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INSTITUTE FOR PLANT PROTECTION AND ENVIRONMENT - BELGRADE

# ZAŠTITA BILJA PLANT PROTECTION

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## ALTERNARIA ALTERNATA A NEW PARASITE OF TOBACCO IN SERBIA

by

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## Summary

Based on the studies of the causer, of the so far unknown diseases, brown spot of tobacco leaves in Serbia, the following conclusion can be made:

- Brown spot of tobacco leaves of semi oriental and oriental tobacco in Serbia is caused by *Alternaria alternata* (Fr. ex Fr.) Kreissel.
- Brown spot of tobacco leaves is a new disease of tobacco in Serbia, even though the causer of the disease, *A. alternata*, is responsible for a number of diseases of vegetables and other plants.
- Symptoms of the disease, identical to those noticed under the conditions of spontaneous diseases were obtained by artificial inoculation of the tobacco leaves.
- When grown at PGA *A. alternata* has the best growth at temperature of 26-29°C. The fungus has the best growth on apple agar media, but the best sporulation was on carrot agar media.

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Original scientific paper

## ERWINIA CAROTOVORA SUBSP. ATROSEPTICA, POTATO PATHOGEN IN OUR COUNTRY

From infected plants and stored potato tubers, several strains of bacteria with white colonies have been isolated. Their pathogenicity was proved by artificial inoculation of plants and tubers reproducing the symptoms of disease similar to those manifested after spontaneous infection.

Morphological, cultural, biochemical and physiological, as well as serological properties indicate that the strains examined belong to the bacterium *Erwinia carotovora* ssp. *atroseptica*, a potato pathogen becoming more and more frequent in this country.

**Key words:** potato plants, tubers, bacterial strains, pathogenicity, *Erwinia carotovora* subsp. *atroseptica*, symptoms, bacteriological properties, ELISA test.

### Introduction

Bacterioses represent important and frequent diseases of potato in many countries in the world (Bentlić et al., 1991; Bain and Pérombelon, 1988; Kúdela, 1986; Naumann et al., 1978; Tanii, 1984; Pérombelon and Kelman, 1980, 1987); and others). Some of them are ranked among quarantine diseases and by spreading they reach new potato growing regions, causing big damages. In this country, bacterioses of potato have been studied rather rarely and hence our insufficient knowledge on them (Panić, 1964, 1976).

In recent years, however, they became more and more frequent in crops of various potato varieties and on tubers during their keeping and storing (Arsenijević et al., 1989, 1990, 1993, 1994; Arsenijević and Olivera Jovanović, 1991).

All of this induced us to deal in a more detailed way with the issue of occurrence and spreading of potato bacterioses in this country and to investigate the characteristics of the pathogens - their causal agents. The aim was to get better knowledge on present species and possible detecting of

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## FREQUENCY OF VIRULENCE ALLELES IN *ERYSIPHE GRAMINIS HORDEI* POPULATION

by

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### Summary

In 1990 to 1992, 252 isolates of parasitic fungus *Erysiphe graminis* DC. f. sp. *hordei* Em. Marchal from Serbia were analysed for virulence to barley resistance genes (table 1).

The results show that in the sexual population of this parasite the most frequent were virulence alleles V-a8 (98,81%), V-41/145 (96,03%), V-g+V-CP (94,05%), V-h (93,25%), V-La (88,94%) and V-nn (82,14%). Frequencies of V-a, V-p and V-a9 in all regions were low (3,57-9,92%). No isolate virulent to ml-05 was detected.

Five the most common phenotypes (14372865, 14210561, 13357585, 9687049 and 13845505) predominated in the populations, with 29,30% of all isolates.

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## INFLUENCE OF VERTICILLIUM LECANII VIEGAS ON COCCUS PSEUDOMAGNOLIARUM KUWANA

Entomophagous fungus *Verticillium lecanii* Viegas is one of significant factors in decrease of population of scale *Coccus pseudomagnoliarum* Kuwana on the citrus trees in the area of Yugoslav seacoast. It is especially present on the scales on those sites, respectively groves, which have humid conditions. It attacks scales in all developmental instars. At places this fungus causes scales mortality to the rate of 98%.

*Key words:* citrus, fungus, *Verticillium lecanii*, scale, *Coccus pseudomagnoliarum*, Yugoslav coast.

### Introduction

During the study of scale *Coccus pseudomagnoliarum* Kuwana on the citrus trees in the region of Yugoslav seacoast, we have recorded that in its populations decrease in natural conditions, in addition to parasites and predators, an important role also belongs to pathogenous fungus *Verticillium* (*Cephalosporium*) *lecanii* Zimm.<sup>1)</sup>

For the first time we recorded in spring (May) 1975 in the experimental lot of citrus trees, that juvenile females change their colour and die. But, this has been a rare phenomenon, observed only at the experimental lot, and we have not paid much attention to it. However, already in autumn of the same year, the fungus started to spread, and on the scales creation of whitish coating was being recorded. The number of attacked scales increases, at the beginning in on the parts of trees branches lying close to the land in the grove, and than in up parts. Scales disease spread further also in other orchards, and especially in period of more humid weather during the autumn, winter and following spring.

We found that fungus *V. lecanii* also infects other species of scales including black olive scale *Saissetia oleae*, Velimirović (1980) and *Pulvinaria floccifera*. Scales of all developmental stages were infected.

1) Fungus determination has been confirmed by dr. G. Zimmermann (Institute für biologische Schädlingsbekämpfung, Darmstadt).

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## THE CHARACTERISTICS OF THE ENTOMOPATHOGENOUS FUNGUS *PANDORA NEOAPHIDIS*

by

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### Summary

Entomopathogenic fungi from the order *Entomophthorales* in the nature often cause the occurrence of mycosis in large prevalence. In the leaf aphid populations epizootia of mycosis occur

regularly. However, as a rule, they occur late, in high population density, when the economic damage threshold is exceeded (Sivcev, 1981). The most numerous entomopathogenous fungus on leaf aphids in *P. neophidis* (remaudiere et Hennebert) Humber.

The goal of this paper was to prove the dependence and the number of *P. neophidis* conidia which is formed on the development stages of *B. brassicae*, pathogenicity, duration of the period of incubation and the effect of this fungus on the fertility of the infected aphids.

The results showed that the number of formed and ejected conidia depends on the dimension of the host body (Graph. 1). The largest number of conidia was found in wingless adult aphids, where was on average 39.969 of conidia. With the body dimension, the number of conidia also decreased, so that the lowest number was found in larvae of the first stage and only 3.865 conidia on average.

By probit analysis of the data it was proved that the middle lethal doses of conidia of this fungus for *B. brassicae*, in the conditions of trial has maximal estimated probability of 6,47 conidia/mm<sup>2</sup> (Graph. 2) With the probability of 95% it can be expected that the real value of LD is between 5,15 and 8,46 conidia/mm<sup>2</sup>. In trial conditions, at the treatment with 1 conidia/mm<sup>2</sup> the total mortality was 10%, with 9 conidia/mm<sup>2</sup> it was 81%, with 19,5 conidia/mm<sup>2</sup> it was 76% and with 61 conidia /mm<sup>2</sup> it was 98%.

At 20°C the aphids die in the period of 3-6 days with the average duration of incubation of 3,8 days (Graph. 3). At the temperature of 16°C aphids die in the period between 3-7 days, with the average incubation period of 4,4 days. At the temperature of 6°C, the infected aphids died from the 10th to 13th day with the incubation period of 11,8 days on average.

The longevity of the infected aphids is considerably lower (Tab. 1). The infected aphids in relation to the healthy lived shorter, from 23-33%. In respect to the number of born aphids it can be seen that at 21,5°C the fecundity decreased for 53%, while in the treatment at the temperature of 16° it decreased.

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## UV RAYS AND *PANDORA NEOAPHIDIS* CONIDIA

by

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### Summary

Entomopathogenous fungus *P. neoaphidis* has the biggest importance in causing mycosis in cabbage aphids population during the spring-summer and autumn maximum of their numerosness, but regularly it occurs late, when the aphid population exceeds the economic damage threshold. It is considered that the decrease of the quantity of infective inoculum, under the level on which it can be registered, is among the most important factors which bring to the late mycosis occurrence. The factors which in nature can cause the mortality of the fungi are numerous. In many cases it has been shown that UV part of sun spectrum has harmful effect on microorganism (Benmz, 1987). The conidia of entomopathogenous fungi of the order *Entomophthorales* are also susceptible on it (Robyn et al., 1985, Carruthers, et al., 1988).

The aim of this paper was to prove how fast the conidia of *P. neoaphidis* loose the germination energy when exposed to UV factors with the length of 254 nm and 366 nm, in laboratory coniditions.

The conidia used in the trial were obtained from, the cultures of *P. neoaphidis*, which were grown on EY medium. Petri dishes were turned upside and every five minutes were rotated over the covering glass, where the conidia for the trial were collected. These conidia were treated 15, 30, 60 and 90 minutes by UV rays. After the treatment, the conidia were kept in optimal conditions for germination in the course of 4 hours and 30 minutes.

The germinability of conidia used in the trial was 95,3%.

It was proved that the conidia loose germinability faster when course of 90 minutes of the exposition around 70% conidia loose the germinability. This points to the fact that the most of conidia exposed to the direct sun radiation during the typical summer day can loose the germinability and that the UV radiation is an important factor of the mortality of conidia. The exposition of the conidia to the rays of the wavelength of 366 nm, which are on the limit of the visible part of light spectrum, has less harmful effect on the germination of conidia. Based on this, it is expected that the conidia exposed to the diffuse light, in the shadow of plants loose the germinability considerably more slowly.

Harmful effect of UV rays of 254 nm turns out also in the shorter length of the initial hyphae of the exposed conidia (Fig. 1). In this conidia the length of the initial hyphae is over 4 times shorter than in non radiated conidia. Behavior like this can be brought in connection with their decreased virulence.

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## EFFECT OF TEMPERATURE, pH AND NUTRIENT MEDIA ON THE GROWTH OF *PHYTOPHTHORA CAPSICI*

by

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### Summary

Four isolates of *Phytophthora capsici* Leonian originating from different regions of Macedonia, such as Skoplje (isolate S-2), Strumica (isolate S-3), Negotin on Vardar (isolate N-1) and Kumanovo (isolate K-4) were included in these investigations. In those mentioned regions paprika is a very important vegetable crop and *P. capsici* occur each year inducing important damages.

The optimum temperature for the growth of *P. capsici* colony was from 25°C (isolates N-1 and S-2), till 28°C (isolate S-3), or till 28-30°C (isolate K-4). A moderate growth of *P. capsici* colony was at the temperature of 15-20°C, as well as at 35°C, but relatively slow growth of the fungus was registered at 10°C.

The most suitable media for the growth of *P. capsici* colony showed to be onion agar. The least suitable was nutrient media with carrot, on which so called "coral" mycelium was frequent. Nutrient media from potato, pea, and corn meal showed to be of an average suitability for the growth of the fungus.

The optimum pH for the growth of *P. capsici* colony was between pH 5.0 (isolates N-1 and S-2), till 6.0 (isolate K-4), or till 6.0-7.0 (isolate S-3). A relatively fast growth of the fungus was registered at the media with pH 8.0, 9.0, 3.5, and 11.0.

RELATIONSHIP OF *TRIALEURODES VAPORARIORUM* WESTW.  
(HOM.: ALEYRODIDAE) AND ITS PARASITOID  
*ENCARSIA FORMOSA* GAIL. (HYM.: APHELINIDAE)

by

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Summary

In this paper the relationship between *T. vaporariorum* (strain Zemun) and its parasitoid *E. formosa* (strain Kišinev) were investigated. Duration of their growth, longevity and reproductive capacity were compared.

It was found out the effect of two temperature treatments on the interactions between *T. vaporariorum* and *E. formosa*. It was proved that the time of growth, fecundity and longevity of *T. vaporariorum* at 20°C were higher than at 25°C. Higher temperature treatment is more favorable for the growth of *E. formosa*, because at that time its fecundity increases, and its longevity decreases.

The results showed that for the growth of *T. vaporariorum* the most favorable relative humidity was around 80%. However, it has the unfavorable effect on the flying out of the *E. formosa* adults.

It was proved that *T. vaporariorum* prefers to feed on tobacco, cucumber, linden tree, bean, fuchsia and gerbera in relation to chrysanthemum and pelargonium. However, the differences between the intensity of the attack to certain varieties of gerbera were discerned.

The efficiency of *E. formosa* in *T. vaporariorum* control is lower in the conditions of short day, such as in the conditions of hair presence and secretion on the leaf. Due to this the efficiency of *E. formosa* is higher on tomato, bean and fuchsia than on cucumber, linden tree and pelargonium.

## Zaključci

Na osnovu napred iznetih rezultata može se konstatovati sledeće:

- fikusova nematoda *Heterodera fici* je vrlo rasprostranjena u stakleničkim objektima u regionu Beograda, odnosno od ukupno 5 ispitanih objekata ova vrsta nije pouzdano utvrđena u jednom (Bežanijska kosa).

- Nivo populacija *H. fici*, u objektima u kojima je konstatovana, je u neposrednoj vezi sa agrotehnikom i negom matičnih biljaka i matičnjaka fikusa. U ustovima optimalnog gajenja i nege fikusa, nivo populacije je visok dok se u manje povoljnim uslovima za biljku (suša, neprihranjivanje i dr.) održava niska populacija *H. fici*.

- U odsustvu biljke hraniteljke i agrotehničkih mera koje prate gajenje fikusa, *H. fici* relativno brzo nestaje.

- *H. fici* je utvrđena na: *Ficus elastica*, *F. decora*, *F. lyrata*, *F. rubicunda* i *F. benjamina* od kojih se, prema našim saznanjima, *F. lyrata* i *F. benjamina* po prvi put navode kao biljke hraniteljke ove vrste.

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## DISTRIBUTION AND POPULATION DENSITY OF *HETERODERA FICI* IN THE GLASSHOUSES IN THE AREA OF BELGRADE

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## Summary

*Heterodera fici* Kirjanova, 1954 was investigated in the glasshouses in the area of Belgrade. In addition to the first recorded in Jajinci (Krnjaić, 1975), this species occurred in another three glasshouses ("Gradsko zelenilo"-Kumodraž, "Medifarm"-Dedinje and "Jevremovac"-botanical garden). In the glasshouse of "Gradsko zelenilo" at Bežanijska kosa, this species was proved so far.

*Heterodera fici* was detected on the following host plants species of the *Ficus*: *Ficus elastica*, *F. decora*, *F. rubicunda*, *F. lyrata* and *F. benjamina*.