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CHARACTERISTICS OF FUNGI AFFECTING ROOT-CROPS IN 1997

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Abstract. In 1997, supplying Plant Pathogenic Microorganism Collection, microflora of diseased root crops from field and storage was analyzed. Samples from Districts Inspectors of PIOR from area of Poland were received, and 139 isolates of fungi from 369 samples of sugar and forage beat, forage cabbage, forage carrot and potatoes were obtained. The most often fungi from genus *Fusarium* occurred, and 23.5% of isolates from beet, 14.2% from cabbage, 29.5% from carrot and 48,2% from potatoes were received. The second dominant was species *Alternaria alternata*, isolated from diseased plants in 28.9%, 50%, 18.5% and 20% respectively. Among saprophytic fungi, species *Penicillium* and *Aspergillus* were represented in 9,7% of obtained isolates. Received results suggested that *Fusarium* spp. and *Alternaria alternata* could be potentially dangerous for root crops as a pathogens or weak pathogens.

Key words: root-crops, pathogens, contamination

I. INTRODUCTION

Fungal diseases cause great economic losses in the yield of root-crops during vegetation and during storage. Recently in Poland it was observed the increasing importance of several pathogens (Kurzawińska 1997).

The present study was undertaken to determine fungi which infected root crops in the stores and fields all over Poland in 1997.

Part of identified fungi were included to the Collection of Plant Pathogens of the Institute of Plant Protection.

II. MATERIAL AND METHODS

Isolates of fungi were obtained from infected root-crops: beets, cabbages, carrots and potatoes from regions located all over the country, collected and sent by county State Plant Protection Service. Collecting started in March and ended in August 1997.

Isolations were made from organs of plants that showed different symptoms of diseases. Usually several fragment of each plant were taken for analysis. Two isolation methods were employed aimed to obtain different pathogenic species

In method 1 tissues excised from disease lesions were disinfected by immersion in 70% ethyl alcohol for 1 sec and then, in 7% hydrogen peroxide solution for 1 min. Any remaining hydrogen peroxide was then removed with distilled water in three successive rinsings lasting for 5, 10 and 15 min. In method 2 tissues were disinfected by immersion in

5-15% sodium hypochlorite solution for 1 min. In both procedures disinfected tissues were paper dried and plated on potato dextrose agar (PDA) at pH 4.5-5.

Plates were incubated at 23°C. After 5-7 days all the colonies out-growing the infected plant fragments were subcultured on fresh PDA plates and identified after suitable incubation period. Fungi were identified according to Gams (1980), Gilman (1959).

III. RESULTS AND DISSCUSSION

Total number of 423 samples of infected plants were obtained for analysis. Many samples have been destroyed during transportation. From 369 non-rotted samples 139 isolates of fungi were obtained. Among them the predominant fungi belonged to *Fusarium* spp. and *Alternaria alternata*. They comprised respectively 39.5% and 25.2% of all fungi isolated. *Fusarium* spp. comprised 23.5% of isolates obtained from beet plants, 14.2% isolates from cabbage, 29.5% from carrot and 48.2% isolates from potato (Tab. 1). These data suggest that *Fusarium* spp. considered chiefly as fungi of great saprophytic abilities, might be also assumed as important soil-borne pathogens – casual agents of root diseases (Wojciechowska-Kot and Kiszczak 1981).

Fusarium sulphureum was isolated from all the root-crops and comprised 13.1% isolates obtained from beet, 3.7% from carrot, 7.1% from cabbage and 10.1% from potato. Moreover three other representants of this genus: *F. avenaceum, F. oxysporum* and *F. solani*

Table 1

The frequency of *Fusarium* spp. isolation from root crops in 1997

Root-crop	Fungus species	% of isolates
Sugar-beet and mangel	*F. avenaceum* (Corda ex Fr.)	2.6
	F. culmorum (W.G.Smith) Sacc.	2.6
	F. oxysporum Schlecht	2.6
	F. solani (Mart.) Sacc.	2.6
	F. sulphureum Schlecht	13.1
Cabbage	*F. culmorum* (W.G.Smith) Sacc.	7.1
	F. sulphureum Schlecht	7.1
Carrot	*F. avenaceum* (Corda ex Fr.)	3.7
	F culmorum (W.G. Smith) Sacc.	7.4
	F. oxysporum Schlecht	7.4
	F. solani (Mart.) Sacc.	7.4
	F. sulphureum Schlecht	3.7
Potato	*F. acuminatum* Ellis, Everh	1.7
	F. avenaceum (Corda ex Fr.) Sacc.	3.3
	F. equiseti (Corda) Sacc.	3.3
	F. lateritium Ness	5.0
	F. oxysporum Schlecht	13.3
	F. poae Wollenweber (Peck)	3.3
	F. solani (Mart.) Sacc.	8.3
	F. sulphureum Schlecht	10.0

were isolated from beet, carrot and potato (2.6--13.3%). Another species: *F. acuminatum*, *F. equiseti*, *F. lateritium* and *F. poae* were isolated only from potato (Tab. 1). *F. sulphureum* isolated also from potato, is common and important pathogen of this crop (Kurzawińska 1992; 1997; Wojciechowska-Kot and Kiszczak 1981). *Fusarium culmorum* was obtained from beet (2.6% isolates), carrot (7.4% isolates) and cabbage (7.1%) but unexpectedly not from potato. Some workers consider this species as the devastating pathogen of *Gramineae* (Booth 1971). Apart from this fungus attacks a wide range of plant species and is assumed by some authors as the most important pathogen of beet and potato (Wnękowski 1979; Kowalik and Lechowicz 1984).

Table 2

The frequency of *Alternaria alternata* isolation from root crops in 1997

Crop-plant	% of fungi isolated
Sugar-bet and mangel	28.9
Cabbage	50.0
Carrot	18.5
Potato	20.0

The remaining species of isolated fungi belong to somewhat sparcely reported rot and leaf-spots agents (Kurzawińska 1992; 1997).

Alternaria alternata was the second predominant pathogen isolated from root-crops in present study. The infection with *A. alternata* reached 28.9% in intected sugar beet, 50% in cabbage, 78.9% in carrot and 20% in potato (Tab. 2). The biggest number of *A. alternata* isolates was among the fungi that infected beet roots. Several workers confirmed these

Table 3

The additonal fungi from root crops obtained in 1997

Root-crop	Fungus species	% of isolates obtained
Sugar-beet and mangel	*Aspergillus* spp. Micheli	15.8
	Epicoccum spp. Link	18.4
	Rhizoctonia solani Kühn	13.1
Cabbage	*Aspergillus* spp. Micheli	14.3
	Colletotrichum higginsianum Sacc. in Higgins	7.1
	Epicoccum spp. Link	14.3
Carrot	*Alternaria radicina* Neergaard	7.4
	Aspergillus niger (Van Tieghem)	7.4
	Botrytis cinerea Pers.	7.4
	Cylindrocarpon destructans Zin.	3.7
	Penicillium spp. Link ex Fries	3.7
	Rhizoctonia solani Kühn	3.7
	Sclerotinia sclerotiorum de Bary	11.1
	Tetracoccosporium paxianum Szabó	3.7
	Trichoderma spp. Persoon ex Fries	3.7
Potato	*Chaetomium* spp. Kunze	1.7
	Colletotrichum coccodes (Berk at B. Taub)	8.3
	Epicoccum spp. Link	1.7
	Gliocladium catenulatum Gilman, E. Abbott	1.7
	Gliocladium roseum (Bainier)	1.7
	Phoma eupyrena (Sacc.)	5
	Rhizoctonia solani Kühn	3.3

results. Accordingly *A. alternata* has been recorded as an important cause of gangrene and lef-spotns of the beet (Rożej and Wnękowski 1979). El Rahim (1988) claimed the importance of *A. alternata* in their role as carrot pathogen. Bogucka (1986), Kurzawińska (1987; 1988; 1989; 1992; 1997), Donegan et al. (1996) all found *A. alternata* to be serious pathogen which occurs every year as common pathogen of potato bulbs dry rot and leaf-spot of potato.

According to unpublished data, *A. alternata* isolates were very differentiated in morphology and the intensity of sporulation (Wiśniewska, personal comunication).

Among the fungi which contaminated plant material, genus *Aspergillus* and *Penicillium* were noted, as they comprised 9.7% of all fungi isolated (Tab. 3).

The majority of identified fungal species cause serious storage rot. Moreover *Fusarium* spp. and *Alternaria alternata* can be serious problem of root crops as either casual agents of diseases or so-called weak pathogens.

IV. CONCLUSIONS

1. *Fusarium* spp. and *Alternaria alternata* were predominant among fungi infecting root-crops: beet, potato, carrot and cabbage in 1997.
2. *Fusarium sulphureum* was noted in all the plants under study, *F. culmorum* occurred in all plant except potato.
3. Saprophytic fungi from The genus *Aspergillus* and *Penicillium* contaminated root-crop plant to rather big extent.

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CHARAKTERYSTYKA GRZYBÓW PORAŻAJĄCYCH ROŚLINY OKOPOWE W 1997 ROKU

STRESZCZENIE

W 1997 roku, uzupełniając Kolekcję Mikroorganizmów Patogenicznych dla Roślin, zanalizowano mikoflorę chorych roślin okopowych, pochodzących z upraw polowych i przechowalni, przesyłanych przez Wojewódzkie Inspektoraty PIOR z terenu całego kraju.

Wyosobniono łącznie 139 izolatów grzybów z 369 prób roślin buraka cukrowego i pastewnego, kapusty pastewnej, marchwi pastewnej i ziemniaka. Z roślin tych otrzymano odpowiednio 38, 14, 27 i 60 izolatów, w tym 25, 10, 16 oraz 51 stanowiły grzyby patogeniczne, natomiast pozostałe 13, 4, 11 i 9 stanowiły tzw. słabe patogeny i saprofity.

Najczęściej izolowano grzyby z rodzaju *Fusarium*. Stanowiły one 23,5% izolatów wyosobnionych z buraka cukrowego i pastewnego, 14,2% z kapusty pastewnej, 29,5% z marchwi pastewnej oraz 48,2% z ziemniaka. Następny pod względem częstości był gatunek *Alternaria alternata*, izolowany odpowiednio w 28,9; 50; 18,5; i 20%. Wśród grzybów saprofitycznych wyróżnić należy rodzaj *Penicillium* i *Aspergillus* reprezentowane przez około 9,7% izolatów otrzymanych łącznie z wszystkich roślin.

Wyniki sugerują, że *Fusarium* spp. i *Alternaria alternata* mogą stanowić potencjalne zagrożenie dla roślin okopowych jako grzyby chorobotwórcze lub grzyby określane jako słabe patogeny.