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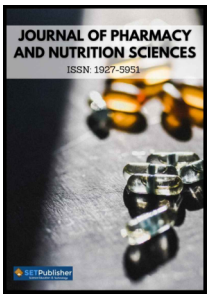

Secondary Metabolites: Detection and Bioactivity

EDITORIAL

Secondary metabolites are valuable organic compounds whose main function is to mediate the interactions between plant and animal ecosystems. Their extraction and characterization represent a crucial point for understanding the contribution on the pharmacological effects deriving from their use and also for the identification of new bioactive molecules. In particular, the secondary metabolites extracted from plants are complex mixtures of compounds belonging to different chemical classes for which a better knowledge of their chemical structure would allow a correct evaluation of the medicinal value of the plant itself. This special issue collects works describing the analytical methods used for the detection of secondary metabolites and the biological analyses carried out to determine their potential activity.

The medicinal plants have been widely designed to find natural remedies against gastric ulcer. In a review paper, the collected articles focused on twenty -two Malaysian plants which can protect the gastric wall from necrotizing agents such as ethanol and fans. The mechanism of gastric protection could occur via four possible pathways, cytoprotection, HSP70 upregulation and pro-apoptotic protein Bax downregulation, inhibition of acid secretion, and antioxidation. Most of the plants showed high enzymatic and non-enzymatic antioxidant activities [1].

In a review, medicinal uses, fitochimic, pharmacological and toxicological properties of the indigenous species belonging to the Araliaceae family in southern Africa (Angola, Botswana, Eswatini, Lesotho, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe were revised) given their wide use in these geographical areas, were evaluated. Eleven species such as, *Cussonia Arborea, C. Airola, C. Natalensis, C. Nicholsonii, C. Paniculata, C. Sphaerocephala, C. Spicata, C. Transvaalensis, C. Thyrsiflora, C. Zuluensis* and *Neocusonia umbellifers* are used as traditional medicines against 48 human and animal diseases. Numerous secondary metabolites have been identified and the extracts and raw compounds obtained from these species, exert different effects including the analgesic, antibacterial, antifungal, antiviral, anticancer, anti -perglicemic, anti -inflammatory, anti -angry, antileishmanial, antioxidant, antiplasmodial, antiprotozoal, anti-ulcer, immunomodulatory, larvicidal, molluscida, spective and cytotoxic [2].

Experimental studies for the regulation of oxidative strategies in liver dysfunction caused by viral infections, have had serious success in recent times years. Liver damage is often a consequence of a severe flu. Mileva *et al*. [3], aimed to estimate the protective effect of a combination of S-adenosyl-Lmethionine (SAM) as a glutathione precursor and Oseltamivir as a specific inhibitor of virus replication on oxidative damage caused by influenza infection in the liver of infected mice. Albino mice were inoculated with 10 × LD50 of influenza virus A/Aichi/2/68(H3N2). Oseltamivir was applied for five days after infection, twice per day, while SAM was applied for ten days starting five days before inoculation. Influenza infection causes severe oxidative damage to the liver. All combinations of SAM and oseltamivir restored the levels of biochemical markers to those of healthy animals and improved virological parameters. This study provides an easy-to-apply approach with good therapeutic potential with a specific antiviral agent and antioxidant precursor. Despite this, this therapeutic proposal requires validation using other animal models of influenza infection and subsequent human clinic evidence.

Abiotic stresses like temperature, water, salinity, ultraviolet (UV) radiations, heavy metals, etc., affect plants' growth and yield. Despite these constraints, plants produce a variety of proteins and metabolites to maintain their survival. Glycine betaine (GB) is a quaternary ammonium compound that belongs to a class of secondary metabolites, present in plants, animals, and microbes. Due to high solubility and low viscosity, its accumulation is commonly observed in chloroplasts and plastids. GB protects the photosystems of plants and balances the pH of the cytoplasm under stress conditions. GB prevents the damage of important biomolecules through reactive oxygen species (ROS) scavengers and reduces lipid peroxidation. The potential bioactivity of GB against various abiotic stresses in plants has been summarized in a review paper [4].

The emergence of the antimicrobial resistance and the side effects of synthetic drugs have aroused interest in the search for new antimicrobial compounds. The antibacterial activity in vitro of green coffee and its active compounds (chlorogenic acid extract and caffeine extract) against some periodontic and nosocomial bacteria, has been the subject of study. Bioactive compounds such as chlorogenic acid and caffeine were extracted by means of soxhlet extraction and were quantified by HPLC UV. The results showed that the aqueous extract of the green coffee grain was the least effective against periodontal and nosocomial bacteria while the methanol extract of the green coffee bean exhibited the highest inhibitory activity. On the contrary, the Ethanolic extract was significantly effective against the Staphylococcus epidermidis among the selected nosocomial pathogens. In conclusion, the antibacterial property of green coffee highlights its potential as a naturally active antibacterial compound [5].

Essential oils extracted by hydrodistillation from wild plants and plants acclimatized under different culture conditions of *Mentha rotundifolia* were investigated and their antimicrobial activity against five pathogenic microbial strains was evaluated by Benhamed *et al.* [6].

Nature has provided us with a wide range of biological compounds that can be used to combat health problems. Food and pharmaceutical companies have developed a range of new approaches to exploit and efficiently preserve the diversity and quality of bioactive compounds. Many workshops regularly make the screening of plant species looking for new bioactive metabolites developing different extractive methods also because no universal extraction method is ideal and each extraction procedure is unique. In this review work, several methods of analysis and extraction procedures have been evaluated [7].

Chemical analysis by GC/MS revealed the predominance of piperitenone oxide. Its content in acclimatized seedlings was 93.07% for seedlings grown at 16°C and a photoperiod of 16 hours light / 8 hours dark, statistically higher than in wild plants where it was around 78%. Limonene content was also different in the two conditions. In general, it was found that the antimicrobial activities of essential oils extracted from acclimatized plants were superior to those of field-grown *M. rotundifolia* plants. In particular, those grown at 16°C or in total darkness were the most active while those grown at 35°C were the least active.

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Dr., PhD, Stefania Garzoli
Department of Chemistry and Technologies of Drug
Sapienza University,
P.le Aldo Moro 5, 00185 Rome
Italy
Tel: +390649913611
E-mail: stefania.garzoli@uniroma1.it