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The fungi communities of the soil environment of *Triticum aestivum* and its forecrops: *Hordeum vulgare*, *Vicia faba* ssp. *minor* and *Trifolium pratense*

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P l ą s k o w s k a E.: *The fungi communities of the soil environment of Triticum aestivum and its forecrops: Hordeum vulgare, Vicia faba ssp. minor and Trifolium pratense.* Acta Mycol. 31 (2): 265-274, 1997.

The species spectrum and abundance of the fungi communities were affected by the soil environment developed by wheat and its forecrops, and by atmospheric conditions. The fungi of the genus *Fusarium* were the greatest threat to winter wheat regardless of the forecrop. The field bean was the best forecrop to the wheat whereas spring barley was the worst.

Key words: winter wheat, forecrops, roots, rhizoplane and rhizosphere fungi.

INTRODUCTION

The winter wheat cultivated after unfavourable forecrops is very susceptible to the foot-rot complex. Different forecrops have a varying effect on the soil environment. Both, the plant root secretions as well as the post harvest plant debris remaining in the field contribute to the development of the specific fungi communities that, apart from the saprophytic species, may include also species pathogenic to wheat. The pathogenic fungi that remain in the soil after harvesting of the forecrop may become a threat to wheat that follows a given forecrop in the field. The saprotrophic fungi that occur in such communities may prevent contacts of pathogenic fungi with wheat roots. Therefore, it is crucial to recognise the species spectrum and abundance of the fungi communities that develop in the soil environment of the forecrops. Then, it will be possible to assess the danger of infection of wheat that follows them in crop rotation.

MATERIAL AND METHODS

The studies were carried out in 1988-1991 at the Agricultural University Experimental Station in Swojec near Wroclaw. The objects of the study were the youngest roots of wheat and the youngest roots of the forecrop plants.

The experiment followed the randomised block design, 4 replicates. Three crop rotation systems were investigated: the 2-, 3-, and the 4-year one with different proportion of cereals (100%, 66%, and 50%). The forecrops were: spriṅg barley, field bean and red clover.

In 1988-1990, the fungi were isolated from the roots and the root environment (the rhizoplane and the rhizosphere) of spring barley, field bean, and red clover using the M a ń k a (1974) method.

The plants for the study were collected at different times:

spring barley: at the milky-dough grain maturity stage
field bean: at the green-yellow seed maturity stage
red clover: after the II-nd windrow.

In 1989-1991, the studies on healthiness of winter wheat grown after these forecrops were carried out. The wheat for this study was collected at the milky-dough grain maturity stage. The isolation of fungi from roots, rhizoplane and rhizosphere of wheat grown after various forecrops was performed using a method of washings according to M a ń k a (1974) just as it was done with roots and rhizosphere of the forecrop plants.

RESULTS

The results of mycological analysis of the roots, rhizoplane and rhizosphere of winter wheat and her forecrops introduced Table 1 and Table 2.

The fungi of genera: *Cladosporium*, *Phoma* and *Penicillium* occurred abundantly in the rhizosphere and rhizoplane of the wheat and the forecrops. The fungi of the genus *Phoma* were connected mainly with the clover roots, for example: *Phoma medicaginis* var. *pinodella*. In 1988, *Penicillium* predominated in the rhizosphere and rhizoplane of barley what was connected with the 1988 drought, and in 1989 and 1990 — in the rhizosphere and rhizoplane of field bean.

In the roots of wheat and the forecrops, the abundance of *Cladosporium* and *Penicillium* was much lower and that of *Fusarium* and *Trichoderma* was much higher than in the rhizosphere and rhizoplane of these plants. *Trichoderma* predominated mainly in the roots of barley. However, it could be found also in other plants.

Table 1

Abundance of fungi isolated from rhizosphere, rhizoplane and roots of forecrops, in 1988-1990 (average values from three years)

Species of fungi	Forecrops for winter wheat:								
	spring barley			field bean			red clover		
	Rs	Pp	R	Rs	Rp	R	Rs	Rp	R
1	2	3	4	5	6	7	8	9	10
Absidia glauca Hagem	1	1	2	2	2	6	–	1	–
Acremonium roseum (Oud.) W. Gams	1	–	–	3	1	–	–	–	–
Acremonium strictum W. Gams	4	10	–	3	4	–	4	6	–
Alternaria alternata (Fr.) Keissl.	15	13	14	3	6	11	7	10	13
Apiospora montagnei Sacc. (st. konid. *Arthrinium*)	8	9	1	24	19	5	6	8	2
Aspergillus pulvinus Kwon et Fennell	–	–	1	–	–	1	2	–	1
Aspergillus versocolor (Vuill.) Tiraboschi	–	–	–	1	–	–	–	–	–
Aureobasidium bolleyi (Sprague) von Arx	3	4	8	–	–	–	–	–	–
Botrytis cinerea Pers.: Fr.	–	–	–	1	3	1	1	1	1
Beauveria bassiana (Bals.) Vuill.	–	–	–	–	–	–	2	5	–
Bipolaris sorokiniana (Sacc.) Shoem.	3	3	19	–	–	–	1	1	–
Cephalosporium curtipes Sacc.	4	5	–	–	1	–	1	6	2
Chaetomium indicum Corda	1	2	–	1	–	–	–	–	–
Chloridium chlamydosporis (van Beyma) Hughes	1	3	–	1	2	–	2	4	–
Chrysosporium pannorum (Link) Hughes	3	11	–	14	31	1	–	1	–
Cladosporium cladosporioides (Fres.) de Vries	17	15	–	9	12	1	12	17	1
Cladosporium herbarum (Pers.) Link	57	42	2	19	20	–	22	25	2
Cladosporium macrocarpum Preuss	2	3	–	1	1	–	–	1	–
Cladosporium sphaerospermum Penzig	1	–	–	–	1	–	–	–	–
Coniothyrium fuckelii Sacc.	1	–	1	1	4	–	2	4	1
Cylindrocarpon destructans (Zins.) Scholten	–	–	2	1	–	1	–	–	5
Cylindrocarpon didymum (Hartig) Wollenw.	–	1	5	–	–	1	2	3	8
Epicoccum purpurascens Ehrenb.	4	4	5	2	1	1	2	–	–
Fusarium avenaceum (Corda: Fr.) Sacc.	–	1	6	3	2	9	–	4	14
Fusarium culmorum (W.G. Sm.) Sacc.	3	4	17	1	–	6	1	–	9
Fusarium equiseti (Corda) Sacc.	–	2	17	1	2	14	2	1	15
Fusarium oxysporum Schlecht.	1	2	39	6	10	104	2	5	65
Fusarium sambucinum Fuckel	–	2	10	–	–	4	–	–	6
Fusarium solani (Mart.) Sacc.	–	1	5	4	4	16	–	2	22
Fusarium sporotrichioides Sherb.	2	5	2	–	–	1	–	–	5
Gliocladium catenulatum Gilman et Abbott	6	6	14	30	25	30	6	4	11
Gliocladium roseum (Link) Bain.	1	5	–	–	–	–	2	2	–
Humicola grisea Traaen	1	1	1	1	–	–	–	1	–
Microdiplodia sp.	–	–	–	3	16	–	–	–	–
Monodictys levis (Wiltsh.) Hughes	2	5	–	–	2	–	1	1	–
Mortierella hygrophila Linnem.	2	7	13	2	2	7	6	5	12
Mucor circinelloides van Tieghem	–	–	–	2	–	5	–	–	1
Mucor fragilis Bain.	–	–	–	–	–	–	–	–	–
Mucor hiemalis Wehmer	10	4	16	7	8	24	6	7	26
Oidiodendron cerealis (Thum.) Barron	–	5	–	–	–	–	–	–	–
Paecilomyces marquandi (Massee) Hughes	–	1	–	–	2	–	3	1	–
Papularia rosea Greben et Kuznetz	3	2	–	2	4	–	1	3	–

cont. Table 1

1	2	3	4	5	6	7	8	9	10
Penicillium granulatum Bain.	–	–	–	4	2	–	–	–	–
Penicillium lanoso-coeruleum Thom	–	–	1	–	–	–	1	–	1
Penicillium lilacinum Thom	5	5	–	–	2	–	2	3	1
Penicillium nigricans (Bain.) Thom	2	–	–	4	10	–	4	3	1
Penicillium notatum Vestling	27	29	25	20	25	13	13	18	8
Penicillium purpurogenum Stoll	6	10	6	–	–	–	–	–	–
Penicillium roseo-purpureum Dierck	–	1	–	5	4	–	5	5	3
Penicillium rugulosum Thom	5	11	5	–	–	–	–	–	–
Penicillium thomii Zaleski	3	1	2	2	4	6	–	–	–
Penicillium urticae Bain.	2	3	3	–	2	3	–	1	–
Penicillium variabile Sopp.	3	5	5	3	–	1	–	–	–
Penicillium velutinum Westling	4	9	2	20	14	20	5	4	7
Penicillium waksmani Zaleski	12	4	3	28	32	11	3	5	5
Phoma eupyrena Sacc.	4	9	2	5	3	–	2	3	2
Phoma exigua Desm.	2	–	–	–	–	–	1	3	2
Phoma fimeti Brun.	1	–	–	3	3	–	10	3	–
Phoma herbarum Westend.	3	6	–	–	–	–	4	3	–
Phoma leveillei Boerema et Bollen	10	10	3	2	3	–	2	10	1
Phoma medicaginis var. *pinodella* (L.K. Jones) Boerema	–	–	–	2	1	–	10	14	15
Rhizoctonia cerealis van der Hoeven	–	1	3	–	–	–	–	–	–
Rhizoctonia solani Kühn	–	–	–	–	1	3	1	–	8
Rhizopus arrhizus Fisch.	–	–	2	1	–	–	–	1	–
Sclerotinia sclerotiorum (Lib.) de Bary	2	1	–	1	2	1	–	–	–
Sporotrichum sp.	5	8	1	2	4	–	1	2	–
Trichoderma hamatum (Bon.) Bain.	1	5	4	–	1	–	–	1	1
Trichoderma harzianum Rifai	4	1	6	1	1	5	–	1	8
Trichoderma koningii Oud.	7	4	15	3	3	15	1	–	6
Trichoderma polysporum (Link: Pers.) Rifai	1	2	1	1	–	–	–	–	2
Trichoderma viride Pers.	1	1	7	–	–	1	–	–	2
Trichothecjum roseum Link	–	–	–	–	–	–	1	2	–
Trichurus sp.	–	2	–	–	1	–	2	4	1
Ulocladium botrytis Preuss	1	–	1	1	1	1	–	1	–
Verticillium lecanii (Zimm.) Viėgas	1	3	–	–	1	–	–	2	–
Dark non-sporulating colonies	5	4	5	2	3	3	2	3	2
Other fungi	10	8	5	3	3	1	7	11	4
Total	**284**	**322**	**307**	**261**	**211**	**333**	**173**	**232**	**302**

Sporadically isolated fungi:
Aspergillus candidus Link, *Aspergillus fumigatus* Fres., *Aspergillus versicolor* (Vuill.) Tiraboschi, *Colletotrichum lindemuthianum* (Sacc. et Magn.) Br. et Cav., *Cylindrocarpon obtusisporum* (Cook et Harkn.) Wollenw., *Fusarium poae* (Peck.) Wollenw., *Fusiarium semitectum* Berk. et Rav., *Geotrichum candidum* Link, *Didiodendron flavum* Szilvinyi, *Paecilomyces carneus* (Duche et Heim) Brown et Smith, *Paecilomyces farinosus* (Dicks: Fr.) Brown et Smith, *Papulaspora polyspora* Hotson, *Papulaspora rubida* Hotson, *Penicillium bacillosporum* Swift *Penicillium chrysogenum* Thom, *Penicillium claviforme* Bain., *Penicillium piscarium* Westling, *Penicillium vermiculatum* Dang., *Periconia macrospinosa* Lefeb. et A.G. Johnson, *Pestalotia hartigii* Tubeuf, *Sclerotinia trifoliorum* Erikss., *Tysanophora penicilliodes* (Roum.) Kendrick, *Torula herbarum* (Pers.) Link et Fr., *Trichoderma longibrachiatum* Rifai.

Rs – rhizosphere, Rp – rhiziplane, R – roots

Table 2

Abundance of fungi isolated from rhizosphere, rhizoplane and roots of winter wheat, in 1989-1991 (average values from three years)

Species of fungi	Winter wheat cultivated after:								
	spring barley			field bean			red clover		
	Rs	Pp	R	Rs	Rp	R	Rs	Rp	R
1	2	3	4	5	6	7	8	9	10
Acremonium roseum (Oud.) W. Gams	1	1	1	–	–	–	–	–	1
Acremonium strictum W. Gams	7	9	1	9	13	1	5	5	1
Alternaria alternata (Fr.) Keissl.	12	14	16	16	10	20	–	9	17
Apiospora montagnei Sacc. (st. konid. *Arthrinium*)	12	16	12	18	17	24	14	27	25
Aspergillus foetidus (Naka.) Thom et Raper	–	–	–	–	1	–	11	1	–
Aspergillus fumigatus Fres.	1	1	–	–	–	–	–	–	1
Aureobasidium bolleyi (Sprague) von Arx	1	4	17	2	4	8	3	2	–
Botrytis cinerea Pers.: Fr.	–	1	2	3	2	2	2	7	1
Beauveria bassiana (Bals.) Vuill.	–	–	1	–	1	–	2	–	1
Bipolaris sorokiniana (Sacc.) Shoem.	–	–	3	–	–	–	–	–	–
Cephalosporium curtipes Sacc.	–	–	–	1	–	–	–	2	1
Chaetomium indicum Corda	1	–	1	–	1	3	–	–	1
Chloridium chlamydosporis (van Beyma) Hughes	3	6	2	3	4	1	2	3	1
Chrysosporium pannorum (Link) Hughes	2	4	1	24	21	2	4	6	4
Cladosporium cladosporioides (Fres.) de Vries	14	17	6	27	24	8	13	19	11
Cladosporium herbarum (Pers.) Link	43	49	14	62	70	13	41	56	22
Cladosporium macrocarpum Preuss	2	4	–	3	3	–	3	4	–
Cladosporium sphaerospermum Penz.	–	–	1	1	–	–	–	1	–
Coniothyrium fuckelii Sacc.	9	4	7	6	10	7	4	2	7
Cylindrocarpon destructans (Zins.) Scholten	–	1	1	–	–	–	–	–	–
Cylindrocarpon didymum (Hartig) Wollenw.	–	3	1	–	–	1	1	–	4
Epicoccum purpurascens Ehrenb.	8	13	14	7	7	16	5	11	8
Fusarium avenaceum (Corda: Fr.) Sacc.	–	5	8	1	1	10	1	1	7
Fusarium culmorum (W.G. Sm.) Sacc.	3	2	10	2	1	3	1	1	5
Fusarium equiseti (Corda) Sacc.	–	1	4	–	–	7	–	2	7
Fusarium oxysporum Schlecht.	–	4	3	1	1	8	1	–	6
Fusarium sambucinum Fuckel	–	–	2	–	–	4	–	–	1
Fusarium semitectum Berk. et Rav.	–	1	1	–	–	–	–	–	1
Fusarium solani (Mart.) Sacc.	–	2	1	2	–	1	–	–	2
Fusarium sporotrichioides Sherb.	1	–	3	1	–	4	1	–	1
Gliocladium catenulatum Gilman et Abbott	1	3	5	3	2	12	–	–	4
Gliocladium roseum (Link) Bain.	1	5	–	1	3	–	2	–	–
Humicola grisea Traaen	1	4	1	1	4	4	2	1	5
Microdiplodia sp.	–	–	–	36	60	3	–	–	–
Monodictys levis (Wiltsh.) Hughes	–	3	1	2	1	–	–	1	–
Mortierella hygrophila Linnem.	1	4	14	1	2	14	2	3	10
Mucor hiemalis Wehmer	4	5	10	6	6	15	3	3	14
Oidiodendron cerealis (Thum.) Barron	–	2	–	1	4	–	–	–	–
Paecilomyces marquandi (Massee) Hughes	–	1	–	–	–	–	1	1	–
Papularia rosea Greben et Kuznetz	3	3	2	6	1	3	3	1	3
Penicillium chrysogenum Thom	–	1	1	–	1	1	1	1	2

cont. Table 2

1	2	3	4	5	6	7	8	9	10
Penicillium lanoso-coeruleum Thom	17	–	12	1	–	–	4	7	2
Penicillium lilacinum Thom	1	2	3	–	3	2	–	–	3
Penicillium nigricans (Bainier) Thom	–	2	–	1	1	–	1	1	3
Penicillium notatum Westling	23	13	26	13	13	18	24	23	26
Penicillium purpurogenum Stoll	–	–	7	1	–	1	–	1	1
Penicillium roseo-purpureum Dierck	–	–	–	–	1	2	1	2	1
Penicillium thomii Zaleski	–	–	1	–	–	–	–	2	–
Penicillium urticae Bain.	1	1	3	1	–	3	–	1	4
Penicillium velutinum van Beyma	–	2	–	1	1	2	–	–	1
Penicillium vermiculatum Dang.	1	1	1	–	–	2	1	–	3
Penicillium waksmani Zaleski	1	3	4	5	1	5	–	1	13
Periconia macrospinosa Lefeb. et A.G. Johnson	–	1	4	–	–	1	–	–	1
Pestalotia hartigii Tubeuf	–	–	–	–	–	–	3	1	–
Phoma eupyrena Sacc.	2	3	3	2	5	6	2	1	5
Phoma exigua Desm.	2	–	2	1	1	2	–	–	1
Phoma fimeti Brun.	4	2	4	2	7	5	9	7	2
Phoma herbarum Westend.	7	10	2	8	7	1	7	11	2
Phoma leveillei Boerema et Bollen	5	10	3	7	10	3	2	3	2
Phoma medicaginis var. *pinodella* (L.K. Jones) Boerema	–	2	–	–	4	2	3	6	7
Rhizoctonia cerealis van der Hoeven	–	–	–	–	–	1	–	2	1
Rhizoctonia solani Kühn	–	–	–	–	–	2	–	1	1
Sclerotinia sclerotiorum (Lib.) de Bary	3	6	–	5	4	6	3	14	1
Torula herbarum (Pers.) Link et Fr.	–	–	–	1	2	–	2	2	–
Trichoderma hamatum (Bon.) Bain.	1	–	–	–	–	2	1	1	1
Trichoderma harzianum Rifai	3	3	7	–	3	6	–	–	4
Trichoderma koningii Oud.	1	2	12	11	1	11	–	1	5
Trichoderma longibrachiatum Rifai	1	1	1	–	–	1	–	–	–
Trichoderma polysporum (Link: Pers.) Rifai	2	2	8	7	1	6	1	–	3
Trichoderma viride Pers.	–	–	2	–	–	1	–	–	–
Trichurus sp.	1	–	–	–	2	–	–	1	–
Ulocladium botrytis Preuss	–	1	–	–	–	1	–	–	1
Verticillium lecanii (Zimm.) Viėgas	–	–	3	1	1	1	–	2	1
Dark non-sporulating colonies	3	4	4	4	5	4	3	5	3
Other fungi	2	–	13	5	22	2	6	4	13
Total	**212**	**264**	**291**	**323**	**370**	**294**	**201**	**270**	**285**

Sporadically isolated fungi:
Acremoniella atra (Corda) Sacc., *Acremonium ochraceum* (Onions et Barron) W. Gams, *Aspergillus candidus* Link, *Aspergillus flavus* Link, *Aspergillus pulvinus* Kwon et Fennell, *Aspergillus versicolor* (Vuill.) Tiraboschi, *Coemansia aciculifera* Linder, *Dendryphion nanum* (Ness) Hughes, *Fusarium poae* (Peck.) Wollenw., *Gaeumannomyces graminis* (Sacc.) Arx et Olivier, *Gliocladium nigrovirescens* van Beyma, *Helminthosporium pedicellatum* Henry, *Mucor spinosus* van Tieghem, *Oidiodendron flavum* Szilvini, *Paecilomyces carneus* (Duche et Heim) Brown et Smith, *Penicillium expansum* Link, *Penicillium frequentans* Westling, *Penicillium herquei* Bain. et Sartory, *Rhizopus arrhizus* Fisch., *Rhizopus nigricans* Ehrenb., *Sporotrichum* sp., *Stachybotris* state of *Melanopsamma pomiformis* (Pers.: Fr.) Sacc., *Trichotecium roseum* Link, *Verticillium fusisporum* W. Gams, *Wardomyces pulvinatus* (Marchal) Dickinson.

Rs – rhizosphere, Rp – rhiziplane, R – roots

The fungi of the genus *Fusarium*, pathogenic for wheat were isolated mainly from the roots of the leguminous plants (ca 60% of all isolates) and, in smaller percentage, from the wheat roots (ca 35% of all isolates).

In the roots of forecrops, with the pathogenic fungi for winter wheat caused the foot-rot complex dominated *F. avenaceum* and *F. culmorum*, *F. avenaceum* as a rule predominated in the roots of red clover and field bean, and *F. culmorum* in the roots of barley. The fungi: *Bipolaris sorokiniana* and *Rhizoctonia cerealis* isolated only from roots of barley, instead *Rhizoctonia solani* to came only from roots of leguminous plants, first of all from the red clover.

In the rhizosphere and rhizoplane of all forecrop plants, the fungi of *Fusarium*, *Rhizoctonia* and *Bipolaris* were infrequent.

In the all years and after all forecrops with roots of winter wheat isolation abundant species: *Alternaria alternata*, *Apiospora montagnei*, *Aureobasidium bolleyi*, *Cylindrocarpon didymum* and *Mortierella hygrophila*. Instead in the rhizoplane and rhizosphere of winter wheat dominated fungi common from soil: *Acremonium strictum*, *Cladosporium cladosporioides*, *Cladosporium herbarum*, *Coniothyrium fuckelii*, *Humicola grisea*, *Mucor hiemalis* and *Penicillium notatum*.

DISCUSSION

The results of the studies on species spectrum of the fungi communities connected with wheat and the forecrops are similar to those obtained in other parts of the country that differed in environmental conditions (W a g n e r 1983; M a j c h r z a k 1985).

The saprotrophic fungi common to the roots, the rhizoplane and rhizosphere predominated in the fungi communities of roots and the rhizosphere of all studied plants. They belong to the following genera: *Cladosporium*, *Mucor*, *Penicillum*, *Phoma* and *Trichoderma*. According to W a r c u p (1971), the listed fungi together with those of genera: *Aspergillus*, *Cephalosporium*, *Rhizopus* and *Zygorhynchus* occur abundantly in the soil.

The high percentage of *Penicillium* in the root zone of the leguminous plants can be attributed to their osmophilous and nitrophilous character; the leguminous plants provide them with plenty of nitrogen accumulated by the nodule bacteria (M a c i e j o w s k a–P o k a c k a 1971).

D o m s h and G a m s (1970) reported that some species of *Penicillium* are antagonistic to the fungi causing the foot-rot complex. At the same time, M a j c h r z a k and M i k o ł a j s k a (1982) pointed that these fungi produce the antibiotic substances which act on the germinating seeds and young plants and may affect their metabolism.

The fungi of the genus *Trichoderma* are known of high effecitivity in limiting the growth of pathogenic fungi due to their ability of producing antibiotics, the rapid growth, and capability of hyperparasitism (S h a n-d a L i u and B a k e r 1980; S a l i n a 1981; D o s S a n t o s and D h i n g r a 1982).

The fungi of the genus *Fusarium*, pathogenic for winter wheat were isolated from wheat grown after leguminous plants as well as after spring barley. This is because these fungi occur on plant roots very abundantly (Ł a c i c o w a 1979; D o r e n d a 1982, 1986; S a d o w s k i 1988). Therefore, growing field bean and red clover as forecrops may result in their increased growth. It must be stressed, however, that among the fungi of the genus *Fusarium*, there predominated *F. oxysporum* Schlecht. that is not pathogenic to the wheat.

The most abundant species of the genus *Fusarium* was *F. avenaceum* (Corda: Fr.) Sacc. Most of the *F. avenaceum* isolates were obtained from wheat grown after field bean and red clover. *F. culmorum* (W.G. Sm.) Sacc., although it is considered the most dangerous pathogen of wheat was not a dominant in the studied environment. It was isolated mainly from the stems of wheat grown after spring barley and red clover that was a companion crop to barley.

The occurrence of a substantial amount of the *Rhizoctonia* fungi can be explained by the fact that *R. solani* Kühn is polyphagous and infests mainly the dicotyledons including field bean and clover and *R. cerealis* van der Hoeven is a well-known pathogen of wheat (R e i n e k e and F e h r m a n n 1979; B o l l e n and v a n d e r H o e v e n 1980).

According to C o u l h o u n and P a r k (1964) the fungi of the genera *Fusarium* and *Rhizoctonia* are particularly noxious in warm and dry soil. Under such conditions, the activity of mycolytic fungi which can limit the pathogens (*Pseudomonas* and *Bacillus*) is diminished. Such soils occur in the area of Swojec.

Most of the fungi identified within the wheat and its forecrops soil environment was not connected to a particular plant. Confirm that investigation of B r u e h l (1975). Also W i l l i a m s and S m i t t h e n n e r (1962), in his investigation proved, that above (over) ca 60% of all isolated fungi werent connected with the concrete plant. However, certain preferences could be seen. *Gliocladium catenulatum* Gilman et Abbott predominated in the roots of the field bean. *Aurobasidium bolleyi* (Sprague) von Arx occurred exclusively in roots of the cereals while *Cylindrocarpon* and *Phoma* were the most abundant in the roots of the clover. Basing on the results obtained, it may be stated that the variation in species spectrum and abundance in the fungi communities of wheat and its forecrops was generated by the plants themselves as well as by environmental factors such as rainfall and temperature.

Within the soil environment of wheat grown after different forecrops there existed a serious danger of plant infection by fungi causing the foot-rot complex. It was due to the too frequent cultivation of cereals in the same stand. The most favourable forecrop for the wheat was the field bean and the least favourable was spring barley. The red clover improved the healthiness of wheat only slightly because of accumulation of the pathogenic fungi in the soil environment. It was in connection with its being a companion crop to barley (M a c k i e w i c z and D r a t h 1974; B o j a r c z u k and B o j a r c z u k 1988).

Experiments and analyses of fungal communities in the environment help to choose the system of cultivation and plant protection against infectious diseases caused by fungi.

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Zbiorowiska grzybów pochodzące ze środowiska uprawnego *Triticum aestivum* i jej przedplonów: *Hordeum vulgare*, *Vicia faba* ssp. *minor* i *Trifolium pratense*

Streszczenie

W latach 1989-1991 badano zdrowotność pszenicy ozimej w uprawie po zróżnicowanych przedplonach (jęczmieniu jarym, bobiku i koniczynie czerwonej). Przedmiotem badań były najmłodsze korzenie pszenicy oraz najmłodsze korzenie jej roślin przedplonowych. W badanych zbiorowiskach grzybów ze środowiska uprawnego pszenicy i jej przedplonów stwierdzono zagrożenie porażenia pszenicy przez patogeny powodujące choroby podstawy źdźbła. Wiązało się to z dużym nagromadzeniem zbóż w płodozmianie. Najlepszym przedplonem pszenicy okazał się bobik a najgorszym jęczmień jary. Koniczyna czerwona z uwagi na to, że siana była jako wsiewka w jęczmień tylko nieznacznie poprawiała zdrowotność uprawianej po niej pszenicy.