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Biopolymers: A Solution for Replacing Polyethylene in Food Packaging

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Abstract : The food industry is one of the major generators of plastic waste derived from conventional synthetic petroleum-based polymers, which are non-biodegradable, used especially for packaging. These packaging materials, after the food is consumed, accumulate serious environmental concerns due to the materials but also to the organic residues that adhere to them. It is the concern of specialists, researchers to eliminate problems related to conventional materials that are not biodegradable or unnecessary plastic and replace them with biodegradable and edible materials, supporting the common effort to protect the environment. Even though environmental and health concerns will cause more consumers to switch to a plant-based diet, most people will continue to add more meat to their diet. The paper presents the possibility of replacing the polyethylene packaging from the surface of the trays for meat preparations with biodegradable packaging obtained from biopolymers. During the storage of meat products may occur deterioration by lipids oxidation and microbial spoilage, as well as the modification of the organoleptic characteristics. For this reason, different compositions of polymer mixtures and film conditions for obtaining must be studied to choose the best packaging material to achieve food safety. The compositions proposed for packaging are obtained from alginate, agar, starch, and glycerol as plasticizers. The tensile strength, elasticity, modulus of elasticity, thickness, density, microscopic images of the samples, roughness, opacity, humidity, water activity, the amount of water transferred as well as the speed of water transfer through these packaging materials were analyzed. A number of 28 samples with various compositions were analyzed, and the results showed that the sample with the highest values for hardness, density, and opacity, as well as the smallest water vapor permeability, of 1.2903E-4 ± 4.79E-6, has the ratio of components as alginate: agar: glycerol (3:1.25:0.75). The water activity of the analyzed films varied between 0.2886 and 0.3428 (aw< 0.6), demonstrating that all the compositions ensure the preservation of the products in the absence of microorganisms. All the determined parameters allow the appreciation of the quality of the packaging films in terms of mechanical resistance, its protection against the influence of light, the transfer of water through the packaging. Acknowledgments: This work was supported by a grant of the Ministry of Research, Innovation, and Digitization, CNCS/CCCDI – UEFISCDI, project number PN-III-P2-2.1-PED-2019-3863, within PNCDI III.

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