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PhD thesis title: Development of formulation, implementation into production and evaluation of the effectiveness of selected biocides.

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The doctoral dissertation consists of two parts. The first part involves the issues related to development and implementation of new formulations of biocides. These topics are implemented in response to the request and demand of managers of individual departments at ICB Pharma or external cooperating companies. The second part of the study concerns the ecotoxicological effect of preparations based on Siltac EC (an agent with a physical mode of action).

I. Participation in the development and implementation of some preparations available on the market.

1. Development of an agrochemical preparation with the trade name SiliCu. The preparation was commissioned by the Crop Care Department of ICB Pharma and it is based on the Siltac EC technology. The mentioned product is intended for the physical immobilization of plant pests. In addition, it is a complementary source of copper for plants. Studies conducted on crops has also confirmed its antifungal activity. The preparation has been marketed in Turkey and Kenya. SiliCu is a safe alternative to preparations containing popular pesticides.

2. Development of an agricultural preparation with the trade name Fesil. This product was also commissioned by the Crop Care department of ICB Pharma. The mentioned preparation is intended for the physical immobilization of plant pests. The selection of appropriate ingredients also makes it an iron supplement for the treated plants. Fesil is available in Serbia, Greece and Italy. Like SiliCu, it is a safe alternative to pesticide-based preparations.

3. Development of an innovative technology on the basis of which anti-parasitic collars with the trade name "Frexin" are produced. The product was introduced to the Polish market by the company Laboratorium Organiczne "LAB" sp. Z o.o. Collars effectively and safely protect dogs against ectoparasites (fleas and ticks), which has been confirmed by research. The active substances are deposited in a polyvinyl chloride matrix. This method allows to place the mass containing the active substances on the inside of the collar polyester strap. As a result, the action

of the active substances is directed exactly to the dog's hair. Thus, it is not necessary to use a very high concentration of the active substance. The directional action of the matrix also makes the collar relatively safe for the consumer since he has limited access to the matrix. The registration of the collar based on this technology is currently underway in the United States and the European Union.

4. Development of the technology on which the preparations including such larvicides as pyriproxyfen and S-methoprene were based. Preparations with the trade name Metholarv 0.5GR and Pyrilarv 0.5GR were created at the request from the Pest Department of ICB Pharma. Both preparations are designed to inhibit the development of adult mosquitoes by disrupting the stage development of the mentioned insects. In order to achieve this, during the development of the preparations the active substances were subjected to a microcapsulation process to extend the duration of action of larvicides to about one month. Then, an appropriate aqueous dispersion of acrylic copolymers was selected so that the capsules containing the active substance can be successively washed from the surface of the sand. Efficacy studies confirmed the satisfactory effects of the preparations, which allowed their registration, implementation and sale in Australia and Turkey.

II. Ecotoxicological effects of preparations based on Siltac EC

1. The effectiveness of the preparation with a physical mode of action (Siltac EC) in controlling apple aphids and spider mites in raspberry and blackcurrant crops was confirmed. The conducted studies have proven that the agent has an immobilizing effect on pests of crops and it is a good alternative to biocidal preparations containing classical pesticides.

2. The research carried out on honey bees treated with Siltac EC confirmed its relatively low toxicity to these beneficial insects. It can be assumed that this preparation is relatively safe for bees and may be a promising alternative for commonly used hazardous agrochemicals.

3. The research confirmed that the preparation with the trade name Dergall is an innovative agent that can be used in poultry as a modern and safe method of chicken eggs disinfecting. The use of this preparation may contribute to an increase in the hatchability of chickens.