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BIOLOGICAL PROTECTION OF PLANTS: ONTOLOGICAL APPROACH

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Summary. The article is devoted to the ontological analysis of the processes of production of entomophages for biological plant protection. Research methods – system analysis, approach based on ontologies. Known studies on the use of ontologies in agriculture are analyzed. Ontologies of technological processes of production of *Aphidoletes aphidimyza* and *Chrysoperla carnea* have been developed. The advantages of the proposed approach for biological protection of plants are given.

Keywords: biological plant protection, entomophages, ontological approach.

Introduction

Protection of plants from harmful organisms plays an important role in increasing production and improving the quality of crop production [1]. The use of entomophages in the cultivation of cultivated plants makes it possible to ensure early detection of the pest, reduce the pesticide load and preserve the ecological purity of the crop [2]. At the same time, the production of entomophages in the conditions of technocenosis represents a complex biotechnical system of the man-machine type with a significant number of discrete operations, which requires systematization, generalization to increase the efficiency of its functioning, using the results of scientifics research, modern software tools. The use of an approach based on ontologies allows to increase the level of informativeness and competence of the person who makes decisions in the processes of managing biotechnical production for biological plant protection.

Ontology is a machine-interpreted conceptualization of some area of knowledge [3]. Ontological models can be used as a universal tool for integrating data and knowledge from disparate sources of information [4].

The advantages of using ontologies are:

– the integrity of the presentation of information regarding the subject area [5];

– holistic approach to decision-making processes [6].

The purpose of the research was to conduct an ontological analysis of the processes of entomophages production for biological plant protection.

Materials and methods

The Engineering and Technological Institute "Biotechnica" of the National Academy of Agrarian Sciences of Ukraine carries out scientific research on the engineering and technological support of the production of biological plant protection products, including the development of a decision support system based on ontologies in the production of entomophages.

At present, the known studies on the use of ontologies in agriculture relate to:

– insect ontology, which is the basis for identifying an insect by its characteristics and for beginners to gain basic knowledge about insects [7];

– ontology-based decision support system for controlling insect pests of sugarcane, rice, soybean and cocoa [8];

– the use of ontologies for the official and explicit description of the knowledge of experts in agricultural entomology and the diagnosis of insect pests [9];

– ontology-based decision support for grape crop protection [10];

– structuring knowledge about the processes of managing the production of entomophages in the form of ontologies [11];

– ontologies of the processes of intellectual management of the production of entomophages for biological plant protection based on the application of the results of own research regarding the development and implementation of intelligent data analysis in this production [12];

– ontology of knowledge in the processes of production and use of biological means of plant protection and ontology of knowledge of researchers based on research results of ETI "Biotechnica" of the National Academy of Agrarian Sciences of Ukraine [13];

– ontologies of production processes of the entomophage *Habrobracon hebetor* [14];

– ontology-based expert system for rice disease identification and control recommendations [15].

Research methods – system analysis, approach based on ontologies.

Results and discussion

Using the analysis of scientific works [1, 11-14, 16] and a free software environment Visual Understanding Environment, ontologies of technological processes of the production of *Aphidoletes aphidimyza* and *Chrysoperla carnea* were developed (fig. 1, fig. 2).

Predators *Aphidoletes aphidimyza* and *Chrysoperla carnea* are used to control various types of aphids [17]. *Aphidoletes aphidimyza* is used to protect plants from aphids on all vegetable crops that are grown in closed soil; in practice, it is most often cucumber and tomato [1]. *Chrysoperla carnea* is widely bred for use mainly to protect vegetable and ornamental crops from aphids in closed soil [1].

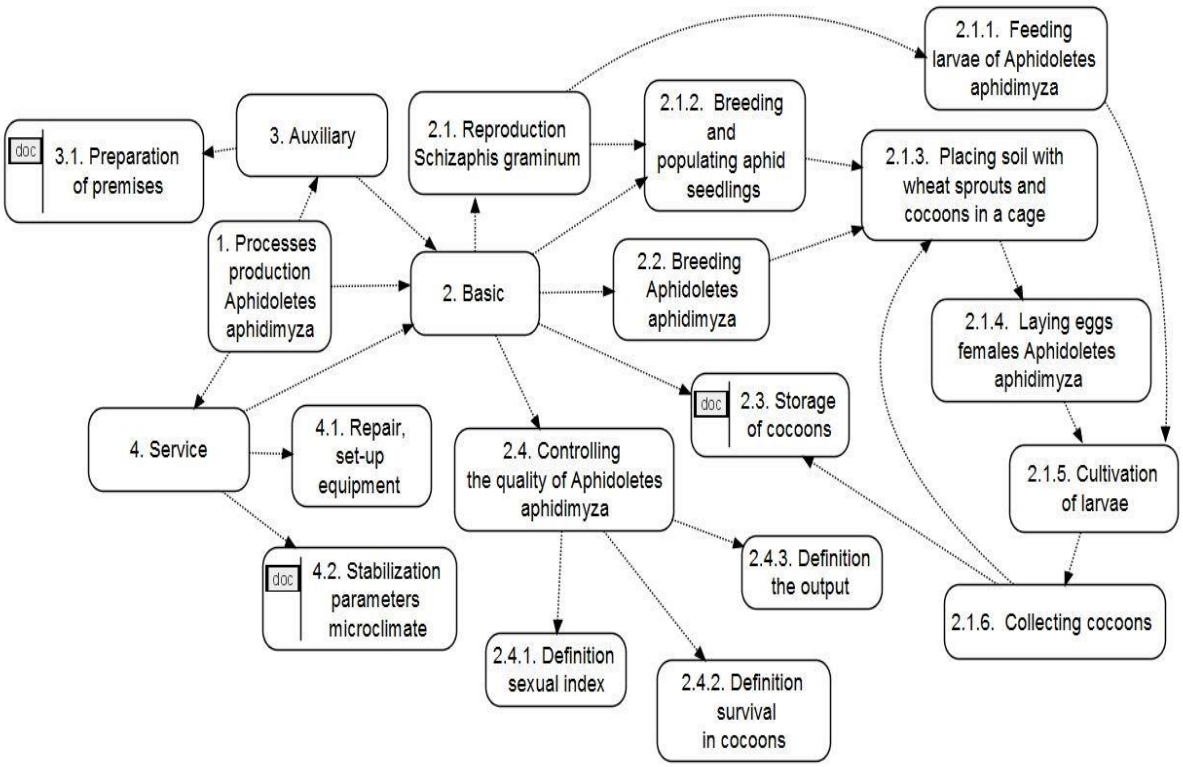


Figure 1. Ontology of the technological process of the production of

Aphidoletes aphidimyza

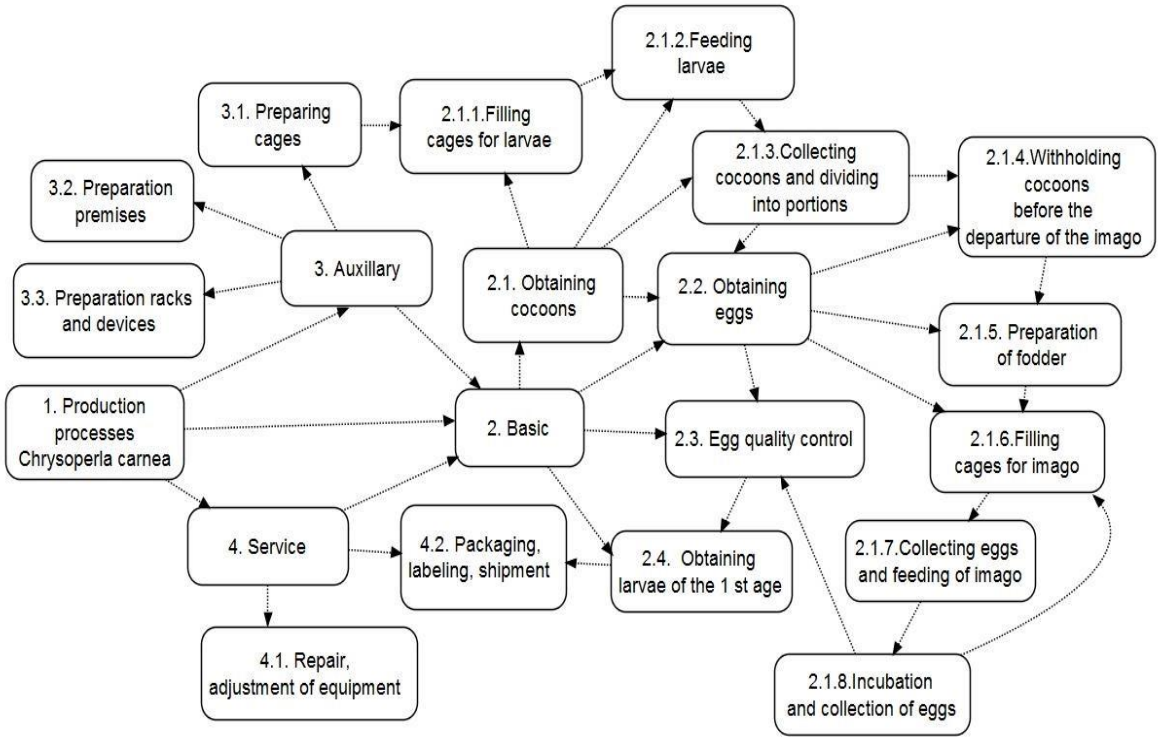


Figure 2. Ontology of the technological process of the production of *Chrysoperla carnea*

Conclusions

The advantages of the ontological analysis of the production processes of entomophages for the biological protection of plants are: systematic processing of knowledge using modern software tools; increasing the level of informativeness regarding the management processes of this production; integration of knowledge; decision support.

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