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COMPARATIVE ANALYSIS OF THE MYCOBIOTA FROM THE FOREST HABITATS FROM SILVOSTEPA OLTENIEI

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ABSTRACT

The protected area "Silvostepa Olteniei" is located in the Oltenia Plain, part of the Romanian Plain, on the administrative territory of the counties of Dolj and Mehedinti. The forest habitats in this site are grouped into 6 forest bodies belonging to 3 habitats: 91M0. 91E0 and 91I0*. The area overlaps in a percentage of 0.52% with the Poiana Bujorului Reservation in Pleniţa forest. The territorial boundaries of the six enclaves that are part of the site are given by the very irregular contour of the forest bodies that separate them from the surrounding agricultural land. The comparative analysis of the mycobiota of the 3 forest habitats reveals similarities (the large number of species of the Erysiphaceae family, or the presence of the same host species in different habitats) but also differences (small number of species in the most affected habitat in the area - 91E0*)*

INTRODUCTION

Some written mentions of plant diseases date back to the XIX century. In the first decades of the twentieth century, works of mycology and phytopathology were published (I. Constantineanu - Les Uredinees de , in which he describes 273 parasitic species on 592 species of plants; C. Petrescu – Mycological flora of Moldova; Gh. Ionescu – Parasitic fungi on trees; I. Grinţescu – Species of Orobanche parasitizing on tobacco). The bases of the vegetal pathology were laid by acad. Tr. Săvulescu (1889-1963), who for 4 decades created the Romanian phytopathological school and published monumental works, such as: "Monografia Uredinalelor", 2 volumes, 1953, and "Ustilaginalelele din R. P. R.", 2 volumes, 1957.

Studies from other similar regions of Oltenia were published by Mitrea &Dunărințu (2010, 2011), Răduţoiu et al. (2014), Răduţoiu (2015) and from the protected area Silvostepa Oltenia were published by Mitrea & Fodor (2020a, 2020b).

MATERIAL AND METHODS

The protected area "Silvostepa Olteniei" is located in the Romanian Plain, at altitudes ranging from 91 to 276 m.

Our research was focused on the 6 forest bodies (their interior and peripheral areas). Presence in most cases of agricultural land on the outskirts of forests justifies the presence in the mycobiotic conspect of habitats of species that veget on plants characteristic of these places.

The hydrographic network of this site is tributary to the Desnăţui River with its main tributaries Terpeziţa, Valea Rea, Baboia, Baldal, Buzat and Banagui.

Tectonic area falls into an area with pronounced stability, and the relief is generally flat, in some places being interrupted by small depressions and short slopes.

RESULTS AND DISCUSSIONS

The research of the mycobiota of the three forest habitats led to the identification of common species, found in all three habitats, but also species with a smaller area within a certain habitat. Below are the perspectives of the mycobiota from the 3 habitats encountered in the Forest-sop of Oltenia:

Following the determination of the material collected from habitat 91M0, the following species have been identified: Albuginaceae: *Albugo amaranthi* (Schwein.) A. Kuntze on the leaves of *Amaranthus retroflexus* L.; Peronosporaceae: *Basidiophora entospora* Roze Cornu - on the leaves of *Erigeron annuus* (L.) Pers., *Bremia lactucae* Regel - on the vegetative organs of *Hieracium murorum* L., *Lapsana communis* L. and *Taraxacum officinale* Weber.; *Bremia sonchi* K. Sawada on the leaves of *Sonchus arvensis* L., *Peronospora alchemillae* Otth - on the leaves of *Potentilla reptans* L., *Peronospora alta* Fuck. - on the leaves of *Plantago major* L., *Peronospora ficariae* L. R. Tul. ex of Bary - on *Ranunculus repens* L., *Peronospora trifoliorum* De Bary - on the stem and leaves of *Trifolium hybridum* L., *Peronospora verbenae* U. Braun, Jage, Udo Richt. et H. J. Zimmerm. - on the leaves of *Verbena officinalis* L.; Taphrinaceae *Taphrina pruni* Tul. - on the fruits of *Prunus spinosa* L.; Erysiphaceae: *Blumeria graminis* f sp. secale (sin. *Erysiphe graminis* f. sp. *secale*) - on the leaves and ears of *Elymus repens* (L.) Gould., *Diaporte adunca* (Rob.) Niessl - on the leaves of *Plantago lanceolata* L., *Erysiphe cichoracearum* D.C. ex Merat. - on the leaves of *Lapsana communis* L., *Erysiphe circaeae* L. - on the leaves of *Circaea lutetiana* L., Erysiphe graminis D.C. ex. Merat. - on the leaves of Brachypodium sylvaticum Huds., *Erysiphe martii* Lév. – on the leaves of *Robinia pseudacacia* L., *Erysiphe sordida* L. Junell. - on the leaves of *Plantago major* L., *Erysiphe syringae* Schwein. - on the leaves of *Ligustrum vulgare* L., *Erysiphe viciae* Fuss. - on the leaves of *Robinia pseudacacia* L., *Podosphaera tridactyla* (Wallr.) By Bary - on the leaves of *Prunus spinosa* L., *Sawadea bicornis* (wallr.) Homma - on the leaves of *Acer campestre* L., *Acer tataricum* L., *Sphaerotheca alchemillae* (Grev.) L. Junell - on the leaves of *Agrimonia eupatoria* L., *Uncinula prunastri* (D.C. ex Merat) Sacc. - on the leaves of *Prunus spinosa* L.; Clavicipitaceae: *Claviceps purpurea* (Fr.) Tul. on *Dactylis glomerata* L.; Phyllacoraceae: *Phyllachora graminis* (Pers.) Fuck - on the leaves of *Brachypodium sylvaticum* (Huds.) Beauv., *Polystigma rubrum* (Pers.) DC. - on the leaves of *Prunus spinosa* L.; Mycosphaerellaceae: *Mycosphaerella graminicola* (Fuckel) J. Schröt. - on the leaves of *Elymus repens* (L.) Gould, *Mycosphaerella mori* (Fuck.) Lind. - on the leaves of *Morus alba* L., *Mycosphaerella plantaginis* (Sollm.) Vestergr. – on *Plantago major* L., *Mycospherella rubi* (Fr.) Roark - on the leaves of *Rubus caesius* L., *Mycosphaerella sentina* (Fuck.) Schroet. - on *Pyrus pyraster* leaves (L.) Burgsd., *Mycosphaerella ulmi* Kleb. – on the leaves of *Ulmus glabra* Huds., Venturiaceae: *Venturia pyrina* Aderh. - on the leaves and fruits of *Pyrus pyraster* (L.) Burgsd.; Dermateaceae: *Diplocarpon rosae* Wolf. - on the leaves of *Rosa canina* L.; Coprinaceae: *Coprinus comatus* (O.F. Müll.) Pers. – present on the ground at the edge of the forest of *Quercus cerris* and *Quercus frainetto*, in places more or less ruderalized; Fam. Amanitaceae: *Amanita caesarea* (Scop. et. Fr.) Pers. et. Schw. – parasitic in the forest of *Quercus cerris* and *Quercus*

frainetto; Gomphaceae: *Ramaria flava* (Tourn. ex Battarra) Quel. – present in forests of sky and gooseberry; Phallaceae: *Phallus impudicus* L. – on the ground in the forest of sky and garnet; Melampsoraceae: *Cronartium flaccidum* (White and Schw.) Wint. - on the leaves of *Vincetoxicum hirundinaria* Medicus., Phragmidiaceae: *Phragmidium disciflorum* (Tode) James - on the leaves of *Rosa canina* L., *Phragmidium violaceum* (Schultz.) Wint. - on the leaves of *Rubus candicans* Weihe et Rchb.; Pucciniaceae: *Puccinia behenis* (DC.) Otth. - on the leaves of *Silene vulgaris* (Moench) Garcke., *Puccinia circaeae* Pers. – on the leaves of *Circaea lutetiana* L., *Puccinia glechomatis* DC. - on the leaves of *Glechoma hirsuta* Waldst. Kit et., *Puccinia lapsanae* (Schultz) Fuck - on the leaves of *Lapsana communis* L., *Uromyces dactylidis* Otth. - on the leaves of *Dactylis glomerata* L., *Urocystis agropyri* (Preuss) A.A. Fisch. Waldh. - on the leaves of *Elymus repens* (L.) Gould, *Cladosporium epihyllum* (P.) Mart - on the leaves of *Robinia pseudacacia* L., *Cladosporium herbarum* (Pers.) Link. on the leaves of *Elymus repens* (L.) Gould, *Stigmina carpophila* (Lev.) Ellis on the leaves of *Prunus spinosa* L.; Botryosphaeriaceae: *Phoma pomorum* Thüm. – on the leaves of *Prunus spinosa* L.; Sphaeropsidaceae: *Ascochyta glechomae* Sandu Mititiuc – on the leaves of *Glechoma hederacea* L., Fam. Septoriaceae: *Septoria agropyri* Ellis et Everh. - on the leaves of *Elymus repens* (L.) Gould, *Septoria cornicola* Desm. - on the leaves of *Cornus sanguinea* L., *Septoria cytisi-hirsuti* Săvul. Sandu et – on the leaves of *Chamaecytisus hirsutus* L. subsp. *leucotrichus* (Schur) A. et D. Löve, *Septoria erigerontis* Peck - on the leaves of *Erigeron annuus* (L.) Pers., *Septoria gei* Rob et Desm. - on the leaves of *Geum urbanum* L., *Septoria veronicae* Roberge ex Desm. – on the leaves of *Veronica chamaedrys* L.

The analysis of the mushroom species identified in habitat 91M0 reveals a good representation of species from the families Erysiphaceae, Peronosporaceae and Pucciniaceae – over 50% (Fig. 1, Table 1).

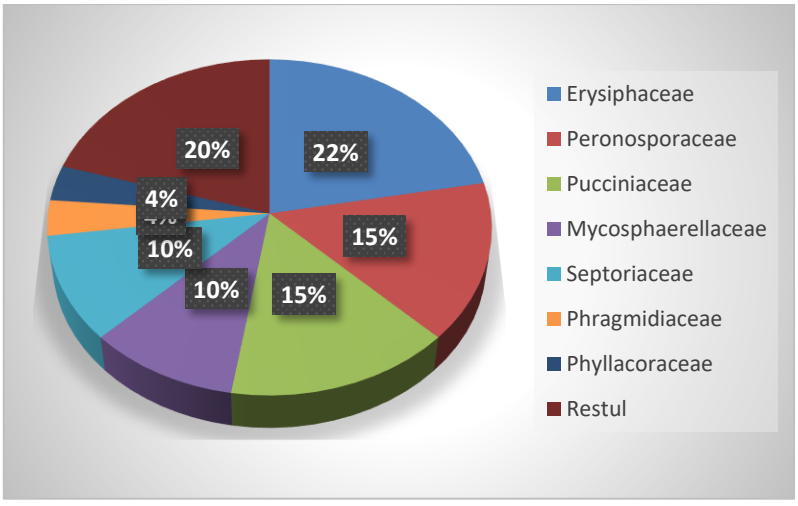

Figure 1. Taxonomic analysis of mycobiota identified in habitat 91M0 (orig.)

Tabel 1

Taxonomic analysis

Family	Number of species	Family	Number of species
Erysiphaceae	13	Taphrinaceae	1
Peronosporaceae	9	Clavicipitaceae	1
Pucciniaceae	9	Venturiaceae	1
Mycosphaerellaceae	6	Phallaceae	1
Septoriaceae	6	Dermateaceae	1
Phragmidiaceae	2	Coprinaceae	1
Phyllacoraceae	2	Gomphaceae	1
Melampsoraceae	1	Botryosphaeriaceae	1
Pluteaceae	1	Sphaeropsidaceae	1
Albuginaceae	1		

In habitat 91I0* the following species have been identified: Albuginaceae: *Albugo amaranthi* (Schwein.) A. Kuntze on the leaves of *Amaranthus retroflexus* L.; Peronosporaceae: *Basidiophora entospora* Roze Cornu - on the leaves of *Erigeron annuus* (L.) Pers., *Bremia lactucae* Regel - on the vegetative organs of *Hieracium murorum* L., *Lapsana communis* L.; *Bremia sonchi* K. Sawada on the leaves of *Sonchus arvensis* L., *Peronospora alchemillae* Otth - on the leaves of *Potentilla reptans* L., *Peronospora alta* Fuck. - on the leaves of *Plantago major* L., *Peronospora ficariae* L. R. Tul. ex of Bary - on *Ranunculus repens* L., *Peronospora lamii* A. Br. - on the vegetative parts of *Lamium maculatum* L., *Peronospora niesleana* Berl. - on the leaves of *Alliaria petiolata* (Bieb.) Cavara Grande., *Peronospora trifoliorum* De Bary - on the stem and leaves of *Trifolium hybridum* L., Taphrinaceae: *Taphrina pruni* Tul. – on fruits of *Prunus spinosa* L.; Erysiphaceae: *Blumeria graminis* f sp. *secale* (sin. *Erysiphe graminis* f. sp. *secale*) - on the leaves and ears of *Elymus repens* (L.) Gould., *Erysiphe cichoracearum* D.C. ex Merat. - on the leaves of *Sonchus arvensis* L. on the leaves of *Lapsana communis* L., *Erysiphe circaeae* L. - on the leaves of *Circaea lutetiana* L., *Erysiphe graminis* D.C. ex. Merat. - on the leaves of *Brachypodium sylvaticum* Huds., *Erysiphe heraclei* DC. - on the leaves of *Anthriscus sylvestris* (L.) Hoffm. *Erysiphe polygoni* D.C. ex. St. Am. - on the leaves of *Rumex crispus* L., *Erysiphe sordida* L. Junell. - on the leaves of *Plantago major* L., *Erysiphe syringae* Schwein. - on the leaves of *Ligustrum vulgare* L., *Erysiphe viburni* Duby (*Microsphaera viburni* (Duby Blumer) - on the leaves of *Viburnum opulus* L., *Microsphaera alphitoides* Griff. et Maubl., on the leaves of *Quercus robur* Willd., *Podosphaera tridactyla* (Wallr.) By Bary – on the leaves of *Prunus spinosa* L., *Sawadea bicornis* (Wallr.) Homma - on the leaves of *Acer campestre* L., *Sphaerotheca alchemillae* (Grev.) L. Junell - on the leaves of *Agrimonia eupatoria* L., *Sphaerotheca balsaminae* (Wallr.) Kari - on the stem and leaves of *Impatiens noli-tangere* L., *Sphaerotheca erigerontis-canadensis* (Lev.) L. Junell - on the leaves of *Taraxacum officinale* Web. ex F.H.Wigg., *Uncinula prunastri* (D.C. ex Merat) Sacc.

- on the leaves of *Prunus spinosa* L.; Clavicipitaceae: *Claviceps purpurea* (Fr.) Tul. on *Dactylis glomerata* L.; Phyllacoraceae: *Phyllachora graminis* (Pers.) Fuck - on the leaves of *Brachypodium sylvaticum* (Huds.) Beauv., *Polystigma rubrum* (Pers.) DC. - on the leaves of *Prunus spinosa* L.; Valsaceae (sin. Gnomoniaceae): *Hypoxylon fragiforme* (Pers.) J. Kickx f. – on the branches of *Cerasus avium* (L.) Moench., *Xylaria longipes* Nitschke - common on rotting stumps, fallen branches, deciduous stumps; in the territory on *Carpinus betulus*; Mycosphaerellaceae: *Mycosphaerella graminicola* (Fuckel) J. Schröt. - on the leaves of *Elymus repens* (L.) Gould, *Mycosphaerella mori* (Fuck.) Lind. - on the leaves of *Morus alba* L., *Mycosphaerella plantaginis* (Sollm.) Vestergr. – on *Plantago major* L., *Mycospherella rubi* (Fr.) Roark - on the leaves of *Rubus caesius* L., *Mycosphaerella sentina* (Fuck.) Schroet. - on the leaves of *Pyrus pyraster* (L.) Burgsd., *Mycosphaerella elmi* Kleb. – on the leaves of *Ulmus glabra* Huds., *Ramularia geranii* (Westend.) Fuckel – on the stems and leaves of *Geranium phaeum* L.; Venturiaceae: *Venturia pyrina* Aderh. - on the leaves and fruits of *Pyrus pyraster* (L.) Burgsd.; Polyporaceae: *Fomes fomentarius* (L.) J.K. Kickx – frequent on deciduous trunks throughout the researched territory; *Polyporus squamosus* (huds.) Fr. – on hornbeam ritidom (*Carpinus betulus* L.); *Trametes versicolor* (L.) Lloyd in the advanced stage of putrefaction; Ganodermataceae: *Ganoderma applanatum* (Pers.) Pat. present on maple, lindpe species; Fam. Russulaceae: *Russula lepida* Fr. – present in the forest by *Carpinus betulus* L. with *Quercus robur* L.; Stereaceae: *Stereum hirsutum* (Willd.) Pers. – present on deciduous stumps (species of Quercus, etc.); *Stereum gausapatum* (Fr.) Fr. on oak (*Quercus robur*) and hornbeam (*Carpinus betulus*) branches in various stages of putrefaction; Sclerodermataceae: *Scleroderma verrucosum* (Bull.) Pers. – on the ground in the forest clearing of *Carpinus betulus* with *Quercus robur*; Tricholomataceae: *Collybia fusipes* (Bull. et Fr.) Quel – present on the stumps of *Carpinus betulus* in the forest; Agaricaceae: *Agaricus arvensis* Schaeff. - found in meadows; *Agaricus sylvaticus* Schaeff. ex Secr. - on the ground in the forest of *Carpinus betulus* with *Quercus robur*; Fam. Lycoperdaceae: *Lycoperdon foetidum*. - on the ground in the forest of *Carpinus betulus* with *Quercus robur*; *Lycoperdon giganteum* Koke – parasitic on the ground in forests of a mixture of *Carpinus betulus* with *Robinia pseudacacia*; *Macrolepiota procera* (Purpose.) Singer – common in the forests built by *Quercus robur*; Schizophyllaceae: *Schizophyllum commune* Fr. – on branches of *Carpinus betulus* L.; Coprinaceae: *Coprinus comatus* (O.F. Müll.) Pers. – present on the ground at the edge of the forest of *Quercus cerris* and *Quercus frainetto*, in more or less ruderalized places; Pluteaceae (syn. Amanitaceae); *Amanita alba* Gillet - on the ground in the forest of *Carpinus betulus* with *Quercus robur*; Melampsoraceae: *Cronartium flaccidum* (White and Schw.) Wint. - on the leaves of *Vincetoxicum hirundinaria* Medicus., Pucciniaceae: *Puccinia behenis* (DC.) Otth. - on the leaves of *Silene vulgaris* (Moench) Garcke., *Puccinia circaeae* Pers. – on the leaves of *Circaea lutetiana* L., *Puccinia glechomatis* DC. - on the leaves of *Glechoma hirsuta* Waldst. Kit et., *Puccinia lapsanae* (Schultz) Fuck - on the leaves of *Lapsana communis* L., *Uromyces dactylidis* Otth. - on the leaves of *Dactylis glomerata* L., *Urocystis agropyri* (Preuss) A.A. Fisch. Waldh. - on the leaves of *Elymus repens* (L.) Gould, *Stigmina carpophila* (Lev.) Ellis on the leaves of *Cerasus avium* (L.) Moench. and *Prunus spinosa* L.; Botryosphaeriaceae: *Phoma pomorum* Thüm. – on the leaves of *Prunus spinosa* L.; Sphaeropsidaceae: *Ascochyta glechomae* Sandu Mititiuc – on the leaves of *Glechoma hederacea* L.; Fam. Septoriaceae: *Septoria agropyri* Ellis et Everh.on the leaves of *Elymus repens* (L.)

Gould, *Septoria cornicola* Desm. - on the leaves of *Cornus sanguinea* L., *Septoria gei* Rob et Desm. - on the leaves of *Geum urbanum* L.

The analysis of the species' perspective identified in habitat 91I0* shows the large number of vascular plants that are affected by various mycosis. Although this habitat has a poor representation in the area compared to the habitat 91M0, it still has a good representation in species of fungi (70 taxa – Fig. 2, Table 2).

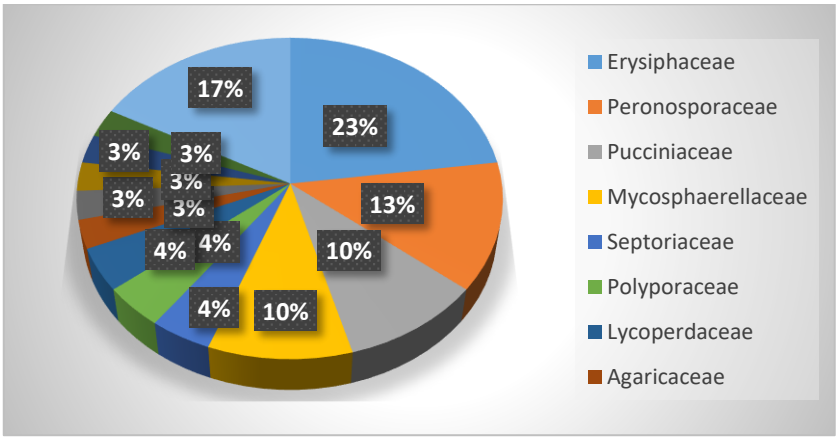

Figure 2. Taxonomic analysis of mycobiota identified in habitat 91I0* (orig.)

Tabel 2

Taxonomic analysis

Family	Number of species	Family	Number of species
Erysiphaceae	16	Melampsoraceae	1
Peronosporaceae	9	Ganodermataceae	1
Pucciniaceae	7	Albuginaceae	1
Mycosphaerellaceae	7	Taphrinaceae	1
Septoriaceae	3	Clavicipitaceae	1
Polyporaceae	3	Venturiaceae	1
Lycoperdaceae	3	Sclerodermataceae	1
Agaricaceae	2	Tricholomataceae	1
Valsaceae	2	Schizophyllaceae	1
Phyllacoraceae	2	Coprinaceae	1
Pluteaceae	2	Botryosphaeriaceae	1
Stereaceae	2	Sphaeropsidaceae	1

In habitat 91E0* the following species have been identified: Albuginaceae: *Albugo amaranthi* (Schwein.) A. Kuntze on the leaves of *Amaranthus retroflexus* L.;

Peronosporaceae: *Basidiophora entospora* Roze Cornu - on the leaves of *Erigeron annuus* (L.) Pers., *Bremia sonchi* K. Sawada on the leaves of *Sonchus arvensis* L., *Peronospora alta* Fuck. – on the leaves of *Plantago major* L., *Peronospora ficariae* L. R. Tul. Ex of Bary – on *Ranunculus repens* L., *Peronospora niesleana* Berl. – on the leaves of *Alliaria petiolata* (Bieb.) Cavara Grande., Erysiphaceae: *Erysiphe cichoracearum* D.C. ex Merat. – on the leaves of *Sonchus arvensis* L. *Erysiphe circaeae* L. – on the leaves of *Circaea lutetiana* L., *Erysiphe convolvuli* D.C. ex. St. Am. – on the leaves of *Convolvulus arvensis* L., *Erysiphe sordida* L. Junell. – on the leaves by *Plantago major* L., *Erysiphe urticae* (Wallr.) Blumer – on the stem and leaves of *Urtica dioica* L., *Sphaerotheca fugax* Penz. Sacc.) – on the leaves of *Geranium phaeum* L., *Sphaerotheca alchemillae* (Grev.) L. Junell – on the leaves of *Agrimonia eupatoria* L., *Uncinula adunca* (Wallr. Ex. Fr.) Lev. – on the leaves of *Salix fragilis* L.; Mycosphaerellaceae: *Mycospherella rubi* (Fr.) Roark – on the leaves of *Rubus caesius* L., Dermateaceae: *Diplocarpon rosae* Wolf. – on the leaves of *Rosa canina* L.; Polyporaceae: *Lentinus tigrinus* (Bull.) Fr. – present on trunks and stumps of willow and poplar in most of the localities of the investigated territory; *Phellinus igniarius* (L.) Quel. – present on the ritidom de *Salix fragilis*; *Trametes hirsuta* (Wulfen) Pilate – frequently on willow and hornbeam stumps; *Trametes versicolor* (L.) Lloyd in the advanced stage of putrefaction; Pleurotaceae: *Pleurotus ostreatus* (Jacq.) P. Kumm. – present on willow, poplar and acacia; Melampsoraceae: *Melampsora allii-salicy-albae* Kleb. – on the leaves of *Salix alba* L., *Melampsora amygdalina* Klebathn – on the leaves of *Salix fragilis* L.; Pucciniaceae: *Puccinia circaeae* Pers. – on the leaves of *Circaea lutetiana* L., *Puccinia lapsanae* (Schultz) Fuck – on the leaves of *Lapsana communis* L., *Uromyces polygoni* (Pers.) Fuck. – on the leaves of *Polygonum aviculare* L., Septoriaceae: *Septoria gei* Rob et Desm. – on the leaves of *Geum urbanum* L., *Septoria rubi* West. – on leaves of *Rubus caesius* L.

Taxonomic analysis of the mycobiota identified in habitat 91E0* of the "Oltenia Silvostepa" highlights the presence in large numbers of species from the families Erysiphaceae, Peronosporaceae and Polyporaceae (Fig. 3, Table 3.).

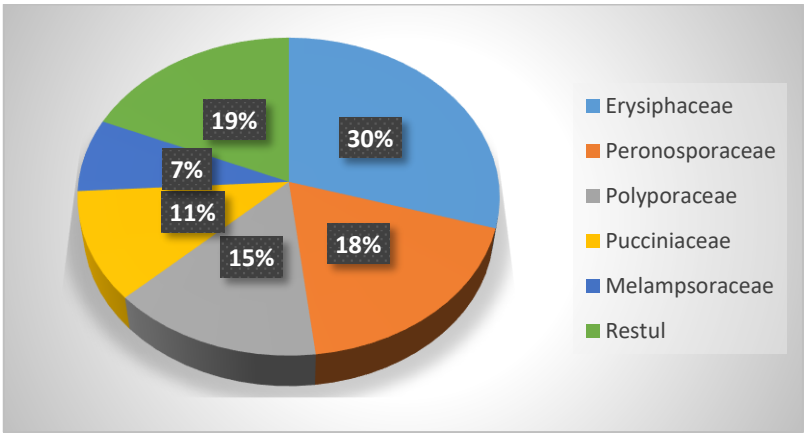

Figure 3. Taxonomic analysis of mycobiota identified in habitat 91E0* (orig.)

Tabel 3.

Taxonomic analysis

Family	Number of species	Family	Number of species
Erysiphaceae	8	Mycosphaerellaceae	1
Peronosporaceae	5	Dermateaceae	1
Polyporaceae	4	Albuginaceae	1
Pucciniaceae	3	Septoriaceae	1
Melampsoraceae	2	Pleurotaceae	1

CONCLUSIONS

The comparative analysis of the mycobiota from the three habitats present in the forest-protection area of Oltenia Silvostepa highlights the large number of species from the Erysiphaceae family in most of the areas. Although habitat 91E0* is the most subject to anthropogenic factor it has the fewest vascular plants attacked by fungi. The insignificant differences between habitats 91M0 and 91I0* in terms of the composition of the mycobiota is explained by the position of these areas in the field (adjoining) and the number of common host plants.

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