

## Abstract

Habilitation thesis entitled "Biologically active compounds with biotechnological significance" presents some of the undertaken researches and the obtained results after receiving PhD title. Most of these studies were conducted in multidisciplinary research projects.

The first chapter provides scientific and professional achievements grouped by thematic directions. A major concern is the field of biodegradation enzymes with applications in lignocellulosic materials biodegradation, accounting, moreover, a continuation of the researches addressed in the thesis. Thus, there were investigated and characterized various sources of lignocellulosic biomass (straw and corn stalks, wheat straw, barley straw, sorghum, string vine, energy plants) and the chemical pre-treatment methods, enzymatic or combination thereof, to increase overall conversion into bioethanol or biogas. The undertaken investigations intended to continue and expand the isolation, purification and characterization of complex enzyme systems containing cellulases, xylanases and amylases synthesized by fungi, in order to obtain high enzymatic activity preparations for biofuels destination. Optimizing the action parameters of these preparations was studied in relation to the substrate on which to act and the scope of use.

Natural leather and fur biodegradation by microbial and enzymatic processes has been addressed as an alternative to harsh chemical treatments that are applied routinely. There have been a number of fungal (*Aspergillus oryzae* and *Aspergillus ochraceus*) and bacterial strains tested (*Bacillus amyloliquefaciens*, *Bacillus licheniformis*, *Bacillus spp.*, *Pseudomonas fluorescens*) in order to obtain a proteolytic complex capable of hydrolyzing collagen and keratin from these materials. The kinetic parameters were investigated for the enzymes with significant activity and a study was carried out on the stability during storage of the obtained preparations, maintained in a lyophilized state or in solution state at different temperatures.

We tested a number of newly synthesized benzimidazole derivatives with low molecular weight, on their ability to inhibit MMP activity. These enzymes are involved in various pathologies such as rheumatoid arthritis, cardiovascular disease and multiple sclerosis. The inhibitory effect was assessed by estimating both interstitial collagenase enzyme activity using pure type IA collagen and the natural structures represented by two types of collagen gels extracted from bovine conjunctive tissue (SCI and IATC).

Another well-defined research line it is represented by mycotoxins, secondary metabolites synthesized species of filamentous fungi. A number of studies conducted include information on the incidence of mycotoxins (deoxynivalenol, zearalenone and ochratoxin A) in grain (determined

at harvest time and during storage in different conditions), grapes and wine. *In vitro* studies were conducted to test the pathogenicity / aggressiveness of *Fusarium graminearum* and *Fusarium culmorum* isolates correlated with the accumulation of deoxynivalenol in germinated wheat seeds. Deoxynivalenol stability tests showed a high resistance to high temperatures thereof.

The effects of mycotoxins on the viability and proliferation of human cells were studied HepG2 liver cell line and kidney Hek 293 cell line, showing a correlation with deoxynivalenol and ochratoxin A tested concentration and with period of the applied treatment. A series of experiments were devoted to highlighting a possible impairment of the junction protein of the IPEC1 porcine intestinal epithelial monolayer by deoxynivalenol and zearalenone. Thus, these mycotoxins can induce increased permeability of the intestinal epithelium. It has been demonstrated that zearalenone also alters several important parameters of the hepatic cellular immune response.

The paper mentioned and activities for the determination of other compounds with biotechnological significance (amino acids, organic acids, vitamins, and polyphenols) isolated from various matrices in order to assess their nutritional qualities, antioxidant and antimicrobial properties.

The results presented were obtained, mostly within multidisciplinary research teams in which each member has contributed to the planning and conducting experiments, according to his expertise.

The second chapter is dedicated to presenting research conducted in the 8 international projects and 32 national projects, 16 as being responsible, are referred to articles, presentations and patents results.

The last chapter includes information on the recognition and impact of the undertaken activity. They are listed citations in ISI and BDI publications, quality reviewer for publications Romanian Biotechnological Letters and Scientific Bulletin, Series F Biotechnologies and affiliation to international (International Society of Mycotoxicology) and Romanian scientific societies (Romanian Society of Medical Mycology and Mycotoxicology Romanian Society Romanian Society of Chemistry and Biochemistry and Molecular Biology). The chapter ends with the development plan and professional, scientific and academic career development.