

ISSN 1821-1046

UDK 630

INSTITUTE OF FORESTRY  
BELGRADE



INSTITUT ZA ŠUMARSTVO  
BEOGRAD

**SUSTAINABLE FORESTRY    ODRŽIVO ŠUMARSTVO**

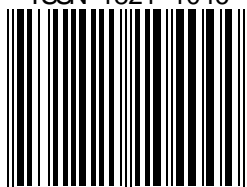
COLLECTION  
TOM 61-62

ZBORNIK RADOVA  
TOM 61-62



**BELGRADE    BEOGRAD**  
**2010.**

ISSN 1821-1046



9 771821 104000

ISSN 1821-1046  
UDK 630

**INSTITUTE OF FORESTRY  
BELGRADE**



**INSTITUT ZA ŠUMARSTVO  
BEOGRAD**

**SUSTAINABLE FORESTRY**

COLLECTION  
TOM 61-62

**ODRŽIVO ŠUMARSTVO**

ZBORNİK RADOVA  
TOM 61-62

**BELGRADE BEOGRAD  
2010.**



**INSTITUTE OF FORESTRY  
BELGRADE**

**INSTITUT ZA ŠUMARSTVO  
BEOGRAD**

**PROCEEDINGS**

**ZBORNİK RADOVA**

**Publisher**

Institute of Forestry  
Belgrade, Serbia

**Izdavač**

Institut za šumarstvo  
Beograd, Srbija

**For Publisher**

Ljubinko Rakonjac, Ph.D.

**Za izdavača**

Dr Ljubinko Rakonjac

**Editorial Board**

Mara Tabaković-Tošić, Ph.D.

Institute of Forestry, Belgrade

Dragana Dražić, Ph.D.

Institute of Forestry, Belgrade

Snežana Rajković, Ph.D.

Institute of Forestry, Belgrade

Ljubinko Rakonjac, Ph.D.

Institute of Forestry, Belgrade

Miloš Koprivica, Ph.D.

Institute of Forestry, Belgrade

Radovan Nevenić, Ph.D.

Institute of Forestry, Belgrade

Mihailo Ratknić, Ph.D.

Institute of Forestry, Belgrade

Zoran Miletić, Ph.D.

Institute of Forestry, Belgrade

Milorad Veselinović, Ph.D.

Institute of Forestry, Belgrade

Biljana Nikolić, Ph.D.

Institute of Forestry, Belgrade

Vesna Golubović-Čurguz, Ph.D.

Institute of Forestry, Belgrade

Assoc. Prof. Iantcho Naidenov, Ph.D

Bulgaria

Prof. Nikola Hristovski, Ph.D.

Macedonia

Dr Kalliopi Radoglou, Ph.D.

Greece

**Redakcioni odbor**

Dr Mara Tabaković-Tošić

Institut za šumarstvo, Beograd

Dr Dragana Dražić

Institut za šumarstvo, Beograd

Dr Snežana Rajković

Institut za šumarstvo, Beograd

Dr Ljubinko Rakonjac

Institut za šumarstvo, Beograd

Dr Miloš Koprivica

Institut za šumarstvo, Beograd

Dr Radovan Nevenić

Institut za šumarstvo, Beograd

Dr Mihailo Ratknić

Institut za šumarstvo, Beograd

Dr Zoran Miletić

Institut za šumarstvo, Beograd

Dr Milorad Veselinović

Institut za šumarstvo, Beograd

Dr Biljana Nikolić

Institut za šumarstvo, Beograd

Dr Vesna Golubović-Čurguz

Institut za šumarstvo, Beograd

Assoc. Prof. Dr Iantcho Naidenov

Bugarska

Prof. Dr Nikola Hristovski

Makedonija

Dr Kalliopi Radoglou

Grčka

**Chief Editor**

Mara Tabaković-Tošić, Ph.D.

**Glavni i odgovorni urednik**

Dr Mara Tabaković-Tošić

**Technical Editor and Layout**

Tatjana Čirković-Mitrović, M.Sc.

**Tehnički urednik i prelom teksta**

Mr Tatjana Čirković-Mitrović

**Secretary**

Tatjana Čirković-Mitrović, M.Sc.

**Sekretar Zbornika**

Mr Tatjana Čirković-Mitrović

**Printed in**

150 copies

**Tiraž**

150 primeraka

**Printed by**

Klik print

Beograd

**Štampa**

Klik print

Beograd

All rights reserved. No part of this publication might be reproduced by any means: electronic, mechanical, copying or otherwise, without prior written permission of the publisher.

Belgrade, 2010

Preuzimanje članaka ili pojedinih delova ove publikacije u bilo kom obliku nije dozvoljeno bez odobrenja

Beograd, 2010

**Cover Page:** Author of the Photos T. Ćirković  
**Naslovna strana:** Autor fotografije T. Ćirković

CIP – Каталогизација у публикацији  
Народна библиотека Србије, Београд

630

**SUSTAINABLE Forestry** : collection = Održivo šumarstvo = zbornik radova / glavni i odgovorni urednik Mara Tabaković-Tošić. –2009, T. 59/60– . – Beograd (Kneza Višeslava 3) : Institut za šumarstvo, 2009- (Beograd: Klik print). – 24 cm

Godišnje. – Je nastavak: Zbornik radova – Institut za šumarstvo = ISSN 0354-1894

ISSN 1821-1046 = Sustainable Forestry

COBISS.SR-ID 157148172

**SADRŽAJ CONTENTS**  
**TOM 61-62**

---

*Zoran MILETIĆ*

**THE POSSIBILITY OF USING SOME CONIFEROUS SPECIES FOR THE  
IMPROVEMENT OF THE CHARACTERISTICS OF MINE SOILS**

7

---

*Ljubinko RAKONJAC, Zagorka TOMIĆ, Aleksandar VASILJEVIĆ,  
Mihailo RATKNIĆ, Milorad VESELINOVIĆ*

**THE SITE CHARACTERISTICS, FLORISTIC COMPOSITION AND  
STRUCTURE OF THE SPRUCE FOREST (ASS. *PICEETUM EXCELSAE*  
*MONTANUM SERBICUM* GREBENŠČIKOV 1950.) IN PESHTER PLATEAU**

15

---

*Mihailo RATKNIĆ, Ljubinko RAKONJAC*

**SESSILE OAK AND HORNBEAM FOREST RESOURCES  
IN PESHTER PLATEAU**

27

---

*Sonja BRAUNOVIĆ, Mihailo RATKNIĆ*

**THE ENDANGERMENT OF THE ECOSYSTEM DIVERSITY OF  
GRDELICHKA GORGE AND VRANJSKA BASIN OWNING  
TO THE ANTHROPOGENIC FACTOR**

41

---

*Vesna GOLUBOVIĆ-ĆURGUZ, Mara TABAKOVIĆ-TOŠIĆ,  
Dragan KIKOVIĆ, Ljubinko JOVANOVIĆ*

**THE INHIBITORY EFFECT OF FUNGICIDES BENFUNGIN WP AND  
KAPTAN FLON ON THE GROWTH OF MYCELIUM  
OF MYCORRHIZAL FUNGI**

55

---

*Mara TABAKOVIĆ-TOŠIĆ, Snežana RAJKOVIĆ,  
Vesna GOLUBOVIĆ-ĆURGUZ, Miroslava MARKOVIĆ*

**COMPATIBILITY OF THE MICROBIOLOGICAL PESTICIDES IN THE  
SYNCHRONISED SUPPRESSION OF POWDERY MILDEWS  
AND THE GYPSY MOTH**

65

---

*Katarina MLADENOVIĆ, Bojan STOJNIĆ, Zlatan RADULOVIĆ*  
**FAUNA OF PREDATORY MITES (ACARI: PHYTOSEIIDAE)  
IN THE ARTIFICIALLY ESTABLISHED STANDS  
ON THE RECLAIMED MINE SOILS**

75

---



UDK 630\*414.12=111  
Original scientific paper

**COMPATIBILITY OF THE MICROBIOLOGICAL PESTICIDES IN THE  
SYNCHRONISED SUPPRESSION OF POWDERY MILDEWS  
AND THE GYPSY MOTH\***

*Mara TABAKOVIĆ-TOŠIĆ, Snežana RAJKOVIĆ,  
Vesna GOLUBOVIĆ-ČURGUZ, Miroslava MARKOVIĆ<sup>1</sup>*

**Abstract:** *After an intensive defoliation on oaks and multiannual forest fruits and aromatic plants, which can be caused by early-season defoliators and the gypsy moth when they outbreak, the new foliage is susceptible to the attack of powdery mildews (agents - pathogenic fungus from order Erysiphales). To prevent the great damage, the compatibility of the microbiological insecticide Foray 48B and microbiological fungicide AQ10 was analysed in laboratory conditions, as the components of a mixture with insecticide and fungicide properties, which can be applied in the synchronic suppression of defoliators from the Lepidoptera order and powdery mildews. The application of the above mixture could prevent the succession of some harmful biotic factors and the further chain-linking of adverse effects.*

**Key words:** *Bacillus thuringiensis ssp. kurstaki, Ampelomyces quisqualis, compatibility, mixture, powdery mildews, gypsy moth*

**KOMPATIBILNOST MIKROBIOLOŠKIH PESTICIDA PRI  
SINHONIZOVANOM SUZBIJANJU PEPELNICA I GUBARA**

**Izvod:** *Posle intenzivnog brsta na hrastovima i šumskim višegodišnjim vrstama voćkarica i aromatičnog bilja, koji mogu prouzrokovati rani defolijatori i gubar kada se jave u prenamnoženju, novo mlado lišće je osetljivo na napad pepelnica (izazivači*

---

\* Acknowledgement: The study was partly financed by the Ministry of Science of the Republic of Serbia, the Project TR-20202 " Development of biotechnological methods for the establishment and improvement of Forest Ecosystems "

<sup>1</sup> Institute of Forestry, Belgrade, Serbia

patogene gljive iz reda *Erysiphales*). Da bi se sprečile veće štete, u laboratorijskim uslovima, istražena je kompatibilnost mikrobiološkog insekticida Foray 48B sa mikrobiološkim fungicidom AQ10, kao komponenti mešavine sa insekticidnim i fungicidnim svojstvima, koja bi se mogla primeniti za istovremeno suzbijanje defolijatora iz reda *Lepidoptera* i pepelnica. Primena navedene mešavine sprečila bi sukcesiju nekih štetnih biotičkih faktora i dalje ulančavanje šteta.

**Ključne reči:** *Bacillus thuringiensis* var. *kurstaki*, *Ampelomyces quisqualis*, kompatibilnost, mešavina, pepelnice, gubar

## 1. INTRODUCTION

The Serbian forests are resources of numerous products, partly quantified and valorized. The complex, frequently complementary use of as much as possible products of forest ecosystems is of permanent importance. Along with timber, the main product, the most important in the commercial sense recently have been forest fruits and aromatic plants, in which Serbia is abundant, due to favourable site conditions. People have harvested and processed forest plants for medicinal purposes since the beginning of history. Forestry in Serbia intends to enrich 500,000 ha of degraded forests by these valuable plants.

Since these species are hosts of numerous, omnipresent, phitopathogenic fungi and economically harmful insects, in the harmony with the trend of forest protection and guidelines to organic products, Institute of Forestry in Belgrade have been studied the biological efficiency of biofungicides and bioinsecticides which could be applied simultaneously in suppressing of the two groups of economically significant and harmful biological agents.

The cases of outbreaking of economically harmful insect species in the group of defoliators, when the adequate measures of protection are not applied, usually cause a significant damage of leaf mass and defoliation, to which the infested plant usually responds by new leafing. In the case of oaks and multiannual forest fruits and aromatic plants, the young, secondary foliage with the thin, newly formed cuticle becomes highly susceptible to the infection by the pathogenic fungus from order *Erysiphales* (powdery mildews), which is often related to the mass dying of host plants after defoliation. The hibernation of this pathogen is possible not only in the stage of cleistothecium and mycelium in the infected bud, but also in the form of chlamydospores which develop on the mycelium on the fallen leaves. Their germination in the following spring and the contact with the young leaves can also cause the infections of the primary leaves (Lazarev and Tabaković-Tošić, 2006; Tabaković-Tošić, 2008; Tabaković-Tošić and Rajković, 2008).

The possibilities of plant protection against the agents of powdery mildew have been investigated for a long time, predominantly in the nurseries, and more rarely in the stands. Most often, chemical fungicides are tested and applied, mainly based on sulphur, which show good biological efficacy, but also numerous disadvantages. As their efficacy is limited in time, treatments have to be repeated often. The majority of applied preparations do not have the systemic impact; they do not protect the entire plant, but only the treated plant parts.

Biological protection against powdery mildew can be conducted by the control of its agents by biofungicides, such as e.g. Mycotal (based on *Verticillium lecanii*), Supresivit (based on *Trichoderma harzianum*), Ibefungin (based on *Bacillus subtilis*), AQ10 (based on *Ampelomyces quisqualis*), or by using growth activators, the preparations which increase host resistance, such as Bion 50 WG (Soukup, 2005).

Also, some horticultural oils offer good protection against the attack of the fungi from the order *Erysiphales*. The highest biological efficacy was achieved by neem oil (oil extracted from the plant *Azadirachta indica*), garlic oil, jojoba oil and soybean oil.

The aim of this study was to examine the biological efficacy and compatibility of microbiological fungicide AQ10 and the microbiological insecticide Foray 48B, components of the mixture for the synchronic suppression of the gypsy moth and the preventive protection of the assimilation organs against mildew infestation. The future of pest and disease controls is in the discovery and sometimes rediscovery of environmentally friendly pesticides. This research is the result of the general direction for integrated forest protection which emphasises the exclusion of chemical control and the application of biological control.

## 2. MATERIAL AND METHOD

AQ10 is a new biofungicide that contains fungal spores of *Ampelomyces quisqualis* for control of powdery mildew by parasitizing and killing the fungal organisms that cause the disease. *A. quisqualis* is a hyperparasite of powdery mildews, which infects 256 plant species within 172 genera in 59 families. It colonizes hyphae, conidiophores, cleistothecia in direct penetration. Host cells are killed shortly after pycnidial formation (2-4 days after infection). AQ-10 should be applied in doses of 30-50-70 g/ha (Rajkovic at all., 2010a, 2010b, 2010c). AQ10 is mostly preventive product but it acts also eradically and is efficient also against mycelia which passed the winter.

In the experiments, which were made in the nursery "Rogot" on the oak seedlings *Q. robur* L. , aged 8 years, biofungicide for the control of powdery mildew *Microsphaera alphitoides* Griff. and Maubl was tested.

The initial application should begin before the appearance of the symptoms and at the latest when three spots on 100 leaves have been observed. AQ10 has very short pre-harvest interval, only 24 hours, so it can be applied prior to and on the day of harvest.

The trials were set by fully randomized block design. The experiment was conducted in four repetitions. The basic plot is consists of 8 trees (1x3 m apart) 25 m<sup>2</sup>. The estimation of leaves with secondary infection with powdery mildew was conducted as follows: 15 well-developed leaves on shoot were selected from the outer zones of branched part of each tree. It was recommended to avoid the shoots with primary infection of powdery mildews and shoots completely infected by powdery mildews, as well as shoots that arise from the interior foliage. The scale of values which was used to record the results of each leaf is 0-4.

**Table 1.** *Variants (doses) of the applied preparations in the laboratory tests of their compatibility and biological efficacy*

Code	Name	Rate
1	distilled water	1000 l/ha
2	Foray 48B	3000 ml/ha + water to 1000 l/ha
3	Foray 48B + AQ10 (50g)	3000 ml/ha Foray 48B + 50 g/ha AQ10 + water to 1000 l/ha
4	Foray 48B + AQ10 (30g)	3000 ml/ha Foray 48B + 30 g/ha AQ10 + water to 1000 l/ha

The experiments of biological efficacy of insecticide Foray 48B and its combinations with fungicide AQ10, were established in the period 2009-2010, during the third larval instar of the gypsy moth. From the beginning of feeding till the end of the two groups of experiments the caterpillars were fed with the natural food (Pedunculate oak leaves), but from the third instar the food was shortly soaked in water solutions of the analysed doses of the preparation (Table 1). During the experiments, temperature and light conditions were constant (temperature 21°C, light regime - 10 hours night, 14 hours a day). The potency was controlled 72, 144 and 216 hours after the establishment of the experiments, and the individuals which survived in the treated and control groups were monitored till the end of the development.

All experiments were established in the complete random block pattern in four repetitions, where the blocks for each variant present 3 Petri dishes with the corresponding number of larvae (15).

The statistical processing consisted of the analysis of variance, the calculation of the mean value of the number of alive larvae, efficacy by Abbott (E), as well as the testing of the differences of mean values of mortality (LSD test).

### 3. RESULTS AND DISCUSSION

In the Table 2 the data of the powdery mildews infestation on the oak leaves are presented. AQ10 was applied in two doses, at the lowest application dose (30g/ha) percentage of infection was 15.35, in the highest dose (50g/ha) 2.15. These results of studies show that if this application of biofungicide AQ10 higher doses is efficient for the control of infection, it could be recommended for control of powdery mildew on oak.

There are no statistically differences between the highest dose of application of AQ10 (ab) and fungicide Sulfur (a) (Duncan, 1955). Fungicide Sulfur SC showed the efficiency of 76.53% which is the low efficiency for chemical fungicides but still satisfactory for practice. Infection on control variant was 19.60% (c) which means that the presence of pathogens was significant in order to conduct this experiment and to properly assess the effectiveness of the investigated preparations.

**Table 2.** Intensity of attacks *M. alphitoides* on oak leaves and efficiency of biofungicide AQ10

Fungicide	Conc./Doses (%, kg/ha)	Infection (%)	Efficacy (%)	Standard (%)
AQ10	30 g	15.35 bc	21.68	28.33
AQ10	50 g	2.15 ab	63.52	83.00
Sulfur SC	0.5%	4.60 a	76.53	100.00
Untreated	-	19.60 c	0.00	0.00
<b>LSD 005:</b> 6.65				
<b>LSD 001:</b> 9.33				

At the Institute of Forestry in Belgrade in the two-year period (2009-2010), the possibilities of synergetic effect of biological insecticide Foray 48B (active ingredient: *Bacillus thuringiensis* ssp. *kurstaki*) with biological fungicide AQ10 (active ingredient: parasitic fungus of powdery mildew - *Ampelomyces quisqualis*), was studied in the aim of the synchronic suppression of the two most significant agents on oaks and forest fruit trees – powdery mildews and the gypsy moth. The study results are presented in Tables 3 - 5.

**Table 3.** Biological efficacy of the tested mixtures of biological insecticide and fungicide in the suppression of the third larval instar of the gypsy moth, 72 (a), 144 (b) and 216 (c) hours after test establishment

Code	Number of alive larvae per repetition								X mean		E by Abbott %	
	I		II		III		IV		2009	2010	2009	2010
	2009	2010	2009	2010	2009	2010	2009	2010				
<b>a)</b>												
1	15.0	14.7	15.0	15.0	15.0	14.7	15.0	15.0	15.0	14.85		
2	5.7	2.3	6.0	0.0	4.3	0.0	6.0	0.0	5.50	0.575	63.33	96.13
3	5.7	0.0	3.3	0.0	4.0	0.3	3.3	0.7	4.07	0.25	72.87	98.32
4	5.3	2.7	5.3	2.3	5.0	2.0	6.0	0.7	5.40	1.925	64.00	87.04
<b>b)</b>												
1	14.7	14.7	14.7	15.0	15.0	14.7	15.0	15.0	14.85	14.85		
2	2.0	0.0	1.3	0.0	0.7	0.0	1.7	0.0	1.42	0.0	90.44	100
3	0.7	0.0	0.7	0.0	0.7	0.3	0.3	0.7	0.60	0.25	95.96	98.32
4	0.3	0.0	0.7	0.0	0.7	0.0	0.7	0.0	0.60	0.0	95.96	100
<b>c)</b>												
1	14.7	14.7	14.7	15.0	15.0	14.7	14.7	15.0	14.77	14.85		
2	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.15	0.0	98.98	100
3	0.7	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.25	0.0	98.31	100
4	0.3	0.0	0.7	0.0	0.7	0.0	0.7	0.0	0.60	0.0	95.94	100

**Legend:**

- |                            |                            |
|----------------------------|----------------------------|
| 1 - Distilled water        | 2 - Foray 48B              |
| 3 - Foray 48B + AQ10 (50g) | 4 - Foray 48B + AQ10 (30g) |

In laboratory conditions, 216 hours after the experiment was established, the identical 100% biological efficacy was attained by the all three variants, i.e., *Ampelomyces quisqualis* – active ingredient of the fungicide, did not have a negative effect on the activity and efficacy of the insecticide.

**Table 4.** *Test of the least significant differences per experiment groups*

Code*		Homogeneous groups		Code		Homogeneous groups		Code		Homogeneous Groups	
2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
After 72 hours				After 144 hours				After 216 hours			
3	3			4	2			2	2		
4	2			3	4			3	3		
2	4			2	3			4	4		
1	1			1	1			1	1		

\* Legend in Table 2

**Table 5.** *Test of the least significant differences per experiment groups (period 2090-2010, X mean)*

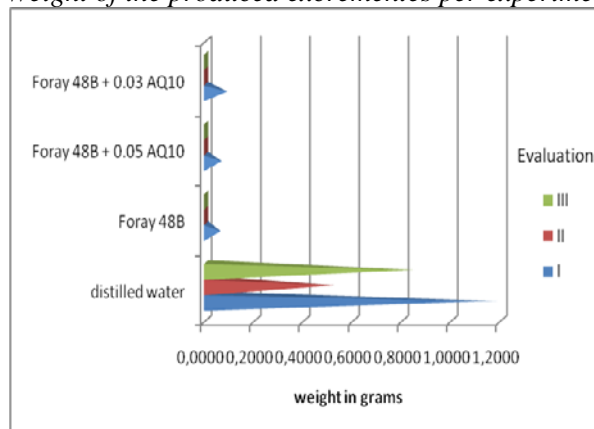
Code*	Homogeneous groups	Code	Homogeneous groups	Code	Homogeneous groups
After 72 hours		After 144 hours		After 216 hours	
3		4		2	
2		3		3	
4		2		4	
1		1		1	

\* Legend in Table 2

The analysis of variance shows the statistically significant differences between the study variances on the one side, and control group on the other side (after 144 hours F-ratio is 578.39, and after 216 hours it is 7514.69). LSD test shows that, at the end of the experiment, the study preparations formed 2 homogeneous groups within which there are no statistically significant differences (Table 4) of biological efficacy in the suppression the gypsy moth larvae.

The goal of the insecticide application in forest ecosystems is the protection of the foliage against damage, by which the indirect consequences of the harmful effects of defoliators are avoided. Therefore, a very important moment is the time when feeding ceases, from the time of the insecticide application, and it can be monitored by the control of the quantity of the excreted excrements.

**Figure 1.** *Weight of the produced excrementes per experimental groups*



The analysis of results in Figure 2 shows at first a great difference in the weight of the produced excrementes in the group fed on the treated food, compared to the control group. The feeding, i.e. the excretion, after 72 hours of exposure, continued only in the control group, which is in harmony with the mechanism of the applied pesticide. LSD test at the probability level of 95% shows the statistically significant differences between all analysed variants which make one homogenous group and the control.

#### 4. CONCLUSION

The laboratory analyses of the potentials of synergetic effect of the insecticide Foray 48B and fungicide AQ10 mixed in different concentrations show that the biological activities and the efficacy of the mixtures are not reduced compared to the individual components when they are applied separately.

The previous research is a good base for further research of the application of the mixture of biofungicide AQ10 and the bioinsecticide Foray48B in the aim of synchronic suppression of the gypsy moth caterpillars and powdery mildews.

## REFERENCE

- Duncan, D.B. (1955): Multiple-range and multiple F test. *Biometrics*, 11, 1-42.
- EPPO (1997): Guidelines for the efficacy evaluation of plant protection products: Conduct and reporting of efficacy evaluation trials – PP 1/181(2), in EPPO Standards: Guidelines for the efficacy evaluation of plant protection products, 1, EPPO, Paris, 52-58.
- Lazarev, V., Tabaković-Tošić, M. (2006): Biological fungicides, growth activator and plant oil as the components of the mixture for simultaneous suppression of mildew and gypsy moth. Proceedings of International Scientific Conference "Sustainable Use of Forest Ecosystems - The Challenge of the 21<sup>st</sup> Century", Donji Milanovac, Serbia, 303-307.
- Rajkovic, S., Tabakovic-Tosic, M., Markovic, M., Milovanovic, J., Mitic, D. (2010a): Application of AQ10 biofungicide on *Quercus robur* L. seedlings. *Fresenius Environmental Bulletin*, Vol.19, 12:214-221, Germany.
- Rajkovic, S., Tabakovic-Tosic, M., Markovic, M., Rakonjac, Lj., Ratknic, M., Mitic, D. (2010b): Biofungicide for powdery mildew control. Proceedings of the 6th Conference on Aromatic and Medicinal Plants of Southeast European Countries, April 18-22, Antalija, Turkey, 1096-1106.
- Rajkovic, S., Tabakovic-Tosic, M., Mitic, D., Markovic, M. (2010c): Efficacy of biofungicide AQ10 and polymer NU-Film in controlling powdery mildew. Proceedings of the 13th Congress of the Mediterranean Phytopathological Union (MPU), June 20-25, Rome, Italy, 579-580.
- Soukup, F. (2005): Oak mildew – possibilities of its control. *Journal of Forest Science*, 51, pp. 195-202.
- Tabakovic-Tosic, M. (2005): Major factor for successfully apply of comercial *Bacillus thuringiensis* var. *kurstaki* against gypsy moth outbreaks in forests. Proceedings of 25th Jubilee Assembly of East Palearctic Regional Section, Budapest, Hungary, 185-189.
- Tabakovic-Tosic, M. (2007): Compatibility of soybean oil and biological insecticide D-Stop in the synchronised suppression of oak mildew and the gypsy moth. Jubilee Assembly of East Palearctic Regional Section - International Organisation for Biological Control of Noxious Animals and Plants (IOBC) - International Scientific Symposium "Biocoenose regulation as a background for updated phytosanitary technologies" in Saint Petersburg, Pushkin (Russian Plant Protection Research Institute) in May 21-25, 2007. Information bulletin EPRS IOBC, 38: 226-230, Saint Petersburg, Russian Federation.
- Tabakovic-Tosic, M. (2008): Entomopathogenic bacterium *Bacillus thuringiensis* ssp. *kurstaki* the important component of the integral protection of forest ecosystems. / Institute of forestry Belgrade, special editions, , Belgrade, 1-148.
- Tabakovic-Tosic, M., Rajković, S. (2008): Synchronised suppression of oak mildew and the gypsy moth with mixture of biological insecticide D-Stop and soybean oil. Материалы VI Международной конференции "Современное состояние и перспективы развития микробиологии и биотехнологии", Том 2 : 313-315, Минск, Беларусь.

# COMPATIBILITY OF THE MICROBIOLOGICAL PESTICIDES IN THE SYNCHRONISED SUPPRESSION OF POWDERY MILDEWS AND THE GYPSY MOTH

*Mara TABAKOVIĆ-TOŠIĆ, Snežana RAJKOVIĆ,  
Vesna GOLUBOVIĆ-ĆURGUZ, Miroslava MARKOVIĆ*

## Summary

The Serbian forests are resources of numerous products, partly quantified and valorized. The complex, frequently complementary use of as much as possible products of forest ecosystems is of permanent importance. Along with timber, the main product, the most important in the commercial sense recently have been forest fruits and aromatic plants, in which Serbia is abundant, due to favourable site conditions. People have harvested and processed forest plants for medicinal purposes since the beginning of history. Forestry in Serbia intends to enrich 500,000 ha of degraded forests by these valuable plants.

Since these species are hosts of numerous, omnipresent, phitopathogenic fungi and economically harmful insects, in the harmony with trend of forest protection and guidelines to organic products, Institute of Forestry in Belgrade have been studied the biological efficiency of biofungicides and bioinsecticides which could be applied simultaneously in suppressing of the two groups of economically significant and harmful biological agents.

The laboratory analyses of the potentials of synergetic effect of the insecticide Foray 48B and fungicide AQ10 mixed in different concentrations show that the biological activities and the efficacy of the mixtures are not reduced compared to the individual components when they are applied separately.

The previous research is a good base for further research of the application of the mixture of biofungicide AQ10 and the bioinsecticide Foray 48B in the aim of synchronic suppression of the gypsy moth caterpillars and powdery mildews.

## KOMPATIBILNOST MIKROBIOLOŠKIH PESTICIDA PRI SINHRONIZOVANOM SUZBIJANJU PEPELNICA I GUBARA

*Mara TABAKOVIĆ-TOŠIĆ, Snežana RAJKOVIĆ,  
Vesna GOLUBOVIĆ-ĆURGUZ, Miroslava MARKOVIĆ*

## Rezime

Šume Srbije su resurs mnogobrojnih, samo delom kvantifikovanih i valorizovanih produkata. Pitanje kompleksnog, često komplementarnog korišćenja što većeg broja produkata šumskih ekosistema, trajno je aktuelno. Pored drveta, kao glavnog proizvoda, u novije vreme na prvo mesto po komercijalnom kriteriju izbijaju šumski plodovi, medicinsko i aromatično bilje, kojima zbog vrlo povoljnih stanišnih uslova, Srbija obiluje. Intencije šumarstva Srbije su da se oko 500.000 ha degradiranih šuma obogati i ovim vrlo vrednim rastinjem.

Kako su ove vrste domaćini brojnih fitopatogenih gljiva i ekonomski štetnih insekata, a u skladu sa opšteprihvaćenim opredeljenjem zaštite šuma i smernicama organske proizvodnje, u Institutu za šumarstvo u Beogradu vrše se ispitivanja biološke efikasnosti biofungicida i bioinsekticida, koji bi se mogli primeniti simultano pri suzbijanju dve prethodno navedene grupe ekonomski štetnih bioloških agensa.

Laboratorijska ispitivanja mogućnosti sinergetskog delovanja insekticida Foray 48B i fungicida AQ10 pomešanog u različitim koncentracijama su pokazala da kod mešavina ne dolazi do umanjenja biološke aktivnosti i efikasnosti u odnosu na pojedine komponente kada se primene samostalno.

Dosadašnja saznanja pružaju dobru osnovu za dalja istraživanja primene mešavine biofungicida AQ10 i bioinsekticida Foray 48B u cilju istovremenog suzbijanja gusenica gubara i pepelnica.