



CAETS



## EDITOR-IN-CHIEF'S WORD

Dear readers,

One of the tasks of our Academy is, among others, to familiarise the general public with the scientific research activities of our members, especially if these are related to their applications in industry.

In this issue Prof. Đurđica Ačkar, PhD, associate member of the Department of Bioprocess Engineering of the Academy, and full professor at the Faculty of Food Technology Osijek of the Josip Juraj Strossmayer University of Osijek, as the guest editor presents some of the possibilities and achievements in food industry especially related to the care of the quality management of waste as one of the necessities of sustainable modern civilization.

I believe that the contents of this issue will enable you to familiarise yourself with some aspects of the above-mentioned problem.

Editor-in-Chief

Vladimir Androćec, President of the Croatian Academy of Engineering



## EDITOR'S WORD

Dear readers,

As in many other areas of contemporary engineering, environmental issues are of increasing importance in the food industry. To this end, recycling or reducing biological waste from food production has become a frequently addressed research topic during recent years.

By following this trend, it is my pleasure to present in this edition of Engineering Power a series of papers dealing with different aspects of by-product management in the food industry, representing excellent

scientific research in the field conducted at the Faculty of Food Technology Osijek.

The Guest-Editor of this issue is Đurđica Ačkar, full professor at the Faculty of Food Technology Osijek, Josip Juraj Strossmayer University of Osijek, and associate member of the Academy in the Department of Bioprocess Engineering.

Editor

Zdravko Terze, Vice-President of the Croatian Academy of Engineering



## FOREWORD

Environmental issues are deeply embroiled in the EU Strategy From Farm to Fork. Today, more than ever, the impact of food industry on the greenhouse gas (GHG) emission, water and soil pollution is protruding. It is estimated that more than 25% of GHG emissions results from food production. Therefore, food industry today faces the demand to shift from traditional "use-and-discard" approach to production that has at least neutral, if not positive environmental impact.

In recent years, many research objectives have been reuse, recycling or reduction of biological waste generated during food processing. Food industry by-products are no longer seen as a waste, but as valuable raw materials for further processing. The papers presented in this issue represent scientific research in this field conducted by different research teams at Faculty of Food Technology Osijek. As shown in the papers, the Faculty researchers deal with food industry by-products from different aspects: use in food, production of additives for bakery industry, extraction of bioactive components using green extraction techniques and use of by-products as substrates for microbial fermentation. More specifically, the overview of research of apple pomace, sugar beet pulp, and brewers' spent grain use in production of extruded snacks and modified flour; application of cocoa husk in chocolate production; as well as extraction of bioactive compounds from citrus peel, cocoa husk and tobacco waste using supercritical CO<sub>2</sub>, subcritical water, high-voltage discharge-assisted extraction is presented in the first paper. It has shown how by-products from plant processing can be valorised through value-added food and pharmaceutical products. The second paper gives an example of valorisation of grape processing by-products by application of biorefinery concept, and gives an overview of "reuse-reduce-recycle" approach in the food industry. The third paper focuses on egg-shell, coffee spent grounds and brown onion skin in production of collagen, hyaluronic acid, enzyme immobilization, in addition to extraction of bioactive components. Combined, the three papers offer different approaches in the solution of food industry by-product disposal which may be applied in the industry single-handedly or combined. The last papers gives a different approach, showing that addressing waste disposal issues should be done in a broader range. It shows an example of educational activities involved in the municipal waste management, broadening Faculty's involvement in the environmental campaign.

Guest-Editor

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