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Macromycetes of oak forests in the Jurassic Landscape Park (Częstochowa Upland) – monitoring studies

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Mycological observations were carried out between 1994 – 1996 in two representative plots (1000 m^2 each) in 80-year-old oak plantation (*Quercus robur* and *Qu. petraea*) on calcareous hill in the Mstów village in the Jurassic Landscape Park. The project was carried out in the frame of international network of the „Mycological monitoring in European oak forests". During 24 visits in the plots a total of 190 species of macromycetes was recorded: 80 mycorrhizal and 110 saprobic fungi. Among them 2 species are new to Poland and 16 are inscribed in the Red List of threatened macromycetes in Poland (Wojewoda and Ławrynowicz 1992).

Key words: macromycetes, mycological monitoring, oak decline, Poland.

INTRODUCTION

The oak belongs to the most important forest trees widely distributed in Europe. However, in the last decades it has showed regionally reduced vitality and local die-back. This phenomenon has been also observed in Poland (Przybył 1995). Fungi and their communities seem to be very useful bioindicators of the forest deterioration. Following the proposal by Fellner and Arnolds (1991), three countries started to co-operate within the project of „Mycological monitoring in European oak forests" (Perini, Ławrynowicz and Fellner 1995). The project includes studies of fungal communities in various types of oak woods along the north-south transect through Europe – from the Baltic Sea in Poland towards the Czech Republic to the Mediterranean area in Italy (Perini et al. 2000).

In Poland 16 permanent plots in 7 localities in different parts of the country were established in representative stands in the forests of various type and management, from virgin forest to plantations. The plots were investigated 3 years according to uniform methods used in the project.

Subsequent detailed reports on the observation series performed in Poland have been already published by Lisiewska and Połczyńska (1998), Skirgiełło (1998), Łuszczyński (1998), Wojewoda, Heinrich and Komorowska (1999), Ławrynowicz and Stasińska (2000). The present paper will be followed by the work on the observations made in Central Poland by Ławrynowicz, Kałucka and Sumorok (2001).

I am indebted to the following persons for their help: Prof. E. Parmasto, Prof. W. Wojewoda and Dr L. Krieglsteiner for helping in determination of some wood-inhabiting fungi, Prof. J. Jakubowska-Gabara for phytosociological elaboration of observation plots, Dr M. Stasińska, Dr I. Kałucka, Dr M. Ruszkiewicz-Michalska, Dr J. Szkodzik, Dr J. Żelazna-Wieczorek, mgr D. Seta and G. Samek for assistance in field studies and help in preparation of the manuscript for publication; mgr D. Babska for drawing the map.

STUDY AREA

Two permanent plots, I and II, assigned as P5 and P6 in the project, were selected in the Jurassic Landscape Park in the village Mstów situated ca. 13 km NE of the Częstochowa town (Fig. 1).

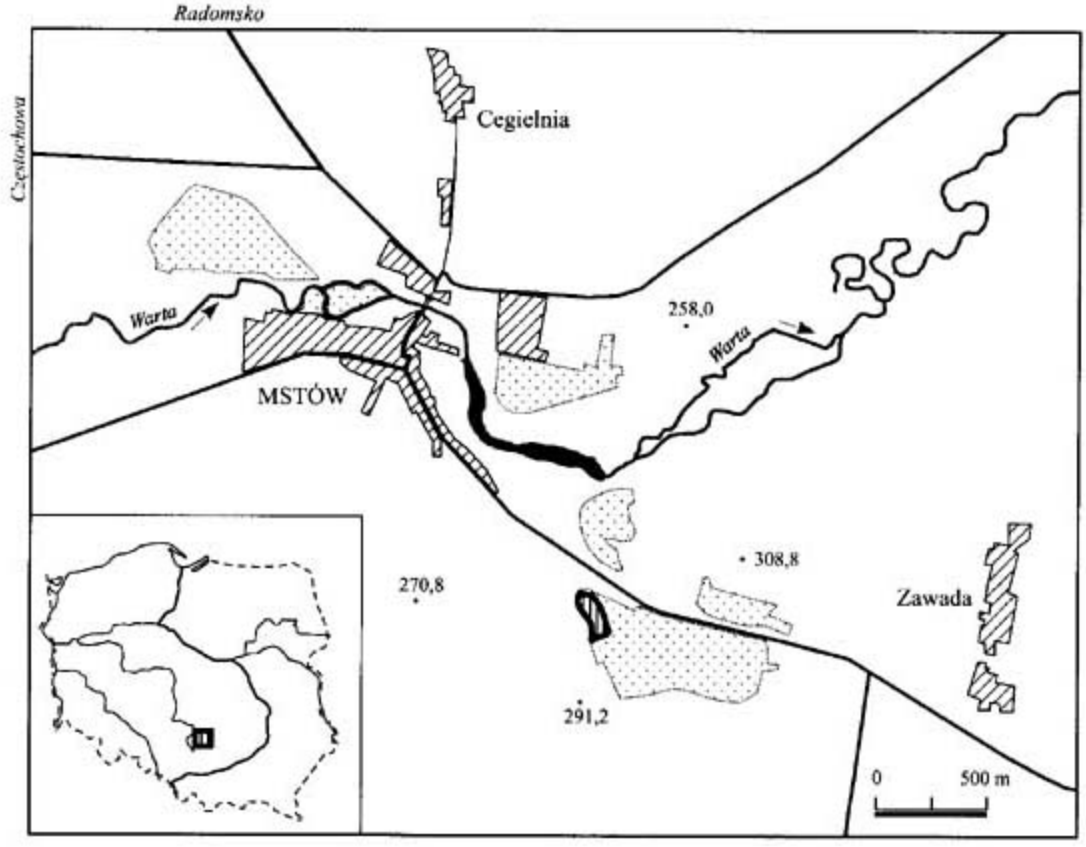

Fig. 1. Location of the study area in the Jurassic Landscape Park

An oak plantation, established in 1920, replaced the old forest burnt during the I World War. It covers a slope of calcareous hill of 250 m a.s.l. at the edge of deciduous forest. The oak plantation is surrounded in WS by an open xerothermic pasture and on the other sides by mixed deciduous forest with stand consisting of *Betula pendula, Fagus sylvatica, Quercus robur* and *Pinus sylvestris*. The soil type is determined as rendzina, pH 6.5–7.

The mean monthly and mean annual temperatures, as well as monthly and annual precipitation totals are given in Tables 1 and 2, respectively.

After 80 years of afforestations the vegetation changed conspicuously. According to phytosociological analysis made by J a k u b o w s k a - G a b a r a (1996) the plots are covered with the *Quercus-Brachypodium pinnatum* community.

T a b l e 1

Mean monthly and mean annual air temperatures for the meteorological station in Częstochowa [°C]

Year/ Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I-XII
1994	2.2	−1.6	4.5	8.8	12.6	16.5	22.2	18.4	14.7	6.5	3.8	1.0	9.1
1995	−1.5	2.8	2.4	7.6	12.4	16.6	20.4	18.2	12.5	10.8	0.5	−4.4	8.2
1996	−5.4	−5.1	−1.9	7.5	14.1	16.9	16.2	17.6	9.7	9.1	5.3	−5.4	6.6

T a b l e 2

Monthly and annual precipitation totals for the meteorological station in Częstochowa [mm]

Year/ Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I-XII
1994	51.7	7.6	79.3	89.2	97.8	33.3	44.9	114.8	70.7	49.4	26.3	50.5	715.5
1995	35.3	46.7	38.1	50.0	57.1	92.0	72.2	82.6	74.2	10.3	34.8	32.7	626.0
1996	22.2	30.3	18.3	51.8	110.9	87.0	110.4	78.0	111.2	38.7	55.7	12.3	726.8

METHODS

Mycosociological survey was made according to standard methods in two permanent plots of 1000 m^2 divided into 10 subplots (Fig. 2). The studies were carried out from the summer 1994 to the late autumn 1996. The species diversity of macromycetes, their abundance, frequency, and trophic groups were recorded monthly. Altogether 24 field observations were made. The location of trees, stumps and fallen branches in each plot was charted (Fig. 2). The fungi were analysed regarding the ecological groups – mycorrhizal symbionts and saprotrophs. All fruit-bodies were noted on each square, as well as all comments concerning the substrate: soil (s), wood (w), litter (l). Single specimens growing on dead grasses and old mushroom fruit-bodies are assigned to litter-inhabiting fungi group. All species are listed in Table 4 and 5 with indication of: SF – spatial frequency; TF – temporal frequency;

DCy – total number of fruit-bodies in a year; mDCv – maximal number of fruit-bodies in the plot recorded during one visit.

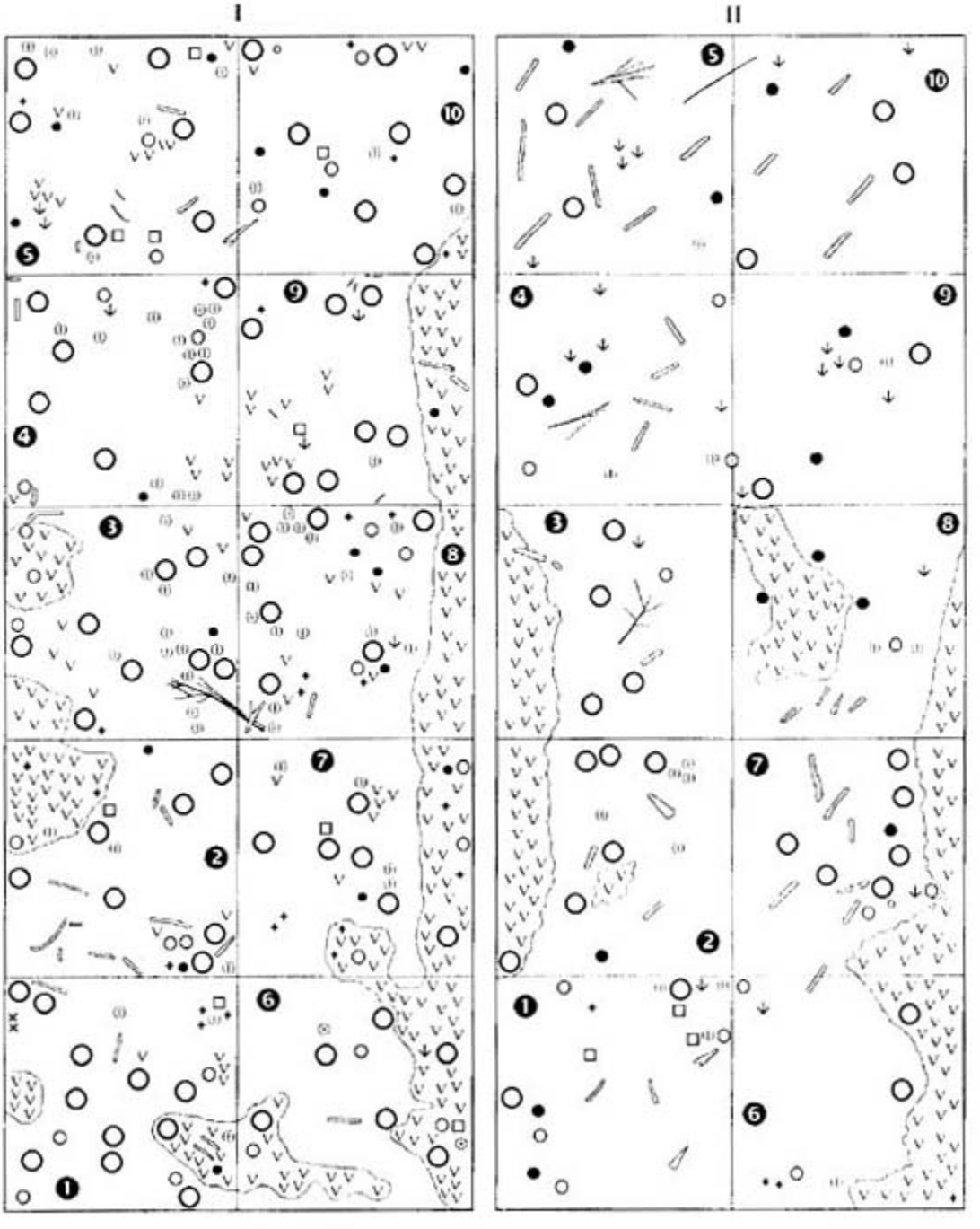

Fig. 2. Structure of the tree stand in the plots
Quercus: o – living tress, • – stumps; □ – *Sorbus aucuparia*; ⊕ – *Crataegus monogyna*; ∇ – *Prunus spinosa*; ↓ – *Juniperus communis*; + – *Rosa canina*; × – *Euonymus europaeus*

Phytosociological releves were made by professional botanist – Prof. J. Jakubowska-Gabara, who described all 16 monitoring plots involved in the project in Poland using Braun-Blanquet method. The phytosociological results are presented in Table 3. Tables 4 and 5 are prepared in accordance with the previously published results concerning the other plots in Poland. Special attention was paid to the qualitative and quantitative analysis of macromycetes. Differences in fungal composition between the plots, as well as the ratio of mycorrhizal to saprotrophic species are shown in Table 6 and 7.

The following works were used for the identification of species and as a source of nomenclature: Dennis (1968), Domański (1972), Domański, Orłoś and Skirgiełło (1973), Wojewoda (1977), Moser (1978), Jülich (1984), Kreisel (1987), Hawksworth et al. (1995). Names of vascular plants are according to Mirek et al. (1995).

REMARKS ON THE VEGETATION

The area is interesting both for mycologists and botanists. It is rich in macrofungi, occurring especially abundantly in forest, and rich in vascular plants, growing on calcareous soil in forest and in open places (Ławrynowicz 1986). The phytosociological releves of mycologically investigated plots are presented in Table 3.

In the vicinity of the mycological plots the area of interesting botanical monitoring is situated as well. The observations on the introduction of two species threatened in Poland – *Carlina onopordifolia* and *Inula ensifolia* – are carried out here. The plants are in danger of extinction in native localities. The experiment of so called "metaplantation" succeeded – both plants are flowering. The attention of botanists, and local inhabitants as well, is also focused on other rare plants, e.g. *Anemone sylvestris, Orchis mascula, Carlina acaulis, Gentiana ciliata* and *Digitalis grandiflora.*

Description of permanent plots

The plots are close to each other but vary in exposition, density of the undergrowth and intensity of human impact (penetration by people).

Plot I is a rectangle 20 m × 50 m, situated on NW slope (exp. 30°) of calcareous hill, ca. 200 m a.s.l. The soil is of the rendzina type (pH 7). It is occupied by the *Quercus-Brachypodium pinnatum* community (Table 3). The tree stand consists of 80-year-old oaks – prevailing *Quercus robur* and *Qu. petraea.* Crowns density reaches 50–70%. The shrub layer consists of *Prunus spinosa, Crataegus monogyna, Rosa canina, Sorbus aucuparia* and *Juniperus communis.* The herb layer is dominated by *Brachypodium pinnatum* (80–100%). Oak stumps and fallen branches are present in the plot. Close to its border the specimen of *Betula pendula* is growing. The plot is crossed by the path used by people to climb the hill.

Table 3

Floristic composition in investigated plots in the Mstów oak forest (Jakubowska-Gabara 1999)

Locality 2			Mstów – Jura Krakowsko-Częstochowska (JKCz)																			
Community			*Quercus–Brachypodium pinnatum*																			
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			II	II	II	II	II	II	II	II	II	II	I	I	I	I	I	I	I	I	I	I	o
Number of releve			1	2	3	4	5	10	9	8	7	6	6	1	7	2	8	3	4	9	5	10	n
Area of releve		m^2	100																				s
Data			July 1999																				t
Density of trees canopy	a	%	60	70	40	45	40	30	40	50	60	50	70	60	60	60	60	65	60	60	70	55	a
Density of shrubs	b	%	10	–	5	0	0	0	5	–	5	5	10	35	30	40	60	30	10	20	10	20	n
Cover of herb layer	c	%	100	100	100	100	100	100	100	100	100	100	95	80	95	80	40	90	100	90	100	100	c
Cover of mosses	d	%	–	–	–	<5	<5	–	<5	–	<5	–	–	–	–	<5	<5	–	<5	–	<5	–	y
Exposition			SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	
Slope			5	5	5	5	3	2	2	3	3	5	15	15	10	15	10	10	10	15	15	10	
Trees and shrubs:																							
Quercus robur	a		4	4	3	3	3	3	3	3	4	3	4	4	4	4	4	4	4	4	4	4	V
	c		1	1	+	+	+	+	+	+	+	2	2	1	1	1	2	2	2	1	1	1	V
Quercus petraea	a		.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	.	.	.	.	I
	c		.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	+	.	.	I
Crataegus monogyna	b		2	.	.	.	.	.	+	.	1	+	2	2	2	2	3	2	1	2	1	2	IV
	c		+	+	+	+	+	+	+	+	1	+	1	1	+	+	1	+	1	+	+	+	V
Prunus spinosa	b		.	.	.	.	.	.	.	.	.	.	1	3	1	3	3	1	.	.	+	.	II
	c		1	1	1	+	+	+	1	1	2	.	3	2	3	3	3	2	1	3	1	1	V
Rosa canina	b		.	.	.	.	.	.	.	.	.	.	+	2	1	1	2	1	1	.	1	1	III
	c		+	+	+	.	+	.	.	+	+	+	+	+	1	+	+	1	+	+	+	+	V
Pyrus communis	b		.	.	.	.	.	.	.	.	.	.	1	1	+	1	.	2	.	+	.	+	II
	c		+	+	+	+	+	.	+	.	.	+	+	+	+	+	+	+	+	+	+	.	IV
Rhamnus catharticus	b		.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	1	.	I
	c		+	.	+	+	+	+	+	.	+	+	+	+	1	+	1	+	+	+	+	+	V

Sorbus aucuparia	b	.	.	.	.	.	.	.	.	.	.	.	1	1	+	+	.	.	.	.	.	I
	c	.	+	.	.	+	+	+	+	.	+	+	+	+	+	+	.	+	.	+	.	IV
Juniperus communis	c	+	+	+	1	.	1	+	.	+	.	.	+	+	.	+	+	+	+	+	+	IV
Cerasus avium	b	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	+	.	.	.	.	I
	c	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	+	+	+	.	.	II
Ribes spicatum	c	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	+	.	.	.	.	I
Prunus avium	b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	I
	c	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	I
Fraxinus excelsior	c	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	I
Malus sylvestris	b	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	I
Euonymus europaeus	b	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	I
	c	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	I
Cornus sanguinea	c	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	I
Viburnum opulus	c	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	I
Herbs and mosses:																						
Quercetalia pubescentis																						
Primula veris		1	1	.	+	.	.	+	1	2	1	2	3	1	2	2	1	+	+	1	+	V
Campanula persicifolia		.	.	1	1	1	1	.	1	.	1	.	1	1	+	+	+	+	.	1	.	IV
Ranunculus polyanthemos		.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	I
Trifolio-Geranietea sanguinei																						
Agrimonia procera		+	+	1	1	1	1	1	+	1	1	2	2	1	+	.	1	+	+	+	+	V
Peucedanum cervaria		.	.	+	1	2	2	2	2	.	.	3	2	3	2	1	2	1	+	1	+	IV
Coronilla varia		+	+	1	+	1	+	1	+	1	1	+	.	+	.	.	+	.	.	.	.	IV
Galium verum		+	1	+	1	1	+	1	1	+	+	.	+	+	.	.	.	.	.	.	.	III
Poa angustifolia		.	.	+	.	.	+	.	+	.	+	+	+	+	.	+	+	+	.	.	.	III
Campanula rapunculoides		.	.	.	.	+	.	.	.	.	.	+	+	+	.	.	.	+	+	+	.	II
Vicia tenuifolia		.	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Galium mollugo		.	.	.	+	.	+	+	.	.	.	.	.	+	+	.	.	.	.	.	.	II
Trifolium alpestre		.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	I
Anthericum ramosum		.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Thalictrum minus		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	I
Anemone sylvestris		.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	I

Tab. 3 cont.

Medicago falcata	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	I
Astragalus glycyphyllos	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	I
Festuco-Brometea																						
Brachypodium pinnatum	5	5	5	5	5	5	5	5	5	5	4	4	4	3	2	4	5	5	5	5		V
Euphorbia cyparissias	+	+	+	+	.	+	1	.	+	1	+	+	+	+	.	.	+	+	1	.		IV
Plantago media	+	+	+	.	+	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.		II
Pimpinella saxifraga	.	+	+	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.		II
Poa compressa	.	.	.	1	+	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.		I
Allium montanum	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.		I
Salvia pratensis	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+		I
Filipendula vulgaris	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.		I
Seseli annuum	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		I
Molinio-Arrhenatheretea																						
Taraxacum officinale	+	+	+	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	.	.		V
Galium boreale	+	+	+	+	2	1	+	.	+	.	.	.	.	.	.	.	+	.	.	.		III
Vicia cracca	+	.	+	.	.	.	.	+	.	1	+	+	+	.	.	+	.	.	.	+		III
Dactylis glomerata	.	.	.	.	.	+	+	.	.	+	+	+	.	.	+	+	.	.	.	.		II
Achillea millefolium	.	+	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.		I
Veronica teucrium	+	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.		I
Prunella vulgaris	.	.	+	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.		I
Centaurea jacea	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.		I
Trifolium montanum	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.		I
Lotus corniculatus	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.		I
Arrhenatherum elatius	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.		I
Selinum carvifolia	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.		I
Briza media	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.		I
Others:																						
Viola collina	1	2	1	.	1	1	1	2	1	1	3	2	2	2	+	1	1	+	1	+		V
Fragaria vesca	1	2	.	1	2	2	1	2	2	.	2	3	3	1	2	2	1	2	1	1		V
Cruciata glabra	1	1	1	1	1	1	+	1	+	.	.	.	2	1	1	.	1	1	1	+		IV

Geum urbanum	.	.	.	+	+	.	.	+	+	+	1	1	1	+	+	+	+	1	1	+	IV
Hieracium lachenalii	+	+	.	+	+	+	+	.	.	+	.	.	+	.	+	.	+	+	+	.	III
Ajuga reptans	.	+	.	.	+	+	.	.	.	.	+	+	+	+	1	.	.	+	+	.	III
Hypericum perforatum	+	+	.	+	.	.	.	+	.	+	+	+	1	.	.	.	.	.	+	.	III
Viola sp.	.	.	+	1	1	1	.	+	+	.	+	+	1	.	.	.	.	.	.	.	III
Melampyrum pratense	+	+	+	1	1	1	.	1	.	1	.	.	.	.	.	.	.	.	.	.	II
Solidago virgaurea	.	.	+	.	+	+	.	.	.	+	+	+	.	.	+	.	+	.	.	.	II
Stachys officinalis	+	.	.	+	.	.	+	.	.	+	.	.	+	.	+	.	+	.	.	.	II
Rubus sp.	.	.	.	.	.	.	.	+	.	.	+	2	.	2	.	.	.	+	.	1	II
Carex montana	.	.	.	.	+	.	.	.	.	1	.	+	+	1	+	.	.	.	.	.	II
Agrostis capillaris	.	.	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	+	.	I
Festuca ovina	.	.	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Veronica chamaedrys	.	.	.	+	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	I
Hieracium sabaudum	.	.	.	+	.	+	.	.	+	.	.	+	.	.	.	.	.	.	.	.	I
Viola riviniana	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1	.	.	.	+	I
Chamaecytisus ruthenicus	+	.	+	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Carex glauca	.	.	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	I
Chamaecytisus ratisbonensis	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	I
Verbascum nigrum	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	I
Knautia arvensis	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	I
Senecio jacobea	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Vaccinium myrtillus	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Torilis japonica	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	I
Vicia sepium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	I
Vincentoxicum hirundinaria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	I
Thymus pulegioides	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Cirsium lanceolatum	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Stellaria graminea	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Plagiomnium cuspidatum	.	.	.	+	.	.	.	.	+	.	.	.	.	+	+	.	.	.	.	.	I
Thuidium philiberti	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Hypnum cupressiforme	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Plagiothecium curvifolium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	I
Dicranella heteromalla	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	I

Plot II is of the same dimensions, but is situated on the WS slope of the hill (exp. 10°). The soil type, as well as plant community is as above. The soil pH amounts to 6.5. The tree stand consists of 80-year-old *Quercus robur* accompanied by *Qu. petraea*, crowns density reaches 50%. The shrub layer is poorly developed, with single *Juniperus communis, Rosa canina, Sorbus aucuparia, Crategus monogyna*, and some groups of *Prunus spinosa*, mostly near the border of the plot (Fig. 2). Although the shrub layer varies in different subplots, its average coverage does not exceed 5%. The herb layer is dominated by *Brachypodium pinnatum* (80–100%). Oak stumps and fallen branches are present in the plot. Because the plot is open on the SW side and the undergrowth is poor, the late autumn winds partly take the leaf litter away. The area is penetrated by people looking for mushroom and by people coming out from the forest to admire a beautiful panorama of Jurassic landscape and xerothermic vegetation.

RESULTS

No essential differences in the occurrence of fungi and their species composition were observed between the plots. It results from a great similarity of habitat conditions: the tree stands consist exclusively of oak in the same age, soil and vegetation cover are also uniform. However, variable density of the undergrowth, different slope exposition and intensity of human impact caused remarkable qualitative and quantitative changes in fungi occurring on the plots.

Plot I. Altogether, 142 species were distinguished. Detailed data concerning abundance of fruit-bodies, their spatial frequency (SF) and temporal frequency (TF) are given in Table 4. According to the numbers of fruit-bodies produced by particular species two opposite groups of species can be distinguished: one with large amount of fruit-bodies and the other with single individuals during the period of three years. There were 22 species which produced more than 100 fruit-bodies, and among them 6 species with abundance above 200, e.g. *Mycena vitilis* – 492, *Lactarius quietus* – 415, *Cortinarius trivialis* – 309, *Leotia lubrica* – 246, *Collybia dryophila* – 226, *Marasmius rotula* – 218. The abundant species were mostly homogeneously distributed in the plot, but some of them were limited to particular subplots, e.g. 195 fruit-bodies of *Armillaria mellea* were collected only in two subplots and what is more the numbers of fruit-bodies varied from year to year, e.g. 139 in 1994, 56 in the next year and no fruit-bodies in the last year. *Amanita phalloides* was noted during the first two years, but *Coprinus domesticus* – during the two last years.

Table 4

Synoptical table of fungal species in plot I

DCy – number of fruit-bodies, SF – spatial frequency, TF – total temporal frequency and mDCv – maximum number of fruit-bodies during one visit in the plot

Years	1994			1995			1996			1994–1996			
Number of observations	7			8			9			24			
Number of species	77			103			84						
142	DCy	SF	TF	DCy	SF	TF	DCy	SF	TF	DCy	mDCv	SF	TF
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Agrocybe praecox	.	.	.	2	1	1	.	.	.	2	2	1	1
Amanita citrina	101	10	6	62	10	3	6	2	1	169	42	10	10
A. pantherina	15	3	4	6	3	2	.	.	.	21	7	3	6
A. phalloides	8	1	2	6	1	1	.	.	.	14	6	1	3
A. rubescens	53	10	6	32	7	5	5	2	2	90	28	10	13
A. vaginata	3	1	1	4	1	1	10	2	3	17	6	3	5
Armillaria mellea s. l.	139	2	4	56	2	3	.	.	.	195	62	2	7
Ascocoryne sarcoides	32	1	1	.	.	.	13	1	1	45	32	1	2
Bjerkandera adusta	10	1	7	10	1	8	10	1	9	10	10	1	24
Boletus edulis	3	2	2	1	1	1	.	.	.	4	2	3	3
B. luridus	3	1	1	2	1	1	.	.	.	5	3	2	2
Bovista nigrescens	1	1	1	.	.	.	1	1	1	2	1	2	2
B. plumbea	.	.	.	4	1	1	.	.	.	4	4	1	1
Calocera cornea	.	.	.	9	2	2	5	2	2	14	4	2	4
Calocybe carnea	3	2	2	.	.	.	10	1	1	13	10	2	3
C. gambosa	.	.	.	14	2	1	13	2	1	27	14	2	2
Cantharellus cibarius	44	1	1	26	3	3	4	1	1	74	22	5	5
C. cinereus	.	.	.	16	2	1	.	.	.	16	16	2	1
Chondrostereum purpureum	10	1	3	10	3	3	10	1	3	10	10	3	9
Clavulina cinerea	50	4	3	.	.	.	30	1	1	80	30	4	4
Clitocybe candicans	.	.	.	17	4	3	.	.	.	17	12	4	3

Tab. 4 cont.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
C. clavipes	23	6	3	2	1	1	.	.	.	25	12	6	3
C. costata	.	.	.	6	2	2	6	2	2	12	4	2	4
C. dealbata	74	10	3	.	.	.	.	.	.	74	60	10	3
C. gibba	.	.	.	19	6	5	2	1	1	21	8	6	6
Clitopilus prunulus	7	2	3	3	1	1	.	.	.	10	4	2	4
Collybia asema	.	.	.	41	8	3	24	3	1	65	24	8	4
C. butyracea	.	.	.	.	.	.	2	1	1	2	2	1	1
C. dryophila	66	10	4	89	10	6	71	8	5	226	30	10	15
C. fusipes	9	1	2	.	.	.	4	1	1	13	8	1	4
C. tuberosa	.	.	.	.	.	.	20	2	1	20	20	2	1
Conocybe tenera	.	.	.	.	.	.	4	1	1	4	4	1	1
Coprinus domesticus	.	.	.	25	8	5	5	2	2	30	8	8	7
C. micaceus	.	.	.	32	1	2	.	.	.	32	32	1	2
C. plicatilis	.	.	.	6	2	2	.	.	.	6	4	2	2
Cortinarius alboviolaceus	.	.	.	.	.	.	4	1	1	4	4	1	1
C. trivialis	224	10	4	53	8	3	32	3	3	309	120	10	10
Cylindrobasidium evolvens	10	1	2	.	.	.	.	.	.	10	10	1	2
Dacrymyces stillatus	.	.	.	30	5	4	50	5	4	80	10	5	8
Entoloma juncinum	.	.	.	2	1	1	.	.	.	2	2	1	1
E. nidorosum	.	.	.	5	2	2	.	.	.	5	3	2	2
E. rhodopolium	6	3	2	4	1	1	5	2	2	15	4	3	3
Exidia plana	.	.	.	16	2	2	.	.	.	16	10	2	2
E. glandulosa	.	.	.	8	1	1	6	1	1	14	8	1	2
Hapalopilus nidulans	.	.	.	3	2	2	2	1	1	5	2	2	3
Hebeloma crustuliniforme	.	.	.	22	4	3	.	.	.	22	12	4	3
H. sinapizans	95	10	3	16	3	2	.	.	.	111	25	10	5
Helvella crispa	62	5	3	9	3	2	13	3	1	84	31	6	5
H. lacunosa	4	1	2	1	1	1	2	1	1	7	3	3	4

Hohenbuehelia atrocoerulea	.	.	.	11	2	3	3	1	1	14	8	3	3
Humaria hemisphaerica	58	4	4	31	2	4	12	1	2	101	20	5	10
Hydnum repandum	.	.	.	3	1	1	.	.	.	3	3	1	1
Hygrophorus eburneus	82	10	3	6	1	1	12	2	1	100	44	10	5
Hymenogaster tener	9	1	1	4	1	1	1	1	1	14	9	1	3
Hypholoma fasciculare	153	2	3	60	4	5	12	1	2	195	60	4	10
H. sublateritium	67	1	4	13	2	2	23	1	2	103	23	2	8
Hysterangium coriaceum	.	.	.	.	.	.	13	1	2	13	13	1	2
Inocybe asterospora	.	.	.	11	1	3	12	2	2	23	8	3	5
I. fastigiata	.	.	.	12	2	2	12	2	1	24	12	4	3
I. geophylla	26	2	3	60	9	5	27	3	2	113	26	10	10
I. goodeyi	8	1	1	2	1	1	6	1	1	16	8	2	3
I. petiginosa	.	.	.	6	1	1	.	.	.	6	6	1	1
I. praetervisa	.	.	.	2	2	1	.	.	.	2	2	2	1
Laccaria amethystina	60	10	4	16	3	2	28	4	2	104	26	10	8
L. laccata	40	6	4	32	7	6	6	1	1	78	18	7	11
L. tortilis	9	1	1	4	1	1	.	.	.	13	9	1	2
Lactarius azonitens	.	.	.	.	.	.	14	2	2	14	10	2	2
L. acerrimus	76	4	3	25	4	5	4	1	1	105	32	6	9
L. camphoratus	24	5	4	4	1	1	.	.	.	28	15	5	5
L. chrysorrheus	.	.	.	16	3	2	16	2	2	32	10	3	4
L. fuliginosus	26	2	2	.	.	.	.	.	.	26	16	2	2
L. insulsus	31	6	3	.	.	.	.	.	.	31	22	6	3
L. mitissimus	59	8	2	.	.	.	.	.	.	59	40	8	2
L. necator	16	2	1	.	.	.	.	.	.	16	8	2	1
L. quietus	147	10	4	142	10	7	126	10	4	415	80	10	15
L. serifluus	.	.	.	33	8	4	.	.	.	33	17	8	4
L. subdulcis	29	4	2	10	3	2	.	.	.	39	25	4	4
L. vellereus	.	.	.	3	1	1	.	.	.	3	3	1	1
L. volemus	5	3	1	6	2	1	2	1	1	13	6	4	3

Tab. 4 cont.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
C. clavipes	23	6	3	2	1	1	.	.	.	25	12	6	3
Leotia lubrica	75	3	3	11	2	2	155	6	2	246	122	6	7
Lepiota clypeolaria	.	.	.	1	1	1	.	.	.	1	1	1	1
Lepista nebularis	.	.	.	16	3	2	8	2	2	24	8	5	4
L. nuda	.	.	.	11	3	2	.	.	.	11	9	3	2
Lycoperdon molle	.	.	.	3	1	1	5	2	2	8	3	3	3
L. perlatum	.	.	.	9	3	4	8	1	1	17	8	3	5
Marasmiellus ramealis	92	2	2	70	3	3	.	.	.	162	50	5	5
Marasmius rotula	70	3	2	80	3	5	68	3	2	218	70	6	7
M. scorodonius	.	.	.	4	2	1	.	.	.	4	2	2	1
Merulius tremellosus	10	1	1	20	2	1	10	1	2	40	20	2	4
Mycena acicula	.	.	.	.	.	.	18	2	2	18	12	2	2
M. galericulata	.	.	.	19	2	4	.	.	.	19	8	2	4
M. galopus	12	2	3	8	2	1	.	.	.	20	8	2	4
M. inclinata	.	.	.	18	2	2	.	.	.	18	10	2	2
M. polygramma	65	3	3	16	3	3	16	1	1	97	33	3	7
M. pura	10	4	2	35	9	5	20	8	2	65	18	10	9
M. sanguinolenta	.	.	.	28	6	3	18	3	1	46	18	6	4
M. vitilis	144	10	3	230	10	3	118	10	7	492	80	10	13
M. zephirus	.	.	.	120	10	3	60	8	2	180	70	10	5
Otidea leporina	5	1	1	.	.	.	.	.	.	5	5	1	1
Peniophora incarnata	.	.	.	10	1	1	.	.	.	10	10	1	1
P. quercina	40	10	7	150	10	8	50	10	8	150	50	10	23
Peziza badia	.	.	.	.	.	.	4	2	2	4	3	2	2
Phlebia radiata	.	.	.	10	1	3	10	1	2	10	10	1	3
Ph. rufa	.	.	.	2	1	1	4	1	2	6	4	1	3
Pholiota lenta	11	2	2	12	4	3	.	.	.	23	8	4	5
Pluteus atricapilus	11	3	3	5	3	2	.	.	.	16	8	3	5
P. lutescens	76	8	3	46	2	10	43	8	3	165	40	8	16
Polyporus ciliatus	.	.	.	.	.	.	11	2	1	11	11	2	1
Ramaria formosa	3	1	2	.	.	.	.	.	.	3	3	1	2

R. ochraceovirens	7	1	1	.	.	.	.	.	.	7	7	1	1
Resupinatus trichotis	.	.	.	.	.	.	52	4	3	52	32	4	3
Rickenella fibula	.	.	.	6	2	2	.	.	.	6	3	2	2
Russula aurata	4	1	1	.	.	.	.	.	.	4	4	1	1
R. cyanoxantha	.	.	.	4	1	1	.	.	.	4	4	1	1
R. foetens	.	.	.	.	.	.	3	2	1	3	2	2	1
R. fragilis	.	.	.	.	.	.	6	3	1	6	6	3	1
R. heterophylla	.	.	.	7	1	1	.	.	.	7	7	1	1
R. lepida	13	2	1	.	.	.	.	.	.	13	13	2	1
R. nitida	16	2	3	.	.	.	.	.	.	16	8	2	3
R. pectinata	.	.	.	2	1	1	.	.	.	2	2	1	1
R. puellaris	.	.	.	6	1	2	.	.	.	6	5	1	2
R. versicolor	.	.	.	.	.	.	2	1	1	2	2	1	1
R. vesca	19	3	3	8	1	1	2	1	1	29	12	3	4
Schizopora paradoxa	20	10	4	100	10	8	100	10	9	240	100	10	21
Sebacina incrustans	.	.	.	.	.	.	10	1	1	10	10	1	1
Simocybe rubi	.	.	.	.	.	.	2	1	1	2	2	1	1
Steccherinum ochraceum	10	1	1	20	1	1	50	4	6	50	20	4	8
Stereum hirsutum	30	2	7	60	4	8	40	4	9	60	20	4	24
S. rugosum	20	3	7	20	2	3	20	2	9	20	20	3	22
Stropharia aeruginosa	35	5	3	7	2	3	11	4	3	53	30	5	9
Tomentella lateritia	9	1	1	.	.	.	.	.	.	9	9	1	1
Trametes hirsuta	41	3	5	.	.	.	.	.	.	41	20	3	5
T. versicolor	45	3	6	10	1	8	10	2	9	65	10	3	23
Tremella mesenterica	15	2	4	.	.	.	.	.	.	15	8	2	4
Tricholoma saponaceum	.	.	.	4	1	1	.	.	.	4	4	1	1
T. scalpturatum	.	.	.	.	.	.	17	2	1	17	17	2	1
T. sejunctum	.	.	.	21	2	4	12	1	2	33	18	2	6
Vuilleminia comedens	.	.	.	.	.	.	20	2	2	20	20	2	2
Xerocomus chrysenteron	23	5	3	18	3	3	13	2	1	54	18	5	7
Xerula pudens	106	10	4	2	1	1	92	10	4	200	45	10	9
X. radicata	2	1	1	.	.	.	.	.	.	2	2	1	1
Xylaria hypoxylon	30	3	3	.	.	.	10	10	3	30	10	10	6

The second group consists of macromycetes producing a small number of fruit-bodies. Altogether 38 species with number of carpophores below 10 were recorded; they were usually limited to one or two subplots.

Frequency of carpophores (TF during 24 visits and SF in 10 subplots) was also variable:

- 33 species were collected only once
- 37 species – only in one subplot
- 23 species only once in one subplot (the remaining 10 – in 2 subplots).

On the other hand:

- 17 species were collected at least 10 times
- 17 species in all subplots
- 9 species were noted at least 10 times in all 10 subplots.

The number of species noted only once varied in years: 1994 – 7; 1995 – 15; 1996 – 11.

Trophic groups are indicated in Tables 6 and 7. There were 58 mycorrhizal species in plot I; 12 species were found exclusively in this plot, e.g. *Hysterangium coriaceum*, rare hypogeous fungus. The presence of two other species: *Lactarius necator* and *Russula nitida* is connected with the presence of *Betula* in the vicinity of the plot.

The group of saprotrophic fungi consisted of 84 species (18 collected exclusively in plot I); among them 23 were growing on soil, 46 on wood and 15 on the litter layer.

Plot II. In total, 159 species of macromycetes were collected. The number of species which produced more than 100 fruit-bodies amounted only to 19; among them there were only two species with the total abundance of carpophores over 200: *Mycena vitilis* – 245 and *Xerula pudens* – 227. Other species worth noticing are: *Leotia lubrica* – 194, *Collybia asema* – 186, *Amanita citrina* – 174, *Lactarius quietus* – 164, *Marasmius rotula* – 192 carpophores. Some of the abundantly fructificating species were limited to single subplots, *Armillaria mellea* with 172 specimens in two subplots only and *C. cinereus* with 40 fruit-bodies also in two subplots and what is more collected only once.

Table 5

Synoptical table of fungal species in plot II

DCy – number of fruit-bodies, SF – spatial frequency, TF – total temporal frequency and mDCv – maximum number of fruit-bodies during one visit in the plot

Years	1994			1995			1996			1994 – 1996			
Number of observations	7			8			9			24			
Number of species	90			102			91						
159	DCy	SF	TF	DCy	SF	TF	DCy	SF	TF	DCy	mDCv	SF	TF
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Agaricus campestris	4	1	1	.	.	.	.	.	.	4	4	1	1
Agrocybe praecox	.	.	.	.	.	.	47	2	2	47	26	2	2
Amanita citrina	96	10	3	68	10	3	10	2	2	174	51	10	8
A. crocea	.	.	.	6	2	2	3	1	1	9	4	3	3
A. pantherina	18	2	4	.	.	.	2	1	1	20	9	2	5
A. rubescens	34	10	5	44	4	5	15	5	2	93	18	10	12
A. vaginata	8	1	2	10	3	2	3	1	1	21	9	5	5
Armillaria mellea s. l.	28	1	3	64	2	3	80	1	1	172	80	2	7
Ascocoryne sarcoides	.	.	.	.	.	.	10	1	1	10	10	1	1
Bjerkandera adusta	10	1	7	10	1	8	20	2	9	20	20	2	24
Boletus aereus	.	.	.	2	1	1	.	.	.	2	2	1	1
B. edulis	1	1	1	.	.	.	1	1	1	2	1	1	2
B. radicans	.	.	.	.	.	.	2	2	1	2	1	2	1
Calocybe carnea	.	.	.	9	1	1	1	1	1	10	9	1	2
Calvatia excipuliformis	6	2	2	.	.	.	.	.	.	6	4	2	2
Camarophyllus pratensis	4	2	2	.	.	.	.	.	.	4	2	2	2
Cantharellus cibarius	14	1	3	4	1	1	104	5	4	122	38	5	8
C. cinereus	.	.	.	.	.	.	40	1	1	40	40	1	1
Clavulina cinerea	.	.	.	19	3	2	10	1	1	29	10	3	3
C. rugosa	.	.	.	26	2	3	.	.	.	26	12	2	3
Clavulinopsis helvola	22	1	2	4	1	1	.	.	.	26	22	2	3

Tab. 5 cont.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Clitocybe bresadoliana	7	1	1	.	.	.	.	.	.	7	7	1	1
C. clavipes	12	3	3	5	2	1	.	.	.	17	6	3	4
C. costata	.	.	.	4	1	1	16	3	3	20	11	4	4
C. dealbata	28	2	2	10	2	2	.	.	.	38	18	2	4
C. gibba	.	.	.	10	2	2	.	.	.	10	8	2	2
C. rivulosa	.	.	.	18	2	1	.	.	.	18	18	2	1
Clitopilus prunulus	6	2	2	.	.	.	.	.	.	6	4	2	2
Collybia asema	94	10	3	54	10	3	38	4	3	186	50	10	9
C. dryophila	74	10	4	18	3	2	90	6	4	182	47	10	10
C. fusipes	4	1	1	9	1	1	.	.	.	13	9	1	2
C. peronata	1	1	1	4	1	1	12	1	2	17	8	1	4
C. tuberosa	4	1	1	42	2	2	8	1	1	54	28	1	1
Conocybe tenera	.	.	.	.	.	.	6	2	2	6	4	2	2
Coprinus domesticus	1	1	1	22	5	4	4	2	2	27	9	5	7
C. plicatilis	.	.	.	2	1	1	.	.	.	2	2	1	1
Corticium evolvens	10	1	2	.	.	.	.	.	.	10	10	1	2
Cortinarius trivialis	98	8	4	23	4	3	2	1	1	123	44	10	8
Craterellus cornucopioides	.	.	.	.	.	.	10	1	1	10	10	1	1
Crinipellis stipitaria	.	.	.	26	5	2	.	.	.	26	24	5	2
Crucibulum laeve	.	.	.	15	1	1	.	.	.	15	15	1	1
Cyathus striatus	.	.	.	.	.	.	12	1	1	12	12	1	1
Cystoderma carcharias	.	.	.	.	.	.	14	2	2	14	8	2	2
Dacrymyces stillatus	.	.	.	10	1	1	120	4	6	130	60	5	7
Entoloma juncinum	20	2	1	3	1	1	.	.	.	23	20	3	2
E. nidorosum	12	2	1	9	2	1	.	.	.	21	12	3	2
E. rhodopolium	24	3	3	13	2	2	.	.	.	37	10	4	5
Exidia plana	20	2	1	20	2	1	20	2	3	60	20	4	5
E. glandulosa	20	1	1	10	1	1	.	.	.	30	20	2	2
Hapalopilus nidulans	1	1	1	2	1	2	.	.	.	3	1	1	3

Hebeloma crustuliniforme	51	4	2	3	1	1	5	2	3	59	30	4	6
H. sacchariolens	12	3	1	10	3	1	.	.	.	22	12	3	2
H. sinapizans	86	3	3	32	3	3	34	4	3	152	42	7	9
Helvella crispa	4	1	2	2	1	1	.	.	.	6	3	2	3
H. lacunosa	10	2	2	1	1	1	.	.	.	11	9	2	3
Hohenbuehelia atrocoerulea	.	.	.	12	3	2	21	4	5	33	8	4	7
Humaria hemisphaerica	10	1	1	8	2	1	.	.	.	18	10	2	2
Hydnum repandum	.	.	.	5	1	1	.	.	.	5	5	1	1
Hygrocybe conica	.	.	.	.	.	.	4	1	1	4	4	1	1
Hygrophorus eburneus	152	10	3	18	3	1	.	.	.	170	80	10	4
H. nemoreus	.	.	.	.	.	.	4	1	1	4	4	1	1
Hymenogaster tener	7	1	2	5	1	1	1	1	1	13	5	2	3
Hypholoma fasciculare	73	3	4	12	3	2	25	2	2	110	33	4	8
H. sublateritium	30	2	4	4	1	1	.	.	.	34	16	2	5
Hypoxylon fragiforme	.	.	.	.	.	.	150	2	5	150	90	2	5
Inocybe asterospora	4	1	1	6	2	1	15	4	2	25	12	4	4
I. fastigiata	17	2	2	4	1	1	5	1	2	29	14	2	5
I. geophylla	.	.	.	12	2	1	.	.	.	12	12	2	1
I. goodeyi	.	.	.	2	1	1	.	.	.	2	2	1	1
I. patouilliardii	.	.	.	.	.	.	6	2	1	6	6	2	1
I. petiginosa	.	.	.	4	1	1	.	.	.	4	4	1	1
I. praetervisa	8	1	1	3	2	1	.	.	.	11	8	2	2
Laccaria amethystina	88	8	4	60	6	4	12	4	3	160	44	10	11
L. laccata	15	3	3	32	6	4	20	2	3	67	12	6	10
L. tortilis	.	.	.	7	1	1	14	1	1	21	14	1	2
Lactarius acerrimus	.	.	.	2	1	1	4	2	1	6	4	2	2
L. azonitens	.	.	.	.	.	.	15	3	2	15	9	3	2
L. camphoratus	.	.	.	.	.	.	8	2	2	8	4	2	2
L. chrysorrheus	9	2	1	.	.	.	.	.	.	9	9	2	1
L. fuliginosus	10	2	2	.	.	.	.	.	.	10	6	2	2
L. insulsus	21	5	3	.	.	.	.	.	.	21	10	5	3
L. piperatus	.	.	.	.	.	.	1	1	1	1	1	1	1

Tab. 5 cont.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Clitocybe bresadoliana	7	1	1	.	.	.	.	.	.	7	7	1	1
L. quietus	68	10	4	31	8	4	65	6	4	164	37	10	12
L. serifluus	.	.	.	6	2	1	41	5	2	47	31	5	3
L. subdulcis	30	4	3	.	.	.	.	.	.	30	18	4	3
L. theiogalus	.	.	.	3	1	1	.	.	.	3	3	1	1
L. vellereus	.	.	.	6	1	1	2	1	1	8	6	1	2
L. volemus	2	1	1	4	2	1	6	1	1	12	6	3	3
Leccinum duriusculum	.	.	.	.	.	.	4	1	1	4	4	1	1
Leotia lubrica	27	3	2	4	1	1	163	7	4	194	108	8	7
Lepiota clypeolaria	.	.	.	1	1	1	.	.	.	1	1	1	1
Lepista nebularis	8	1	1	40	8	2	20	2	2	68	16	8	5
L. nuda	6	1	1	15	2	2	.	.	.	21	6	2	3
Lycoperdon molle	4	1	2	4	1	1	4	2	1	12	4	2	4
L. nigrescens	.	.	.	2	1	1	.	.	.	2	2	1	1
L. perlatum	.	.	.	.	.	.	8	2	1	8	6	2	1
L. umbrinum	4	1	2	.	.	.	.	.	.	4	2	1	2
Marasmiellus ramealis	28	1	2	70	2	2	35	1	1	133	35	4	5
Marasmius rotula	12	1	1	128	6	3	52	3	3	192	90	6	7
M. scorodonius	5	1	1	.	.	.	12	1	1	17	12	2	2
Mycena galericulata	28	5	4	25	2	2	.	.	.	53	19	7	6
M. galopus	4	2	2	8	2	1	.	.	.	12	8	2	3
M. inclinata	.	.	.	23	2	3	.	.	.	23	9	2	3
M. leptocephala	.	.	.	.	.	.	2	1	1	2	2	1	1
M. polygramma	.	.	.	4	1	1	.	.	.	4	4	1	1
M. pura	27	3	3	56	10	3	2	1	1	85	32	10	7
M. vitilis	76	10	3	110	10	6	59	8	5	245	60	10	14
M. zephirus	.	.	.	21	3	2	.	.	.	21	12	3	2
Peniophora quercina	20	3	7	30	10	8	.	.	.	30	10	10	15

Peziza badia	4	1	1	.	.	.	3	1	1	7	4	2	2
Phaeomarasmius erinaceus	.	.	.	2	1	1	8	2	1	10	4	3	2
Phlebia radiata	.	.	.	.	.	.	20	2	2	20	10	2	2
Pholiota lenta	18	3	2	.	.	.	.	.	.	18	10	3	2
Pluteus atricapilus	2	1	1	11	4	3	1	1	1	14	6	6	4
P. lutescens	51	7	3	34	6	3	10	4	3	95	20	7	9
Polyporus brumalis	.	.	.	.	.	.	2	1	1	2	2	1	1
P. ciliatus	.	.	.	.	.	.	13	2	2	13	12	2	2
Psathyrella gracilis	12	1	1	2	1	1	.	.	.	14	12	2	2
P. obtusata	4	1	1	8	1	1	.	.	.	12	8	2	2
Radulomyces confluens	20	2	1	.	.	.	.	.	.	20	20	2	1
R. molaris	.	.	.	.	.	.	10	1	1	10	10	1	1
Resupinatus trichotis	.	.	.	18	1	3	20	1	1	38	20	2	4
Rickenella fibula	.	.	.	20	2	3	22	2	2	42	20	4	7
Russula albonigra	3	1	1	.	.	.	.	.	.	3	3	1	1
R. atropurpurea	63	5	3	9	1	1	.	.	.	72	30	5	4
R. brunneoviolacea	18	3	2	.	.	.	.	.	.	18	7	3	2
R. chamaeleontina	4	1	1	3	1	1	12	2	1	19	12	4	3
R. cyanoxantha	.	.	.	8	3	1	7	4	1	15	8	4	2
R. delica	3	2	2	.	.	.	.	.	.	3	2	2	2
R. foetens	.	.	.	4	1	1	.	.	.	4	4	1	1
R. fragilis	.	.	.	.	.	.	2	1	1	2	2	1	1
R. lepida	7	1	1	.	.	.	.	.	.	7	7	1	1
R. luteotacta	.	.	.	.	.	.	1	1	1	1	1	1	1
R. nigricans	14	2	3	.	.	.	.	.	.	14	6	2	3
R. pectinatoides	.	.	.	.	.	.	17	4	4	17	8	4	4
R. vesca	4	1	1	22	4	2	7	2	2	33	12	4	5
R. virescens	2	1	1	.	.	.	.	.	.	2	2	1	1
Schizophyllum commune	.	.	.	6	1	1	33	1	1	39	33	1	2
Schizopora paradoxa	30	3	3	100	10	8	80	8	7	100	100	10	18

Tab. 5 cont.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Scleroderma citrinum	.	.	.	.	.	.	3	1	1	3	3	1	1
Sebacina incrustans	.	.	.	.	.	.	30	2	4	30	20	2	4
Sphaerobolus stellatus	21	1	1	32	1	1	.	.	.	53	32	2	2
Steccherinum ochraceum	.	.	.	.	.	.	20	2	5	20	20	2	5
Stereum hirsutum	30	3	7	30	3	8	40	4	9	40	40	4	24
S. rugosum	2	1	7	2	1	8	.	.	.	20	2	1	15
Stropharia aeruginosa	15	3	3	4	1	1	6	2	2	25	12	6	6
Tomentella lateritia	.	.	.	1	1	1	.	.	.	1	1	1	1
Trametes hirsuta	.	.	.	.	.	.	4	1	5	4	4	1	5
T. versicolor	.	.	.	10	1	1	20	2	6	20	20	2	6
Tremella mesenterica	.	.	.	12	1	1	10	1	1	22	12	2	2
Tricholoma saponaceum	.	.	.	8	2	1	.	.	.	8	8	2	1
T. scalpturatum	.	.	.	50	4	1	12	2	1	62	50	6	2
T. sejunctum	10	2	2	20	2	1	.	.	.	30	20	4	3
T. terreum	4	1	1	.	.	.	.	.	.	4	4	1	1
Tubaria furfuracea	.	.	.	.	.	.	4	2	1	4	2	2	1
Vuilleminia comedens	.	.	.	20	2	3	20	1	1	20	20	2	3
Xerocomus badius	1	1	1	2	1	1	.	.	.	3	2	2	2
X. chrysenteron	19	5	3	34	3	4	17	4	3	60	16	5	10
Xerula pudens	65	8	4	86	8	4	76	6	2	227	51	8	10
Xylaria hypoxylon	20	2	2	20	2	3	20	1	1	60	20	3	6

The second conspicuous group of fungi consists of species which produced a small amount of fruit-bodies. 47 species were represented by single specimens (the number of carpophores not exceeding 10) collected during the three years and limited usually to one or two subplots.

The frequency of carpophores (TF during 24 visits and SF in 10 subplots) was also variable:

- 41 species were collected only once
- 44 species – only in one subplot
- 31 species only once in one subplot.

On the other hand:

- 12 species were observed at least 10 times
- 12 species in all subplots
- 7 species noted at least 10 times in all subplots.

The number of species noted only once varied in years: 1994 – 7; 1995 – 15; 1996 – 17.

To sum up, in plot I and II, 142 and 159 fungal species were found, respectively: 30 species were collected only in plot I and 46 only in plot II.

Trophic groups

The mycorrhizal and saprotrophic species are indicated in Tables 6 and 7, respectively. No real parasites were found in the macromycete group.

Among the species collected, as many as 80 (41%) were mycorrhizal: 58 in plot I and 68 in plot II. The specimens seem to be associated with oaks: *Quercus robur* and *Qu. petraea* equally. The plots had 46 species in common, 12 were found only in plot I and 22 only in plot II.

The group of saprotrophic fungi consisted of 110 species: 84 in plot I and 91 in plot II. The plots had 68 species in common, 18 were collected only in plot I and 24 only in plot II. The group comprised 56 species inhabiting wood, 31 species growing on soil and 22 – on litter.

Table 6

List of mycorrhizal species collected during the three year research (1994–1996) in two permanent plots

Species	Number of fruit-bodies	Species	Number of fruit bodies
In plots I and II			
Lactarius quietus (Fr.) Fr.	579	*Amanita pantherina* (DC: Fr) Krombh.	41
Cortinarius trivialis Lge.	432	*Lactarius chrysorrheus* Fr.	41
Amanita citrina (Schaeff.) Pers.	343	*Amanita vaginata* (Bull.:Fr.) Vitt.	38
Hygrophorus eburneus (Bull.: Fr.) Fr.	270	*Lactarius fuliginosus* Fr.	36
Laccaria amethystina (Huds. ex Hook.) Cke.	264	*Lactarius camphoratus* (Bull.) Fr.	36
Hebeloma sinapizans (Paul.: Fr.) Gill.	263	*Laccaria tortilis* (Bolt.) Cke.	34
Amanita rubescens Pres. (: Fr.)	183	*Hymenogaster tener* Berk. et Br.	27
Cantharellus cibarius Fr.	196	*Entoloma nidorosum* (Fr.) Quél.	26
Laccaria laccata (Scop.: Fr.) Bk. et Bk. s. l.	145	*Entoloma juncinum* (Kuehn. et Romagn.) Noord.	25
Inocybe geophylla (Sow.: Fr.) Kumm.	125	*Lactarius volemus* (Fr.) Fr.	25
Lactarius acerrimus Britz.	120	*Lactarius azonites* (Bull.) Fr.	20
Xerocomus chrysenteron (Bull.) Quél.	114	*Russula lepida* Fr.	20
Hebeloma crustuliniforme (Bull.) Quél.	81	*Inocybe goodeyi* Gill.	18
Lactarius serifluus (DC.: Fr.) Fr.	80	*Clitopilus prunulus* (Scop.: Fr.) Kumm.	16
Tricholoma scalpturatum (Fr.) Quél.	79	*Russula cyanoxantha* (Schaeff.) Fr.	19
Lactarius subdulcis Bull.: Fr.	69	*Inocybe praetervisa* Quél.	13
Tricholoma sejunctum (Sow.: Fr.) Quél.	63	*Tricholoma saponaceum* (Fr.) Kumm.	12
Russula vesca Fr.	62	*Lactarius vellereus* (Fr.) Fr.	11
Cantharellus cinereus Pers.: Fr.	56	*Inocybe petiginosa* (Fr.) Gill.	10
Inocybe fastigiata (Schaeff.) Quél.	53	*Hydnum repandum* L.	8
Entoloma rhodopolium (Fr.: Fr.) Kumm.	52	*Russula fragilis* (Fr.) Fr.	8
Lactarius insulsus Fr.	52	*Russula foetens* Fr.	7
Inocybe asterospora Quél.	48	*Boletus edulis* Bull.: Fr.	6
Only in plot I			
Lactarius mitissimus Fr.	59	*Russula puellaris* Fr.	6
Lactarius necator (Bull. Em Pers.: Fr.) Karst.	16	*Boletus luridus* Schaeff.: Fr.	5
Russula nitida (Pers.: Fr.) Fr.	16	*Cortinarius alboviolaceus* (Pers.: Fr.) Pouz.	4
Amanita phalloides (Fr.) Link	14	*Russula aurata* (With.) Fr.	4
Hysterangium coriaceum Hesse	13	*Russula pectinata* Fr.	2
Russula heterophylla (Fr.) Fr.	7	*Russula versicolor* Schaeff.	2
Only in plot II			
Russula atropurpurea (Krombh.) Britz.	72	*Camarophyllus pratensis* (Pers.: Fr.) Kumm.	4
Hebeloma sacchariolens Quél.	22	*Tricholoma terreum* (Schff.: Fr.) Kumm.	4
Russula chamaeleontia (Fr.) Fr.	19	*Xerocomus badius* (Fr.) Kuehn.: Gilb.	3
Russula brunneoviolacea Crawsh.	18	*Lactarius thelogalus* (Bull.: Fr.) S.F.Gray	3
Russula pectinatoides Peck	17	*Russula albonigra* Krbh.	3
Russula nigricans (Bull.) Fr.	14	*Russula delica* Fr.	3
Amanita crocea (Quél.) Sing.	11	*Boletus radicans* Pers.: Fr.	2
Craterellus cornucopioides (L.) Pers.	10	*Boletus aereus* Bull.: Fr.	2
Inocybe patouillardii Bres.	6	*Russula virescens* (Schaeff. ex Zant.) Fr.	2
Leccinum duriusculum (Kalchbr. & Schul. ap. Fr.) Sing.	4	*Lactarius piperatus* (L.: Fr.) Pers.	1
Hygrophorus nemoreus (Pers.: Fr.) Fr.	4	*Russula luteotacta* Rea	1

Table 7

List of saprotrophic species collected during the three year research (1994–1996) in two permanent plots

Species	Number of fruit-bodies	Substrate	Species	Number of fruit-bodies	Substrate
In plots I and II					
1	2	3	1	2	3
Mycena vitilis (Fr.) Quél.	737	w	*Hohenbuehelia atrocoerulea* (F.: Fr.) Sing.	47	w
Leotia lubrica Pers.	440	s	*Trametes hirsuta* (Wulf.: Fr.) Pil.	45	w
Schizopora paradoxa (Schrad.: Fr.) Donk	220	w	*Ascocoryne sarcoides* (Jacq.: Fr.) Groves et Wilson	55	w
Xerula pudens (Pers.) Sing.	427	w	*Exidia glandulosa* (Bull.): Fr. = *E. truncata* Fr.	44	w
Marasmius rotula (Scop.: Fr.) Fr.	410	w	*Clitocybe clavipes* (Pers.: Fr.) Kumm.	42	l
Collybia dryophila (Bull.: Fr.) Kumm.	408	l	*Mycena inclinata* (Fr.) Quél.	41	w
Armillaria mellea (Vahl.: Fr.) Kumm. s.l.	367	w	*Pholiota lenta* (Pers.: Fr.) Sing.	41	l
Hypholoma fasciculare (Huds.: Fr.) Kumm.	305	w	*Stereum rugosum* Pers.: Fr.	40	w
Marasmiellus ramealis (Bull.: Fr.) Sing.	295	w	*Vuilleminia comedens* (Nees.: Fr.) R. Maire	40	w
Pluteus romellii (Britz.) Sall.	260	w	*Tremella mesenterica* Retz.: Fr.	37	w
Collybia asema (Fr.: Fr.) Kumm.	251	l	*Lepista nuda* (Bull.: Fr.) Cooke	33	l
Mycena zephirus (Fr.: Fr.) Kumm.	259	l	*Clitocybe costata* Kuehn. et Romagn.	32	l
Dacrymyces stillatus Nees: Fr.	201	l	*Mycena galopus* (Pers.: Fr.) Kumm.	32	s
Peniophora quercina (Pers.: Fr.) Cooke	180	w	*Sebacina incrustans* (Pers.: Fr.) Tul.	32	w
Schizophyllum commune Fr.: Fr.	180	w	*Clitocybe gibba* (Pers.: Fr.) Kumm.	31	l
Mycena pura (Pres.: Fr.) Kumm.	159	w	*Bjerkandera adusta* (Wild.: Fr.) Karst.	30	w
Hypholoma sublateritium (Fr.) Quél.	150	s	*Phlebia radiata* Fr.	30	w
Stereum hirsutum (Willd.: Fr.) Pers.	100	w	*Pluteus atricapillus* (Batsch.) Fay.	30	w
Humaria hemisphaerica (Wiggers: Fr.) Fuckel	130	w	*Collybia fusipes* (Bull.: Fr.) Quél.	26	w
Clavulina cinerea (Bull.: Fr.) Schroet.	119	s	*Lycoperdon perlatum* Pers.: Pers.	25	s
Mycena polygramma (Bull.: Fr.) S.F. Gray	109	s	*Polyporus ciliatus* Fr.: Fr.	24	w
Clitocybe dealbata (Sow.: Fr.) Kumm.	112	w	*Lycoperdon molle* Pers.: Pers.	20	s
Lepista nebularis (Batsch: Fr.) Harmaja	100	l	*Calocybe carnea* (Bull.: Fr.) Donk	15	s
Helvella crispa (Scop.) Fr.	92	l	*Collybia tuberosa* (Bull.: Fr.) Kumm.	74	l
Resupinatus trichotis (Pers.) Sing.	90	s	*Marasmius scorodonius* (Fr.: Fr.) Fr.	21	w
Xylaria hypoxylon (L. ex Hook.) Greville	90	w	*Cylindrobasidium evolvens* (Fr.: Fr.) Jül.	20	w
Trametes versicolor (L.) Pil.	90	w	*Helvella lacunosa* Afz.: Fr.	18	s
Stropharia aeruginosa (Curtis: Fr.) Quél.	85	w	*Scleroderma citrinum* Pers.	13	s
Mycena galericulata (Scop.: Fr.) Quél.	78	s	*Peziza badia* Pers.	11	s
Steccherinum ochraceum (Pers.: Fr.) S.F. Gray	72	w	*Tomentella laterita* Pat.	10	w
Exidia plana (Wigg.) Donk	76	w	*Conocybe tenera* (Schaeff.: Fr.) Fay.	10	s
Coprinus domesticus (Bolt.: Fr.) S.F. Gray	58	w	*Coprinus plicatilis* (Curt.: Fr.) Fr.	8	s
Agrocybe praecox (Pers.: Fr.) Fay.	57	w	*Hapalopilus nidulans* (Pers.: Fr.) Karst.	8	w
Rickenella fibula (Bull.: Fr.) Raith.	49	s	*Leplota clypeolaria* (Bull.: Fr.) Kumm.	2	s

Tab. 7 cont.

1	2	3	1	2	3
Only in plot I					
Mycena sanquinolenta (Alb. et Schw.: Fr.) Karst.	46	l	*Peniophora incarnata* (Pers.: Fr.) Karst.	10	w
Coprinus micaceus (Bull.: Fr.) Fr.	32	w	*Ramaria ochraceovirens* Jungh.	7	l
Calocybe gambosa (Fr.) Donk	27	s	*Phlebia rufa* (Fr.) Christ.	6	w
Merulius tremellosus Schrad.: Fr.	20	w	*Otidea leporina* (Batsch) Fuckel	5	l
Mycena acicula (Schaeff.: Fr.)	18	s	*Bovista plumbea* Pers.	4	s
Clitocybe candicans (Pers.: Fr.) Kumm.	17	l	*Ramaria formosa* (Fr.) Quél.	3	s
Calocera cornea (Batsch.: Fr.) Fr.	14	w	*Bovista nigrescens* Pers.: Pers.	2	s
Chondrosterum purpureum (Pers.: Fr.) Pouz.	10	w	*Collybia butyracea* (Bull.: Fr.) Kumm.	2	l
			Simocybe rubi (Berk.) Sing.	2	w
			Xerula radicata (Relh.: Fr.) Dvrfelt	2	w
Only in plot II					
Hypoxylon fragiforme (Pers.: Fr.) Kickx	150	w	*Psathyrella obtusata* (Fr.) A. H. Smith	12	l
Sphaerobolus stellatus Tode: Pers.	53	w	*Cyathus striatus* (Huds.) Willd.: Pers.	12	w
Crinipellis stipitaria (Fr.) Pat.	26	l	*Phaeomarasmius erinaceus* (Fr.) Kuehn.	10	w
Clavulina rugosa (Bull.: Fr.) Schroet.	26	s	*Radulomyces molaris* (Fr.) M. P. Christ.	10	w
Clavulinopsis helveola (Fr.) Corner	26	s	*Clitocybe bresadoliana* Sing.	7	l
Radulomyces confluens (Fr.: Fr.) M. P. Christ.	20	w	*Lycoperdon umbrinum* Pers.: Pers.	4	s
Clitocybe rivulosa (Pers.: Fr.) Kumm.	18	l	*Hygrocybe conica* (Scop.: Fr.) Kumm.	4	s
Collybia peronata (Bolt.: Fr.) Kumm.	17	l	*Agaricus campestris* Vitt.	4	s
Crucibulum laeve (Huds.) Kambly	15	w	*Tubaria furfuracea* (Pers.: Fr.) Gill.	4	l
Cystoderma carcharias (Pers.: Secr.) Fay.	14	s	*Lycoperdon nigrescens* (Pers.:) Lloyd	2	s
Psathyrella gracilis (Fr.) Quél.	14	l	*Mycena leptocephala* (Pers.: Fr.) Gill.	2	w
Calvatia excipuliformis (Scop.: Pers.) Perdeck	6	s	*Polyporus brumalis* (Pers.): Fr.	2	w

Ecological groups: l – litter; w – wood; s – soil

DISCUSION AND CONCLUSIONS

During the three year study in permanent plots 190 species of macrofungi were found. Among them, 80 were mycorrhizal and 110 were saprotrophic species. No real macromycete parasites were noted. Some species known as parasites, e.g. *Collybia fusipes, Armillaria mellea* and *Schizophyllum commune* inhabited only dead stumps of single cut oaks. The stand is relatively young and consists exclusively of oak. This could be considered a factor limiting the number of macromycetes both mycorrhizal and saprotrophic species.

On the other hand, examination of pure oak stand could revealed how many macromycetes were able to form relationships with *Quercus robur* and *Qu. petraea*. No difference was noted regarding the affinity between mushrooms and particular oak species. It confirmed the observations made in the Ińsko Landscape Park where *Quercus robur* and *Qu. petraea* grew on two different plots (Ł a w r y n o w i c z and S t a s i ń s k a 2000).

A distinct feature of the forest investigated is its artificial origin as a monocultural plantation, but the number of macromycete species in the plots is comparable with those stated in the other localities searched within the

project by Skirgiełło (1998), Lisiewska, Połczyńska (1998), Łuszczyński (1998), Wojewoda et al. (1999) and Ławrynowicz and Stasińska (2000). Yet, the number of mycorrhiza forming species collected in the oak plantation is significantly higher (42,1%) than in the forest of natural origin including the Białowieża National Park (21%) (Skirgiełło 1998). The lowest ratio (12%) of mycorrhizal fungi was noted in the Niepołomicka Forest, probably due to the influence of air pollution (Wojewoda et al. 1999).

The group of saprotrophic fungi is quite rich in spite of relative uniformity of the kind and form of substrate, especially wood – there are no logs or other remains of aged trees in the plots, all dick branches are collected periodically by local inhabitants. It could be considered a limiting factor. Total number of 110 saprotrophs is comparable with that found in the other oak forests investigated by the above mentioned authors. Among saprotrophic macrofungi, the largest group of 56 species inhabited oak wood remains, mostly small twigs and stumps. These fungi were distributed more or less homogeneously throughout the plots, except for the species growing on stumps, which were limited to the particular subplots.

On the basis of the abundance and frequency of fungi dominant species can be distinguished: *Mycena vitilis, Lactarius quietus, Cortinarius trivialis, Peniophora quercina, Schizopora paradoxa, Collybia dryophila, C. asema, Laccaria amethystina, Amanita citrina, A. rubescens.* Some abundantly fructificating species were limited to the single subplots, e.g. *Armillaria mellea, Bjerkandera adusta, Stereum rugosum, S. hirsutum, Hypholoma sublateritium, H. fasciculare* or were noted at long intervals e.g. *Agrocybe praecox, Hygrophorus eburneus, Cantharellus cinereus, Leotia lubrica, Marasmiellus ramealis.*

Relatively high diversity of fungal species in the plots in pure oak forest is also a result of calcareous soil with pH 6,5–7, hilly configuration of the area and various expositions of the slopes. Several rare species including those inscribed in different categories of threat on the Red List in Poland occur here: E – *Boletus radicans*; V – *Boletus edulis* and *Xerula pudens*; R – *Lactarius acerrimus, L. chrysorrheus, Inocybe goodeyi, Ramaria formosa, Clavulina rugosa* and *Phaeomarasmius erinaceus*; I – *Cantharellus cibarius, Tricholoma sejunctum, Lactarius insulsus, Entoloma juncinum, Clitocybe candicans, Otidea leporina* and *Camarophyllus pratensis.* Some of the above species, e.g. *Tricholoma sejunctum* under oak trees and *Phaeomarasmius erinaceus* on oak twigs were occurring abundantly and frequently, similarly *Xerula pudens, Resupinatus trichotis* and *Hohenbuehelia atrocoerulea.* Two hypogeous basidiomycetes were also found in the plots: *Hymenogaster tener* in both plots and *Hysterangium coriaceum* in plot I (Tables 4 and 7).

SUMMARY

1. In the years 1994–1996 a monitoring study on macromycetes was carried out in a 80-year-old oak plantation on calcareous soil at the Mstów village in the Jurassic Landscape Park.
2. Two permanent study plots were set up in the patches of *Quercus-Brachypodium pinnatum* plant community. Each plot of 1000 m^2 was divided into 10 (10 m × 10 m) subplots: 24 observations were performed in each of them.
3. During the 3-year studies 190 species of macromycetes were identified: 9 *Asco-* and 181 *Basidiomycota*. The number of fruit-bodies, as well as spatial and temporal frequency are given for each species.
4. Sixteen species indicated on the Red List of threatened macromycetes in Poland were found. One species, *Tomentella lateritia* is new to Poland.
5. Some species of fungi abundantly occurring in permanent plots are rare in the country, e.g. *Xerula pudens, Tricholoma sejunctum, Phaeomarasmius erinaceus, Boletus radicans, Hohenbuehelia atrocoerulea and Resupinatus trichotis*.
6. Among the species collected, 80 are mycorrhizal and 110 are saprotrophic species.
7. Examining the tree stand consisting exclusively of oak enabled observations of the variety and estimation of the number of fungal species associated with this tree. Neither qualitative nor quantitative differences regarding the affinity between macromycetes and particular species of oak: *Quercus robur* or *Qu. petraea*, were found.
8. Distinct correlation between the increase in fruit-bodies production (frequency and abundance) and the increase in rainfall accompanied by a suitable air temperature (Table 2, 3 and 4, 5) was confirmed.
9. On the basis of abundance and frequency a group of dominant macromycetes was distinguished.
10. The numbers of species collected in the two plots investigated are comparable with the numbers of fungi found in the other Polish plots examined in the project.
11. Relatively great number of mycorrhizal fungi (42% of collected species) indicates an active role of mushrooms in the development of oak plantation.
12. It seems that direct and indirect human impact does not injure mycorrhizal association of oak, as evidenced by the abundance of mycorrhizal fungi. That gives a good prognosis for the future of oaks in the area.

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Macromycetes lasu dębowego w Jurajskim Parku Krajobrazowym (Wyżyna Częstochowska) – studia monitoringowe

Streszczenie

Praca przedstawia wyniki badań grzybów makroskopowych w latach 1994-1996 na dwóch stałych powierzchniach obserwacyjnych założonych w lesie komunalnym w Mstowie na terenie Jurajskiego Parku Krajobrazowego w ramach międzynarodowego projektu badawczego „Mycological monitoring in European oak forests". Celem projektu, sterowanego przez Unię Europejską, była ocena warunków rozwoju dębów na podstawie analizy grzybów pod względem składu gatunkowego i udziału grup troficznych, tj. symbiontów mikoryzowych, saprotorfów i pasożytów.

Powierzchnie założone w Mstowie, oznaczone jako I i II, a w oryginale projektu P_5 i P_6 (po 1000 m² każda z podziałem na 10 podpowierzchni) należą do grupy 16 powierzchni wytypowanych w Polsce i obejmujących reprezentatywne ekosystemy z udziałem dębów.

Powierzchnie w Mstowie odznaczają się tym, że drzewostan jest jednowiekowy i wyłącznie dębowy z przewaga ilościową *Quercus robur* nad *Qu. petraea*. Drzewostan pochodzi z nasadzenia częściowo na miejscu spalonego w czasie I wojny światowej lasu komunalnego, zwanego „Górami", a częściowo na przylegającej do lasu murawie kserotermicznej użytkowanej jako pastwisko gminne w części zwanej „Golizną". Pod wpływem zalesienia murawa kserotermiczna o kompozycji gatunków zbliżonej do *Adonido-Brachypodietum* przekształca się w kierunku ciepłolubnej dąbrowy reprezentującej *Quercetalia pubescentis*.

Wytypowane powierzchnie różnią się ekspozycją terenu, zwarciem podszycia i intensywnością wydeptywania gleby. Powierzchnia I położona jest na stoku o nachyleniu ok. 30%, o gęstym podszyciu z przewagą *Prunus spinosa* oraz znacznym udziale *Rosa canina* i *Crataegus monogyna* nie jest przyjazna dla spacerowiczów, dlatego w nieznacznym stopniu narażona jest na wydeptywanie.

Powierzchnia II usytuowana na terenie o nachyleniu ok. 5% i słabo wykształconym podszyciu w postaci pojedynczych okazów *Juniperus communis* i kęp zarośli *Prunus spinosa* jest terenem intensywnie wydeptanym.

W ciągu trzech sezonów wegetacyjnych dokonano łącznie 24 obserwacji, w czasie których zbierano na powierzchniach wszystkie pojawiające się gatunki grzybów i liczono ich owocniki, oddzielnie na każdej podpowierzchni. Uzyskane dane co do obfitości owocowania grzybów oraz frekwencji czasowej i przestrzennej zestawiono w tabele analityczne (tab. 4 i 5) oraz syntetyczne (tab. 7 i 8). Na dwóch powierzchniach (w sumie 2000 m²) zebrano łącznie 190 gatunków grzybów makroskopowych. Liczba roślin naczyniowych na tych powierzchniach wynosi 87. Zebrane grzyby wykazują szerokie zróżnicowanie taksonomiczne i ekologiczne; 9 gatunków należy do *Ascomycota* a 181 do *Basidiomycota*. Reprezentują też różne grupy troficzne: 80 (czyli 42%) tworzy związki mikoryzowe z dębami zas 110 to gatunki saprotorficzne rozwijające się na glebie, w warstwie ściółki i na martwym drewnie. Tych ostatnich jest najwięcej: 56 gatunków czyli 51% grzybów saprotroficznych zebranych na badanych powierzchniach. Nie stwierdzono pasożytów o owocnikach makroskopowych. Na uwagę zasługuje duża liczba grzybów mikoryzowych, najwyższa spośród 16 badanych powierzchni w Polsce.

Na podstawie stopnia obfitości i frekwencji wytypowano gatunki dominujące w badanej monokulturze dębowej, a także stwierdzono występowanie gatunków rzadkich oraz zagrożonych, z których 16 wykazanych jest na Czerwonej Liście gatunków zagrożonych w Polsce. *Tomentella lateritia* jest gatunkiem nowym dla Polski.