

## PRELIMINARY DATA ON FUNGAL ANTAGONISTS OF FALSE HELLEBORE (*VERATRUM ALBUM* SSP. *LOBELIANUM*) IN GEORGIA AND THEIR POTENTIAL AS EFFECTIVE BIOCONTROL AGENTS

GVRITISHVILI M.<sup>1</sup>, KIKODZE D.<sup>2</sup>, HEINZ MÜLLER-SCHÄRER<sup>3</sup>

<sup>1</sup>Tbilisi Botanic Garden. E-mail: mirian\_550@yahoo.com

<sup>2</sup>Ketshoveli Institute of Botany

<sup>3</sup>Department of Biology, University of Fribourg, Perolles, CH-1700 Fribourg.  
E-mail: heinz.mueller@unifr.ch

(Received April 17, 2006)

### Abstract

Among pathogenic fungi (antagonists) occurring in Georgia on False Hellebore *Cylindrosporium veratrinum*, *Marssonina veratri* and *Botrytis elliptica* are considered to be potential antagonists for biological control of this noxious weedy herbaceous plant of mountain pastures and haylands. Besides 12 species of fungi associated with False Hellebore are first recorded in Georgia.

**Key words:** Georgia, *Veratrum*, fungal antagonists, weed biocontrol.

### Introduction

False Hellebore is among the most noxious weedy herbaceous plants of mountain pastures and haylands in Georgia. Traditional mechanical and chemical methods of control available are time consuming and economically and ecologically undesirable.

Though importance of biological control of weeds with plant pathogenic fungi has been understood for a long time, the use of mycoherbicides is relatively recent concept and a number of products are already available on the market [Hawsworth et al., 1996].

### Materials and Methods

The material investigated includes specimens collected during field observations carried out in east (Gudauri environs) and west (Shuakhevi district, Ajara) Georgia in 2002-2004. Populations of False Hellebore were examined at 8 sites utilizing the methodology described below.

A transect was made through the population (straight line or W-shaped) of 50 x 2m = 100m<sup>2</sup>. Numbers of *Veratrum* plants were counted, and every x<sup>th</sup> plant was calculated to result in 50 regularly spaced plants over transect. Damage level has been assessed on a 0-5 scale (0: healthy, no signs of damage, 5: >80% defoliated or infected). Plant leaves infected by pathogens were collected and identified. All 50 plants were uprooted and the root and root crown were inspected for pathogen damage.

## Results and discussion

According to literature sources [Badridze, 1969; Imerlishvili, 1968; Kanchaveli, 1971; Murvanishvili, 1966; Vassilevsky, Karakulin, 1950] 11 fungal species are referred to as associated with False Hellebore in Georgia. As a result of identification of all the fungal complexes that inhabit the weed under the consideration, their total number is equal to 25 (see list below). Among them *Cylindrosporium veratrinum*, *Marssonina veratri* and *Botrytis elliptica* seem to be most perspective biocontrol agents.

*Cylindrosporium veratrinum*. The fungus is very common leaf-spotting pathogen of False Hellebore in Georgia. The disease first appears at the end of June and reaches its maximum in August-September. Spots are brown, linear, limited by the veins, often confluent and covering nearly the whole of the leaf surface (Fig. 1). *C. veratrinum* produces conidiomata with grey to rose conidial mass predominantly on upper leaf surface. This indicates that during the growing season spread of conidia and infection of plants take places in rainy weather (by splash and by wind blown mist). Ways and means of mycelium (inoculum) survival in dormance period are not known. However, using analogy with similar (allied) parasitic fungi from Coelomycetes the fungus survival can be assumed by mycelium existing in the rhizomes.

**Table 1.** List of pathogenic and other fungi associated with *Veratrum album* ssp. *lobelianum* in Georgia. Abbreviations: C - Coelomycetes; H - Hyphomycetes; M - Mycelia sterilia (Agonomycetales); P - Pyrenomycetes (in broad sense); U - Uredinales.

Species	Parasitic	Saprobic	Sources	Host range
<i>Alternaria alternata</i> (Fr.) Keissl. (H)		+		Plurivorous
<i>Ascochyta veratri</i> Cav. (C)	+		[1,5]	Specific
<i>Botrytis elliptica</i> (Berk.) Cooke (H)	+		[2,3]	Known on <i>Lilium</i> spp.
<i>Cercospora veratri</i> Peck (H)	+		[6,7]	Specific
<i>Coleophoma</i> sp. (C)		+		Specific ?
<i>Cylindrosporium veratrinum</i> Sacc. & G. Winter (C)	+		[5,9]	Specific
<i>Didymella</i> sp.-1 (P)		+		?
<i>Didymella</i> sp.-2 (P)		+		Plurivorous
<i>Epicoccum nigrum</i> Link (H)		+		Plurivorous
<i>Fusoma veratri</i> Allesch. (C)	+		[7]	= <i>Marssonina veratri</i>
<i>Leptosphaeria modesta</i> (Desm.) P.Karst. (P)		+		Plurivorous
<i>L. veratri</i> Earle (P)		+		Specific?
<i>Leptosphaeria</i> sp. (P)		+		?
<i>Marssonina veratri</i> (Ellis & Everh.) Magnus (C)	+		[5]	Specific
<i>Phyllosticta albina</i> Bub. & Káb. (C)	+			Specific
<i>P. melanoplaca</i> Thüm. (C)	+		[1,7]	Specific
<i>Pleospora</i> sp. (P)		+		?
<i>Puccinia veratri</i> Duby (U)	+		[5,7]	Specific
<i>Rosellinia</i> sp. (P)		+		?
<i>Sclerotium</i> sp. (M)	+			?
<i>Septogloeum veratri</i> (Allesch.) Wollenw.	+		[1,5]	= <i>Marssonina veratri</i>
<i>Septoria</i> sp.	+		[1]	Specific
<i>Uromyces veratri</i> (DC.) J.Schröt (U)	+		[1,5,7]	Specific
Discom. gen. indet.-1		+		?
Discom. gen. indet.-2		+		?

*Marssonina veratri*. The fungus causes necrotic brown spots on leaves, rarely on vaginae and stems. Spots are elliptical, oblong-elliptical with darker brown margins and somewhat pointed at both ends. Conidiomata with greyish mass of hyaline conidia develop on upper leaf surfaces in the centre of the spots (Fig. 2). In Georgia *M. veratri* occurs throughout the regions observed but in comparison with *C. veratrum*, rarely and less intensively.

*Botrytis elliptica*. The fungus is a widespread pathogen of lilies in Europe and North America [Gould, 1953]. In Georgia it is known on *Lilium candidum* [Bagaturia, 1980]. It has been first found on False Hellebore in east Georgia in July 2004 as a causative agent of grey-brown leaf spot up to 13 cm in diameter or more depending on the size of leaf blades (Fig. 3). Sporulation occurs on the lower leaf surface. It differs from known plurivorous fungus *B. cinerea* Pers. by its large conidia that measure 15-30x13-25  $\mu$ m.



Fig. 1. *Cylindrosporium veratrinum*.

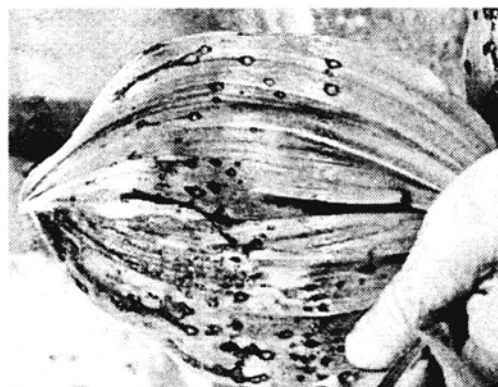


Fig.2. *Marssonina veratri*.



Fig. 3. *Botrytis elliptica*.

**Acknowledgement:** Financial support was provided through SCOPES, an international research programme of the Swiss National Foundation (grant N 7 GEPJ065726 and N IB76AO-106455 to HMS).

#### References:

- Badridze M.A. *Mycoflora of the Iori river valley*. Cand. dissert. Tbilisi, 1969 (Georg.).
- Bagaturiya V.Ya. *Diseases of herbal ornamental plants and preventative measures in eastern Georgia*. In: "Ornamental plant protection from diseases in Caucasus environment" Tbilisi, 1. 7-36, 1980 (Russ.).
- Geuld C.J. *Decay of lily and tulip*. In: Plant Diseases. M., 574-579, 1956. USDA, Washington, 1953 (Russ.).
- Hawksworth D.L., Kirk P.M., Sutton B.C., Pegler D.N. *Ainsworth & Bisby's Dictionary of the Fungi*. 8th ed IMI CAB Int., Cambridge, 1996.
- Imerlishvili V.I. *Mycoflora of the middle part of Kakheti Caucasioni*. Cand. dissert. Tbilisi, 1968 (Georg.).
- Kanchaveli L.A., Melia M.S. *Species of the genus Cercospora in Georgia*. Trans. Georg. Inst. Plant Prot. 23, 312-315, 1971 (Georg.).
- Murvanishvili I.K. *Mycoflora of the Aragvi river valley*. Cand. dissert. Tbilisi, 1966 (Georg.).
- Schaffner U., Kleijn D., Brown V., Müller-Schärer H. *Veratrum album in montane grasslands: A model system for implementing biological control in land management practices for high biodiversity habitats*. Biocontrol News and Information, 22, 19-28. 2001.
- Vassilevsky N.I., Karakulin B.P. *Parasitic imperfect fungi*. 2, M.-L., 1950 (Russ.).

წინასწარი მონაცემები შხამას, *Veratrum album ssp. lobelianum*,  
სოკოვანი ანტაგონისტებისა და მათი, როგორც ბიოკონტროლის  
აგენტების, პოტენციური ეფექტურობის შესახებ

გერიტიშვილი მ.<sup>1</sup>, ქიქოძე დ.<sup>2</sup>, ჰაინც მიულერ-შერერ.<sup>3</sup>

<sup>1</sup>თბილისის ბოტანიკური ბაღი  
<sup>2</sup>ნ. კეცხოველის ბოტანიკის ინსტიტუტი  
<sup>3</sup>ფრაიბურგის უნივერსიტეტი

(მიღებულია 17.04.2006)

#### რეზიუმე

საქართველოში შხამაზე გაერცვლებული პათოგენური სოკოებიდან *Cylindrosporium veratrinum*, *Marssonina veratri* და *Botrytis elliptica* განიხილება, როგორც პოტენციური ანტაგონისტები ალკური სათიბ-საძოვრების ამ აბეზარა სარეველის ბიოკონტროლის მიზნით გამოყენებისათვის. გარდა ამისა, შხამასთან ასოცირებული 12 სახეობა პირველად არის მოყვანილი საქართველოს მიკობიოტისათვის.