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Integration of the Electro-Activation Technology for Soy Meal Valorization

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Abstract : Nowadays, the interest of using sustainable technologies for protein extraction from underutilized oilseeds is growing. Currently, a major disposal problem for the oil industry is by-products of plant food processing such as soybean meal. That is why valorization of soybean meal is important for the oil industry since it contains high-quality proteins and other valuable components. Generally, soybean meal is used in livestock and poultry feed but is rarely used in human feed. Though chemical composition of this meal compensate nutritional deficiency and can be used to balance protein in human food. Regarding the efficiency of soybean meal valorization, extraction is a key process for obtaining enriched protein ingredient, which can be incorporated into the food matrix. However, most of the food components such as proteins extracted from oilseeds by-products imply the utilization of organic and inorganic chemicals (e.g. acids, bases, TCA-acetone) having a significant environmental impact. In a context of sustainable production, the use of an electro-activation technology seems to be a good alternative. Indeed, the electro-activation technology requires only water, food grade salt and electricity as main materials. Moreover, this innovative technology helps to avoid special equipment and trainings for workers safety as well as transport and storage of hazardous materials. Electro-activation is a technology based on applied electrochemistry for the generation of acidic and alkaline solutions on the basis of the oxidation-reduction reactions that occur at the vicinity electrode/solution interfaces. It is an eco-friendly process that can be used to replace the conventional acidic and alkaline extraction. In this research, the electro-activation technology for protein extraction from soybean meal was carried out in the electro-activation reactor. This reactor consists of three compartments separated by cation and anion exchange membranes that allow creating non-contacting acidic and basic solutions. Different current intensities (150 mA, 300 mA and 450 mA) and treatment durations (10 min, 30 min and 50 min) were tested. The results showed that the extracts obtained by the electro-activation method have good quality in comparison to conventional extracts. For instance, extractability obtained with electro-activation method was 55% whereas with the conventional method it was only 36%. Moreover, a maximum protein quantity of 48 % in the extract was obtained with the electro-activation technology comparing to the maximum amount of protein obtained by conventional extraction of 41 %. Hence, the environmentally sustainable electro-activation technology seems to be a promising type of protein extraction that can replace conventional extraction technology.

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