First Record of Liriomyza huidobrensis (Diptera: Agromyzidae) Disseminating Alternaria solani (Pleosporaceae) in Potato Crops in Brazil

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First record of *Liriomyza huidobrensis* (Diptera: Agromyzidae) disseminating *Alternaria solani* (Pleosporaceae) in potato crops in Brazil

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Liriomyza leafminers can adversely affect agronomic crops by transmitting a number of disease pathogens, including fungi, bacteria, and viruses. Often this results from the physical damage to leaves following insertion of an ovipositor by females during the act of egg laying. For example, Durairaj et al. (2010) reported that *L. trifolii* (Burgess) (Diptera: Agromyzidae) females perforate leaves of *Solanum lycopersicum* L. (Solanaceae), predisposing the plant to infection by *Alternaria* (Pleosporales: Pleosporaceae) fungi. Similarly, Deadman et al. (2002) reported that leaf perforation during *L. trifolii* oviposition favored leaf necrosis caused by *Alternaria alternata* (Fr.) Keissl in *S. tuberosum* L. (Solanaceae). *Alternaria* spp. can reduce photosynthetic leaf area and subsequent tuber production in infected potato plants (Simmons 2000).

The economic impacts of *Liriomyza* are high. For example, *Liriomyza* spp. in Kenya have caused losses of US$54 and US$64.5 million in *Pisum sativum* L. and *Phaseolus vulgaris* L. (Fabaceae), respectively (Pratt et al. 2017). These species also are agronomic pests of other vegetable crops such as *Beta vulgaris* L. and *Spinacia oleracea* L. (Amaranthaceae) (Minkenberg 1988). Mujica and Kroschel (2013) reported that the leafminer *L. huidobrensis* (Blanchard) (Diptera: Agromyzidae) was responsible for leaf damage that subsequently reduced yields of *S. tuberosum* by up to 51% in the Cañete Valley (central coast of Peru). Here, we provide the first report on the association of *L. huidobrensis* as a facilitating agent of *A. solani* (Cooke) Wint infection to *S. tuberosum* in a commercial potato crop in Brazil.

Leafminer sampling was conducted twice between Sep 2013 to Apr 2014 in the municipality of Rio Paranaíba (Minas Gerais State, Brazil) on *S. tuberosum* leaves (cv. Ágata) from a field containing larval *L. huidobrensis*. The field (19.208744°S, 46.164902°W) consisted of 35 ha, with potato plants at the tuber formation stage (50 d after planting) (Meier 2001). The field was divided into 5 areas of 5 ha each. Each area was further divided into 10 parcels of 50 × 50 m (2,500 m^2). We evaluated 50 plants per parcel.

Plants were spaced 80 to 87 cm apart with 12 to 15 stems per meter. Mines of *L. huidobrensis* larvae with *A. solani* lesions were visually counted following the method of Alves et al. (2014) (Fig. 1a). Spatial distribution of mines caused by *L. huidobrensis* and *A. solani* lesions was evaluated using the Moran Index (I) ($P \leq 0.05$) with the Z test (Seffrin et al. 2018). This index measures whether a distribution is irregular, even, or clustered. Indices closest to 1 indicate high spatial dependence (clustered values); those closest to zero are characterized as spatial independence, while indices closest to −1 indicate high level of dispersion.

We found a positive and significant correlation (r = 0.84; n = 500; $P < 0.001$) between the number of *L. huidobrensis* mines and *A. solani* lesions, with the dissemination of this pathogen in potato plants being influenced by the degree of spatial distribution of *L. huidobrensis* (I = +0.225; $P = 0.001$) and *A. solani* (I = +0.428; $P = 0.001$). Moreover, the presence of *A. solani* concentric halos in potato leaves associated with *L. huidobrensis* oviposition sites, coincided with growth of this fungus. Our results were similar to those of Durairaj et al. (2010) who reported that *L. trifolii* oviposition sites favored *A. alternata* infection in tomatoes. Indeed, Deadman et al. (2002) observed that as *L. trifolii* oviposition perforations in *S. tuberosum* leaf tissue increased, *A. alternata* lesions increased (Deadman et al. 2002).

Summary

A significant association between *Liriomyza huidobrensis* leafminers and *Alternaria solani* fungus is reported here for the first time in a commercial potato (*Solanum tuberosum*) field in Brazil. We found that there was a high correlation (0.84) between the number of *L. huidobrensis* mines and *A. solani* lesions on infected plants.

Key Words: cluster; miner; oviposition; Solanaceae; spatial distribution; symptoms

Sumário

Uma associação significante entre a mosca minadora *Liriomyza huidobrensis* e o fungo *Alternaria solani* é reportado aqui pela primeira vez em campo de batata comercial (*Solanum tuberosum*) no Brasil. Nós verificamos alta correlação especial (0,84) entre o número de minas de *L. huidobrensis* e as lesões de *A. solani* em plantas infectadas.

Palavras Chaves: agregação; minador; oviposição; Solanaceae; distribuição espacial; sintomas

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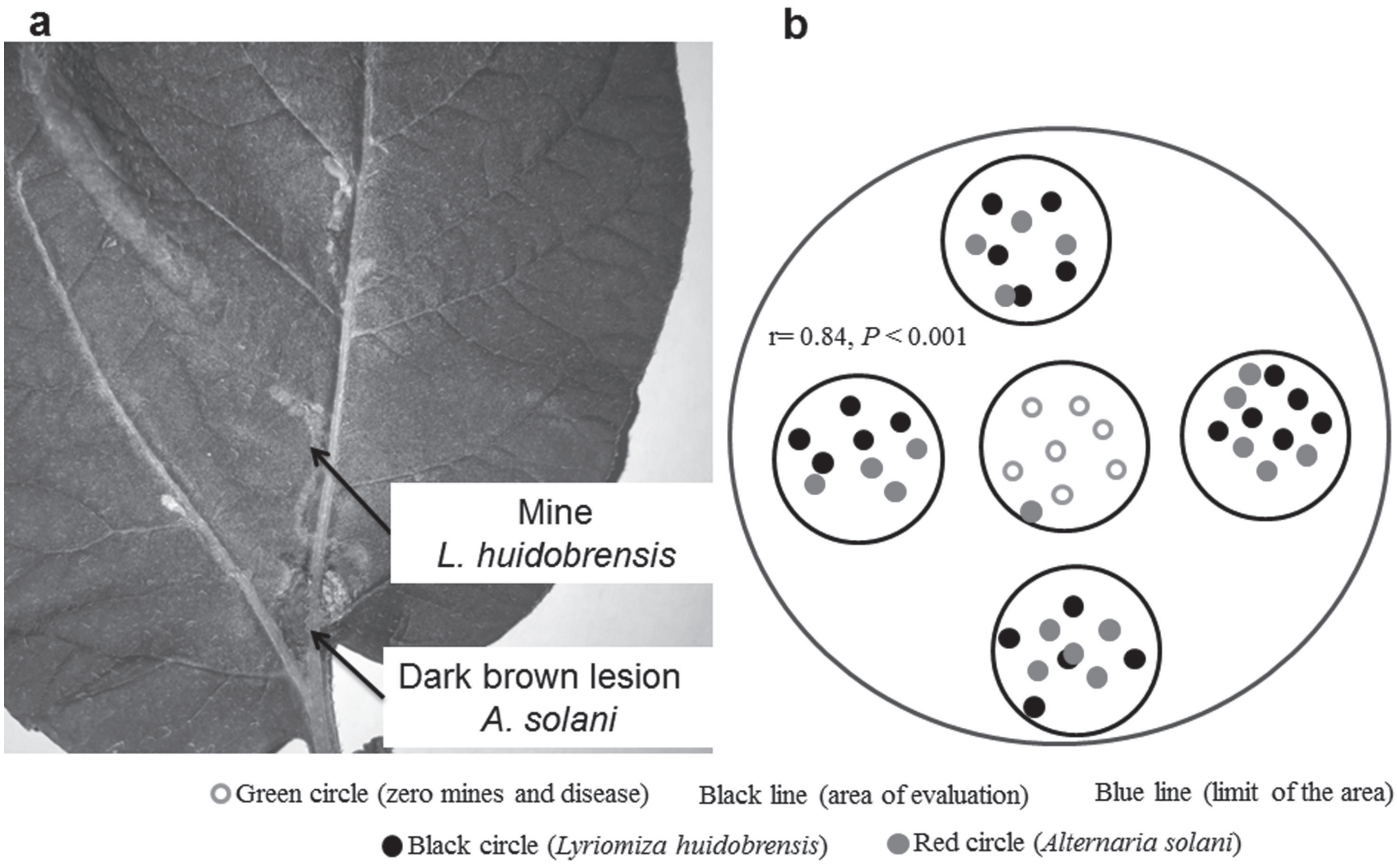

Fig. 1. (a) Presence of *Liriomyza huidobrensis* mines on a *Solanum tuberosum* leaf infected with *Alternaria solani*; (b) diagram showing representative distribution of mines and fungal lesions.

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