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PARASITIC MYCOBIOTA OF YELLOW GENTIAN (*GENTIANA LUTEA* L.)

ABSTRACT: Mycopopulation of yellow gentian growing in plantations was studied in 2008 and 2009. Fourteen species of fungi were registered at seed, out of which five were pathogenic. The most common species was *Alternaria alternata* (72-74 %). Species of the genus *Fusarium* (*F. oxysporum*, *F. solani* and *F. equiseti*) were present in a small percentage (2-6 %). These species, as well as *F. verticillioides,* were isolated from root, and *Fusarium* sp. was isolated from the flowers. *Alternaria alternate, Epicoccum purpurescens*, *Phoma* sp. and *Alternaria* sp. were regularly present on the leaves and stems.

KEY WORDS: *Gentiana lutea*, yellow gentian mycobiota, pathogens

INTRODUCTION

Yellow gentian is a perennial herb on mountain meadows and pastures that are between 800 and 2500 meters of altitude. It grows also in sparse woods and on rocky ground. The root of yellow gentian is used for various galenic preparations such as teas, tinctures, extracts, medicinal wines and spirits. Recent studies indicate that gentian leaf and flower are more interesting drug than the root (Menković et al., 2000).

The uncontrolled exploitation of natural gentian habitats raised the question of its survival. In recent years European countries have banned the collection of wild gentian from nature, which caused serious shortages throughout the world. Its collection in Serbia is, limited and controlled by the order of the Ministry of Environmental Protection (The Official Gazette RS, 50/93). Gentian has been grown on plantations in Serbia over the last six years in order to increase the yield of uniform quality and to preserve biodiversity of wild gentian.

There is little evidence about the disease of yellow gentian. In Serbia, it is a host of 16 fugal species (Pavlović et al., 2006).

MATERIALS AND METHODS

The pathogenic mycrobiota of gentian was studied on the plantation of the Institute of Medicinal Plant Research, Belgrade, in the National Park "Tara" at Tara Mountain in 2008 and 2009. The samples of diseased plant were collected from April to October. Isolation of pathogens from plant material was performed by standard procedure (K i r a l y et al., 1970; D i n g r a and S i n c l a i r, 1986). Fragments of diseased plants were rinsed with tap water, surface sterilized with 2 % NaOCl for two minutes, rinsed again with sterile distillate water and planted on potato dextrose agar (PDA). Isolation from gentian seeds was performed by ISTA method (2003). Four hundred seeds from each seed lot was surface sterilized in 2 % NaOCl for two minutes, rinsed with sterile distillate water and transferred to wet filter paper in Petri dishes. Also, fifty seeds taken from each lot after surface sterilization were transferred to Petri dishes with PDA. Seeds were incubated for 10 days at 25ºC.

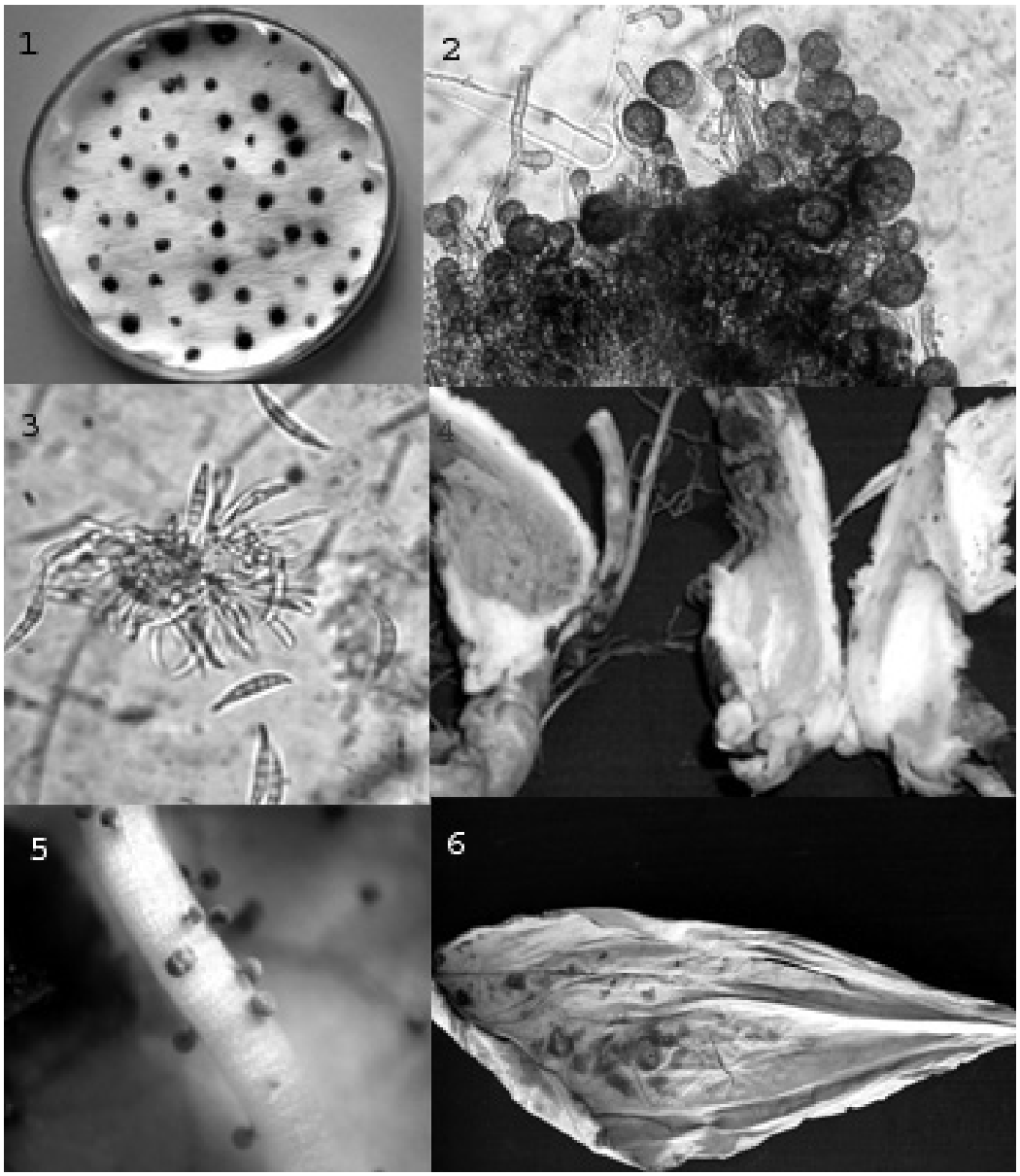
Determination was based on morpho-physiological characteristics and the cultivation of fungi tested (S u t t o n 1980; G e r l a c h and N i r e n b e r g, 1982; N e l s o n et al., 1983; J o f f e, 1986; L e s l i e and S u m m e r e l l, 2006; S i m o n s, 2007).

RESULTS AND DISCUSSION

Yellow gentian is a host of numerous parasitic and saprophytic fungal species in Serbia (Table 1 and 2). The most common species on seed is *Alternaria alternata* (>70 %). In most cases, seeds infected with this fungus do not germinate. This species is also registered on seeds of balm, sage, tansy, valerian, St.John's wort, *Echinacea* spp., and camomile (K o s t i ć et al., 1999; P a v l o v i ć and D r a ž i ć, 2000; P a v l o v i ć et al. 2000a; P a v l o v i ć, 2001; K o s t i ć et al., 2003; P a v l o v i ć, 2003). Seeds in small percentage (2-6 %) were infected with fungal species of the genus *Fusarium* (*F. oxysporum*, *F. solani* and *F. equiseti*), but they are very destructive causing rotting and decay of seedlings. Other registered species do not present any danger to the gentian seed.

Three species of *Fusarium* (*F. oxysporum*, *F. solani* and *F. verticillioides*) caused wet root rot. *Alternaria* sp. and *Epicoccum purpurescens,* and *Alternaria alternata* and *Phoma* sp., respectively, were isolated from stem and leaves with spot symptoms, while *Fusarium* sp. was isolated from flower only.

In general, medicinal plants, as well as weeds, can be classified into a group of plants with the most numerous mycopopulation. However, small number of plant pathologists studied the mycobiota of medicinal plants. This is understandable, because the attention of researchers is focused primarily on the mycopopulation of most important cultivated field and vegetable crops, fruit trees and grape vines.



Seeds of marshmallow severely infected by *Alternaria alternata* (Fig. 1). Conidia of *Epicooccun purpurescens* on seed (Fig. 2). Conidial cells and macroconidia of *Fusarium equiseti* (Fig. 3). The wet root rot of yellow gentian caused by mix infection of *Fusarium* spp. (Fig. 4). *Physarum notabile* on the seedling (Fig. 5). The leaf spots of yellow gentian caused by *Phoma* sp.

Tab. 1 – Incidence of fungi (%) on the seeds of yellow gentian in 2008 and 2009

Pathogen	Year	
	2008	2009
Alternaria alternata	72	74
Aspergillus flavus	2	2
Aspergillus niger	3	3
Botrytis cinerea	4	2
Cephalosporium spp.	2	2
Epicoccum purpurascens	2	4
Fusarium oxysporum	2	6
Fusarium solani	3	2
Fusarium equiseti	2	2
Penicillium spp.	3	3
Physarum notabile	2	3
Physarum sp.	1	-
Mucor sp.	3	2
Rhyzopus spp.	3	3

Tab. 2 – Mycobiota of yellow gentian during vegetation

Plant part	Fungus	Time of isolation
stem	*Alternaria* spp.	Jun-July
	Epicoccum purpurescens	July
Leaf	Alternari alternate	September
	Phoma spp.	August
Flower	*Fusarium* spp.	August
Root	Fusarium oxysporum	September
	Fusarium solani	October
	Fusarium verticillioides	October

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ПАТОГЕНА МИКОБИОТА ЖУТЕ ЛИНЦУРЕ (*GENTIANA LUTEA* L.)

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Резиме

Жута линцура је вишегодишња зељаста биљка планинских ливада и пашњака на надморским висинама између 800 и 2500 метара. Расте и у ретким шумама и на камењарима. Као сировина за фармацеутску индустрију користи се првенствено корен, а у новије време лист и цвет. Да би се сачувао биодиверзитет и повећао принос уједначеног квалитета, линцура се све више плантажно гаји у свету, а код нас последњих шест година. Плантажним гајењем жуте линцуре створени су услови за појаву већег броја патогених гљива у различитим фенофазама развића.

Проучавање патогене микофлоре жуте линцуре испитивано је на плантажи Института за проучавање лековитог биља, Београд, у националном парку "Тара" током 2008. и 2009. године. Преко 70% семена жуте линцуре било је нападнуто врстом *Alternaria alternata.* У већини случајева, семе заражено овом гљивом уопште не клија. Врсте из рода *Fusarium* (*F. oxysporum*, *F. solani* и *F. equisti*), заступљене су у мањем проценту (2-6%) и проузрокују у првом реду смањење енергије клијања и клијавости семена, а затим и трулење и пропадање клијанаца. На корену је констатовано присуство мешане инфекције са *Fusarium oxysporum*, *F. solani* и *F. verticillioides*. Са надземних делова линцуре изоловане су *Alternaria* spp., *Alternaria alternata, Epicoccum purpurescens, Phoma* ps. и *Fusarium* sp.