

## BIOCATALYSIS FOR BIOMASS VALORIZATION: PEPTIDES AND FATTY ACIDS FROM RICE BRAN

Giovanna Speranza<sup>a</sup>, Kalliopi Avramidou<sup>a</sup>, Teodora Bavaro<sup>b</sup>, Carlo F. Morelli<sup>a</sup>, Teresa Recca<sup>a</sup>, Daniela Ubiali<sup>b</sup>

<sup>a</sup> *Department of Chemistry, University of Milan;* <sup>b</sup> *Department of Drug Sciences, University of Pavia*

Waste upgrading practises have attracted a significant attention in recent years with the aim of managing agrofood by-products in a gainful and sustainable way.

We describe here how biocatalysis can assist rice bran valorization, according to the biorefinery concept. [1]

Rice is the staple food for over half the world's population. Rice milling generates a massive amount of waste, namely rice bran (70 kg/ton of rice) and rice husk (200 kg/ton of rice). Rice bran (RB), containing fibers (7-11%), proteins (10-16%), lipids (15-22%), carbohydrates (34-52%), micronutrients, represents a second-generation biomass. [2]

Rice bran proteins (RBP) have a high nutritional value and optimal digestibility and are gluten-free, hypoallergenic and rich in essential amino acids. However, the first hurdle to be overcome for RBP production and large scale application is their extraction. Structural complexity, poor solubility, and strong aggregation make RBP hardly available.

The sequential treatment of RB with carbohydrases and proteases was used to prepare mixtures of water-soluble peptides (RBPHs, RBP Hydrolysates) to be tested as antibacterial, antioxidant and anticholesterol agents, as well as flavour enhancers. [3] Interestingly, sensory analysis revealed that the obtained RBPHs exert only sweet and umami taste.

Rice bran oil (RBO) is one of the most underutilized agricultural commodities. We investigated the use of RBO as a feedstock for the production of FFA-derived chemicals (*e.g.* sugar fatty acid esters). [4] To this aim, RBO was submitted to a preparative lipase-catalyzed hydrolysis to obtain pure FFA. [5] The high acidity of RBO, so far considered as a bottleneck in the exploitation of RBO (*i.e.* biodiesel production) was here turned into an advantage, making available FFA mixtures as synthetic precursors for high added value products.

[1] Mukherjee, J.; Gupta, M.N. *Sustain. Chem. Process* **2015**, 3, 7.

[2] Sharif, M.K.; Butt, M.S.; Anjum, F.M.; Khan, S.H. *Crit. Rev. Food Sci. Nutr.* **2014**, 54, 807-816.

[3] Bagnasco, L.; Pappalardo, V.M.; Meregaglia, A.; Kaewmanee, T.; Ubiali, D.; Speranza, G.; Cosulich, M.E. *Food Res. Int.* **2013**, 50, 420-427.

[4] Biermann, U.; Bornscheuer, U.; Meier, M.A.R.; Metzger, J.O.; Schäfer, H.J. *Angew. Chem. Int. Ed.* **2011**, 50, 3854-3871.

[5] [www.buchi.com/en/content/separation-free-fatty-acids-and-acylglycerols](http://www.buchi.com/en/content/separation-free-fatty-acids-and-acylglycerols) (short note application 267/2016).