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Integrative biological research at the interface of ecology, molecular science, and translational applications

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The Journal of Biological Research (JBR)-Bollettino della Società Italiana di Biologia Sperimentale is one of the oldest journals in Biology. The Journal continues to pursue its mission of disseminating high-quality, peer-reviewed biological research by presenting a diverse and interdisciplinary collection of studies in Volume 98, Issue 1 (2025). The articles presented in this volume cover a broad and interdisciplinary topics useful to understanding biological systems and addressing real-world challenges. This issue, in fact, encompasses experimental investigations, thematic analyses of bioactive compounds, systematic reviews, and scientific reasoning that collectively underscore the breadth and depth of contemporary biological inquiry.

A key theme within this volume is the systematic evaluation of naturally derived compounds for antimicrobial and antioxidant properties. Adeoye-Isijola *et al.*[1] assess the chemical composition and *in vitro* antibacterial activity of the acetone stem bark extract of *Ziziphus mucronata* against potential nosocomial pathogens, integrating Fourier Transform Infrared (FTIR) spectroscopy profiling with bioassays to characterize its pharmacological potential. Concurrently, Bunkaew *et al.*[2] explore the antioxidant and antibacterial efficacy of *Chromolaena odorata* extracts, contributing to the validation of ethnobotanical resources through rigorous scientific analysis. The results show that all extracts contained substantial levels of phenolic and flavonoid secondary metabolites showing strong antioxidant activity and marked antibacterial effects against both Gram-positive and Gram-negative bacterial strains.

Thematic exploration of natural compounds is exemplified by Ben Ammar *et al*. in the study concerning geraniol's protective effects against Ochratoxin A (OTA)-induced nephrotoxicity, including investigations of the PI3K/AKT-Nrf2 signalling pathway[3]. Ochratoxin A (OTA) is a mycotoxin known to induce immunotoxicity, teratogenicity, hepatotoxicity, and nephrotoxicity in humans and animals. Geraniol (GNL), a monoterpene present in various plant oils, acts as an antioxidant and free radical scavenger. The study has been carried out using an animal model of OTA-induced nephrotoxicity; GNL co-administration restored antioxidant enzyme levels, improved biochemical markers, prevented histopathological damage, upregulated pPI3K, pAKT, Nrf2, Bcl2, and downregulated cleaved caspase-3, confirming its nephroprotective effects. These mechanistic insights may contribute to the broader context of phytochemical modulation of toxicological processes.

Mang *et al.*[4] propose a study of molecular characterization and biological diversity regarding chestnut and its destructive parasite *Cryphonectria parasitica*. The study aimed to molecularly characterize and distinguish virulent and hypovirulent *C. parasitica* isolates collected in the Basilicata region (Southern Italy). The authors conclude that for the first time it was possible to distinguish virulent and hypovirulent *C. parasitica* isolates at the molecular level and to identify the hypovirus subtype associated with hypovirulent strains in that region. Overall, this knowledge is useful to improve biological control of chestnut blight disease in Basilicata region where in some localities the chestnut production still represents an important income for the local people.

In two interesting papers nanotechnology and computational biology approaches were used. Nawaz *et al.*[5] report on the biosynthesis of gold nanoparticles using *Tribulus terrestris* fruit extracts and discuss the resultant particles' prospective biological applications. The plant has been traditionally employed as an analgesic and for the management of rheumatic pain, eye disorders, sexual dysfunction, and edema. The study aimed to investigate the use of *T. terrestris* fruit extract as a reducing agent for the synthesis of gold nanoparticles (AuNPs). The AuNPs exhibited inhibitory effects against several bacterial and fungal strains and demonstrated antileishmanial activity at higher concentrations. Moreover, the nanoparticles showed antioxidant activity and were non-toxic to human Red Blood Cells (RBCs) suggesting their potential suitability for clinical applications.

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The increasing prevalence of antibiotic-resistant microorganisms necessitates the development of novel antimicrobial strategies. In this issue complementary to experimental nanobiotechnology, Dahab and Aladhadh[6] employ bioinformatics to investigate garlic-derived antimicrobial peptides (VS-9 and F3-3-c) as Quorum Sensing (QS) inhibitors against foodborne pathogens, illustrating the synergy between computational prediction and practical food safety challenges. Through modeling, characterization, and molecular docking, the antimicrobial potential of these garlic-derived peptides was assessed. Although VS-9 demonstrated stronger anti-QS activity compared to F3-3-c, further experimental studies are required to elucidate their precise mechanisms of action and to fully harness their therapeutic potential.

Ecological research is represented in this issue by Saguem *et al*.[7] biometric analysis of red swamp crayfish *Procambarus clarkii* populations in Moroccan Ramsar sites, generating essential baseline data for conservation and management. The authors collected a total of 10,007 specimens and each individual has been analyzed for sex, Total Length (TL), and Weight (W). The results indicate that all four wetlands provide favorable habitats for *P. clarkii*, supporting population growth and survival. Furthermore, statistically significant differences have been observed among the populations in terms of total length, weight, and sex distribution, highlighting the species' variability and adaptability across different wetland environments.

Another study with an ecological focus is presented by Giannetto *et al*.[8] in which the influence of light wavelength on swimming activity in silver catfish *Rhamdia quelen* is discussed, providing insight into environmental modulation of behavior in aquatic organisms. Cosinor-based time series analyses revealed a clear daily rhythm of swimming activity under all experimental conditions and as *R. quelen* naturally inhabits deeper river regions, green light likely provides an environment that minimally disrupts the circadian clock governing swimming activity. These findings have practical implications for aquaculture, suggesting that light management can enhance fish welfare, reduce operational costs, and increase productivity.

Also interesting is the work by Chakraborty *et al*. reporting the proper storage methods for enhancing the longevity and aroma integrity of fragrant rice.[9] Based on the author findings, storage temperature and packaging materials significantly influenced the amylose content, fat acidity and 2-acetyl-1-pyrroline content of two aromatic rice cultivars at 3 and 6 months after storage. The cold storage performed better over room temperature while vacuum plastic bags and polythene bags performed better over jute gunny bag.[9]

Three papers addressing clinically relevant biological phenomena connected with the concept of Public Health are also included in the issue. Salman *et al.*[10] investigate the correlations among type-1 collagen telopeptides in Iraqi women with breast cancer. Receiver Operating Characteristic (ROC) curve analysis identified N-telopeptide of type 1 collagen (NTX-1) as the most reliable marker for breast cancer diagnosis. These findings suggest that serum NTX-1 may serve as a valuable prognostic biomarker for bone metastases in various cancers, including breast cancer, among Iraqi women[10]. The findings of Hassain *et al.*[11] suggest that elevated miR-4516 levels are proposed to contribute to Colorectal Cancer (CRC) development by regulating specific gene targets positioning miR-4516 as a promising biomarker for disease monitoring and a potential therapeutic target. Finally, the work of Zaid *et al*.[12] reports on the awareness of health care professionals in Palestine regarding probiotics, prebiotics, and synbiotics, linking microbiological knowledge to public health practice.

The issue also includes studies on cultured cancer cells and on genetic polymorphisms in acute lymphoblastic leukemia patients. Altuwayjiri and Almami report the effects of culture media and seeding density on the growth patterns of the NT2/D1 human testicular germ cell line[13], reflecting ongoing efforts to elucidate genetic factors and *in vitro* growth dynamics relevant to disease and cell biology. Another paper, by Edris *et al*., discusses the association of the Reduced Folate Carrier 1 (*RFC1*) gene polymorphisms among acute lymphoblastic leukemia patients, concluding that no correlation has been found[14].

Two comprehensive reviews enrich the issue interesting content. Venturella *et al*. [15] provide a synthesis of risk factors and therapeutic strategies for multiple sclerosis (MS), an area of significant clinical and research interest. The authors elucidate the multifactorial risk factors and etiopathogenesis of MS, emphasizing the interactions between genetic predisposition, environmental influences, including vitamin D deficiency and viral infections, and the gut microbiome in disease development and progression. Abu Zahra[16] provides a comprehensive overview of the involvement of Advanced Glycation End products (AGEs) across a spectrum of chronic human diseases such as vascular dysfunction, cognitive decline, renal impairment, cerebrovascular events, and cardiovascular disease, suggesting possible interventions to mitigate their deleterious effects.

Finally, the letter by Cappello and Gratie[17] regarding the muco-microbiotic layer offers a conceptual framework for understanding mucosal health and disease, stimulating dialogue on host–microbiome interactions and the structural complexity of mucosal environments.

Also in the volume 98, Issue 2, published in December 2025, there are themes that continue to emphasize the interdisciplinary nature of the journal.

Four reviews highlight the pharmacological properties of natural products and their relevance to human health. For instance, red seaweeds have been shown to contain bioactive components with antioxidant, anti-inflammatory, and neuroprotective potential and El Majnaoui *et al.*[18] in their review summarize the potential of the bioactive substances obtained from diverse red seaweeds around the world, which are expected to be promising components for application in the medical industry. Moreover, Martorana *et al.*[19] reported the adaptogenic, anti-inflammatory, antioxidant, immunomodulatory, and neuroprotective properties, largely attributable to the bioactive constituents possessed by *Withania somnifera*. The authors critically evaluate the pharmacological activities and proposed mechanisms of action of *Withania somnifera* bioactive compounds, while also addressing the principal methodological limitations of the current literature.

In this issue the translational potential of natural products has been illustrated also in experimental studies included in the thematic section "Natural compounds" which is issuing of a past Special Issue titled "Natural Compounds: New Strategies to Prevent, Counteract and Slow Down the Progression of Chronic Inflammatory Diseases and to Decrease the Adverse Effects of Current Therapies" aimed at increasing the knowledge about the usefulness of extracts and substances coming from animals, plants and microorganisms, in the framework of the research on chronic inflammatory diseases and the related therapies. These papers reported the cytotoxic effects of the sea anemone *Telmatactis panamensis* by Garcia-Quezada *et al*.[20], the physiological mechanism of action of peptides from snake venom by Lazcano-Peréz *et al.*[21] and the neurotoxic and hemolytic effects of Cnidarian venoms by Killi *et al*.[22], highlighting their diverse biological activities with therapeutic and ecological significance.

A substantial portion of the December papers focus on Clinical and Translational Research. Lakache *et al.*[23] oriented their research toward wound healing and antibacterial properties of *Salvia rosmarinus* extracts supporting the therapeutic use of the plant for pain prevention and wound healing, underscoring its potential for developing clinically valuable products. Impellitteri *et al.* [24] considering that Sodium Lauryl Sulfate (SLS) is one of the most used ingredients in personal care and household cleaning products, exposed *Danio rerio* to SLS and observed its main effects on swimming performance and sociability status. Moreover, the antifungal properties of *Mentha longifolia* essential oils were evaluated by Mokhtari *et al*.[25] This herb has been used as a traditional medicine for a long time and the authors identified a total of twenty compounds[25]. Research on vulvovaginal candidiasis by Sadeq *et al*.,[26] the study regarding sexual dysfunction associated with thyroid disorders by Odhaib and Altemimi,[27] the manuscript on the role of levothyroxine therapy in women with polycystic ovary syndrome and subclinical hypothyroidism[28] together with the paper by Gamal *et al*. reporting the importance of metabolic modulation in osteoporosis[29] highlight in this issue the translational relevance of laboratory findings to patient care. Similarly, Costantino *et al.*[30] discussed the microbiota–gut–brain axis as a target for irritable bowel syndrome therapies suggesting that microbiota tests are increasingly used by patients, and personalized medicine will require gastroenterologists.

One study, authored by Kumosani *et al.*, explored the use of naringenin on the inhibition of protein glycation in diabetic rats as a protection mechanism against nephropathy.[31] Eissa *et al.*[32] discussed the effects of niacin and ubiquinone on lipid metabolism. Niacin, a member of the B-complex vitamin family, plays a crucial role in multiple metabolic pathways, while ubiquinone (Coenzyme Q) is an essential component of the mitochondrial electron transport chain involved in cellular energy production. The authors demonstrated that treatment with niacin, ubiquinone, or their combination significantly enhanced lipoprotein lipase activity and markedly reduced both the obesity index and atherogenic risk.[32]

Two studies have been focused on the prevalence of antibiotic resistance which represents one of the public health problems caused by the improper use of antibiotics. Mustafa and Hama Soor[33] reported the antibiotic resistance patterns of co-isolated *Escherichia coli* and *Klebsiella* spp. in a cross-sectional study investigating the relationship between the resistance and patterns of antibiotic usage intensity. Anwar *et al.*[34] instead discussed wound infections as an increasing concern related to antibiotic resistance, especially in *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae*. The rising incidence of multidrug-resistant infections calls for reinforced infection control measures, optimized antibiotic stewardship, and tailored treatment approaches to enhance patient outcomes in healthcare facilities.[34]

Cardiac biomarker changes following scorpion envenomation reported by Yanchyshyn *et al*.[35] indicate that *Leiurus macroctenus* envenomation may cause significant destruction of the cellular microenvironment in the heart with certain changes in the innate immune response, leading to systemic poisoning. In this issue the clinical and biological significance of estrogen receptor-positive/progesterone receptor-negative breast cancer is explored using bioinformatics, exemplifying how computational tools augment experimental research (Althobiti *et al*.).[36]

Finally, comparative anatomy of humans and domestic canids further underscores the value of biodiversity studies, as pointed out by Gratie *et al*.[37]

JBR published in 2025 also two special volumes including two abstract books: the first one of the 97th National Congress of the Italian Society for Experimental Biology which was hold in Palermo, Italy, from 10 to 13 April 2025, and the second one of the 2nd Plastamination Conference which was hold in Napoli, Italy, from 15 to 17 October 2025.

Overall current and past publications of the Journal of Biological Research reflects the journal's commitment to integrating multidisciplinary approaches that span molecular characterization, ecological assessment, computational analysis, and translational investigations. The diversity of topics and methodological approach represented in this issue show the dynamic landscape of biological research and its relevance to discuss scientific and health-related challenges.

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