DATABASE CONCERNING THE PREDATORS USED FOR THE PHYTOPHAGOUS INSECTS CONTROL IN GREENHOUSES

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Abstract: The databases represent useful information sources for the development and implementing of the Integrated Pest Management Programs. The work describes the development and implementation of a database in which structure four sections are included. The first section comprises basic notions definitions in the field, in order to eliminate any possible confusions arising from erroneous information, incorrect translations taken from the literature etc. Section 2 represents the list / inventory of the useful insects and / or products used in the pest insects control in various greenhouses from the European Union. The list of Biological Control Agents (BCA) with potential use in greenhouses comprises 46 species, for each of them being described: the systematics, scientific name, synonyms, common name(s), species / group of pests for which its use is intended, the original and the E.U. distribution, countries in which is used and/or commercially produced; types of use (protected areas and /or field) and others. Section 3 comprises the list of successfully introduced species for use as BCA in the E.U. Section 4 comprises the producer / by products based on predators' provider companies list. The database includes useful and accessible information for a large category of users; they can inform and select one of the available biological control alternatives.

Key words: *database, predators, greenhouse*

INTRODUCTION

From the pest management practices perspective, the biological control is a reliable alternative, fully complying with the sustainable development principles. The biological control has been used even since approximately two millennia and became largely used in the pest management at the end of the 19th century (DeBach, 1964; Lenteren & Godfray, 2005; Bale et al., 2008). From the first successful program, with large scale release of *Rodolia cardinalis* ladybird beetle, many successes and benefits for farmers and consumers have been obtained worldwide so, is expected that biological control methods to represent up to 35-40% of all crop protection methods by 2050 (Lenteren, 2007). The Biologial Control Agents (BCA) (antagonists or natural enemies: predators, parasitoids and pathogens) are considered as being a reliable and efficient solution for reducing the pest agents population density (Van Lenteren, 2012; Cock et al., 2010; Waage & Greathead, 1988). Cock et al. (2010) estimated that worldwide 170 invertebrate natural enemies are produced and sold for periodical release in augmentative biological control programs of over 100 pest species on approximate 0,4% of the croplands. In 2012, Lenteren estimated that approximately 230 invertebrate natural enemies are available from over 500 suppliers with a market value of more than 300 million $ (Lenteren, 2012).

Given the lack at the national level of useful information source for the development and implementation of the Integrated Pest Management Programs for the protected spaces, this study was conducted for the development of a database containing the list of the potential BCA, with a particular focus on predatory insect species. This was further completed with other elements concerning the basic concepts in the field or the bio-product suppliers list.

MATERIAL AND METHODS

The organization of the database on biological control agents known and / or used for control of insect pests in greenhouses was based on a comprehensive searching of available literature, Internet resources and also on personal communications with experts in the field.

RESULTS AND DISCUSSIONS

The database structure includes 4 sections, organized according to the diagram presented in Figure 1.
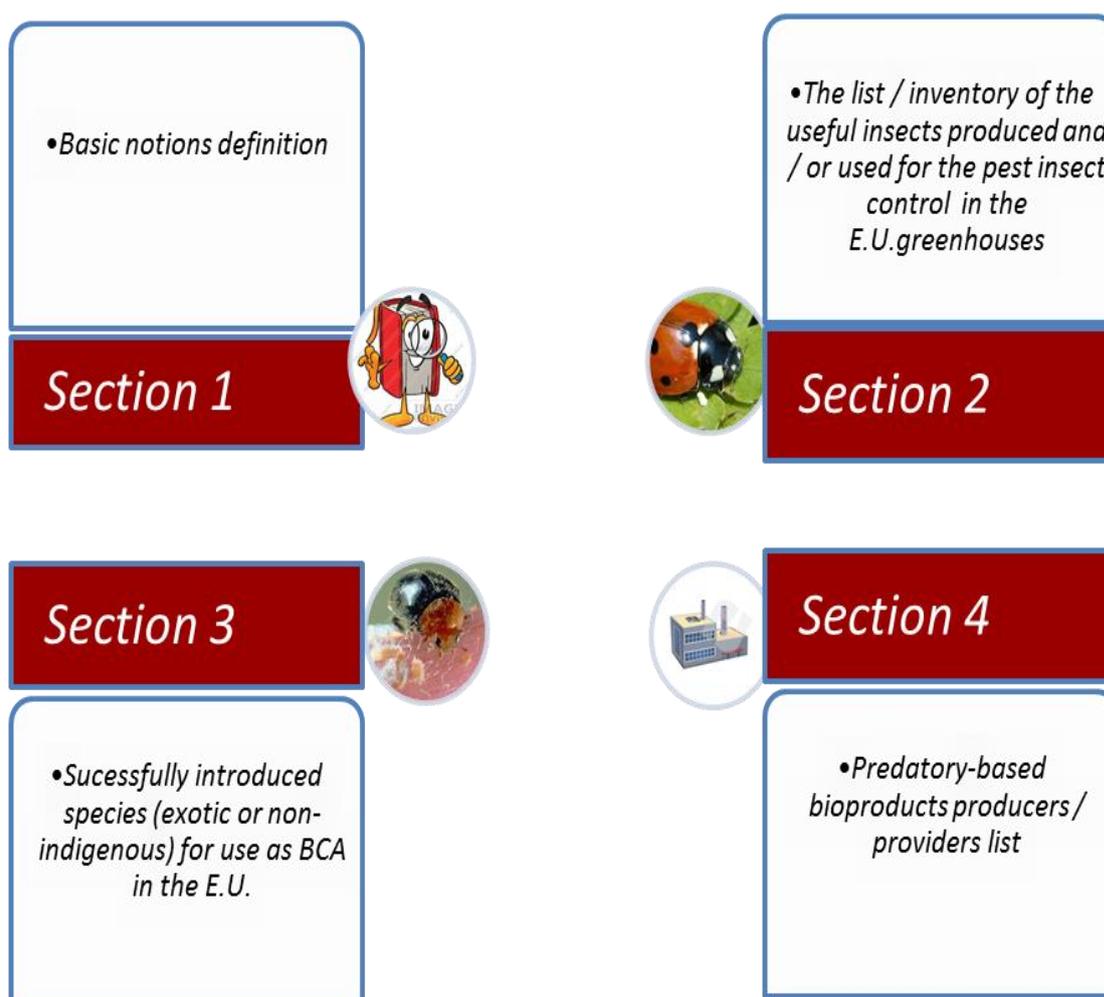

Figure 1. BCA database structure

The basic structure was done in Microsoft EXCEL, as follows:

Section 1: Comprises basic notions definitions in the field, such as: classic biological control, conservation of natural enemies and augmentation of natural enemies, biological control agents etc. This section was designed in order to eliminate any possible confusions arising from erroneous information, incorrect translations taken from the literature etc. For example, the Augmentation of natural enemies is defined as "the periodic release of natural enemies", and a clear distinction should be made on two general approaches to augmentation:

inundative releases and inoculative releases. Inundative releases involves some large numbers of natural enemies to be released for a rapid reduction of a damaging pest population, while the inoculative releasing involves small numbers of natural enemies at prescribed intervals, starting when the pest population is very low (http://www.entomology.wisc.edu).

Section 2: presents the list / inventory of the useful insects and / or products used in the pest insects control in greenhouses and solaria from the European Union. This list contains biological control agents which are recognized by the EPPO Panel on Safe Use of Biological Control to have been widely used in several EPPO countries (http://archives.eppo.int). Within the database, the list of selected BCA with potential use in Romanian greenhouses conditions comprises 46 species, for each of them being described: the systematics, scientific name, synonyms, common name, species / group of pests for which its use is intended, the original and the E.U. distribution, countries in which is used or commercially produced; types of use (protected areas and / or field), date of the first use and others. From the 46 species, distributed as follows: Coleoptera - 13 species, Diptera - 4 species, Hemiptera - 8 species and Hymenoptera - 21 species, the majority (26) are used for the protected spaces pest population control, a part (17) are efficient in the control of the pest populations both in protected spaces and in field conditions, as for the field conditions control is used the smallest number of species (3). Of these, the largest share have the hymenopterans, the other two orders being lesser represented (Figure 2).
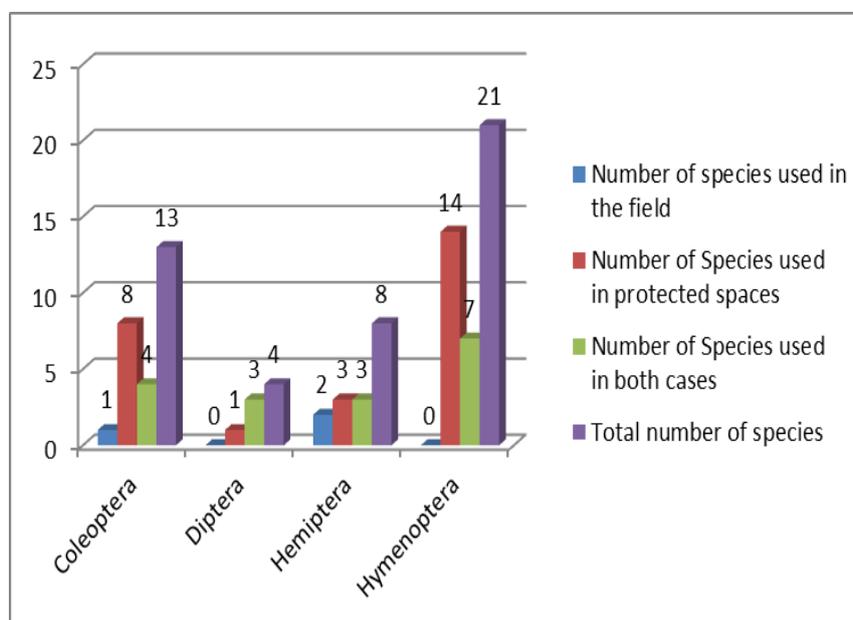

Figure 2. Breakdown into systematic groups of the species used in pest control in E.U. greenhouses and type of use

Our analysis shows that most of the predator species (40, respectively 39) are used in Netherlands and Belgium (Figure 3). In France are released 34 species, 29 in Spain and 28 in Germany. Over 20 species per country are used in Denmark followed by Italy and Portugal and up to 20 species are used in Greece, Great Britain and in Poland.
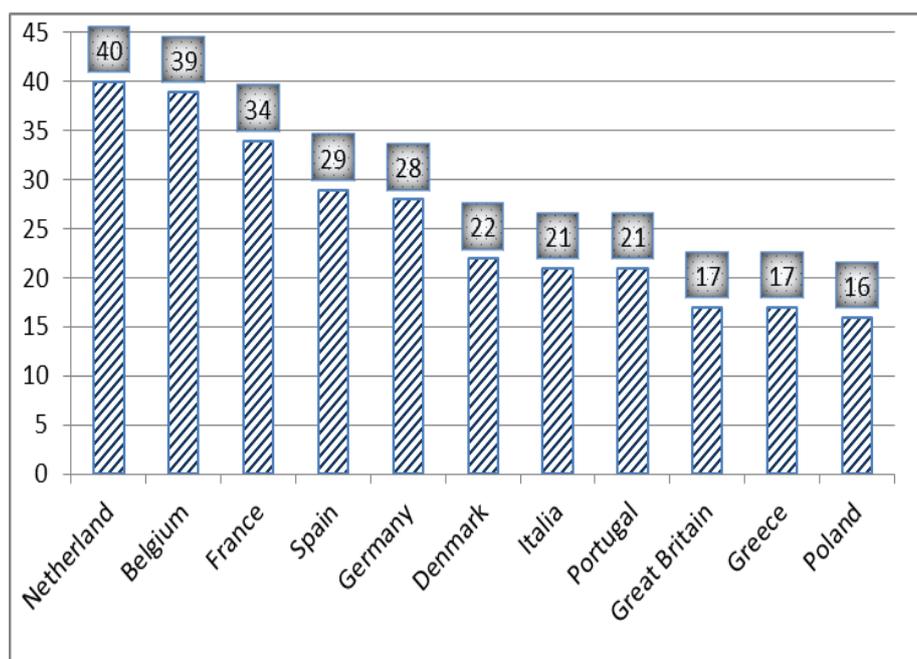
Figure 3. The "top-ten" E.U. country that invested the most in BCA releases
by number of predator species used in greenhouse

Section 3: List of the successfully introduced species for use as BCA in the E.U.

The intensification of the international agricultural products trade and of the tourism is the major ways for accidental introduction of alien / exotic species. Europe has been generally most a source than a destination for the biological control agents from the invertebrates, comparatively with other countries with greater experience in the classical biological control, as Australia, Canada, New Zealand, South Africa and the USA (Bigler et al., 2005). The growing popularity of the classical biological control as an alternative to the pesticide-based programmes resulted in the exotic entomophages species import and release in glasshouses and polythene tunnels in many European countries. In this particularly case of the use of inundative biological control, involving multiple releases of non- indigenous BCA, the regulatory pathway that must be achieved by applicants wanting authorization to release a BCA is therefore complex (http://archives.eppo.int/MEETINGS/2015_conferences/ biocontrol.htm). In the databases made by the authors are listed the exotic species with potential use in protected cultivation (vegetables and ornamentals in glasshouses, greenhouses, or poly-tunnels) at national level, for each of them being also described: the systematics, scientific name, synonyms, common name, species / group of pests for which its use is intended, the original and the E.U. distribution, countries in which is used or commercially produced; types of use (indoor and / or outdoor), date of the first use and others.

Section 4: Manufacturer/Provider companies list for bio products based on predators

In this section, are listed the potential providers for predator-based bioproducts, active on the E.U. market with their contact data, list of the offered products, conditioning details and prices, as long as these data are available.

CONCLUSIONS

Based on extensive documentation, for the first time in Romania, it was made a database containing the list of natural enemies' species that can be used for the control of insect pests in greenhouses at national level.

The database contains information useful and accessible to a wide range of users.

Using this database, farmers can be informed and can select one of the available biological control alternatives.

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