCUMA LONGA* L. GROWN IN NIZAMABAD

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ABSTRACT

Brassinosteroids (BRs) can be lucidly considered as the 6th group of plant growth regulators (PGRs) capable of plant growth and development as well as potential alleviators of abiotic stresses in plants. *Curcuma longa* L. commonly known as turmeric is a medicinally important ingredient in the Indian Cuisine. It is cultivated in Nizamabad district which comprises of semi-arid tropical soil on a large scale. The present study is depicting on the role of homobrassinolide, a potential brassinosteroid in alleviating the stress caused by semi-arid tropical soil of Nizamabad and increasing the growth of *Curcuma longa* L. plants.

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INTRODUCTION

Brassinosteroids (BRs) are low molecular weight PGRs that are consistently capable of plant growth and are present all through the plant kingdom (Vardhini, 2017; 2019). BRs are a group of polyhydroxy lactones with a typical 5α-cholestane skeleton, with different hydroxyl substitutions and connected functional groups (Haubrick and Assman, 2006). The bean second internode bioassay is considered as an important indicator that BRs are potential PGRs. *Curcuma longa* L. belonging to the ginger family viz., Zingiberaceae is medicinally important plant and its rhizome commonly called as turmeric is an important ingredient of the Indian cuisine. The soils of Nizamabad are saline and dry in nature inhibiting the growth and development of most of the agricultural crops grown in them resulting in reduced yield of the crop plants. The present paper is a research study on the application of homobrassinolide on the growth of *Curcuma longa* L. grown in Nizamabad, Telangana State, India.

MATERIALS AND METHODS

Curcuma longa L. plant popularly called as 'turmeric' plant is the present experimental plant material. The rhizomes (underground stems) of Curcuma longa L. variety Acc-79 were procured from Ashwini Fertilizers Ltd., Nizamabad. Homobrassinolide (HBL) was purchased from Godrej Agrovet Pvt. Ltd., Hyderabad, Andhra Pradesh, India. HBL (Double) consists of 0.04% of HBL, 4.0% of water and solvent. Curcuma longa L. plants were grown in Nizamabad town. The experiments were conducted in the field plots beds. The plots comprised a mixture of manure and vermi compost. Turmeric rhizomes sterilized by metaloxin mangozeb were dried in shade for around one and a half hour and planted in the plots. Homobrassinolide was exogenously sprayed to the turmeric plants in four different concentrations viz., 0.5µM, 1.0µM, 2.0µM, and 3.0µM four was supplied as foliar spray on the 20th, 40th and 60th day after sowing. The control plants were treated with distilled water on the same days.

Shoot Length of Turmeric Plants: The plots were watered and the turmeric plants were gently removed. The shoot and rhizome were carefully separated, washed and shaken slightly to remove water molecules. Shoot length was measured on 25th, 45th, 55th and 65th days employing a meter scale and their values were expressed in centimeters.

Shoot Fresh Weight of Turmeric Plants: The fresh weights of the shoots of turmeric plants were recorded on 55th and 65th days. A meter balance was used for this purpose. The shoot fresh weights were expressed in grams.

Shoot Dry Weight of Turmeric Plants: The shoots of turmeric plants were oven dried at 110°C for 24 hours and their dry weights were recorded on 55th and 65th days. The shoot dry weights were expressed in terms of grams.

Table 1. Effect of homobrassinolide on the shoot length of *Curcuma longa*

Treatment	25th Day	45th Day	55th Day	65th Day
Control	25.4±1.529	31.4±0.678	37.42 ± 1.123	49.2 ± 2.463
0.5µM HBL	27.9±1.233	43.4±1.43	63.5 ± 1.20	75.2± 0.219
1.0µM HBL	33.0 ±1.251	45.26 ± 1.413	65.2 ± 2.254	86.2 ± 1.363
2.0µM HBL	33.4 ±2.291	47.4 ±1.246	69.3 ± 2.202	91.5 ± 1.112
3.0µM HBL	37.9±2.321	49.3 ±1.271	73.7 ± 2.012	97.2 ± 1.245

The values are Mean ± SE (n = 5); mean followed by the same alphabet in a column is not significantly different at p=0.05 according to Post Hoc test.

Table 2. Effect of homobrassinolide on the shoot fresh and dry weights of *Curcuma longa*

	Shoot Weight on 55th Day		Shoot Weight on 65th Day	
Treatment	Shoot fresh weight (gm/fr.wt.)*	Shoot dry weight (gm/dry.wt.)*	Shoot fresh weight (gm/fr.wt.)*	Shoot dry weight (gm/dry.wt.)*
Control	4.23±0.910	2.39±0.28	12.08±0.728	4.63±0.251
0.5µM HBL	7.25±0.325	3.92±0.044	17.74±0.261	8.59±0.421
1.0µM HBL	8.95±0.224	4.32±0.526	18.06±0.347	8.99±0.612
2.0µM HBL	9.85±2.489	5.02±0.595	20.74±2.006	9.65±1.159
3.0µM HBL	10.96±2.321	6.05±0.236	23.02±2.110	10.22±1.012

The values are Mean ± SE (n = 5); mean followed by the same alphabet in a column is not significantly different at p=0.05 according to Post Hoc test.

Table 3. Effect of homobrassinolide on the number of leaves per plant of *Curcuma longa*

	Number of Leaves per Plant		
Treatment	25th Day	45th Day	65th Day
Control	8±0.01	9±0.03	10±0.02
0.5µM HBL	9 ±0.04	10 ±0.01	11±0.01
1.0µM HBL	10 ±0.01	11±0.02	12±0.02
2.0µM HBL	11 ±0.03	12±0.01	13±0.01
3.0µM HBL	12 ±0.2	13±0.02	14±0.03

The values are means ±SE (n = 5); mean followed by the same alphabet in a column is not significantly different at p=0.05 according to Post Hoc test.

Table 4. Effect of homobrassinolide on the total leaf area per plant of *Curcuma longa*

	Leaf area (sq.cm)^2*		
Treatment	25th Day	45th Day	65th Day
Control	248.2±21.22	262.23±21.41	281.1±12.91
0.5µM HBL	261.5 ±17.211	285.9 ±19.21	308.1±11.21
1.0µM HBL	284.2 ±22.426	308.8±46.31	321.5±31.62
2.0µM HBL	316.4 ±12.45	338.3±21.22	362±22.34
3.0µM HBL	335.2 ±22.24	358.9±17.24	385.5±30.41

The values are means ±SE (n = 5); mean followed by the same alphabet in a column is not significantly different at p=0.05 according to Post Hoc test.

Foliage of Turmeric Plant: The foliage of turmeric plants in terms of number of leaves per plant was recorded on 25th, 45th and 65th day.

Leaf Area Per Plant: The leaf area per plant was recorded on 35th, 45th, 55th and 65th day. The LI –COR Model LI 3000 Portable Leaf Area Meter was used for measuring leaf area of turmeric plant. The leaf area was multiplied by total number of leaves to calculate total leaf area per plant. On the 65th day 3µM concentration showed 50.89% enhancement compared to untreated controls (Table 2). The dry weight of turmeric shoots also gradually increased as the concentration of applied homobrassinolide increased from 0.5 µM to 3.0 µM (Table 2). The highest enhancement recorded by application of 3.0 µM on the 55th and 65th day compared to control plants is 30.66% and 50.59% respectively. The effect of homobrassinolide the number of leaves per turmeric plant and total leaf area per turmeric plant are shown in Table 3. Application of all concentrations of homobrassinolide proved to be highly effective in increasing the number of leaves per plant though 3.0µM concentration was found to be most stimulatory. The influence of 3.0 µM, 2.0 µM, 1.0 µM and 0.5 µmM on the total leaf area of turmeric plant is shown in Table - 4. Foliar supplementation of four different concentrations of homobrassinolide increased the total leaf area of turmeric plants compared to untreated control plants on all recorded days (25th, 45th and 65th).

The results presented are the mean values of 5 replicates. The data analyses were carried out using one-way analysis of variance (ANOVA) followed by Post Hoc Test (Multiple Comparisons) using SPSS (SPSS Inc., Chicago, IL, USA). The differences were considered significant if p was ≤ 0.05. The mean values were compared and lower case letters are used in figures/table to highlight the significant differences between the treatments.

DISCUSSION

Supplementation of four different concentrations of homobrassinolide as foliar spray exhibited increased shoot length, fresh and dry weights of turmeric plants grown in Nizamabad district. BRs are novel type of PGRs having the potential to enhance plant growth and development. Yang and Li (1999) gave an insight on BR-transgenic mutant defective in cell elongation and cellular organizations during both root and shoot development in *Lactuca sativa*. Supplementation of 24-epibrassinolide to the media resulted in stem elongation of sweet pepper (Franck-Duchenne *et al*., 1998). Seed treatment and foliar application of brassinolide at 0.05, 0.1 & 0.2 ppm resulted in significant increase in growth of tomato (*Lycopersicon esculentum* L.) in terms of length, fresh and dry weight of shoots (Nafie and El-Khallal, 2002). Exogenous supplementation of homobrassinolide to turmeric plants grown in Nizamabad district showed improved foliar growth in terms of number of leaves per plant and total leaf area per plant. Application of 24-epiBL and 28-homoBL enhanced the growth in terms of leaf number, leaf area, and the dry weight of leaves of coleus (Swamy and Rao, 2011). Brassinolide improved the physiological characteristics of *Brassica oleracea* var. italica leaves (Wang and Yang, 2009). Exogenous application of brassinolide resulted in improved growth and anatomical characteristics for leaves of dwarf pear *in vitro* conditions (Chen *et al*., 2014).

Conclusion

The present study reveals that application of homobrassinolide to turmeric plants as exogenous spray resulted in enhanced shoot and foliar growth depicting homobrassinolide as an effective PGR in combating the stress induced by semi –arid soils of Nizamabad. on mustard plants as foliar spray promoted the shoot, root and foliar growth of mustard plants grown in semi-arid soils of Nizamabad. BRs have the ability to promote growth of plant under stressful conditions (Vardhini and Anjum, 2015). The present study reveals a new insight that application of BL overcame the negative effect of the semi-arid conditions of the soil (reflected in the control plants) and promoted the shoot, root and foliar growth (reflected in the BL-treated plants) of mustard.

REFERENCES

Chen, B.Y., Wang, C.H., Chu, Q.G., Tian, Y.K., Sun, J.X. and Xu, Y.S. 2014. Effect of exogenous brassinolide on growth and anatomical characteristics for stems and leaves of dwarf pear *in vitro*. *Beifang Yuanyi*,7-11.

Franck-Duchenne, M., Wang, Y.W., Ben Tahar, S. and Beachy, R.N. 1998. In vitro stem elongation of sweet pepper in media containing 24-epibrassinolide. *Plant Cell Tiss. Org. Cult.*, 53:79-84.

Haubrick, L.L., Torsethaugen, G. and Assmann, S.M. 2006. Effect of brassinolide, alone and in concert with abscisic acid, on control of stomatal aperture and potassium currents of *Vicia faba* guard cell protoplasts. *Physiol. Plant.*, 128: 134-143.

Nafie, E.M. and El-Khallal, S.M. 2002. Effect of brassinolide application on growth and certain metabolic activities and yield of tomato. *Egyptian J. Physiol. Sci*., 24: 103-117.

Swamy, K.N. and Rao, S.S.R. 2011. Effect of Brassinosteroids on the Performance of Coleus (*Coleus forskohlii*). Journal of Herbs, Spices & Medicinal Plants. 17, 12-20.

Vardhini, B.V. (2017). Modifications of morphological and anatomical characteristics of plants by application of brassinosteroids under various abiotic stress conditions - A review. *Plant Gene*. 11: 70-89. http://dx.doi.org/10.1016/j.plgene.2017.06.005.

Vardhini, B.V. (2019). Does application of brassinosteroids mitigate the temperature stress in plants? - A review. *International Journal of Earth Science and Geology*. 1(2): 59-65.

Vardhini, B.V. and Anjum, N.A. (2015). Brassinosteroids make plant life easier under abiotic stresses mainly by modulating major components of antioxidant defense system. *Frontiers in Environmental Sciences,* 2: 67. doi: 10.3389/fenvs.2014.0006.

Wang, T.Q., Yang, X. 2009. The effects of brassinolide on physiological characteristics of *Brassica oleracea* var. italica leaves. *Xinan Daxue Xuebao, Ziran Kexueban*, 31:113-117.

Yang, C.H. and Li, C.I. 1999. A transgenic mutant defective in cell elongation and cellular organization during both root and shoot development in lettuce, *Lactuca sativa*. *Plant Cell Physiol.,* 40: 1108-1118.

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