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Notice for the PhD Viva Voce Examination

Ms Jiang Yingying, Registration Number: 2190019, PhD Scholar at the Department of Life Sciences, School of Sciences, CHRIST (Deemed to be University), will defend her PhD thesis at the public viva-voce examination on Tuesday, 15 September 2026, at 11.30 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029, Karnataka, India.

Title of the Thesis	:	**Integrated Plant Growth Promotion and Pest Management Using *Vitex negundo*-Derived Bioformulations: from Solid-State Fermentation to Nanoparticles**
Discipline	:	**Biotechnology**
External Examiner - I	:	**Dr D Kalaivanan** Senior Scientist Department of Natural Resources Indian Institute of Horticultural Research Indian Council of Agricultural Research-ICAR Bengaluru - 560089 Karnataka
External Examiner - II	:	**Dr Chandra Obul Reddy Puli** Associate Professor Department of Botany Yogi Vemana University Kadapa - 516005 Andhra Pradesh
Supervisor	:	**Dr Paari K A** 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 (Academics)

Place: Bengaluru
Date: 05 September 2026

ABSTRACT

Food security and environmental sustainability are two of the most significant challenges facing modern agriculture, driven by increasing global demand, rising input costs, and the environmental impact of long-term reliance on synthetic fertilizers and pesticides. The aim of this study was to develop and evaluate multifunctional bio-based agricultural inputs from Vitex negundo L. for the enhancement of plant growth and efficient pest control in an environmentally responsible manner. Solid-state fermentation (SSF) of fruit and vegetable residues supplemented with V. negundo led to the development of multifunctional bio-organic substrates. The formulations obtained were optimized for the main culture parameters and their physicochemical properties, nutrient composition and biological activity were evaluated. V. negundo enriched substrates under normal growth conditions led to significant improvement in plant growth parameters, photosynthetic pigment content, biochemical traits and antioxidant enzyme activities as compared to untreated controls and conventionally fertilized plants while under imposed drought and salinity stress, treated plants exhibited better osmotic adjustment and enhanced antioxidant defence mechanisms suggesting that the formulations provide significant stress tolerance apart from their nutritional value. The fermented substrates also showed moderate insecticidal activity, extending their functional relevance to integrated pest management contexts. Simultaneously, silver nanoparticles (AgNPs) were synthesized using V. negundo leaf extract by a green chemistry approach and extensively characterized for its physicochemical, optical and structural properties. Bioassay evaluation against two economically important lepidopteran pests, Spodoptera litura (Fabricius) and Helicoverpa armigera (Hübner) showed potent larvicidal activity at all developmental stages. Treated larvae showed significant morphological, histological, biochemical and molecular alterations signifying multitarget disruption of insect physiology. Safety evaluation using a non-target organism confirmed the selective nature of the observed toxicity. To elucidate the mechanistic basis of the pesticidal activity, GC–MS profiling of V. negundo leaf extract was carried out and the bioactive compounds were subjected to in silico molecular docking against four major insect target proteins – acetylcholinesterase (AChE), carboxylesterase (CES), the ecdysone receptor (EcR), and the juvenile-hormone- binding protein (mJHBP) – revealing strong and selective binding interactions of the shortlisted ligands with catalytically important residues of all four targets, and normal-mode analysis further confirmed the conformational stability of the ligand–protein complexes. Overall, these results show that SSF substrates rich in V. negundo and green-synthesized AgNPs are functionally complementary bio-based inputs that can simultaneously promote plant growth and control agricultural pests within an ecologically sound context, thus adding to the increasing body of evidence supporting the integration of fermentation-derived bioinputs with green nanotechnology as a practical and sustainable alternative to traditional agrochemicals, with significant implications for the development of next-generation integrated crop management systems.

Keywords: *Vitex negundo*, solid-state fermentation, plant growth, pest control

Publications:

1. **Y. Jiang** and P. K. Alagesan, "Biosynthesis of silver nanoparticles using vitex negundo: pesticidal efficacy against spodoptera litura and helicoverpa armigera with a safety assessment," Journal of Applied & Natural Science, vol. 17, no. 3, 2025, doi: 10.31018/jans.v17i3.6708.
2. **Y. Jiang** and K. A. Paari, "In Silico Screening of Medicinal Plant-Derived Compounds Against Spodoptera litura," Journal of Tropical Life Science, vol. 15, no. 1, pp. 209–222, Jun. 2025, doi: 10.11594/jtls.15.01.20.
3. **J. YingYing** et al., "Green nanoparticles in agriculture: enhancing crop growth and stress tolerance," Plant Stress, vol. 18, p. 101017, Dec. 2025, doi: 10.1016/j.stress.2025.101017.
4. J. A. George, J. **Ying Ying**, M. Pappuswamy, B. Balasubramanian, A. Chaudhary, and K. A. Paari, "Evaluation of toxicity of Vitex negundo L. synthesized silver nanoparticles against Aedes aegypti," Plant Sci. Today, May 2024, doi: 10.14719/pst.2961.