CHRIST
(DEEMED TO BE UNIVERSITY)
BANGALORE · INDIA

Notice for the PhD Viva Voce Examination

Mr Wudali Narasimha Sudheer (Registration Number: 1940094), PhD scholar at the School of Sciences, CHRIST (Deemed to be University), Bangalore will defend his PhD thesis at the public viva-voce examination on Wednesday, 17 January 2024 at 10.00 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**Production of Boeravinone B and Related Bioactive Molecules from Cell Cultures of Punarnava, Boerhavia Diffusa Linn.**
Discipline	:	**Botany**
External Examiner (Outside Karnataka)	:	**Dr Siril E A** Professor and Head Department of Botany University of Kerala Kariavattom Trivandrum 695 581 Kerala
External Examiner (Within Karnataka)	:	**Dr Harsha Hegde** Scientist E ICMR-National Institute of Traditional Medicine Nehru Nagar, Belagavi – 590010 Karnataka
Supervisor	:	**Dr Praveen N** Associate Professor Department of Life Sciences School of Sciences CHRIST (Deemed to be University) Bengaluru - 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar

Place: Bengaluru
Date: 12 January 2024

ABSTRACT

Boerhavia diffusa L., commonly referred to as punarnava, belongs to the Nyctaginaceae family. It contains a variety of phytochemicals that contribute to the plant's pharmacological activities. Among these compounds, boeravinone-B, a significant secondary metabolite synthesized within the plant, has been reported to possess various pharmacological properties, including antioxidant, anti-inflammatory, cardio-protective, antimicrobial, and anti-cancer activities. Given its potential, there is a growing need to produce boeravinone-B through biotechnological approaches such as plant tissue cultures. However, limited studies have been conducted on its production via tissue culture. Therefore, our objective was to produce boeravinone-B using callus and cell suspension cultures. To induce callus formation, we employed different auxins (2,4-D, NAA, IAA, IBA, and picloram) and cytokinins (kinetin, BAP, TDZ, and 2-iP) alone and in combination to maximize biomass and boeravinone-B production. We found that a semi-solid medium supplemented with 5.0 mg/L 2,4-D resulted in the highest biomass and boeravinone-B production from leaf explants. Subsequently, we established cell suspension cultures and observed that a combination of 2.0 mg/L picloram and 5.0 mg/L NAA yielded the highest production of boeravinone-B. We further optimized cultural conditions such as pH, inoculum density, sucrose concentration, carbon sources, MS medium strength, ammonium and nitrate ratio, and various concentrations of macronutrients to enhance boeravinone-B production. Additionally, we explored elicitation strategies using both biotic and abiotic components to determine their effects on boeravinone-B production.

Biotic elicitation involved the use of polysaccharides (chitosan), bacteria (*Escherichia coli* and *Bacillus subtilis*), fungi (*Aspergillus niger* and *Cordyceps militaris*), and algal members (*Valonia utricularis* and *Spirulina platensis*). Likewise, abiotic elicitors included signalling molecules (salicylic acid, sodium nitroprusside, and ethephon), polyamines (putrescine, spermine, and spermidine), and heavy metal salts (lead acetate, cadmium chloride, and lanthanum chloride) to stimulate boeravinone-B production. Significant variations were observed among the elicitors in their ability to promote boeravinone-B production, with the order of effectiveness being spermidine > *Spirulina platensis* > salicylic acid > spermine > sodium nitroprusside > *Aspergillus niger* > *Valonia utricularis* > *Cordyceps militaris* > yeast extract > putrescine. By employing these elicitation strategies alongside advancements in molecular aspects and large-scale production in bioreactors, we can ensure a sustainable supply of boeravinone-B and its associated metabolites.

Keywords: Boerhavia diffusa L., boeravinone-B, cell suspension culture, optimization, elicitation.

Publications:

1. **Sudheer, W. N.**, & Nagella, P. (2023). Production of boeravinone-B, total phenolic, flavonoid content and antioxidant activity from callus cultures of Punarnava (*Boerhavia diffusa* L.). *Plant Science Today*, *10*(2), 354-365. https://doi.org/10.14719/pst.2212 (Q3 - Scopus indexed).
2. **Sudheer, W. N.,** Praveen. N (2020). Phytochemistry and Pharmacology of *Boerhavia diffusa* Linn. In Recent trends in medicinal plant sciences, Volume 7 (pp. 93-108). AkiNik Publications. (ISBN: 978-93-90322-09-1).
3. **Sudheer, W. N.** and Praveen N (2020). The Resurrecting Punarnava, COSMOS, Conference proceedings., Basu Prakashana publications., pp.101-104. (ISBN: 978-81-941989-2-5).
4. **Sudheer, W. N.** & Praveen, N. Polyamines influence the production of boeravinone-B from Cell suspension cultures of *Boerhavia diffusa* L. (Under review – Plant cell tissue organ culture; IF: 2.7).
5. **Sudheer, W. N.,** Praveen, N., Al-Khayri, J. M., & Jain, S. M. (2022). Role of plant tissue culture medium components. In Advances in Plant Tissue Culture (pp. 51-83). Academic Press, Elsevier.