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Macromycetes of the *Potentillo albae-Quercetum* in the Świętokrzyskie Mts. – monitoring studies

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The paper contains analysis of macromycetes collected on two observation plots in the forest community *Potentillo albae-Quercetum* in the Świętokrzyskie Mountains. The aim of these investigation was to determine the participation and the role of macromycetes in the forest community with oak trees. During the investigation 182 taxons of macrofungi were collected, 33 species of them were connected with oak trees.

Key words: macromycetes, oak forests, mycological monitoring, threatened fungi, disappearance of oak.

INTRODUCTION

The mycological study in *Potentillo albae-Quercetum* was done as a part of the international programme 'Mycological monitoring in European oak forests'. The western part of the Świętokrzyskie Mountains is occupied by low hills built of Mesozoic limestones. These are small mountain ranges running parallel to each other from west to east or north-west to south-east. Although the highest peaks have the altitude of more than 370 m, their relative high is about 100–120 m. In the regional division of Poland (Kondracki 1998) the ranges belong to the microregion of the Chęciny Hills, mesoregion of the Świętokrzyskie Mountains and macroregion of the Kielce Upland. As regards the geobotanical division they belong to the Chęciński District of the Świętokrzyskie Mountains' Section (Szafer 1977).

Among many hills, of that most are deforested, the Grzywy Korzeczkowskie range is the only one grown by forest. This is a small range running

from north-west to south-east, near Chęciny, about 30 km from Kielce. As regards the geological description the hills are built of Jurassic limestones that in the lower parts are covered with Quaternary sands. In the upper parts the limestones appear on the surface as outcrops. As the exhibition of slopes is clearly diverse and because of the lithological diversity, distinctly zonal vegetation has developed (Fig. 1). On the southern slopes, in the lower parts the oligotrophic pine forest *Peucedano-Pinetum* grows that is higher replaced by the mixed forests *Pino-Quercetum* and *Serratulo-Pinetum*. In the highest parts, on the shallow Jurassic limestone soils there are extensive patches of the oak forest *Potentillo albae-Quercetum* that were the site of mycological study. On the northern slopes, in the upper parts the place of the oak forest is taken by the hornbeam forest *Tilio-Carpinetum* that lower changes into mixed, and next into pine forest (B r ó ż 1986).

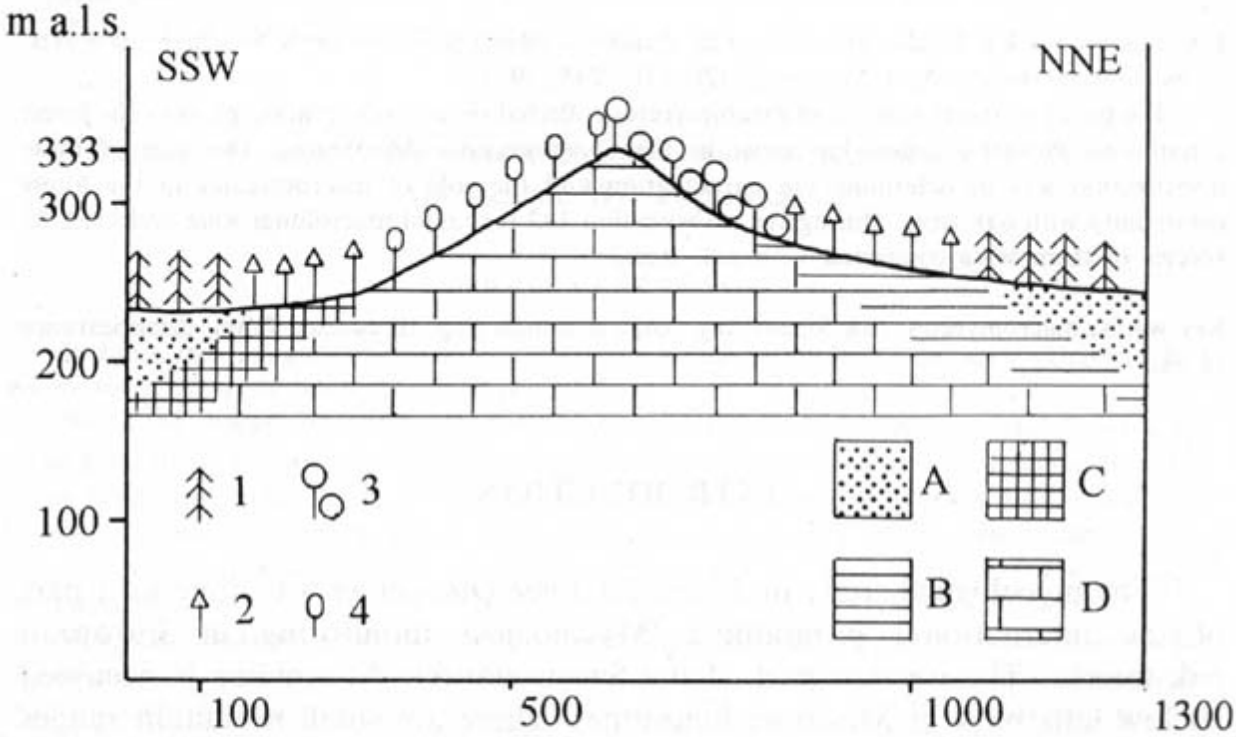


Fig. 1. Distribution of forest communities on the Grzywy Korzeckowskie hills. Plant communities: 1 — pine forest, *Peucuedano-Pinetum*; 2 — mixed coniferous forest, *Serratulo-Pinetum*; 3 — lime--hornbeam forest, *Tilio-Carpinetum*; 4 — clear oak forest, *Potentillo albae-Quercetum*. Substratum: A — sands, B — clays, C — clays and loess, D — limestones (source: Bróż 1986)

The climatic conditions in the area studied are characterised by the data for the Kielce station. The average annual temperature amounts 7.2°C and the average annual rainfall — 670 mm (Fig. 2).

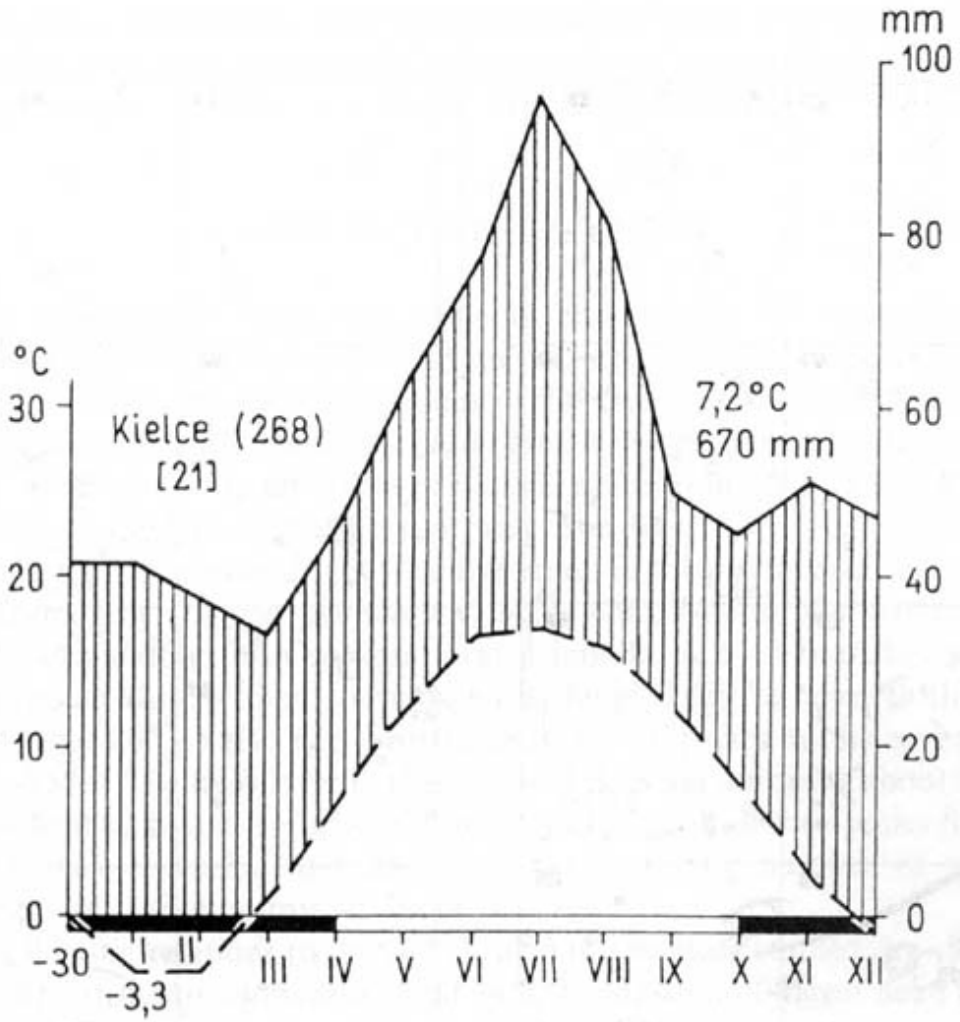
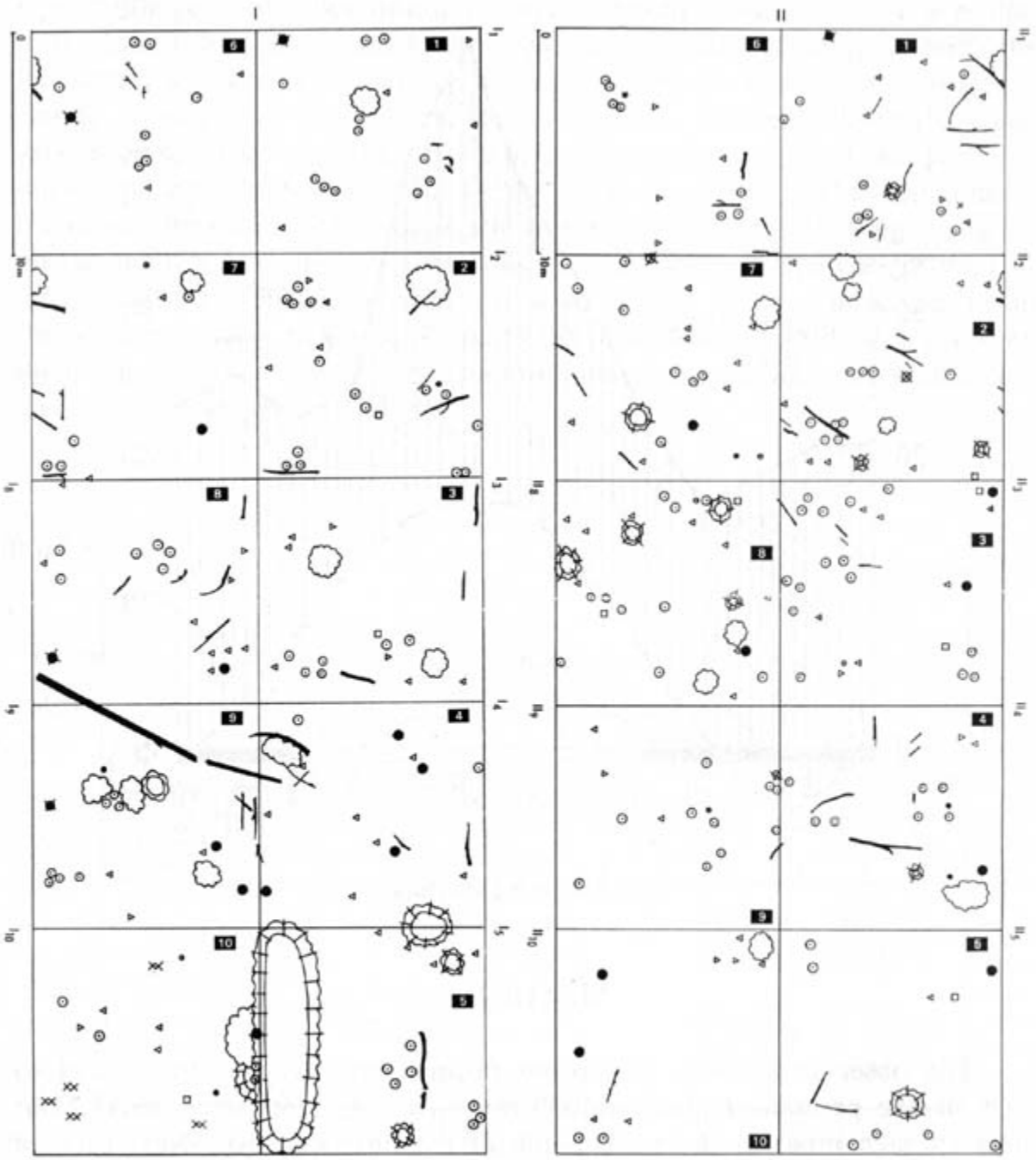


Fig. 2. Climatic diagram

METHODS

The observations were conducted during three seasons from 1994 to 1996 in two permanent plots of 1000 m^2 each. The plots were marked out close to each other in the same patch of the phytocoenosis. Next each of them was divided into 10 smaller 100 m^2 plots. Both big and small plots were durably marked in the field, and subsequently, they were charted in the scale 1:100. The location of all alive and dead trees, lying logs and thicker branches as well as shrubs was also marked on the maps (Fig. 3). In every small plot soil samples from the depth of 5 cm were taken and for all pH in KCl and H_2O was determined. The study was continued from April to November once or twice a month, on average with 10 observations a year. Macromycetes were recorded and collected in every small 100 m^2 plot. For every plot the kind of habitat and number of fruit-bodies of a given species



a b

Quercus petraea: a) alive trees; b) dead trees

Pinus sylvestris: a) alive trees; b) dead trees

Frangula alnus

Juniperus communis

Crataegus monogyna

Cornus sanguinea

Picea abies

Rosa canina

Sorbus aucuparia

Corylus avellana

Fig. 3. The structure of the tree stand on the plots I and II

were recorded. The species were partly identified when they were fresh, and partly when dry, after perishable traits had been noted. The nomenclature follows M o s e r (1983), J ü l i c h (1984) and others.

DESCRIPTION OF PLOTS

The mycological study was done in the patches of *Potentillo albae-Quercetum* located on the south-eastern 15° slopes in the section 189 of the Podzamcze Forest District that belongs to the Dyminy District and the Kielce Forest Inspectorate. The soil of the study area is assigned to Jurassic rendzinas. The pH values in the upper layers of the soil differ from 3.5 to 5.2 in KCl and from 4.6 to 6.1 in H_2O on the first plot, and from 3.4 to 5.4 in KCl and from 4.4 to 6.4 in H_2O on the second plot. The tree stand in the phytocoenosis studied is mainly formed by *Quercus petraea* with some contribution of *Pinus sylvestris*. The oaks originating from suckers form a bundle of 2–3 branches growing from one root. Most of them are infected by fungi. The tree cover in the patch does not exceed 60–85%. The shrub layer is rich in species but its cover is very low (10–15%). The herb layer is also rich and its cover amounts about 90%. It is mainly formed by macroforbs with high contribution of the species from the classes *Festuco-Brometea* and *Trifolio-Geranietea*. The number of vascular plants per 100 m^2 amounts as much as 70.

The floristic relations (trees and shrubs) in the plots studied are shown in Table 1. The structure of the tree stand with the location of bigger dead parts of trees are shown in Fig. 3.

RESULTS

Systematic analysis

During 3 seasons altogether 182 taxons were collected from both plots, of that 181 belonged to *Basidiomycetes* and 1 to *Ascomycetes*. Systematically, from the class *Basidiomycetes* 44 species belong to the order *Aphyllophorales*, 115 to *Agaricales* (7 *Boletaceae*), 17 to *Russales* and 9 to '*Gasteromycetes*'. The most numerous genera were: *Mycena* with 23 species, *Russula* – 13, *Clitocybe* – 11, *Entoloma* – 8, and 7 – *Pluteus*.

Ecological analysis

Of all species found 118 (64%) were saprotrophes, 58 (31%) mycorrhizal and 9 (5%) parasites.

Table 1

Trees and shrubs in the *Potentillo albae-Quercetum* association in the Grzywy Korzeckowskie hills (Jakubowska-Gabara 1996, part of Tab. 3)

Successive number			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	C
Number of plot			I	II	II	II	II	II	II	I	I	I	I	II	II	II	I	I	I	II	I	I	o
Number of releve			10	1	9	4	7	3	8	8	9	4	5	5	2	6	3	6	2	10	7	1	n
Area of releve			100 m²																				s
Date			August 1996																				t
Density of trees canopy	a	%	40	40	60	50	50	60	60	40	30	50	50	50	60	60	40	50	60	35	50	50	a
Density of shrubs	b	%	15	5	5	5	5	20	15	<5	30	15	5	20	5	–	30	<5	15	5	<5	5	n
Cover of herb layer	c	%	90	90	80	90	90	90	90	90	80	80	70	90	90	90	80	70	80	80	80	60	c
Cover of mosses	d	%	<5	–	–	–	–	–	–	<5	<5	<5	–	–	<5	<5	<5	–	<5	–	<5	<5	y
Quercus petraea	a_1		2	3	3	3	3	4	3	3	3	3	3	3	4	3	3	3	3	2	3	3	V
	b		+	·	+	·	·	1	·	·	2	·	+	·	·	·	·	·	·	·	·	·	II
	c		1	+	+	·	+	+	+	+	+	1	+	+	+	+	+	1	+	+	+	+	V
Pinus sylvestris	a_1		1	·	·	·	1	2	1	1	1	1	1	1	·	·	·	·	·	1	·	·	III
	c		·	+	·	·	·	·	+	·	·	·	·	+	·	·	·	·	·	+	·	·	I
Crataegus monogyna	b		·	+	+	·	+	+	+	+	1	1	+	2	1	·	1	·	2	+	1	·	IV
	c		·	+	+	·	+	·	+	+	+	1	·	+	+	·	+	+	+	·	+	·	IV
Juniperus communis	b		1	·	·	·	·	1	+	+	·	+	·	+	+	·	+	+	·	+	·	·	III
	c		+	+	+	+	1	·	+	1	+	1	+	+	+	·	+	+	+	+	+	+	V
Frangula alnus	b		+	·	+	+	·	+	·	+	·	·	+	+	+	·	1	·	·	·	·	+	III
	c		+	+	+	·	·	+	·	+	·	·	·	+	+	+	+	+	·	+	+	+	IV
Cornus sanguinea	b		+	·	·	·	·	1	1	·	2	·	1	+	+	·	·	·	·	·	·	+	II
	c		1	+	·	+	1	·	+	·	+	·	2	+	1	+	+	+	+	·	+	·	IV
Pyrus communis	b		·	·	·	·	·	+	·	·	·	·	+	+	·	·	2	·	·	·	·	+	II
	c		·	·	·	·	·	·	+	·	+	·	·	+	·	+	+	+	·	·	+	1	II

Rosa canina	b	+	·	·	+	·	+	+	·	·	·	·	·	·	·	+	·	·	·	·	+	II
	c	+	+	·	+	+	·	+	·	+	·	+	+	·	·	·	·	·	·	·	·	II
Euonymus verrucosus	b	·	·	·	·	·	·	·	·	+	+	·	·	·	·	·	·	·	·	·	·	I
	c	+	·	·	+	·	·	+	+	+	+	·	+	+	+	1	+	+	·	+	·	IV
Rubus sp. div.	b	+	·	·	+	·	·	+	+	+	+	·	+	+	+	1	+	+	·	+	·	IV
	c	·	·	·	+	+	+	+	+	2	+	+	+	+	·	+	·	·	+	+	+	IV
Prunus spinosa	b	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·	I
	c	1	+	·	·	·	·	+	+	·	1	+	·	·	+	·	+	+	+	+	1	III
Prunus cerasus	b	·	·	+	·	·	·	·	·	1	·	·	+	·	·	·	·	·	1	·	·	I
	c	+	·	+	·	+	·	+	+	+	·	·	+	·	·	+	·	·	+	·	·	III
Rhamnus catharticus	b	1	·	·	+	·	1	·	·	·	·	·	·	·	·	·	+	·	·	·	·	I
	c	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	I
Sorbus aucuparia	b	·	·	·	·	·	+	·	·	+	·	·	·	·	·	·	·	·	+	+	·	I
	c	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	I
Quercus rubra	b	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	I
	c	·	·	+	+	·	·	·	·	·	·	+	·	·	·	·	·	·	·	·	·	I
Abies alba	b	·	·	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	I
	c	·	·	·	·	·	·	·	·	·	·	+	·	·	·	·	·	·	+	·	·	I
Berberis vulgaris	b	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	+	·	·	·	I
Lonicera xylosteum	b	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	I
Rosa sp.	c	·	·	·	+	·	·	·	+	·	+	·	·	·	·	·	·	·	·	·	·	I
Picea abies	c	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	I
Corylus avellana	c	·	+	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	I

The most numerous species were those with a great number of tiny fruit-bodies. Among them *Marasmius bulliardii*, that in 1994 formed as many as 1600 fruit bodies, in 1995 – 750 and in 1996 – 1370, as well as *Macrotyphula juncea*, that appeared in the plots only in 1996 with 500 fruit-bodies, were the most productive species. *Leotia lubrica*, that also occurred only once, had more than 200 fruit bodies. In 1996 some other species also produced as many as 200 fruit bodies. These were: *Mycena epipterygia*, *M. pura*, *M. galopoda*, *M. oortiana* and *Crucibulum laeve*. Of the species with big fruit bodies only *Lactarius quietus* had quite high a number of them (135).

Table 2
Fungi connected with oak trees

	Species	1994	1995	1996	Total	Ecological groups
		Number of fruit-bodies				
1.	*Lactarius quietus*	5	12	135	152	M
2.	*Hygrophorus eburneus*	86	3	14	103	M
3.	*Lactarius chrysorrheus*	8	2	2	12	M
4.	*Boletus aestivalis*	2	4	3	9	M
5.	*Marasmius bulliardii*	1593	750	1372	3715	S
6.	*Mycena inclinata*	91	29	35	155	S
7.	*Peniophora quercina*	25	33	11	69	S
8.	*Hymenochaete rubiginosa*	13	13	10	36	S
9.	*Phanerochaete tuberculata*	5	8	5	18	S
10.	*Collybia dryophila*	2	1	8	11	S
11.	*Daedalea quercina*	2	3	3	8	S
12.	*Dichomitus campestris*	2	1	1	4	S
13.	*Collybia fusipes*	49	19	14	82	P
14.	*Phellinus robustus*	1	8	6	15	P
15.	*Fistulina hepatica*	4	4	4	12	P
16.	*Russula cyanoxantha*	–	2	2	4	M
17.	*Inocybe gausapata*	3	–	1	4	M
18.	*Inocybe auricoma*	1	–	1	2	M
19.	*Inocybe brunneo-rufa*	1	–	1	2	M
20.	*Pluteus olivaceus*	2	–	18	20	S
21.	*Lactarius uvidus*	–	–	40	40	M
22.	*Inocybe petiginosa*	–	–	9	9	M
23.	*Tricholoma lascivum*	–	–	3	3	M
24.	*Amanita fulva*	–	–	2	2	M
25.	*Xerocomus rubellus*	–	–	2	2	M
26.	*Lactarius zonarius*	2	–	–	2	M
27.	*Boletus queletii*	1	–	–	1	M
28.	*Exidia truncata*	–	–	145	145	S
29.	*Hypholoma sublaterinum*	7	–	–	7	S
30.	*Crepidotus variabilis*	–	6	–	6	S
31.	*Marasmius splachnoides*	–	–	5	5	S
32.	*Mycena erubescens*	–	–	3	3	S
33.	*Pluteus atricapillus*	–	–	2	2	S

M – mycorrhizal; S – saprotrophes; P – parasites

There were also many species which only one fruit-body during 3 seasons was observed. This group included: *Amanita spissa*, *Amanita phalloides*, *Boletus queletii*, *Geastrum minimum*, *Laccaria amethystina*, *Lycoperdon mammaeforme*, *Oudemansiella radicata*, *Ou. badia* and *Tricholoma albobrunneum* and others.

The species recorded considerably differed in the seasonal rhythmic of the fruit-bodies production. Most formed fruit-bodies irregularly. There were only 49 species which during 3 growing seasons regularly formed fruit-bodies. Among those were: *Boletus aestivalis*, *Fistulina hepatica*, *Hygrophorus eburneus*, *Lactarius quietus*, *L. chrysorrheus*.

There was strong connection between oaks and 33 species of macromycetes (Tab. 2). Among them 15 were mycorrhizal species (e.g. *Boletus aestivalis*, *B. queletii*, *Hygrophorus eburneus*, *Lactarius quietus*, *L. chrysorrheus*, *L. uvidus*), 15 saprotrophic ones (e.g. *Daedalea quercina*, *Dichomitus campestris*, *Hymenochaete rubiginosa*, *Peniophora quercina*, *Phanerochaete tuberculata*) and 3 parasitic ones: *Collybia fuspies*, *Fistulina hepatica* and *Phellinus robustus*.

Table 3

Fungi included in the red list of threatened fungi in Poland

	Species	The red date book categories			
		E	V	R	I
1.	*Boletus queletii*	1*			
2.	*Lycoperdon mammaeforme*	5			
3.	*Boletus edulis*		2		
4.	*Boletus aestivalis*		9*		
5.	*Dichomitus campestris*		4*		
6.	*Geastrum minimum*		1		
7.	*Fistulina hepatica*		12*		
8.	*Lactarius chrysorrheus*			12*	
9.	*Cerocorticium molare*			6	
10.	*Geastrum quadrifidum*			5	
11.	*Macrotyphula juncea*			493	
12.	*Meruliopsis taxicola*			6	
13.	*Mycena atroalba*			41	
14.	*Mycena flavescens*			15	
15.	*Phaeomarasmius erinaceus*			4	
16.	*Cantharellus cibarius*				1
17.	*Entoloma asprellum*				14
18.	*Entoloma rusticoides*				3
19.	*Russula alutacea*				3
20.	*Russula livescens*				1
21.	*Camarophyllus pratensis*				8
22.	*Clitocybe candicans*				3
23.	*Mycena pelianthina*				2
	Total	2	5	8	8

* – fungi connected with oak trees

It is worth noticing that among all macromycetes found in the study area were some rare species included in the 'red list' of endangered fungi (W o j e w o d a and Ł a w r y n o w i c z 1992). Altogether there were 23 (12%) such species on this list, of that two were reckoned as category E (endangered) – *Boletus queletii* and *Lycoperdon mammaeforme*, 5 to category V (vulnerable), 8 to category R (rare) and 8 to category I (indeterminate) – Table 3.

Among the macromycetes studied were those characteristic of warm and rich in $CaCO_3$ habitats, for instance such thermophilous species as: *Geastrum*

Table 4

The list of species fungi collected on observation plots in the *Potentillo albae-Quercetum* communities

	Species	1994	1995	1996
1.	*Amanita citrina* (Schaeff.) S.F. Gray	+	+	+
2.	*Boletus aestivalis* Paulet: Fr.	+	+	+
3.	*Botryobasidium laeve* (J. Erikss.) Parm.	+	+	+
4.	*Cerocorticium confluens* (Fr.: Fr.) Jül. et Stalp.	+	+	+
5.	*Cerocorticium molare* (Chaill.: Fr.) Jül. et Stalp.	+	+	+
6.	*Clitocybe dealbata* (Sow.: Fr.) Kumm.	+	+	+
7.	*Clitocybe odora* (Bull.: Fr.) Kumm.	+	+	+
8.	*Collybia butyracea* (Bull.: Fr.) Quél.	+	+	+
9.	*Collybia dryophila* (Bull.: Fr.) Kumm.	+	+	+
10.	*Collybia fusipes* (Bull.: Fr.) Quél.	+	+	+
11.	*Crepidotus amygdalosporus* Kühn.	+	+	+
12.	*Dacryomyces stillatus* Nees: Fr.	+	+	+
13.	*Daedalea quercina* (L.) Pers.	+	+	+
14.	*Dichomitus campestris* Quél. Dom. et Orl.	+	+	+
15.	*Entoloma rusticoides* (Gill.) Lge.	+	+	+
16.	*Exidia glandulosa* (Bull.): Fr., non ss. Ricken, Bres. Neuh.	+	+	+
17.	*Fistulina hepatica* (Schaeff.): Fr.	+	+	+
18.	*Hapalopilus rutilans* (Pers.: Fr.) Karst.	+	+	+
19.	*Hygrophorus eburneus* (Bull.: Fr.) Fr.	+	+	+
20.	*Hymenochaete rubiginosa* (Dickson: Fr.) Lev.	+	+	+
21.	*Hyphoderma puberum* (Fr.) Wallr.	+	+	+
22.	*Hyphoderma setigerum* (Fr.) Donk	+	+	+
23.	*Lactarius chrysorrheus* Fr.	+	+	+
24.	*Lactarius quietus* Fr.	+	+	+
25.	*Lycoperdon lividum* Pers.	+	+	+
26.	*Marasmius bulliardii* Quél.	+	+	+
27.	*Meruliopsis taxicola* (Pers.) Bond.: Parm.	+	+	+
28.	*Mycena aetites* (Fr.) Quél.	+	+	+
29.	*Mycena chlorinella* (Lge.) Sing.	+	+	+
30.	*Mycena epipterygia* (Scop.: Fr.) S.F. Gray	+	+	+
31.	*Mycena inclinata* (Fr.) Quél.	+	+	+
32.	*Mycena phyllogena* (Pers.) Sing.	+	+	+
33.	*Mycena polygramma* (Bull.: Fr.) S.F. Gray	+	+	+
34.	*Mycena pura* (Pers.: Fr.) Kumm.	+	+	+
35.	*Mycena rosea* (Bull.) Gramberg	+	+	+

36.	*Mycena vitilis* (Fr.) Quél.	+	+	+
37.	*Peniophora quercina* (Pers.: Fr.) Cke.	+	+	+
38.	*Phanerochaete sordida* (Karst.) J. Erikss. et Ryv.	+	+	+
39.	*Phanerochaete tuberculata* (Karst.) Parm.	+	+	+
40.	*Phellinus contiguus* (Pers.: Fr.) Pat.	+	+	+
41.	*Phellinus robustus* (Karst.) Bourd. et Ga.	+	+	+
42.	*Pluteus atromarginatus* (Konr.) Kühn.	+	+	+
43.	*Pluteus podospileus* Sacc.: Cub.	+	+	+
44.	*Russula alutacea* (Pers.: Fr.) Fr.	+	+	+
45.	*Sistotrema brinkmannii* (Bres.) J. Erikss.	+	+	+
46.	*Stereum hirsutum* (Willd.: Fr.) Pers.	+	+	+
47.	*Tricholoma sulphureum* (Bull.: Fr.) Kumm.	+	+	+
48.	*Tubaria pellucida* (Bull.: Fr.) Gill. (ss. Lge.)	+	+	+
49.	*Vuilleminia comedens* (Nees: Fr.) Maire	+	+	+
50.	*Auriscalpium vulgare* S.F. Gray	+		+
51.	*Bjerkandera adusta* (Willd.: Fr.) Karst.	+		+
52.	*Boletus edulis* Bull.: Fr.	+		+
53.	*Bovista pusilla* (Batsch): Pers., non Rostk.	+		+
54.	*Clavulina cinerea* (Bull.: Fr.) Schroet.	+		+
55.	*Clitocybe fragrans* (Sow.: Fr.) Kumm.	+		+
56.	*Clitocybe gibba* (Pers.: Fr.) Kumm.	+		+
57.	*Coprinus xanthothrix* Romagn.	+		+
58.	*Galerina marginata* (Batsch) Kühn.	+		+
59.	*Hebeloma hiemale* Bres.	+		+
60.	*Hyphodontia subalutacea* (Karst.) J. Erikss.	+		+
61.	*Inocybe auricoma* (Batsch) Fr.	+		+
62.	*Inocybe brunneo-rufa* Stangl et Veselsky	+		+
63.	*Inocybe gausapata* Kühn. et Romagn.	+		+
64.	*Inocybe pseudodestricta* Stangl et Veselsky	+		+
65.	*Laccaria laccata* (Scop.: Fr.) Berk. et Br.	+		+
66.	*Lepiota ochraceofulva* Orton	+		+
67.	*Lycoperdon perlatum* Pers.: Pers.	+		+
68.	*Peniophora nuda* (Fr.) Bres.	+		+
69.	*Pluteus depauperatus* Romagn.	+		+
70.	*Pluteus olivaceus* Orton	+		+
71.	*Ramaria eumorpha* (Karst.) Corner	+		+
72.	*Rickenella fibula* (Bull.: Fr.) Raith.	+		+
73.	*Russula xerampelina* (Schaeff.: Sacr.) Fr.	+		+
74.	*Agaricus abruptibulbus* Peck		+	+
75.	*Clavulina cristata* (Holmsk.: Fr.) Schroet.		+	+
76.	*Conocybe rickeniana* Sing.		+	+
77.	*Cortinarius* sp.		+	+
78.	*Crucibulum laeve* (Huds.) Kambly et al.		+	+
79.	*Dacryomyces minor* Peck		+	+
80.	*Marasmius androsaceus* (L.: Fr.) Fr.		+	+
81.	*Mycena atroalba* (Bolt.: Fr.) Gill.		+	+
82.	*Mycena sanguinolenta* (A. et S.: Fr.) Kumm.		+	+
83.	*Mycena stylobates* (Pers.: Fr.) Kumm.		+	+
84.	*Phaeomarasmius erinaceus* (Fr.) Kühn.		+	+
85.	*Psathyrella pygmaea* (Quél.) Sing.		+	+

Tab. 4 cont.

	Species	1994	1995	1996
86.	*Russula cyanoxantha* Schaeff.: Fr.		+	+
87.	*Russula delica* Fr.		+	+
88.	*Russula nigricans* (Bull.) Fr.		+	+
89.	*Sphaerobolus stellatus* Tode.: Pers.		+	+
90.	*Stereum rugosum* Pers.: Fr.		+	+
91.	*Strobilurus stephanocystis* (Hora) Sing.		+	+
92.	*Strobilurus tenacellus* (Pers.: Fr.) Sing.		+	+
93.	*Stropharia aeruginosa* (Curt.: Fr.) Quél.		+	+
94.	*Collybia butyracea* var. *asema* Fr.	+	+	
95.	*Geastrum quadrifidum* Pers.: Pers.	+	+	
96.	*Tulasnella violacea* (J.-Olsen) Juel	+	+	
97.	*Boletus queletii* S. Schulzer	+		
98.	*Clitocybe candicans* (Pers.: Fr.) Kumm.	+		
99.	*Clitocybe fuliginipes* Metr.	+		
100.	*Clitocybe hydrogramma* (Bull.: Fr.) Kumm.	+		
101.	*Clitocybe metachroa* (Fr.) Kumm.	+		
102.	*Clitocybe subalutacea* (Batsch: Fr.) Kumm.	+		
103.	*Clitocybe umbilicata* (Schaeff.: Fr.) Sing.	+		
104.	*Entoloma leptonipes* (Kühn. et Romagn.) Mos.	+		
105.	*Hypholoma sublateritium* (Fr.) Quél.	+		
106.	*Inocybe eutheles* Berk. et Br. (ss. Sing., Malencon)	+		
107.	*Lactarius zonarius* Fr.	+		
108.	*Oudemansiella radicata* (Relhan: Fr.) Sing.	+		
109.	*Russula chamaeleontina* (Fr.) Fr. ss. Romagn.	+		
110.	*Russula livescens* (Batsch) Quél. ss. Bres.	+		
111.	*Russula sardonia* Fr. em. Rom.	+		
112.	*Russula versicolor* Schaeff.	+		
113.	*Trametes hirsuta* (Wulf.: Fr.) Pil.	+		
114.	*Trechispora farinacea* (Pers.: Fr.) Liberta	+		
115.	*Tricholomopsis rutilans* (Schaeff.: Fr.) Sing.	+		
116.	*Tulasnella inclusa* (Christ.) Donk	+		
117.	*Armillariella mellea* (Vahl. in Fl. Dan.: Fr.) Karst.		+	
118.	*Collybia peronata* (Bolt.: Fr.) Sing.		+	
119.	*Clitocybe ericetorum* Bull.: Quél.		+	
120.	*Crepidotus variabilis* (Fr.: Pers.) Kumm.		+	
121.	*Hypholoma fasciculare* (Huds.: Fr.) Kumm.		+	
122.	*Mycena acicula* (Schaeff.: Fr.) Kumm.		+	
123.	*Oudemansiella badia* (Quél.) Mos.		+	
124.	*Pluteus salicinus* (Pers.: Fr.) Kumm.		+	
125.	*Tricholoma atrosquamosum* (Chev.) Sacc.		+	
126.	*Agaricus silvaticus* Schaeff. et Secr.			+
127.	*Amanita fulva* (Schaeff.) Fr.			+
128.	*Amanita phalloides* (Vaill.: Fr.) Secr.			+
129.	*Amanita rubescens* (Pers.: Fr.) S.F. Gray			+
130.	*Amanita spissa* (Fr.) Kumm. var. *valida* (Fr.)			+
131.	*Camarophyllus pratensis* (Pers.: Fr.) Kumm.			+
132.	*Cantharellus cibarius* Fr.			+

133.	*Chroogomphus rutilans* (Schaeff.: Fr.) O. K. Miller			+
134.	*Clavaria fumosa* Fr.			+
135.	*Clavulina amethystina* (Fr.) Donk			+
136.	*Conocybe tenera* (Schaeff.: Fr.) Kühn.			+
137.	*Craterellus cornucopioides* (L.): Pers.			+
138.	*Entoloma asprellum* (Fr.) Mos.			+
139.	*Entoloma nefrens* (Fr.) Quél.			+
140.	*Entoloma nidorosum* (Fr.) Quél.			+
141.	*Entoloma omphaliformis* Romagn.			+
142.	*Entoloma sarcitulus* (Kühn. et Romagn.: Orton) Mos.			+
143.	*Entoloma turci* (Bres.) Mos.			+
144.	*Exidia truncata* Fr.			+
145.	*Galerina unicolor* (Fr.) Sing.			+
146.	*Geastrum minimum* Schw.			+
147.	*Hygrocybe conica* (Scop.: Fr.) Kumm.			+
148.	*Hyphoderma radula* (Fr.: Fr.) Donk			+
149.	*Inocybe petiginosa* (Fr.: Fr.) Gill.			+
150.	*Laccaria amethystina* (Bolt.: Hooker) Murr.			+
151.	*Lactarius uvidus* Fr.			+
152.	*Leotia lubrica* (Scop.: Fr.) Pers.			+
153.	*Lycoperdon mammaeforme* Pers.			+
154.	*Lycoperdon pyriforme* Schaeff.: Fr.			+
155.	*Macrotyphula juncea* (Fr.) Berthier			+
156.	*Marasmius splachnoides* Fr.			+
157.	*Mycena amygdalina* (Pers.) Sing.			+
158.	*Mycena citrinomarginata* Gill.			+
159.	*Mycena erubescens* v. Hoehn.			+
160.	*Mycena flavescens* Vel.			+
161.	*Mycena flavoalba* (Fr.) Quél.			+
162.	*Mycena galericulata* (Scop.: Fr.) S.F. Gray			+
163.	*Mycena galopoda* (Pers.: Fr.) Kumm.			+
164.	*Mycena galopoda* var. *nigra* (Fl. Dan.)			+
165.	*Mycena oortiana* Kühn.: Hora			+
166.	*Mycena pelianthina* (Fr.) Quél.			+
167.	*Mycena rosella* (Fr.) Kumm.			+
168.	*Panellus stypticus* (Bull.: Fr.) Karst.			+
169.	*Pluteus atricapillus* (Secr.) Sing.			+
170.	*Pluteus exiguus* Pat.			+
171.	*Polyporus arcularius* (Batsch) Fr.			+
172.	*Pseudocraterellus sinuosus* (Fr.) Reid			+
173.	*Russula aurata* (With.): Fr.			+
174.	*Russula foetens* Fr.			+
175.	*Russula vesca* Fr.			+
176.	*Schizophyllum commune* Fr.: Fr.			+
177.	*Tricholoma albobrunneum* (Pers.: Fr.) Kumm.			+
178.	*Tricholoma lascivum* (Fr.) Gill.			+
179.	*Tylopilus felleus* (Bull.: Fr.) Karst.			+
180.	*Xerocomus badius* Kühn.: Gilb.			+
181.	*Xerocomus rubellus* (Krbh.) Quél.			+
182.	*Xerocomus subtomentosus* (L.: Fr.) Quél.			+

minimum, *Lycoperdon mammaeforme*, *L. lividum*, *Entoloma incanum* (outside the plots), *Hygrocybe conica*, *Bovista pusilla*, *Hapalopilus rutilans*, *Diplomitoporus campestris* and *Xerocomus rubellus*.

The calciphilous species were: *Geastrum quadrifidum*, *Russula aurata*, *Hygrocybe conica*, *Entoloma incanum*, *Lycoperdon lividum* and *L. mammaeforme*. Such species as: *Lycoperdon mammaeforme*, *L. lividum*, *Hygrocybe conica*, *Hapalopilus rutilans*, *Diplomitoporus campestris*, *Fistulina hepatica*, *Marasmius splachnoides*, *Boletus aestivalis*, *Tricholoma lascivum*, showing clear trophic relations to *Quercus petraea* as well as habitat preferences, can be locally admitted as characteristic of *Potentillo albae-Quercetum*.

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REFERENCES

Bróż E. 1986. Projektowany rezerwat leśny Grzywy Korzeckowskie w Górach Świętokrzyskich [The projected forest reserve "Grzywy Korzeckowskie" (Korzecko Crests) in the Holy Cross Mnts]. Chrońmy Przyr. Ojcz. 1: 23–37.

Jakubowska-Gabara J. 1996. Phytosociological documentation of permanent plots in Poland. In: R. Fellner, M. Ławrynowicz, C. Perini. Mycological monitoring in European oak forests-the pilot project (msc.).

Jülich W. 1984. Die Nichtblätterpilze Gallertpilze und Bauchpilze. *Aphyllophorales, Heterobasidiomycetes, Gasteromycetes*. Kleine Kryptogamenflora IIb/1. G. Fischer Verl. Jena. pp. 626.

Kondracki J. 1998. Geografia regionalna Polski [The regional geography of Poland]. PWN. Warszawa. pp. 441.

Moser M. 1983. Die Röhrlinge und Blätterpilze (*Polyporales, Boletales, Agaricales, Russulales*). Kleine Kryptogamenflora II b/2. G. Fischer Verl., Jena. pp. 532.

Szafer W. 1977. Szata roślinna Polski Niżowej [The vegetation of Lowland Poland]. In: W. Szafer, K. Zarzycki (eds.). Szata roślinna Polski [The vegetation of Poland]. 1: 17–188. PWN. Warszawa.

Wojewoda W., Ławrynowicz M. 1992. Red list of threatened macrofungi in Poland. In: K. Zarzycki, W. Wojewoda and Z. Heinrich (eds.) List of threatened plants in Poland (2. ed.). PAN, Kraków: 27–56.

Występowanie macromycetes w zespole *Potentillo albae-Quercetum* w Górach Świętokrzyskich – studia monitoringowe

Streszczenie

Badania mikologiczne w świetlistej dąbrowie wykonywano w ramach międzynarodowego programu „Mycological monitoring in European oak forests".

Grzywy Korzeckowskie są niewielkim pasmem wapiennym położonym koło Chęcin, w odległości około 30 km na południowy zachód od Kielc. W związku z wyraźnym zróżnicowaniem

ekspozycji zboczy, a także zróżnicowaniem litologicznym wykształcił się tutaj wyraźny strefowy układ roślinności.

W latach 1994–1996 zebrano z obu powierzchni łącznie 182 gatunki, z czego 181 należały do *Basidiomycetes*, a 1 do *Ascomycetes*.

Pod względem ekologicznym 118 gatunków (64%) stanowiły saprotrofy, 58 gatunków (31%) grzyby mikoryzowe i 9 gatunków (5%) – grzyby pasożytnicze.

Ścisły związek z dębami wykazywała grupa 33 gatunków, do której należało 15 gatunków grzybów mikoryzowych (m.in. *Boletus aestivalis*, *B. queletii*, *Hygrophorus eburneus*, *Lactarius quietus*, *L. chrysorrheus*, *L. uvidus* i in.), 15 gatunków saprotroficznych (m.in. *Daedalea quercina*, *Dichomitus campestris*, *Hymenochaete rubiginosa*, *Peniophora quercina*, *Phanerochaete tuberculata*) i 3 gatunki pasożytnicze: *Collybia fusipes*, *Fistulina hepatica* i *Phellinus robustus*.

Do osobliwości mikologicznych tego terenu należą gatunki rzadkie, m.in. zamieszczone na czerwonej liście grzybów zagrożonych (W o j e w o d a and Ł a w r y n o w i c z 1992). Łącznie tej na liście znalazły się 23 gatunki, tj. 12%, z tego 2 zaliczono do kat. E (wymierające) *Boletus queletii* i *Lycoperdon mammaeforme*, do kat. V (narażone na wymarcie) 5 gatunków, do kat. R (rzadkie) – 8 gatunków i do kat. I (o nieokreślonym statusie) – 8 gatunków.

Wśród zbadanych grzybów stwierdzono gatunki charakterystyczne dla siedlisk ciepłych i zasobnych w $CaCO_3$. Występują tu gatunki termofilne jak: *Geastrum minimum*, *Lycoperdon mammaeforme*, *L. lividum*, *Entoloma incanum* (poza powierzchniami), *Hygrocybe conica*, *Bovista pusilla*, *Hapalopilus rutilans*, *Dichomitus campestris* i *Xerocomus rubellus*. Do grupy grzybów wapieniolubnych należą *Geastrum quadrifidum*, *Russula aurata*, *Hygrocybe conica*, *Entoloma incanum*, *Lycoperdon lividum* i *L. mammaeforme*. Takie gatunki jak: *Lycoperdon mammaeforme*, *L. lividum*, *Hygrocybe conica*, *Hapalopilus rutilans*, *Dichomitus campestris*, *Fistulina hepatica*, *Marasmius splachnoides*, *Boletus aestivalis*, *Tricholoma lascivum* wykazujące wyraźne związki siedliskowe i troficzne z *Quercus petraea*; można uznać je lokalnie za charakterystyczne dla zespołu *Potentillo albae-Quercetum*.