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Diseases in wild-growing honey bearing plants in Lozen Mountain in Bulgaria

Evgeniya Velinova*, Aleksandar Tashev
Department of Dendrology, Faculty of Forestry, University of Forestry, 10 St. Kliment Ochridski Blvd., 1797 Sofia, Bulgaria
*E-mail: *pancheva.evgeniya@gmail.com*

Abstract

The paper presents characteristics of the diseases in melliferous plants of the Bulgarian flora. The survey of the literature data revealed that there are more than 835 pathogens causing diseases in plants of interest. A particular attention is given to the results of investigation conducted in one Bulgarian area – Lozen Mountain. Thirty fungi phytopathogens were identified. Most of them belong to the phyla Deuteromycota and Ascomycota. A full list of investigated species is presented. Phytopathogens as a group on wild-growing melliferous plants were analyzed for the first time.

Keywords: melliferous plants; flora; phytopathogens

Melliferous plants are extremely important for bees. Bees need flowers for sustenance, and flowers need bees for pollination. Based on critical analysis of literature data and our own studies, it was established that wild melliferous plants in Bulgaria are represented by 1064 species belonging to 302 genera, 86 families and 2 phyla (Tashev and Velinova, 2014a).

Meanwhile honey plants are attacked by a significant number of phytopathogens. They can deteriorate honey bee source of food. Some of them directly damaged the blossom. Others can affect indirectly their melliferous parameters by attacking the vegetative plant organs. Not least wild honey bearing plants represent an additional host for infection accumulation which threatens the crops.

There is no published specialized literature for diseases of wild melliferous plants yet. The data was collected for each plant separately.

The first Bulgarian monograph containing information for target pathogens was published in 1962 (Topalov, 1962). It contains data for essential oil crops and their diseases.

Forty years later several volumes of the Atlas of crop diseases were published - Flowers, shrubs and trees (Stancheva and Rosnev, 2002), Diseases of technical crops (Stancheva, 2005), Diseases of permanent crops (Stancheva, 2006). Diseases of technical crops, essential oil crops, medical plants, mahoney, milk thistle, hazel, pine, fir, juniper, oak, willow, poplar, chestnut, maple walnut, almond, wild apple, wild pear, raspberry and others are presented in these publications.

Most of information was collected from foreign literature. The main source is the book 'Diseases and pests of ornamental plants' (Pirone, 1907). It deals with feature pests in ornamental plants and control measures. The book includes information for almost all target plants and their diseases. It provides further evidence of the importance of the problem.

In the monograph 'Fungus diseases of tropical crops' (Holliday, 1980) the author pays attention to the relationship between diseases of crops and diseases of wild plants, including honey bearing plants. The author includes in his research rarely investigated plants which are wild melliferous plants – *Lathyrus pratensis* L., *L. sativus* L. and others.

Based on critical analysis of literature data and our own studies, it was established that there are

more than 835 pathogens causing diseases in main melliferous plants – 320 species (Tashev and Velinova, 2014b).

MATERIAL AND METHODS

The critical analysis of the existing literature sources of the diseases of wild plants (Pirone, 1907; Lazarev et al., 1928; Nenad, 1928; Tabakovic-Toic and Markovic, 1928; Topalov, 1962; Holliday, 1980; Sherf and Macnab, 1986; Smith, 1988; Ogawa and English, 1991; Cooper, 1993; Alercia and Perry, 1994; Butin, 1995; Mirich et al., 1996; Nyvall, 1999; Alford, 2000; Foley, 2002; Mirich and & Tiodirivich, 2006; Stancheva and Rosnev, 2002; Kranz, 2003; Grand and Vernia, 2004; Grubben and Denton, 2004; Naqvi, 2004; Sameva, 2004; Stancheva, 2004; Stancheva, 2006; Stancheva, 2005; Sharma, 2006; Rangaswami and Mahadevan, 2006; McPartland et al., 2006; Cooke et al., 2006; Evstatieva and Stancheva, 2007; Horst and Cloyd, 2007; Koike et al., 2007; Meskauskiene, 2007; Atanasov, 2008; Horst, 2008; Saharan and Mehta, 2008; Eastwell, 2009) has helped building up a database of diseases of main wild melliferous plants in Bulgaria, which includes the systematic affinity of the taxa.

The area has been selected where the abundance of the flora represents the necessary reliable sample. After a comparative analysis we selected Lozen Mountain, Sofia floristic region. Data verification was made by photos and detection of coordinates of all investigated objects.

Determination of phytopathogens was made according to: Crop Disease Guide (Hohryanov et al., 1984), Atlas of Crop Diseases: Flowers, Shrubs and Trees (Stancheva and Rosnev, 2002), Crop Disease Guide (Hohryanov et al., 2003), General Plant Pathology (Stancheva, 2004), Atlas of Crop Diseases: Diseases in Technical Crops (Stancheva, 2005), Atlas of Crop Diseases: Diseases in Permanent Crops (Stancheva, 2006), Morphology and Taxonomy of Fungi (Bessey, 1979), Plant Pathology (Agrios, 1997). Diseases were identified by outward symptoms and based on the most important morphological features of their causers. It is necessary additional studies to be conducted to define systematic position of some species.

RESULTS AND DISCUSSIONS

The aim of the present study is to show results of four years long investigation conducted in Lozen Mountain. Furthermore, the authors wanted to present a thorough characteristic of their taxonomic structure. Thirty fungi were identified (Table 1).

The most represented phyla are Deuteromycota (12 species) and Ascomycota (11 species) (Figure 1). The most numerous classes regarding the identified phytopathogens are Hyphomycetes (7 species),

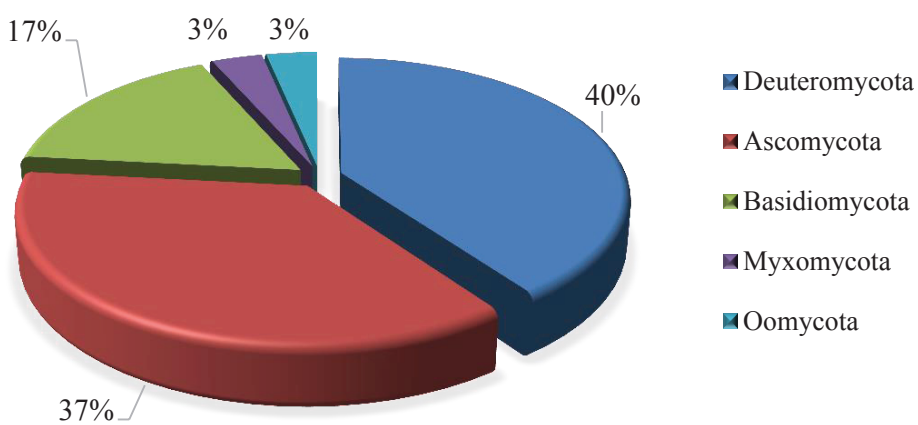

Figure 1. Distribution of the identified fungi in Lozen Mountain according to their phyla

Plectomycetes (7 species), Basidiomycetes (5 species) and Coelomycetes (5 species) (Figure 2). The most represented orders are Erysiphales (7 species) and Moniliales (7 species), followed by Uredinales (5 species), Sphaeropsidales (3 species), Helotiales and Melanconiales (2 species) (Figure 3).

Table 1. Phytopathogens in melliferous plants in Lozen Mountain, altitude and coordinates

Melliferous plant / Phytopathogen	Altitude (m)	Coordinates
***Acer campestre* L., *A. tataricum* L.**		
Rhytisma acerinum Schwein.	632; 899	42 34' 53.2'' N, 23 25' 41.5'' E; 42 34' 50.1'' N, 23 26' 30.6'' E
***Acer hyrcanum* Fisch**		
Phyllosticta sp.	899	42 34' 50.1'' N, 23 26' 30.6' E
Rhytisma acerinum Schwein.	899	42 34' 50.1'' N, 23 26' 30.6' E
***Amygdalus nana* L.**		
Fusicladium amygdali Duc.	899	42 34' 50.1'' N, 23 26' 30.6'' E
***Aremonia agrimonoides* (L.) DC.**		
Oidium sp.	884	42 34' 48.9'' N, 23 26' 22.0'' E
***Chelidonium majus* L.**		
Peronospora chelidonii Miyabe	632	42 34' 53.2'' N, 23 25' 41.5'' E
***Clematis vitalba* L.**		
Alternaria sp.	615; 712	42 34' 55.4'' N, 23 25' 40.4'' E; 42 34' 53.3'' N, 23 26' 02.5'' E
***Cornus mas* L.**		
Stigmina carpophila (Lév.) M.B. Ellis	719	42 34' 54.4'' N, 23 26' 04.7'' E
***Cornus sanguinea* L.**		
Microsphaera alni (DC.) G. Winter	648	42 34' 53.2'' N, 23 25' 49.0'' E
Phyllactinia corylea (Pers.) P. Karst.	648	42 34' 53.2'' N, 23 25' 49.0'' E
***Corylus avellana* L.**		
Phyllactinia suffulta f. sp. *coryli-avellana* Jacz.	719	42 34' 54.4'' N, 23 26' 04.7'' E
Septoria ostryae Peck	719	42 34' 54.4'' N, 23 26' 04.7'' E
***Dianthus deltoides* L.**		
Alternaria dianthi F. Stevens & J. G. Hall	907	42 34' 46.4'' N, 23 26' 39.1'' E
Uromyces dianthi (Pers.)	907	42 34' 46.4'' N, 23 26' 39.1'' E
Fragaria vesca L.		
Diplocarpon earlianum (Ellis & Everh.) F.A. Wolf (a. *Marssonina fragariae* (Lib.) Kleb.)	632	42 34' 53.2'' N, 23 25' 41.5'' E
***Fraxinus ornus* L.**		
Cercospora sp.	626	42 34' 52.3'' N, 23 25' 43.8'' E
***Ligustrum vulgare* L.**		
Phyllactinia sp.	626	42 34' 52.3'' N, 23 25' 43.8'' E
Ramularia ligustrina Maubl.	626	42 34' 52.3'' N, 23 25' 43.8'' E

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Table 1. *Continued*

***Malus sylvestris* Mill.**		
Venturia inaequalis (Cooke) G. Winter	907	42 34’ 46.4´´ N, 23 26’ 39.1´´ E
***Medicago lupulina* L.**		
Pseudopeziza medicaginis (Lib.) Sacc. f. sp. *medicaginis-lupulinae* Schmiedeknecht	646	42 34’ 51.3´´ N, 23 25’ 53.3´´ E
***Melilotus alba* Medicus**		
Oidium sp.	638	42 34’ 49.9´´ N, 23 25’ 53.3´´ E
***Melissa officinalis* L.**		
Septoria melissae Desm.	686	42 34’ 53.2´´ N, 23 25’ 41.5´´ E
***Plantago major* L.**		
Oidium sp.	638	42 34’ 49.9´´ N, 23 25’ 53.3´´ E
***Polygonatum multiflorum* (L.) All. Fl. Pedem.**		
Myxomycota	719	42 34’ 54.4´´ N, 23 26’ 04.7´´ E
***Potentilla argentea* L.**		
Oidium sp.	638	42 34’ 49.9´´ N, 23 25’ 53.3´´ E
***Prunus spinosa* L.**	632	42 34’ 53.2´´ N, 23 25’ 41.5´´ E
Podosphaera tridactyla (Wallr.) de Bary	632; 712	42 34’ 53.2´´ N, 23 25’ 41.5´´ E; 42 34’ 53.3´´ N, 23 26’ 02.5´´ E
***Pyrus pyraster* Burgsd.**		
Diplocarpon mespili (Sorauer) Sutton (a. *Entomosporium maculatum* Lév.)	632	42 34’ 53.2´´ N, 23 25’ 41.5´´ E
***Quercus cerris* L.**		
Microsphaera alphitoides Griffon & Maubl.	719	42 34’ 54.4´´ N, 23 26’ 04.7´´ E
***Robinia pseudoacacia* L.**		
Alternaria sp.	632	42 34’ 53.2´´ N, 23 25’ 41.5´´ E
***Rosa canina* L.**		
Phragmidium mucronatum (Pers.) Schltdl.	632	42 34’ 53.2´´ N, 23 25’ 41.5´´ E
***Rubus caesius* L.**		
Phragmidium rubi-idaei Karst	907	42 34’ 46.4´´ N, 23 26’ 39.1´´ E
***Salix caprea* L.**		
Melampsora abietis-caprearum Tubeuf	648	42 34’ 53.2´´ N, 23 25’ 49.0´´ E
***Sambucus ebulus* L.**		
Colletotrichum sp.	615	42 34’ 55.4´´ N, 23 25’ 40.4´´ E
***Sorbus aucuparia* L.**		
Gymnosporangium juniperinum (L.) Fr.	638	42 34’ 49.9´´ N, 23 25’ 53.3´´ E
***Sorbus torminalis* (L.) Crantz**		
Venturia inaequalis (Cooke) G. Winter	626; 638	42 34’ 52.3´´ N, 23 25’ 43.8´´ E; 42 34’ 49.9´´ N, 23 25’ 53.3´´ E
***Syringae vulgaris* L.**		
Alternaria sp.	626	42 34’ 52.3´´ N, 23 25’ 43.8´´ E
Microsphaera syringae (Schwein.) H. Magn.	626	42 34’ 52.3´´ N, 23 25’ 43.8´´ E

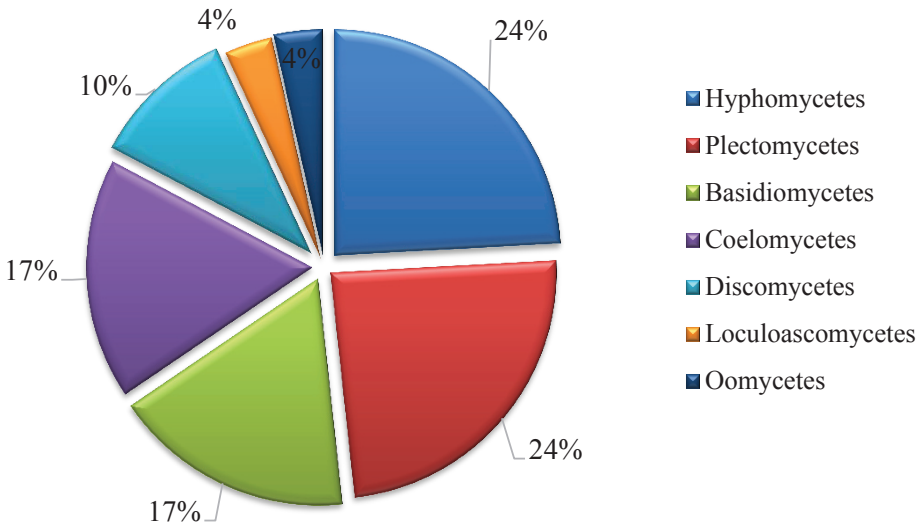

Figure 2. Distribution of the identified fungi in Lozen Mountain according to their classes

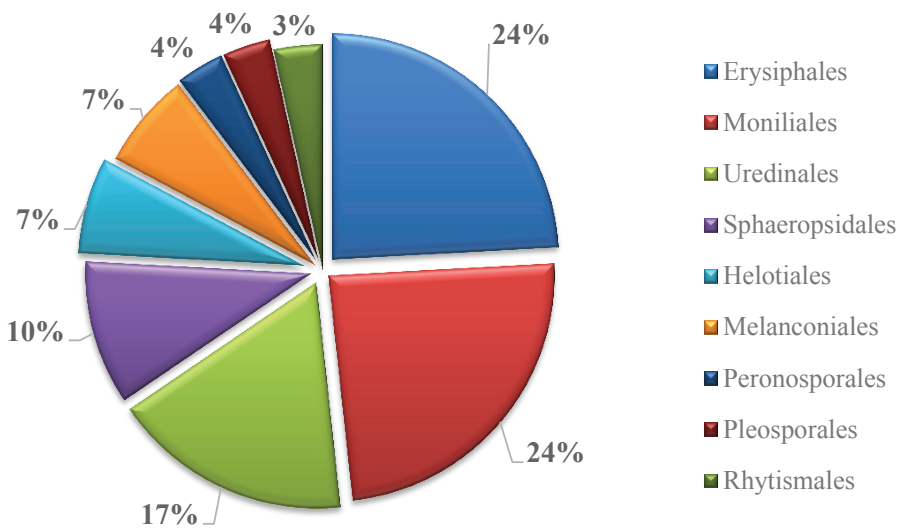

Figure 3. Distribution of the identified fungi in Lozen Mountain according to their orders

CONCLUSION

The first survey aimed at the elaboration of a list and characteristics of the phytopathogens in melliferous plants of the Bulgarian flora has contributed to the following conclusions:

Thirty fungi phytopathogens were identified in investigation conducted in the Lozen Mountain. Most phytopatogens belong to the phyla Deuteromycota (12 species) and Ascomycota (11 species). The most numerous classes are Hyphomycetes (7 species) and Plectomycetes (7 species). The richest orders are Erysiphales (7 species) and Moniliales (7 species).

The results can be used by beekeepers to obtain information about possible damage to the honey bearing plants in different parts of Bulgaria, as well as by specialists in plant protection prognosticate proximal melliferous plants as an infection sources for crops.

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