Journal of Plant Development Sciences

(An International Monthly Peer Reviewed Journal)

Volume 17 **Number 8** **August 2025**

Content

Journal of Plant Development Sciences Vol. 17(8)

PLANT GROWTH AND DEVELOPMENT IN SPACE: CHALLENGES AND OPPORTUNITIES

Bratislav Stankovic[1]*

[1]*Bratislav Stankovic, United States Patent and Trademark Office, Alexandria, VA 22314, USA*
** Bratislav Stankovic contributed to this article in his personal capacity; the views expressed are his own and do not necessarily represent the views of the USPTO or the US Government.*
Email: bratislav.stankovic@fulbrightmail.org

Received-28.07.2025, Revised-15.08.2025, Accepted-29.08.2025

Abstract: The growth of plants in outer space has elicited much scientific interest. Plants are expected to be essential for sustaining human life during extended space missions, likely starting soon with a journey to Mars. Given their ability to endure harsh conditions on Earth and evidence that model plants can complete their life cycle in microgravity, plants are well-suited for space-based life support systems. Their role goes beyond biology—successfully cultivating plants in space also reflects our technological ability to (re)create supportive living environments in microgravity. This knowledge also benefits humanity on Earth: by understanding how to grow plants in harsh conditions in space, we could apply that knowledge to growing agriculturally important crops in challenging conditions on Earth. Decades of research have revealed many challenges of growing plants in microgravity, space and on other celestial bodies, but our understanding of this endeavor has improved significantly. As space exploration moves forward, we can be increasingly confident in our capability to cultivate plants aboard spacecraft, on the Moon and beyond. Although plants will need specially designed environments to thrive in microgravity, we already possess the knowledge and tools to create such systems on a small scale.

Keywords: Space biology, Gravitational biology, Microgravity, Plant development, Spaceflight

Journal of Plant Development Sciences Vol. 17(8)

THE MULTIFUNCTIONAL ROLE OF PHENOLIC COMPOUNDS IN PLANTS AND HUMANS

David Pedroza-Escobar[1], Sofia-Joseline Sandoval-Villagrana[1,2], Alejandra Torres-Flores[1,2], Irais Castillo-Maldonado[1], Dealmy Delgadillo-Guzmán[2], Cecilia Hernández-Morales[3], José Alfredo Facio-Umaña[3], Joaquín Avalos-Soto[4], Miguel Ángel Téllez-López[4], Gladis Michel-Ramírez[1], Cristian Mayela Estrada-Valenzuela[3], Agustina Ramírez-Moreno[5], Erika Flores-Loyola[5], Jorge Haro-Santa Cruz[1], Tania González-Cortés[1]*

[1]*Centro de Investigación Biomédica. Universidad Autónoma de Coahuila. Unidad Laguna. Torreón, Coahuila, 27000, México*
[2]*Facultad de Medicina. Universidad Autónoma de Coahuila. Unidad Laguna. Torreón, Coahuila, 27000, México*
[3]*Facultad de Odontología. Universidad Autónoma de Coahuila. Unidad Laguna. Torreón, Coahuila, 27000, México*
[4]*Cuerpo Académico Farmacia y Productos Naturales, Facultad de Ciencias Químicas, Universidad Juárez del Estado de Durango, Gómez Palacio, México*
[5]*Facultad de Ciencias Biológicas. Universidad Autónoma de Coahuila. Unidad Laguna. Torreón, Coahuila, 27275, México.*
Email: tania-gonzalez@uadec.edu.mx

Received-02.08.2025, Revised-13.08.2025, Accepted-27.08.2025

Abstract: Phenolic compounds constitute a structurally diverse group of plant secondary metabolites with significant ecological and biomedical relevance. This review provides an expanded and integrated classification into eleven groups, including both classical phenols and specialized derivatives with important biological activity. The objective is to present a framework that links chemical structure, plant function, and potential applications in human health and industry. The

manuscript discusses their biosynthetic origins, and details their ecological roles in defense, stress tolerance, pigmentation, and signaling. A comprehensive description of tissue-specific distribution, environmental modulation, developmental variation, and genetic influence is provided, highlighting factors that determine phenolic profiles in different plant species. The review also examines their health-promoting properties, such as antioxidant, anti-inflammatory, antimicrobial, and immunomodulatory effects, and explores how these functions contribute to chronic disease prevention, microbiome modulation, and pharmacological innovation. Emerging applications are discussed, including their use in green synthesis of nanoparticles, biopolymer modification, active food packaging, cosmetic formulations, and environmental remediation. Conclusion: phenolic compounds act as molecular bridges between plant biology and human well-being, with multifunctional properties that make them strategic in addressing challenges in health, sustainability, and industry.

Keywords: *Phenolic compounds, Secondary metabolites, Antioxidant activity, Phytochemistry, Human health applications*

Journal of Plant Development Sciences Vol. 17(8)

NEW STATE RECORDS OF TWO EDIBLE SPECIES OF *TERMITOMYCES* (*LYOPHYLLACEAE*) FROM ARUNACHAL PRADESH, INDIA

Arvind Parihar*

Botanical Survey of India, Arunachal Pradesh Regional Centre, Itanagar, Arunachal Pradesh, India
Email: arvind_peaec@rediffmail.com

Received-01.08.2025, Revised-14.08.2025, Accepted-28.08.2025

Abstract: Two edible species of the Genus *Termitomyces* are recorded for the first time from the state of Arunachal Pradesh, India. Detailed Macro- and micro-morphological characterization coupled with colored illustrations are provided.

Keywords: Arunachal Pradesh, Edible, New Record, *Termitomyces*

Journal of Plant Development Sciences Vol. 17(8)

PHYTOPHAGOUS INSECTS INFESTING *TABERNAEMONTANA DIVARICATA* LINN. IN KARNATAKA, INDIA

Nalini, U.R., Mamatha, N., Manjula, K.N., Athulya, R., Narasimhamurthy and Sundararaj, R.*

Forest Protection Division, ICFRE-Institute of Wood Science and Technology,18th Cross Malleswaram, Bengaluru, 560 003, India
Email: rsundariwst@gmail.com

Received-27.07.2025, Revised-12.08.2025, Accepted-26.08.2025

Abstract: Surveys conducted to understand the diversity of phytophagous insects infesting *Tabernaemontana divaricata* in Karnataka revealed the occurrence of 13 species of phytophagous insects which includes 4 species of defoliators and 9 species of sap suckers. Among the insect pests, the infestation of *Parotis marginata* was found to be severe, affecting health and even causing death of plants, requiring cultural as well as plant protection management strategies.

Keywords: Insects, Survey, *Tabernaemontana divaricata*

Journal of Plant Development Sciences Vol. 17(8)

SEED CERTIFICATION STANDARDS IN *BACOPA MONNIERI* (L.) WETTST. UNDER FIELD CONDITIONS: IMPLICATIONS FOR QUALITY PLANTING MATERIAL

Parmeshwar Lal Saran*, Manjari and Manish Kumar Mittal

ICAR- Directorate of Medicinal and Aromatic Plants Research, Anand, Gujarat, India
Email: plsdehradun@gmail.com

Received-02.08.2025, Revised-13.08.2025, Accepted-30.08.2025

Abstract: *Bacopa monnieri* (L.) Wettst., commonly known as Brahmi or Jal Brahmi, is a creeping perennial herb of the family Plantaginaceae, naturally occurring in marshy habitats, wetlands, and along riverbanks in tropical and subtropical regions (Saran et al., 2022a). In India, it has been used for centuries in Ayurveda, Siddha, and Unani medicine as a "Medhya Rasayana" (brain tonic) to promote memory, learning, and concentration (Russo and Borrelli, 2005). Pharmacological studies have established its neuroprotective, nootropic, antioxidant, hepatoprotective, and adaptogenic effects, with the triterpenoid saponins, collectively termed bacosides, identified as the principal bioactive compounds (Saran et al., 2021). Due to its therapeutic attributes, *B. monnieri* has gained global recognition as a high-value medicinal crop, and its demand in the pharmaceutical and nutraceutical industries continues to increase (WHO, 2021).

Keywords: *Bacopa monnieri*, bacoside, DBM-4, seed standards