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INSTITUTE FOR PLANT PROTECTION — BEOGRAD

# **Z A Š T I T A B I L J A**

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Original scientific paper

## INVESTIGATIONS OF ENTOMOFAUNA ON *CARDUUS* GENUS (ASTRACEAE) PLANTS IN YUGOSLAVIA

### Introduction

There are very few data on phytophagous insects of *Carduus* genus pertinent to the territory of Yugoslavia. Some specimens from this group of plants are very dangerous weeds in our country, but they are even more dangerous in the parts of the world where they have been introduced by men. In North America and some other parts of the New World, several species of *Carduus* genus are classified as the most dangerous weeds introduced, because with no natural enemies (phytophagous microorganisms and phytophagous animals) and in the absence of the other, stronger competing species, they cover more and more pastures and other terrains.

The above are the main reasons why the investigations of these plants and their natural enemies became increasingly interesting in the second half of this century. The international research efforts were concentrated on finding ways for biological control, in other words, to identify more organisms which, as the natural enemies of these plants in the countries of their origin, could be introduced to the countries of the New World.

Our country has been involved in such scientific researches since 1985. The entomologists from Belgrade, Zagreb and Novi Sad Plant Protection Institutes are involved in making the inventory of entomofauna on *Carduus* genus plants and other related genera (*Onoprodum*, *Cirsium*) on the entire Yugoslav territory. In addition to making such an inventory, the experiments regarding the more prominent species nutrition and biology were carried out.

### Basic Characteristics of the *Carduus* genus Plants

This genus species most frequently found in our country are *C. acanthoides* L. 1753 and *C. nutans* L. 1753. The first of the two is more frequent on mesophyllous sites, while the other one is more often found on thermophyllous sites. The most frequent species in the northern part of our

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Original scientific paper

## THE INSECT FAUNA COMPLEX ON *EUPHORBIA CYPARISSIAS* L. IN YUGOSLAVIA

This study dealt with indigenous insects that regulate the *Euphorbia cyparissias* L. population density in Yugoslavia. The four—year investigations, from 1985 through 1988, showed that in our country insects are the significant biological factor influencing this weed's distribution and population density for quite a long time. There are 29 insect species identified on *E. cyparissias* in Yugoslavia. Most of these species are of *Coleoptera* genus (14), *Lepidoptera* (6), *Diptera* (4), *Hymenoptera* (2) and *Heteroptera* (one species). For some of these species *E. cyparissias* is the sole feeding plant.

### Introduction

The introduced weeds are usually imported without their natural enemies, which are basically phytophagous arthropods or phytopathogenic microorganisms (Maw, 1976). The colonized plant species have the ability to use the convenient natural conditions for their growth and spread without competing with the natural flora, and since they have no natural enemies, they are able to cover considerable land and water surfaces (Harris, 1973). In Canada, 73 out of 103 important weeds, have been the introduced ones (Frankton et al., 1970). Control of such domesticated weeds with chemical, agrotechnical and other traditional methods is very often difficult and also uneconomical. That is why the introduced weeds have been recently controlled with natural enemies from the given weed's country of origin.

Using insects (the most numerous class of animals that are mainly herbivores) for the biological control of weeds, is the reality, and in practice, this method has more than once given favourable results (Frick, 1974; Goeden, 1978; Maddox, 1982). In the United States, 69% of the introduced insects naturalized and therefore have been successfully used for control of certain weed species (Piper, 1985). But, before making a decision to actually use insects for the biological control, it is necessary to study the basic issues that may influence the success of this method.

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Original scientific paper

## PHENOLOGIE DE LA NOCTUELLE DU CHOU (*MAMESTRA BRASSICAE* L.) DANS LA REGION DE BELGRADE<sup>1</sup>

### Introduction

La Noctuelle du chou (*Mamestra brassicae* L.) est un des plus importants ravageurs de légumes et tout particulièrement du chou et du chou-fleur. Dans le cadre de l'application du système d'irrigation par aspersion, on cultive les légumes sur des parcelles limitées en surface, en y effectuant plusieurs cultures dans le cours de l'année. *M. brassicae* est une espèce sédentaire et la densité de la population dépend des conditions locales. Dans la région de Belgrade, elle est régulièrement présente en grand nombre, ce qui nécessite une surveillance des cultures et des méthodes de lutte, car à un stade avancé, les chenilles se réfugient dans le tête du chou, en y creusant des galeries. Bien que les insecticides chimiques soient efficaces, à cause de leurs résidus on cherche de nouveaux moyens de lutte contre ce ravageur. Une solution semble être dans la lutte par application de préparations virales (Akutsu, 1967, Gröner, 1976, Injac, Burgerjon, 1980, Bues, et autres, 1983) ou bien dans les lâchers de parasites d'oeufs (*Trichogramma* sp.). Les moyens biologiques sont spécifiques et nécessitent une connaissance précise des dates d'application et de la densité de la population de *M. brassicae*. Une étude préalable a été conduite concernant sa phénologie dans les champs, afin de préciser les possibilités de prévision et l'application des méthodes biologiques dans la lutte contre ce ravageur. Dans ce travail, nous donnons les résultats des études sur les relations entre la plante hôte, le ravageur et la température comme facteur abiotique, dans la région de Belgrade.

### Méthode de travail

Dans la région de Belgrade, dans le cadre de l'utilisation du système d'arrosage pour la période allant de 1986. à 1988., on a délimité 10 rangées de 80 plants par rangée, soit en total 800 plants. Cette expérimentation a été effectuée dans le cadre de la production commerciale du chou-pommé et chou-fleur. Les différentes variétés de

1) Ce travail a été financé dans le cadre du projet YU—USA pp 656 ou intitulé "ETUDES EPIZOOLOGIQUES DU VIRUS *Mamestra brassicae* L."

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LYFE CYCLE OF HAZELNUT BIG BUD MITE *PHYTOPTUS*  
*AVELLANAE* (NAL.) (ACARIDA: ERIOPHYOIDEA)  
AND THE RESULTS OF ITS CONTROL

by

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Summary

Hazelnut big bud mite *Phytoptus avellanae* (Nal.) is a well known and wide spread pest in Euroasia, North America and Australia. Many investigations were carried out to improve the knowledge concerning its relatively complicated life cycle.

Observations were made on mite-infested hazelnut buds from susceptible trees in western Serbia in the course of a two year period starting from 1977 in order to clarify the life cycle of the mite.

Only buds caused by *Ph. avellanae* were found. No Cecidophyopsis vermiformis causing the so called "summer big buds" were found. Migratory population consisted exclusively of nymphs and the migration period lasted two months. Quiescent state lasted to the mid August and in this period buds were normal in size. Mites started intensive reproduction at the end of summer, and population maximum was reached in spring of the following year. Successful control was achieved by two applications of endosulphan during migration.

Our results are very close to those carried out by Krantz (1974), but no *C. vermiformis* were found. Keifers (1975) description of life cycle, two types of nymphs and favorite sites of invasion were not confirmed in our plantations. Nevertheless, "Tegonotus like" nymphs were found in Yugoslavia, but in one isolated population on the Durmitor Mountain. Possible explanations are given in the paper.

GYMNOSPORANGIUM GAEUMANNI ZOGG, UNE RARE ET,  
POUR LA YUGOSLAVIE, NOUVELLE ESPECE

par

M. Mijušković et V. Vujanović

Résumé

*Gymnosporangium gaeumanni* Zogg, trouvé pour la première fois en Yougoslavie le 17 mai 1989 sur *Juniperus communis* ssp. *communis* var. *intermedia* (Schur) Sanio au environ de Žabljak, à 1400 m d'altitude, n'a été connu auparavant qu'en Suisse et Canada.

Spermagonies et écidies inconnues. Les sores à uredo se forment sur la face supérieure des aiguilles du génévrier, âgées de un à deux ans. Les sores sont brun, plus ou moins pulvérulents. Uredospores sont élipsoïdes ou sphériques, de dimensions moyennes 23,8x23,1  $\mu\text{m}$ , brunes, avec les parois verriqueuses; les spores sont munies d'une dizaine de pores germinatifs (le plus souvent de 6 à 8). Le pédicelle est hyaline et flexible. On a trouvé aussi des amphispores à parois plus épaisses. Uredospores sont, d'ailleurs, connues uniquement chez cette et deux autres espèces du genre *Gymnosporangium*: *G. nootkatense* Arth. et *G. paraphysatum* V.—Bourgin.

Les sores à teleuto ne sont pas trouvés, mais les teleutospores se forment sur les mêmes cellules basales avec les urodospores, avec lesquelles sont intermêlées. Teleutospores sont très rares. Elles sont généralement de forme irrégulière, avec les parois brunes, épaisses et lisses. Chaque cellule est munie d'un pore germinatif. Les pédicelles sont longs, hyalines, persistants, non gonflant lors de l'humectation. Dans un cas on a trouvé, au mois de juin, les teleutospores à des parois plus minces; ces spores ont été plus nombreuses et, dans la majorité des cas, déjà germées et déchargées. Les dimensions moyennes des teleutospores bicellulaires sont 40,74 x 29,19  $\mu\text{m}$  et des unicellulaires environs 13 x 9  $\mu\text{m}$ . Les teleutospores à parois minces, déjà germées, avaient les dimensions moyennes de 44,63 x 20,44  $\mu\text{m}$ .

Intermêlées avec les uredospores on a trouvé des spores hyalines, élipsoïdes—oblongues, avec les parois inusuelles, très épaisses, finement striées, dont la nature et rôle ne sont pas connus.

À côté des spores à l'aspect décrit, on a noté aussi des cas de déviation de la forme standard.

## BREEDING FOR RESISTANCE TO LEAF RUST AND POWDERY MILDEW OF WHEAT

by

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### Summary

The sources of resistance as parents have been selected on the basis of several year testings in seedling and adult growth stages. Eight donors were selected for *Puccinia recondita tritici* and sixteen for *Erysiphe graminis tritici*. The simple crosses between parents have been realized, and father corresponding back-crosses. The pedigree method was used with the progenies.

It was obvious that homozygous resistance to *Erysiphe graminis tritici* was the most prevalent, while the same was true in segregation of resistance to *Puccinia recondita tritici*.



sorte zasad relativno uspešno rešio problem otpornosti prema prouzrokovalačnu stabljične rde.

- Zbog stalnih promena koje se dešavaju u populaciji parazita, neophodno je i dalje pratiti spektar virulentnosti kako bi se na vreme registrovala pojava novih biotipova i identifikovali efikasni geni rezistentnosti. U tom cilju potrebno je i proširiti ispitivanja uvođenjem novih linija i sorata sa poznatim Sr genima.

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### VIRULENCE SPECTAR OF *Puccinia graminis f. sp. tritici* ERIKSS. ET HENN. IN SOUTHEASTERN PART OF YUGOSLAVIA IN 1986 AND 1987

by

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#### Summary

Virulence of *Puccinia graminis f. sp. tritici* isolates collected in southeastern part of Yugoslavia during 1986 and 1987 summers has been investigated on seedlings of Wheat lines and cultivars with designated major genes for resistance to stem rust (Sr—1, Sr—5, Sr—6, Sr—7a, Sr—7b, Sr—8, Sr—9a, Sr—9b, Sr—9d, Sr—9e, Sr—9g, Sr—10, Sr—11, Sr—13, Sr—14, Sr—16, Sr—21, Sr—28, and SR—36).

In 1986, 93 isolates were tested and great percentage were virulent for most of genes evaluated and for genes Sr—7b, Sr—9a, Sr—9g, Sr—10, Sr—13, Sr—14, Sr—16 and Sr—28 100% of isolates were virulent. 161 isolates were investigated in 1987 and high percentage of virulence was

estimated too. Only for genes Sr—9b, Sr—11, Sr—21 and Sr—36 virulence was lower than 50% (45,88%; 20,46%; 22,94% and 45,88% respectively), while virulence to genes Sr—6, Sr—7b, Sr—9a, Sr—9g, Sr—10, Sr—13, Sr—14, Sr—16 and Sr—28 was 100%. The only genes for resistance which in both years had no adequate genes for virulence were Sr—7a and Sr—9e, so these genes should be incorporated into new resistant wheat varieties.

Number of virulence genes in investigated isolates rated from 10 to 17. The greatest number of isolates in 1986 had 16, 13 and 15 virulence genes (36,38%; 23,54% and 22,47% respectively), and in 1987 most frequent were isolates with 13, 15 and 16 virulence genes (45,26%; 26,04% and 14,88% respectively). Such complex virulence points to great problems appearing in breeding wheat for resistance to stem rust.

## SIGNIFICANCE OF SOME Pm GENES FOR WHEAT BREEDING ON RESISTANCE TO POWDERY MILDEW

by

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### Summary

Numerous authors point at Powdery mildew as serious disease in our country. Therefore, significance of resistant varieties for wheat production is very high. There are many different methods of breeding for wheat resistance, but one of more perspective is accumulation of resistant genes in some new variety.

Investigation of efficiency of Pm 1, Pm 2, Pm 3b, Pm 3c, Pm 4a, Pm 4b and Mld genes in the priod 1985—1987 show that thers effect on wheat resistance is different.

More efficient genes are: Pm 4b (99,0%) and Mld (98,5%). High degree of effecience have genes Pm 4 and Pm 3b, as combination of genes Pm 2 + Pm 6 (CI 12633). However, total resistance is not achived and we have to look for new donors of resistant genes.

By crossing of some susceptible varieties (Kosmajka, Partizanka, Kavkaz, Rana 2, Bezostaja 1 and Krajinka) with varieties which are carriers of resistant genes (H. Stamm 13471 -MLd, Weihenstephan M<sub>1</sub> - Pm 4b and CI 12633 - Pm 2 + Pm 6) we got many resistant hybrid progenies.

Segregation in F<sub>2</sub> generation show that resistance of varieties H. Stamm 13471 and Weihenstephan M<sub>1</sub> to race 27 is controlled by one gene, and resistance of variety CI 12633 by two genes. In first case number of resistant to susceptible plants in all cross combinations was 3:1, and in the second the ratio was 15:1.

By crossing varieties H. Stamm 13471 x Weihenstephan M<sub>1</sub> we got segregation 15:1. This point the presance of two independent dominant genes.

THE REACTION OF SPRING WHEAT GENOTYPES TO *Puccinia  
recondita tritici* IN HILLY—MOUNTAIN REGIONS OF BOS-  
NIA AND HERCEGOVINA

by

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Summary

In the period 1979—1981 the trials (Nevesinje, Gacko, Duvno i Kupres) were conducted to examine the reaction of 35 spring wheat genotypes and 26 Lr. lines to *Puccinia recondita tritici* (Tab. 1, 2 and 3).

The results showed susceptibility of all 35 genotypes as well as 23 Lr. lines. Resistant were only Lr. 18, Lr. 19 and Lr. 24. Different pathogen populations were found in the region of Nevesinje and Gacko compared to Duvno and Kupres.

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THE FIVE—YEAR STUDIES OF THE PHYSIOLOGICAL RACES  
*ERYSIPHE GRAMINIS F.SP. TRITICI* IN THE WESTERN PART OF  
YUGOSLAVIA (1983—1987)

by

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Summary

Over the five—year investigations of incidence and spread of the physiological races of powdery mildew (*Erysiphe graminis f.sp. tritici*) 29 physiological races were determined as well as five undertermined isolates (table 2,3). In this period (1983—1987) only race 46 was isolated each year, i.e. in all five years. The most prevailing races were 46 and 75 which were recorded in almost all locations where the samples were taken from and virtually on all varieties (table 1). The investigations are closely connected with the problem of wheat breeding, the objective of which is the creation of new varieties resistant or tolerant to powdery mildew, in order to prevent the damage caused by epiphytotic attack of powdery mildew in the humid part of western Yugoslavia.

*MICROSPHAERA BAEUMLERI* P. MAGN., A PARASITE ON SOME  
PLANT SPECIES IN YUGOSLAVIA

by

B. Ranković

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Summary

In the present paper the appearance of powdery mildew (fungi) is described on the plant species *Heleborus odorus* L. The causer is the species *Microsphaera baeumleri* P. Magn. Its biometric characteristics after microscopic examination are: size of diameter of the fruit bodies; distribution, number, length and branching of the appendages; shape and size of the wall cells; shape, number and size of the ascus, and other characteristics of the fruit states. We have not found the conidial states of this fungus.

We have found that there are some morphological differences of powdery mildew on different hosts. This finding is a valuable base for an assertion that there are some causers of the powdery mildew.

THE INVESTIGATION OF *SPHAEROPSIS VISCI* (SALM.) SACC.  
AND *COLLETOTRICHUM GLOEOSPORIOIDES* (SACC.) PENZ.,  
PARASITE ON EUROPEAN MISTLETOE (*VISCUM ALBUM* SUBSP.  
*TYPICUM* BECK)

by

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Summary

A mycopopulation of European mistletoe on *Acer plantanoides*, *A. saccharinum* and *Populus nigra* was studied in period 1977—1988. In a crown of *Acer saccharinum* 92 individual specimens of the European mistletoe were registered in 1977. On one particular acceris branch, as long as 70 cm, 23 germinating mistletoe seeds were found.

The investigation pointed as predominant fungi species registered on infected mistletoe following two species: *Sphaeropsis visci* and *Colletotrichum gloeosporioides*.

The symptoms of disease caused by *S. visci* could be registered on all plant organs all over the year (January — December), while the symptoms caused by *C. gloeosporioides* could be registered of foliage only, mainly in July and August. The pycnidia of *S. visci* are formed on practically all mistletoe's organs. The conidia germinate in range 5° — 35°C. The temperature optimum for germination is 30°C; minimum 5°C; and maximum approximative 35°—40°C. The conidia formed in January and February might germinate in a high percentage. The highest radial growth was registered on PDA. The pycnidia are formed on PDA, carrot agar and prune agar. The conidia could germinated as long as 210 days, an even more, after being storage under laboratory conditions.

The acervuli of *C. gloeosporioides* are formed on leaf only. The temperature optimum for germination of conidia is 35°C; maximum 40°C and over; minimum 5°—10°C. The PDA appeared as the most favorable medium for growth of the fungus. The temperature optimum for radial growth is 30°C; maximum 40°C and over; minimum 5°—10°C.

CHARACTERISTICS OF SOME *SEPTOCYTA RUBORUM* (LIB.)  
PETRAK (SYN. *RHABDOSPORA RAMEALIS* /ROB. EX DESM.)  
SACC., *R. RUBORUM* (LIB.) JORSTAD ISOLATES ORIGINATING  
FROM CULTIVATED BLACKBERRY PLANTS

by

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Summary

A great number of fungi isolates were isolated from the diseased blackberry canes being characteristic for their slow development on nutritive media.

As regards their unequal aspect and other mutual differences, two of 40 isolates were chosen for further parasite investigations: Rb—21 and Rb—22.

It turned out that colonies were formed on the nutritive media being similar to the species of *Septoria* genus: *S. tritici*, *S. lycopersici*, *S. ribis* etc.

The colonies have various aspect depending on the isolate. Rb—21 isolate forms dark greyish colonies and Rb—22 isolate forms white greyish colonies in their air part while the substrate part of colonies of both isolates is dark brown.

The Szapek's acid synthetic agar, onions agar and potato agar are the best media for development of the parasites. The degree of fructification is the strongest on them, except on the Czapek agar which is without fructification.

The optimum temperature for the development of colonies is about 25°C. At 25°C, Rb—21 isolate has stronger fructification than Rb—22.

As regards the acidity of media, the parasite has no greater demands, although the increase of Rb—22 isolate on media pH 3,0 and 3,5 is of unusual slow development and has quite different aspect. Therefore one gets impression that two different fungi species are present instead of one, because Rb—22 isolate forms little leathery colonies of beige colour, and Rb—21 forms greater and dark-greyish ones.

The sectorial development of parasite is expressed, which is also its characteristic.

The parasite forms pycnidia with characteristic thread—like and colourless pycnospores both on the media and on the diseased blackberry tissues. The size of pycnidia from the natural material amounts to 150,00 — 330,00 x 100,00 — 270,00 with an average of 230,40 x 190,12  $\mu\text{m}$ , and



pycnospores 22,50—51,75x1,25—2,5  $\mu\text{m}$  with an average of 33,62x1,79  $\mu\text{m}$ . The size of pycnospores of Rb—21 isolates is: 17,50 — 60,00 x 1,25 — 2,50 with an average of 35,50 x 1,44  $\mu\text{m}$  and Rb—22: 13,75 — 47,50 x 1,25 — 2,50  $\mu\text{m}$ .

Artificial inoculations done in field in July 1987. and 1988. did not cause any changes on the blackberry canes and leaves, nor on the inoculated apple fruits of Golden Delicious in laboratory.

It can be concluded on the basis of the mycological characteristics: the aspect of colonies, formation of pycnidia and pycnospores and their characteristics, as well as of other above mentioned results, that both investigated isolates are most similar to *Septocytia ruborum* species to which they probably belong (Koellreuter, 1951; Boerema and Adriana Verhoeven, 1972; Smith et al., 1988).

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*OIDIUM* SP., A NEW PARASITE IN SPECIES *CARPINUS BETULUS* L.  
AND *ECHINOCYSTIS ECHINATA* MUHL.

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Summary

*Oidium* sp. is described as a new causer of powdery mildew on the plant species *Carpinus betulus* L. In this paper the appearance of powdery mildew and of its *Oidium* sp., are cited for the first time on the plant species *Echinocystis echinata* Mühl.

These fungi are characterized mainly by the following taxonomic features: morphological features of conidia, conidiophora and mycelium, germination way of conidia, disposition of germ, types of appressoria.

These features are a reliable base for an assertion that these fungi are a new pathogenic species.