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CONTENTS

Reviews papers

Original scientific papers

Zaštita bilja, Vol. 43 (3), br. 201: 153 – 167 (1992), Beograd

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Reviews paper

STALK AND EAR ROT DISEASES AND BREEDING PROGRAMS

This paper presents a survey of former studies on the resistance of maize to the stalk and ear rot pathogens and highlights further directions of research in this field.

Key words: Maize, stalk and ear rot pathogens, resistance, breeding programs.

Introduction

Stalk rot is the most widely spread and most destructive maize disease not only in Europe, but in the whole world. Causes of lodging and maize stalk breakage in the field are twofold: of non-parasitic and parasitic origin. Lodging can be caused by morphological and anatomic traits of the plant such as a weak root system, heavy weight of ear, content of parenchyma, sclerenchyma, cellulosis, lignine, and other substances contributing to the firmness and elasticity of the maize stalk. Parasitic lodging is caused by a disease complex known as stalk rot. Pathogens are fungi and bacteria which can individually cause stalk rot, but very often these two kinds of pathogens occur together.

Stalk rot. The most common pathogens are fungi of the genus *Fusarium,* followed by species of the genera *Sclerotium, Nigrospora, Cephalosporium, Heliminthosporium, Diploida, Pythium, Phaeocytosporella,* etc.

In the U.S. in the 1950's *Diplodia maydis* (Berk.) Sacc. was dominant, while in the last decade the composition of micoflora has changed significantly so that the prevalent pathogen became *Gibberella zeae* (Schw.) Petch. (Hooker and White, 1976).

In Europe the dominant species are from the genus *Fusarium* of which the most important are *F. graminearum (Gibberella zeae), F. moniliforme* and *F. culmorum,* while the species *F. avenaceum, F. poase, F. oxysporum, F. lateritium,* etc. also occur.

The disease occurs after maize pollination and develops until harvest. Infected plants are easily seen. At first, leaves turn grayish – green as if damaged by frost. Bottom internodes rot and are in the beginning light brown changing later to dark brown. Plants die prematurely, break easily and lodging becomes common.

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APPLICATION OF THE ENTOMOPHAGOUS NEMATODES AS BIOINSECTICIDES

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Summary

Entomophagous nematodes from the *Steinernema* and *Heterorhabditis* genus are the ones that most fequently in combination with the bacteria of the *Xenorhabdus* genus, attack and destroy a large number of insect pests present in plant production.

This paper presents the most recent accomplishments in applying nematodes and bacteria of the *Xenorhabdus* genus for control of insect pests in the world. It also refers to the possibility of expanding and commercialization of this bio-control method in plant protection.

In addition to that, it discloses the first data on the *Steinernema* and *Heterorhabditis* genus nematodes presence in soil samples from several localities in Serbia. Forty-eight (48) soil samples („Navip" Plantation, Leskovac-10; PKB Plantation, Boleč-12; and DDP „Zlatica", Lazarevo 16) have been tested in the course of this study. Six samples were found to have 1-3 larvae of *Galleria mellonella* that contained the *Steinernema* genus entomophagous nematodes, while the presence of the *Heterohabditis* genus nematodes has been recorded in two samples.

The entomophagous nematodes were absent from the *Bothynoderes punctiventris* and the *Tanymecus dilaticolis* imagoes, five thousand of which have been tested through maceration over a sieve (with filter paper) in Petri dishes (with water).

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SEASONAL DYNAMICS AND DENSITY OF CABBAGE APHID'S *(BREVICORYNE BRASSICAE* L.)*) ENTOMOPATHOGENOUS FUNGI

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Summary

The maximum density of cabbage aphids is regularly recorded twice a year, in June and in October. In fall, the aphid population density is always higher, so they cause damages, while in summer, during the first maximum-density period, they irregularly multiply above the thereshold of harmfulness. The cabbage aphids control is often a delicate task due to the nearing harvest season. That is why the usefulness of entomopathogenous fungi is studied. In order to be able to consider the possibilities of utilizing entomopathogenous fungi in control of cabbage aphids, it is necessary to know their characteristics, behavior and their role in regulating the insects' population. As it has not been described so far, this study's objective has been to monitor the occurrence and presence of mycoses on cabbage aphids, as well as to qualitatively determine the density of entomopathogenous fungi species present in regulating these aphids population density.

Conducted investigations results indicate that entomopathogenous fungi are indeed a significant factor in regulating cabbage aphids density. The fungi regularly occur inside the host's population during its attack on cabbage in the month of June. They continue to be present in July and through the part of August. No mycotic aphids were found in the period from the second-half of August to the second-half of September. The mycoses regularly occur only at the end of

September, even during the years of drought. There is a mass occurrence of disease in October. They vary in intensity and duration, so they are regularly present even in November. In 1987 we were finding recently dead aphids all though the beginning of December.

In five years we inspected 3.960 aphid individuals that died of mycoses. Within this total number, *P. neoaphidis* was found to be the cause in 73.5% of cases; *E. planchoniana* in 12.1%; *N. fresenii* in 8.9%; the species from *Conidiobolus* genus in 2.9%; mixed infections in 2%; *E. radicans* in 0.4%, and the unidentified hypha bodies in 0.2%.

Based on the data acquired in the period from 1985 to 1990, we can conclude that *P. neoaphidis* is an entomopathogenous fungi that is the most significant in regulation of cabbage aphids density. It is, among the recorded fungi species, the one most equally distributed during the attack of cabbage aphids. In the period of mycoses occurrence in cabbage aphids's population, *P. neoaphidis* was, versus other species, found in each sample of the infected aphids inspected. The results presented on Tables 1 – 5, demonstrate that *P. neoaphidis* was during the hot summer months, always the most numerous fungi that in the fall caused a mass occurrence of mycotic infections. The inspection of leaf aphid populations showed that this fungi always initiated mycoses.

E. planchoniana is the second-numerous species of entomopathogenous fungi registered both in summer and in the fall. Its role in regulating the cabbage aphids density is more prominent in the fall, in conditions of the aphids' higher density. The largest number of leaf aphids infected with this fungi was found in conditions of the big autumn drought, in 1987 when the main source of high humidity was dew. The reason why this species is not that significant in summer time, in our conditions, is most probably the low density of the host's population during that season. The permanent spores of *E. planchoniana* were found mostly in October and November, and only once in September.

N. fresenii is the third-numerous fungi found in infected aphids. This species, similar to the previous one, was found in summer and in the fall. In the fall, it was much more numerous and found in dense colonies. It occurs in conditions of warm and humid weather. The aphids infected with this fungi were usually found on the leaf's stem or at the beginning of the main cabbage leaves vein inside the dense aphid colonies. The permanent spores of this species were found in dead aphids only in the fall.

Different from the previous three fungi species, *C. obscurus* is sporadically present in the cabbage aphid population. It usually occurs twice, in June and in October, and it is more numerous when the weather is cold and humid. The other two species of this genus, *C. coronatus* C. and *C. osmodes,* are even less numerous. *C. coronatus* was found in warm and humid weather, while *C. osmodes* was found at the beginning of winter, in December. We found only the *C. obscurus* permanent spores, and that only at the beginning of June and October of 1990- the year that had been favorable for this fungi.

E. radicans is the species that sporadically occurs on cabbage aphids. It has been registered only in 1987, in the period from July to October. Although this species had regularly formed the permanent spores in the infected adults of *Empoasca* sp. cycads on sugar beet at the same locality and during the same period, we did not find any in the leaf aphids.

Mixed infections were found in the infected aphids always in fall, in time of the mass occurrence of mycoses. In all the cases of mixed infections, we found *P. neoaphidis* in combination with one of the three species: *N. fresenii, E. planchoniana* and *C. obscurus.* At the beginning of the mixed infections occurrence, *P. neoaphidis* was found in conidious forms of these three fungi species, while in October and November, it was often found in association with the permanent spores of these species. In the total number of the mixed infections registered, the participation of *P. neoaphidis* and *N. fresenii* is the highest – 69%. The mixed infections have been only once found in the spring-summer period of mycoses presence in cabbage aphids population.

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Original scientific paper

OCCURRENCE OF THE NECROTIC STRAIN OF POTATO VIRUS Y (PVY^N) IN SOME LOCALITIES IN SERBIA

Studies were conducted on the spread of the necrotic strain of potato virus Y (PVY^N) in some regions in Serbia. Infection of the healthy potato plants during one vegetation in the potato-growing regions ranged from 75% to 100%.

Key words: potato, necrotic strain of potato virus Y (PVY^N), spread, Serbia

Introduction

Due to the specificity of spread and control strategies, viruses are major causal agents of potato diseases. The importance of some economically significant viruses is reflected in the intensity of their spread in nature and their effect on yield reduction. According to the results of studies conducted so far, potato virus *Y (PVY)* was found to be most prevalent in our parts (Milošević, 1989). The same author (1990) reported the necrotic strain of this virus (PVY^N) to be the most widely spread within the potato virus Y group.

The necrotic strain of virus Y (tobacco veinal necrosis strain) (de Bokx and Huttinga, 1981), previously designated as a new strain (de Bokx, 1962, loc. cit. Nohejl, 1981), began to spread more intensely in Europe in the 1950's (Klinkowski and Schmelzer, 1957; Weidemann, 1988). It was named "Tabakrippenbraune Virus *(TRBV)*" by Klinkowski and Schmelzer since it induced veinal necrosis in tobacco leaves. This strain of virus Y has been described by many authors and its significance, epidemiology and control were in details reported by Weidemann (1988). The incidence of this strain and its economic importance for potato production in some European countries were reported by Bode and Volk (1957), Klinkowski nd Schmelzer (1957), Richardson (1958), Ross (1959), de Bokx (1961, loc. cit. Weidemann, 1988), Nohejl (1981, 1983). However, the problem of the spread of the potato necrotic strain of virus Y in Europe has in recent years been pointed out again (Chrzanowska, 1991).

In our parts, a more intense spread of virus Y^N occurred in the late 1980's and early 1990's. Its epidemic spread posed a serious problems in the seed-potato production in Serbia. The aim of this paper was therefore to stress importance of the occurrence of necrotic strain of the potato virus Y and the problems in potato production associated with it.

STUDY ON THE *PRUNE DWARF VIRUS* – PEACH ISOLATE

by

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Summary

The paper presents studies on the prune dwarf virus isolate infecting vineyard peach in the region of south Serbia. *PDV* was isolated from the peach trees showing symptoms of chlorotic rings and mottling.

Investigation of biological properties showed this isolate to cause symptoms typical of *PDV* on woody and herbaceous indicators. *PDV* from peach has thermal inactivation point at 40°C, dilution end point of 10^{-1} and its stability *in vitro* is improved by adding 0.01 M NaDIECA and 0.005 M cysteine hydrochloride.

Of the four procedures used for purification, the clarification of extract with ether and carbon terachloride (Wetter, 1960) proved to be best. Virus preparations sedimenting in sucrose gradient columns formed three light scaterring zones. The UV absorption spectrum of the purified virus had maximum absorption at 260 nm, minimum at 242 nm and $A_{260/280}$ value 1.57. Coat protein molecular weight is approx. 24 kDa.

Three sera prepared against this *PDV* isolate using different rabbit imunization schemes had low titers determined by Ouchterlony gel double diffusion test and could not be successfully used for direct detection of *PDV* in woody plant by means of the ELISA technique.

STUDY OF *COLLETOTRICHUM GLOEOSPOROIDES* Penz./Sacc., CAUSER OF THE SOUR CHERRY ANTHRACNOSE AND THE EFFECT OF SOME FUNGICIDES ON THIS FUNGUS „*IN VITRO*"

by

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Summary

In the past ten years, the sour cherry anthracnose is getting to be a more significant disease in Yugoslavia. Due to this disease the chery fruit yields have been reduced up to 50%.

The fungus, which at nutrients media produced whitish, and later on greyish, colony with pinkish acervuly and one cell conidia, was isolated from the diseased fruits.

Based on the disease symptoms, the morphological and cultural characteristics, the isolated fungus was identified to be *Colletotrichum gloeosporoides*.

The fungus had a favourable growth on fresh prepared PDA media at temperature 12-27°C, with optimum at 22-27°C, where as at 32°C the fungus did not grow. Most favourable colony growth was on the carrot, malts, *PDA* and prunes nutrients media. The fungus had a favourable growth on PDA nutrients media with pH 5-8.

Prochloraz and Chlorthalonil were the most effective against fungus colony growth, compared to Captan which was less effective. In this respect these fungicides may be tested in field trials against the sour cherry anthracnose causer. Iprodione and Vinclozolin had no effect on fungus growth

APPLICATION OF INDIRECT ELISA TECHNIQUE FOR DETECTING PRUNEDWARF VIRUS AND TOBACCO STREAK VIRUS

by

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Summary

Since 1980 a direct DAS ELISA technique has been used as a routine method for detecting viruses of fruit crops at the Fruit and Grape Research Centre at Čačak. For a quick and reliable diagnosis, two indirect ELISA techniques were employed. I ELISA in which virus adsorbs passively to microtitre plate (K o e n i g , 1981) was used for the detection of prune dwarf virus (PDV) in sweet cherry, peach and plum samples. F (ab')$_2$ ELISA, as desribed by B a r b a r a and C l a r k (1982), was used to screen raspberries for the presence of tobacco streak virus (TSV).

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INFECTIVE FRUIT DEFORMATION IN QUINCE CV. LESKOVAČKA

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Summary

Several years ago we observed fruit deformation in quince cv. Leskovačka, a phenomenon which has not been reported so far in our country.

Considering the fact that Leskovačka is the leading quince cultivar in our varieties range, as well as the damage to infected fruits which was of economic importance, a preliminary study was conducted on the disease distribution, symptoms and transmission by grafting.

The disease was found to occur with differing intensity in a number of plantings. A more severe infection was observed in the plantation orchards in Vraćevšnica, Kosančić, Subotica and smaller plantings in the vicinity of Čačak and Kraljevo. In addition to the changes on fruits which were usually smaller and showed severe deformations and depressions with the occurrence of sclerenchyma cells and necrosis in the mesocarp, the symptoms were also recorded on the leaves and bark. Two types of symptoms occurred on leaves: the yellowing along and between the veins with leaf deformation and sooty ring spot. The infected trees are more dwarfing and branches and trunk show bark splitting, roughness, bare areas and dieback of branches with progressive decline of the whole tree.

The trials on graft-transmission showed that the inoculation of healthy plants of cv Leskovačka resulted in reproduction of identical symptoms both on leaves and fruits, which clearly indicates that the disease is induced by pathogenic agent(s).

The disease has also been observed to spread in nature but the way of spreading is still unknown.