INTRODUCTION OF *Entomophaga maimaiga* IN THE GYPSY MOTH POPULATIONS IN SOME COPPICE BEECH FORESTS IN CENTRAL SERBIA

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INTRODUCTIONT

The gypsy moth (*Lymantria dispar* L., Lepidoptera: Erebidae) is the most dangerous defoliating pest in Serbia. During the outbreak in Central Serbia, gypsy moth frequently spread in the broadleaf forests which cover an area of several hundred thousand hectares. It is strongly polyphagous. In Eurasia, it is able to consume foliage of around 500 species of trees and shrubs.

Naturally occuring enthomopathogens are important regulatory factors in insect population. Entomopathogenic organisms, various types of viruses, microsporidia, bacteria, protozoa, fungi, nematodes, which can under the favourable conditions cause the massive insect mortality and are of great breeding capacity, normally live in nature. Epizootics caused by naturally occurring viral and fungal pathogens are often responsible for spectacular crashes of insect pest populations.

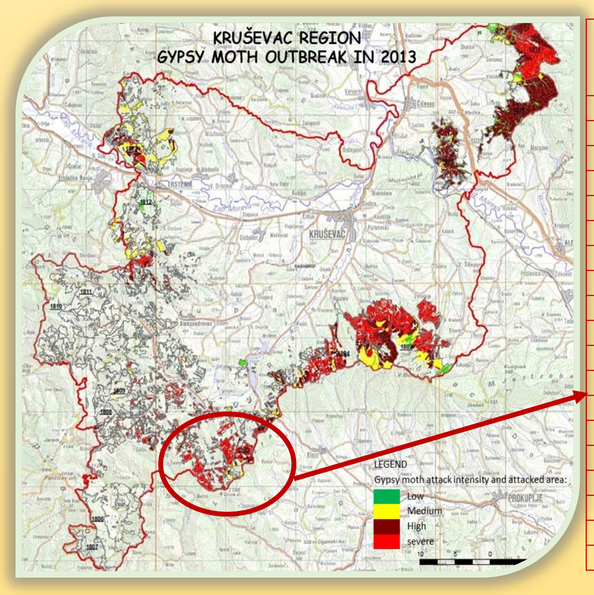
Entomophaga maimaiga Hamber, Shimauzu & Soper (Entomophtorales: Entomophtoraceae) is not native entomopathogenic fungus in Europe. In 1999, it was introduced for the first time in Bulgaria. Recent data suggest that *E. maimaiga* is getting spread in Europe. Since 2011 the fungus has been found in several other European countries. First time this fungus was reported from the European part of Turkey in 2011 and in the same year it was also found in Serbia.

The artificial spread of pathogens, as part of biological control, is recommended where natural spread will be insufficient, because of shortage of time or because the density of host population is too low to allow satisfactory natural spread. Obviously, this method has advantages because only small amounts of the pathogen and inexpensive equipment for field application are needed.

MATERIALS AND METHODS

The research was conducted in the coppice beech forests located in Kruševac region – (Public Enterprise Srbijašume, Forest Estate Rasina, Forest Administration Brus, Management Unit Žunjačko-Batotske planine).

The population density of *L. dispar* was determined by using route measurement at the beginning of autumn of 2013. Using this method, it was determined that the average density of gypsy moth egg masses was 250-8,000 per hectare.



Plot number	Forest compartment	Altitude m	Gypsy moth	
			Attack intensity	Egg masses per hectare
1	55, 56	645	Severe	752
2	86, 87	513	Severe	7,020
3	71, 77	572	Severe	5,240
4	73, 75	835	Severe	936
5	133, 134	870	Severe	4,361
6	137, 138	773	Severe	7,878
7	117, 119	682	Severe	7,650
8	150	939	Severe	2,609
9	160, 161	550	Severe	3,191
10	170	574	Severe	1,600
11	38	328	High	470
12	39, 36	707	Severe	927
13	28, 29	556	High	450
14	23	397	High	423
15	18	454	High	332
16	123	567	Severe	5,580
17	98	577	Severe	2,317
18	184	623	Severe	987
19	112	790	high	251

In early December 2013 at 19 selected plots the assisted spread of it was performed, through the introduction of the infectious inoculum in the coppice beech forests. The introduction of *E. maimaiga* was carried out in one spot of the stand with approximate area 100 sq. m. Under the conditions of the global warming and great drought, the special recipe for the preparation of inoculum was made (40 dead caterpillars mixed with soil and superabsorbent polymers) and introduced around the base of 5 trees. *L. dispar* cadavers containing *E. maimaiga* azygospores were collected in the same regions of Central Serbia, where strong epizootics was determined in the spring of 2013.

The evaluation of *E. maimaiga* infections was recorded as positive when azygospores and conidiospores were detected in the cadavers of dead gypsy moth larvae. The species identification was based on the size, shape and structural characteristics of different life forms of the fungus – azygospores, conidiospores and mycelia. The success of the introduction was evaluated in spring and summer 2014.

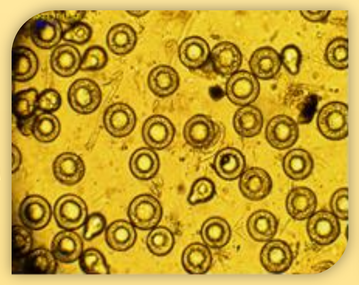
RESULTATES AND DISCUSION

In the coppice beech forests of the studied area, the collapse of the outbreak of the gypsy moths was caused by the introduced entomopathogenic fungus of the gypsy moth *E. maimaiga*. In the studied area of Kruševac region the clear and characteristic symtoms of the fungal diseases were at 89-100% of the reported dead gypsy moth larvae.

Plot	Gypsy moth dead caterpillars						
	Sample size	With *Entomophaga maimaiga*					
		conidiospores		azygospores		conidiospores and azygospores	
	N	N	%	N	%	N	%
1	25 + 25+ 25 + 25	3	3	63	63	34	34
2	25 + 25+ 25 + 25	1	1	79	79	20	20
3	25 + 25+ 25 + 25	-	-	96	96	2	2
4	25 + 25+ 25 + 25	2	2	87	87	7	7
5	25 + 25+ 25 + 25	-	-	100	100	-	-
6	25 + 25+ 25 + 25	1	1	87	87	11	11
7	25 + 25+ 25 + 25	-	-	86	86	3	3
8	25 + 25+ 25 + 25	-	-	100	100	-	-
10	25 + 25+ 25 + 25	-	-	81	81	18	18
11	25 + 25+ 25 + 25	-	-	100	100	-	-
12	25 + 25+ 25 + 25	3	3	85	85	10	10
13	25 + 25+ 25 + 25	-	-	93	93	2	2
14	25 + 25+ 25 + 25	1	1	96	96	2	2
15	25 + 25+ 25 + 25	-	-	100	100	-	-
16	25 + 25+ 25 + 25	5	5	77	77	17	17
17	25 + 25+ 25 + 25	-	-	98	98	2	2
18	25 + 25+ 25 + 25	-	-	57	57	41	41
19	25 + 25+ 25 + 25	2	2	78	78	10	10

By the microscopic analysis of the dead caterpillars the presence of a higher number of conidiospores (in younger larval instars) and azygospores (dominant in the older larval instars of gypsy moths) was clearly determined.

Conidiospores and azygospores isolated from dead gypsy moth larvae



In September 2014, as well as in the previous years, the number of the newly laid gypsy moth egg masses was determined. During the examination were not found laying new egg masses. The situation is the same in the whole forests area, which is the result of the applied method of suppression by artificial spreading of pathogen *E. maimaiga*, as a part of integrated pest management

Summer 2014-Defoliation 0%

ACKNOWLEDGMENTS

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