

Fermented Fruit and Vegetable Discard as a Source of Feeding Ingredients and Functional Additives

Authors : Jone Ibarruri, Mikel Manso, Marta Cebrián

Abstract : A high amount of food is lost or discarded in the World every year. In addition, in the last decades, an increasing demand of new alternative and sustainable sources of proteins and other valuable compounds is being observed in the food and feeding sectors and, therefore, the use of food by-products as nutrients for these purposes sounds very interesting from the environmental and economical point of view. However, the direct use of discarded fruit and vegetables that present, in general, a low protein content is not interesting as feeding ingredient except if they are used as a source of fiber for ruminants. Especially in the case of aquaculture, several alternatives to the use of fish meal and other vegetable protein sources have been extensively explored due to the scarcity of fish stocks and the unsustainability of fishing for these purposes. Fish mortality is also of great concern in this sector as this problem highly reduces their economic feasibility. So, the development of new functional and natural ingredients that could reduce the need for vaccination is also of great interest. In this work, several fermentation tests were developed at lab scale using a selected mixture of fruit and vegetable discards from a wholesale market located in the Basque Country to increase their protein content and also to produce some bioactive extracts that could be used as additives in aquaculture. Fruit and vegetable mixtures (60/40 ww) were centrifugated for humidity reduction and crushed to 2-5 mm particle size. Samples were inoculated with a selected *Rhizopus oryzae* strain and fermented for 7 days in controlled conditions (humidity between 65 and 75% and 28°C) in Petri plates (120 mm) by triplicate. Obtained results indicated that the final fermented product presented a twofold protein content (from 13 to 28% d.w). Fermented product was further processed to determine their possible functionality as a feed additive. Extraction tests were carried out to obtain an ethanolic extract (60:40 ethanol: water, v.v) and remaining biomass that also could present applications in food or feed sectors. The extract presented a polyphenol content of about 27 mg GAE/gr d.w with antioxidant activity of 8.4 mg TEAC/g d.w. Remaining biomass is mainly composed of fiber (51%), protein (24%) and fat (10%). Extracts also presented antibacterial activity according to the results obtained in Agar Diffusion and to the Minimum Inhibitory Concentration (MIC) tests determined against several food and fish pathogen strains. In vitro, digestibility was also assessed to obtain preliminary information about the expected effect of extraction procedure on fermented product digestibility. First results indicated that remaining biomass after extraction doesn't seem to improve digestibility in comparison to the initial fermented product. These preliminary results show that fermented fruit and vegetables can be a useful source of functional ingredients for aquaculture applications and a substitute of other protein sources in the feeding sector. Further validation will be also carried out through "in vivo" tests with trout and bass.

Keywords : fungal solid state fermentation, protein increase, functional extracts, feed ingredients

Conference Title : ICWB 2023 : International Conference on Waste Biorefinery

Conference Location : Rome, Italy

Conference Dates : October 09-10, 2023