FIRST REPORT OF *ACREMONIUM CHARTICOLA* (LINDAU) W. GAMS ON RAPESEED SAMPLES IN STORAGE DURING 2012 IN SERBIA

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***Abstract**: Last years in Serbia rapeseed is being grown on much bigger areas than before. In our country it belongs to the category of crops whose time will come. The objective of this study was to investigate fungal infestation of different rapeseed genotypes (20) as it follows: Banaćanka, Slavica, Branka, Ilia, Kata, Nena, NS-I-31, NS-I-32, NS-I-33, NS-I-101, NS-I-102, NS-I-126, NS-I-128, NS-I-129, NS-I-134, NS-I-136, NS-I-137, NS-I-138, Jasna and Zorica. Rapeseed genotypes were grown on the experimental field of the Institute of Field and Vegetable Crops, Rimski Šančevi, Novi Sad, Province of Vojvodina, Serbia. Samples were collected during the storage. Cultivation of rapeseed samples and isolation of fungi were done by use of two media: potato dextrose agar (PDA) and filter paper (FP). Incubation was carried out at 25 ºC for 10 days. Isolated fungi were classified into five genera and nine species: Acremonium charticola (Lindau) W. Gams, Alternaria alternata (Fr.) Keissler, Aspergillus flavus Link, Aspergillus niger van Tieghem, Phoma glomerata (Corda) Wollenweber & Hochapfel, Phoma macrostoma Montagne, Penicillium chrysogenum Thom, Penicillium citrinum Thom and Penicillium rugulosum Thom. The first evaluation of mycopopulations was performed 7 days after setting of the experiment. The second evaluation was performed 5 days after the occurrence of fungi on seed and the third followed 10 days after it. The results were statistically analyzed by the program STATISTICA 12. It was found that the highest share in mycopopulations isolated on PDA and FP had Acremonium charticola and Aspergillus flavus. The last one is known as a producer of aflatoxins and some other toxic metabolites. Other species occurred at a significantly lower intensity. It is the first report of Acremonium charticola on rapeseed in Serbia.*

***Key words*:** *rapeseed, mycopopulations, Acremonium charticola, Aspergillus flavus*

INTRODUCTION

Rapeseed (*Brassica napus*) is part of *Brassicaceae* family. It belongs to group of plants that are grown in moderate climate. Rapeseed is grown because of the seed which contains 40-48% of oil and 18-25% of protein (MARINKOVIĆ et al., 2003; MARJANOVIĆ-JEROMELA et al., 2002). Seed can be used for producing food oil and biodiesel. Last years in Serbia rapeseed is being grown on much bigger areas than before. In our country it belongs to the category of crops whose time will come. Rapeseed can be found on significant areas of more than 1.000 ha since 1977 in Serbia. Since then, rapeseed growing area increased up to max 30.000 ha in 1985, with the average yield of 2.2-2.5 t/ha. These areas decreased after 1985 and in the last 20 years remained only 2.000 to 7.000 ha (CRNOBARAC AND MARINKOVIĆ, 2006).

MATERIAL AND METHODS

Rapeseed genotypes were grown on the experimental field of the Institute of Field and Vegetable Crops, Rimski Šančevi, Novi Sad, Province of Vojvodina, Serbia. Samples were collected during the storage. The objective of this study was to investigate fungal infestation of different rapeseed genotypes (20) as it follows: Banaćanka, Slavica, Branka, Ilia,

Kata, Nena, NS-I-31, NS-I-32, NS-I-33, NS-I-101, NS-I-102, NS-I-126, NS-I-128, NS-I-129, NS-I-134, NS-I-136, NS-I-137, NS-I-138, Jasna and Zorica.

Cultivation of rapeseed samples and isolation of fungi were done by use of two media: potato dextrose agar (PDA) and filter paper (FP). The samples were set up on medium on 21.05.2013. (10 genotypes) and 10.06.2013. (10 genotypes), in the Laboratory of Phytopathology, at the Faculty of Agriculture, University of Novi Sad.

20 seeds were taken from each of 20 samples and then were set up on PDA medium. 40 seeds from each sample were set up on filter paper. Rapeseed samples were incubated at 25 ^{o}C.

The first evaluation of mycopopulations was performed 7 days after setting of the experiment. The second evaluation was performed 5 days after the occurrence of fungi on seed and the third followed 10 days after it. The results were statistically analyzed by the program STATISTICA 12.

RESULTS AND DISCUSSIONS

Occurrence of diseases was monitored in the Laboratory of Phytopathology at the Faculty of Agriculture, University of Novi Sad during 10 days. Pathogens were determined at the Faculty of Technology, University of Novi Sad.

Isolated fungi were classified into five genera and nine species: *Acremonium charticola* (Lindau) W. Gams, *Alternaria alternata* (Fr.) Keissler, *Aspergillus flavus* (Link), *Aspergillus niger* van Tieghem, *Phoma glomerata* (Corda) Wollenweber & Hochapfel, *Phoma macrostoma* Montagne, *Penicillium chrysogenum* (Thom), *Penicillium citrinum* (Thom) and *Penicillium rugulosum* (Thom).

Results are presented in table 1 (PDA) and table 2 (filter paper).

Table 1

Third rate of intensity of disease occurrence on rapeseed which was set up on PDA medium (10^{th} day- 06.06.2013. and 26.06.2013.)

	Aspergillus flavus	*Aspergillus niger*	*Penicillium citrinum*	*Penicillium chrysogenum*	*Penicillium rugulosum*	*Phoma glomerata*	*Phoma macrostoma*	*Alternaria alternata*	*Acremonium charticola*
Banaćanka	0,05^{ab}	0,00^{abc}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{abc}	0,03^{bc}	0,03^{a}	0,28^{de}
Slavica	0,20^{cd}	0,00^{abc}	0,00^{a}	0,05^{ab}	0,00^{a}	0,00^{abc}	0,00^{abc}	0,00^{a}	0,00^{a}
Branka	0,15^{bc}	0,00^{abc}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{abc}	0,00^{abc}	0,03^{a}	0,20^{cde}
Ilia	0,03^{ab}	0,00^{abc}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{abc}	0,00^{abc}	0,00^{a}	0,48^{f}
Kata	0,03^{ab}	0,03^{b}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{abc}	0,00^{abc}	0,00^{a}	0,15^{bcd}
Nena	0,03^{ab}	0,03^{bc}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{abc}	0,00^{abc}	0,00^{a}	0,30^{e}
NS-1-31	0,05^{ab}	0,00^{abc}	0,03^{ab}	0,03^{a}	0,00^{a}	0,00^{abc}	0,00^{abc}	0,00^{a}	0,10^{abc}
NS-1-126	0,00^{a}	0,00^{abc}	0,05^{b}	0,00^{a}	0,03^{b}	0,00^{abc}	0,00^{abc}	0,03^{a}	0,18^{bcde}
NS-1-33	0,03^{ab}	0,00^{abc}	0,00^{a}	0,00^{a}	0,00^{a}	0,03^{ab}	0,00^{abc}	0,00^{a}	0,28^{de}
NS-1-128	0,05^{ab}	0,00^{abc}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,03^{b}	0,00^{a}	0,08^{abc}
NS-1-129	0,40^{d}	0,00^{abc}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{abc}	0,00^{abc}	0,00^{a}	0,00^{a}
Jasna	0,05^{ab}	0,00^{abc}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{abc}	0,00^{abc}	0,00^{a}	0,00^{a}
NS-1-101	0,03^{ab}	0,00^{abc}	0,00^{a}	0,03^{a}	0,00^{a}	0,00^{abc}	0,00^{abc}	0,00^{a}	0,00^{a}
Zorica	0,05^{ab}	0,00^{abc}	0,00^{a}	0,00^{a}	0,00^{a}	0,03^{bc}	0,00^{ac}	0,00^{a}	0,00^{a}
NS-1-102	0,08^{ab}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}
NS-1-134	0,13^{abc}	0,00^{a}	0,00^{a}	0,03^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}
NS-1-32	0,05^{ab}	0,00^{a}	0,00^{a}	0,05^{ab}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}
NS-1-136	0,05^{ab}	0,00^{abc}	0,00^{a}	0,10^{b}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,05^{ab}
NS-1-137	0,05^{ab}	0,00^{abc}	0,00^{a}	0,05^{ab}	0,00^{a}	0,00^{a}	0,00^{abc}	0,00^{a}	0,00^{a}

NS-1-138	0,03^{ab}	0,00^{a}	0,00^{a}	0,05^{ab}	0,00^{a}	0,00^{a}	0,00^{abc}	0,00^{a}	0,00^{a}
Average	0,08	0,003	0,004	0,02	0,002	0,003	0,003	0,005	0,11

Based on the review and identification of pathogens that were developed around the seeds on PDA medium, *Acremonium charticola* (Lindau) occurred on most of the genotypes, with the highest representation on genotypes Ilia and Nena. On the second place was *Aspergillus flavus* (Link). That can be very important in terms of the production of mycotoxins (PARK et al., 2000). The highest occurrence of *A. flavus* was on genotype NS-1-129.

Other pathogens occurred at a significantly lower intensity. *Penicillium rugulosum* (Thom) occurred with the lowest representation.

Table 2

Third rate of intensity of disease occurrence on rapeseed which was set up on filter paper (10^{th} day - 06.06.2013. and 26.06.2013.)

	Aspergillus flavus	*Aspergillus niger*	*Penicillium citrinum*	*Penicillium chrysogenum*	*Penicillium rugulosum*	*Phoma glomerata*	*Phoma macrostoma*	*Alternaria alternata*	*Acremonium charticola*
Banaćanka	0,00^{a}	0,00^{a}	0,00^{a}	0,03^{abcd}	0,00^{a}	0,00^{a}	0,05^{b}	0,00^{a}	0,25^{g}
Slavica	0,06^{abcd}	0,00^{a}	0,00^{a}	0,05^{abcd}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,08^{bcde}
Branka	0,15^{e}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,08^{abcde}
Ilia	0,03^{ab}	0,00^{a}	0,00^{a}	0,05^{abcd}	0,00^{a}	0,00^{a}	0,05^{b}	0,06^{bcd}	0,18^{f}
Kata	0,00^{a}	0,00^{a}	0,00^{a}	0,05^{abcd}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,14^{ef}
Nena	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,10^{def}
NS-1-31	0,00^{a}	0,00^{a}	0,00^{a}	0,01^{abcd}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,10^{cdef}
NS-1-126	0,00^{ab}	0,00^{a}	0,01^{b}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,06^{cde}	0,10^{cdef}
NS-1-33	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,04^{b}	0,00^{a}	0,00^{bcd}	0,10^{cdef}
NS-1-128	0,08^{abc}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,05^{abcd}
NS-1-129	0,14^{de}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{ab}
Jasna	0,13^{cde}	0,00^{a}	0,00^{a}	0,05^{bc}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{ab}
NS-1-101	0,00^{a}	0,00^{a}	0,00^{a}	0,03^{abcd}	0,00^{a}	0,00^{a}	0,00^{a}	0,09^{e}	0,03^{abc}
Zorica	0,08^{abcde}	0,00^{a}	0,00^{a}	0,03^{abcd}	0,00^{a}	0,00^{a}	0,04^{b}	0,00^{a}	0,05^{abcd}
NS-1-102	0,08^{cde}	0,00^{a}	0,00^{a}	0,04^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}
NS-1-134	0,11^{cde}	0,00^{a}	0,00^{a}	0,03^{abcd}	0,00^{a}	0,00^{a}	0,00^{a}	0,03^{abc}	0,00^{a}
NS-1-32	0,06^{abcd}	0,00^{a}	0,00^{a}	0,04^{abcd}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,01^{ab}
NS-1-136	0,05^{abc}	0,00^{a}	0,00^{a}	0,06^{b}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,01^{ab}
NS-1-137	0,08^{abcde}	0,00^{a}	0,00^{a}	0,05^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}
NS-1-138	0,08^{bcde}	0,00^{a}	0,00^{a}	0,05^{bcd}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}	0,00^{a}
Average	0,06	0,00	0,0005	0,03	0,00	0,0005	0,02	0,01	0,07

Acremonium charticola (Lindau) and *Aspergillus flavus* (Link) had the highest representation of the tested pathogens on filter paper. Banaćanka had the highest percentage of seed infection by *A. charticola* (Lindau). Pathogen *Aspergillus flavus* (Link) was the second most frequent pathogen. Seven samples were without presence of *A. flavus* (Link) colonies on filter paper. Colonies of the other samples were noticed with larger or lesser intensity.

Penicillium chrysogenum (Thom) was on the third place according to representation. Six samples were without presence of *P. chrysogenum* (Thom). Other pathogens occurred at a significantly lower intensity.

CONCLUSIONS

The following pathogens were determined on rapeseed: *Acremonium charticola* (Lindau) W. Gams, *Alternaria alternata* (Fr.) Keissler, *Aspergillus flavus* (Link), *Aspergillus niger* van Tieghem, *Phoma glomerata* (Corda) Wollenweber & Hochapfel, *Phoma macrostoma* Montagne, *Penicillium chrysogenum* (Thom), *Penicillium citrinum* (Thom) and *Penicillium rugulosum* (Thom). It was found that the highest share in mycopopulations isolated on PDA and FP had *Acremonium charticola* (Lindau), which has not been established in Serbia until nowadays. In general species occurred in closed space which has high humidity (COLLIER et al., 1998). *Acremonium* species often find on rest of root rapeseed even until 19.5 months after harvest (KRIAUČIŪNIENĖ et al., 2008).

Pathogen *Aspergillus flavus* (Link) was the second most frequent pathogen. That can be very important in terms of the production of mycotoxins (PARK et al., 2000; SHAUKAT, 1981). Other pathogens occurred at a significantly lower intensity.

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