SUMMARY

The development of agricultural production and food economy is inherently related to the use of plant protection products. The tightening regulations on ensuring a high level of protection of human and animal health and the environment force the need to look for new solutions aimed at minimizing the negative impact of toxic chemicals, especially pesticides, which are excessively introduced into the environment.

Therefore, the aim of the aim of this PhD thesis was to develop the composition and conditions for the synthesis of biodegradable copolymers useful in forming matrices and microparticles carrying plant protection products in the processes of their controlled soil release. Basically, a type of biodegradable polymer support was obtained, based on lactide, glycolide and polyethylene oxide block terpolymers obtained by ring-opening polymerization (ROP). These terpolymers were then incorporated as a component of compatible polymer mixtures formed with derivatives of appropriately modified ε-caprolactone grafting oligosaccharides such as dextrins and maltodextrins.

The literature part of the dissertation presents problems resulting from environmental pollution with plant protection products, with particular emphasis on the two soil herbicides, metazachlor and pendimethalin, commonly used in agriculture. Biodegradable polymers and polymer blends, including poly (lactide) and its copolymers, polysaccharide grafted copolymers and biodegradable polymer mixtures containing polysaccharides, were characterized. The mechanism and factors influencing the degradation of polymers and polymer blends were analyzed in detail, and the directions of application of biodegradable polymers were discussed in agriculture.

The experimental part includes the purpose and concept of the PhD thesis dissertation, a list of all materials used in the research, instrumental techniques and analytical methods used during the characterization of the obtained polymers. The course of the synthesis of individual polymer materials was described in turn and the materials obtained were characterized. The results of the research on the degradation of selected polymer materials in soil, water and activated sludge were also presented, and the release profiles of selected model soil herbicides metazachlor and pendimethalin were characterized. The selected materials were also used to obtain microspheres that were characterized and subjected to degradation tests and determination of the herbicide release profile, and subjected to preliminary evaluation of herbicidal activity on selected

species commonly known as nuisance to crops, and the toxicity of degradation products of polymer carriers was assessed using biological assay methods.

As the composition of the obtained polymer matrices was developed in such a way as to enable, along with the degradation of the carrier, the most effective release of the active ingredient in an amount that would effectively inhibit the growth of the undesirable plant, it was proved that the proposed controlled release system for agriculture and horticulture allows you to extend the period of stability of concentrated active agents, and also contributes to the reduction of intensive pesticide treatments. Moreover, the proposed systems should significantly reduce the negative impact of pesticides on humans, fauna and flora due to the reduction of the amount of agrochemicals applied to the environment.

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