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First report of *Stemphylium lycopersici* from Far East Russia: a new record and new host

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Abstract — Recovery of *Stemphylium lycopersici* in Russia is documented for the first time. The pathogenic fungus was isolated from living tomato and chrysanthemum leaves and recovered for the first time from eggplant leaves (*Solanum melongena*, *Solanaceae*). A brief fungus description and illustration are included. Some phylogenetic, geographic, and ecological information is reviewed.

Key words — distribution, *Lycopersicon esculentum, Stemphylium floridanum*

Introduction

The distribution of many species of the genus *Stemphylium* has not been adequately documented. Notably, the geography and ecology of this genus across Russia have never been thoroughly investigated or reviewed. In an early review of *Stemphylium* in Russia, *S. lycopersici* (Enjoji) W. Yamam. (= *S. floridanum* C.I. Hannon & G.F. Weber), was mentioned only once as a species from the south of the Russian Far East, but with no additional information about host plant or reference (Egorova 1999). In other studies dedicated to diversity of phaeodictyosporic hyphomycetes on vegetables and ornamentals in that same region (mostly surroundings of Vladivostok) (Nelen & Vasilieva 1959; Nelen 1962, 1972; Egorova & Pavlyuk 2006), this species was not described at all. Another similar species described on solanaceous plants, *S. solani* G.F. Weber, has been reported in Russia on tomato stems (Nelen 1968), but the article contained no additional description, and the accompanying figures were of poor quality. Thus, the species could not be clearly defined at that time, but it was certainly not *S. solani* or *S. lycopersici*.

During a study of hyphomycetes infecting leaves of solanaceous crops in 2006–10, approximately 120 samples of leaves (each sample consisted of a set of diseased leaves from one field) were collected in different regions of Russia.

These regions included the European part of the country (North West, Central, East, North Caucasus), south of Western and Eastern Siberia, and the Far East (South and Kamchatka). More than 1000 isolates of phaeodictyosporic hyphomycetes were obtained from those samples and nine isolates were keyed to the genus *Stemphylium*. Four of them were preliminarily identified as *S. lycopersici*. The main objectives of the present work were to positively identify isolates of *S. lycopersici* and to determine substrates and habitats of this species in Russia.

To accomplish this goal, these four isolates of *S.* cf. *lycopersici* from *Solanaceae,* along with a collection of additional Russian *Stemphylium* isolates (n = 51) recovered from other plant families and from different regions of Russia in 2002-2011, were subjected to morphological analysis. All isolates were grown on potato carrot agar (PCA) at 24°C under light/dark cycle (12/12 h) for 8–12 days. All isolates are kept in the Laboratory of Mycology and Phytopathology of the All-Russian Institute of Plant Protection in Saint Petersburg.

Results

As a result of analysis five of 55 isolates examined have been positively identified as *S. lycopersici*: MF-P106011 and MF-P106041 [tomato, *Lycopersicon esculentum* Mill. (= *Solanum lycopersicum* L.), September 2006], MF-P223011 and MF-P223021 (eggplant, *Solanum melongena* L., August 2010), and MF-P310011 (chrysanthemum, *Chrysanthemum* sp., August 2010). All isolates originated from Primorskiy kray (south of the Far East) from the outskirts of Vladivostok (43°14–15′N 132°00–04′E). To our knowledge, this is the first discovery of *S. lycopersici* on eggplant as well as the first conclusively documented discovery of the fungus in Russia.

The *S. lycopersici* colonies were light grey in the central part with wooly colorless aerial mycelium. The diameter of 7-day old colonies on PCA was approximately 50 mm. Sporulation was moderate or abundant. Three of the five isolates (MF-P106011, MF-P223021, and MF-P310011 from tomato, eggplant, and chrysanthemum, respectively) produced on PCA a red brown or yellowish pigment, revealing some variation within the species. Ascomata were absent.

Morphology of all isolates examined corresponded to previously published descriptions (Ellis & Gibson 1975; Nishi et al. 2009). Conidia were oblong conical at the apex, bluntly rounded at the base, with 1–5 transverse eusepta and several transverse, longitudinal or/and oblique distosepta in all transverse divisions (Fig. 1). The total number of transverse septa was 5–8, but distosepta were often weakly seen due to conidia wall ornamentation. Conidia were usually constricted at 3(–4) major transverse septa, pale to mid brown, smooth or minutely verruculose, mostly 50–74 × 16–23 µm, with length/ breadth (l/b) ratio 3:1 or more.

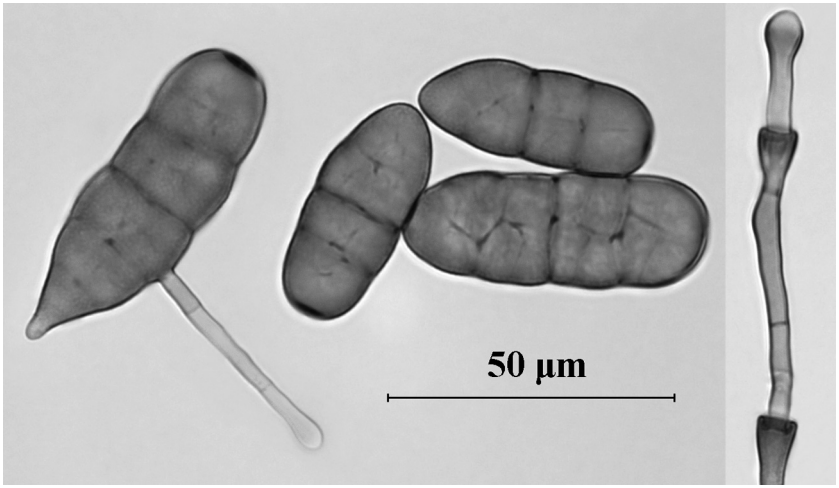

Fig. 1. *Stemphylium lycopersici*: conidia and conidiophores from culture on PCA.

Discussion

In addition to *S. lycopersici,* several other *Stemphylium* species have been found on solanaceous crops including eggplant. In general, these recoveries represent incidental occurrences, except for the recovery of *S. solani*, which has been found perhaps exclusively on solanaceous hosts (Farr et al. 1989; Ellis & Gibson 1975b). Both *S. lycopersici* and *S. solani* are characterized by oblong conidia, pointed at the apex, rounded at the base. However, *S. solani* differs from *S. lycopersici* in a number of features, notably shorter conidia (35–55 × 18–28 µm), smaller l/b ratio (1:2), smaller number of transverse septa (3–6), and conidia that are mostly constricted at the one median septum only.

Stemphylium lycopersici has an unusual host specialization in that only a few plants of two different families (*Solanaceae* and *Asteraceae*) have been described as hosts of this fungus. Among solanaceous plants, the fungus has been revealed on tomato (*Lycopersicon esculentum*) and pepper (*Capsicum annuum* L.) (Saito et al. 1970; Câmara et al. 2002; Inderbitzin et al. 2009). Among asteraceous plants, the fungus has been described from chrysanthemum (*Chrysanthemum morifolium* Ramat.) (Jackson 1961; Tammen 1963; Nishi et al. 2009). *Stemphylium lycopersici* was noted by Ellis & Gibson (1975a) to be a pathogen of some other plants, including *Allium*, *Carthamus*, and *Gladiolus*, but these records have not been supported by other sources.

Molecular phylogenetic study results were concordant with the morphological species concept (Câmara et al. 2002; Inderbitzin et al. 2009). Several gene sequences of isolates from *Chrysanthemum*, *Lycopersicon*, and *Capsicum* have been identical. Interestingly, the closest relatives of *S. lycopersici*

have been obtained from plants of families *Solanaceae*, *Asteraceae*, and *Araceae* (*S. xanthosomatis* B. Huguenin obtained from *Xanthosoma sagittifolium*) (Inderbitzin et al. 2009).

Stemphylium lycopersici has been recorded in many Asian countries, North America, Australia and other places (Kenya, Venezuela, Cuba, Dominican Republic, Indonesia, and Tahiti) (Jackson 1961; Tammen 1963; Ellis & Gibson 1975a; Câmara et al. 2002; Inderbitzin et al. 2009; Nishi et al. 2009). This study has revealed this fungus in Russia as well, but only in the Asian part. Taken together, these data are evidence of the distribution of this fungus in all continents excluding Europe.

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