# Physiological, genetic, and pathogenetic variability in *Macrophomina phaseolina*, the causal agent of charcoal rot


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## ABSTRACT

**Motivation:** *Macrophomina phaseolina* (Tassi) Goidanich is a primarily soilborne pathogen with a wide distribution, varied host range, great longevity and high competitive saprophytic ability (Babu *et al*., 2010). About 500 plant diseases are caused by this fungus (Su *et al.*, 2001), and it is often termed 'charcoal rot'. Charcoal rot has emerged as an important disease in strawberry production systems that have abandoned soil fumigation with methyl bromide (Mertely *et al*., 2005; Zveibil and Freeman, 2005; Aviles *et al*., 2008). Although, only one species (*M. phaseolina*) is recognized within the genus *Macrophomina* (Sutton, 1980), the high levels of morphological variability of *M. phaseolina* across different hosts and geographical regions suggest that this species may be divided into subgroups (Aboshosha et al., 2007; Beas-Fernández *et al*., 2006; Hawatema y Hameed, 2006; Karunanithi *et al*., 1999; Mayek-Pérez *et al*., 1997; Mihail y Taylor, 1995; Omar *et al*., 2007). This work aimed to study the population structure of *M. phaseolina* associated with strawberry crop in Huelva, and to characterize the isolates with respect to *in vitro* growth rate, genotypic variability, and pathogenicity to strawberry plants.

**Methods and results:** Twenty two isolates of *M. phaseolina* from strawberry, blueberry, watermelon and rice are tested in this work. The morphological characteristics of the isolates are investigated, including colony phenotype on medium containing 120 mM potassium chlorate (Pearson *et al*., 1986), and relative growth rate at different temperatures and pH (Beas-Fernandez *et al*., 2006; Mayek-Perez *et al*., 1997). Pathogenicity test are carried out under controlled conditions. Mono-sclerotic cultures of the fungus were obtained for molecular characterization.

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### *REFERENCES*

Avilés, M, Castillo, S, Bascón, J, Zea-Bonilla, T, Martín-Sánchez, PM and Pérez-Jiménez, RM. 2008. First report of *Macrophomina phaseolina* causing crown and root rot of strawberry in Spain. Plant Pathology 57, 382–382.

Abosha, SS, Attaalla SI, El-Korany, AE and El-Argawy, E. 2007. Characterizacion of *Macrophomina phaseolina* isolates affecting sunflower growth in El-Behera governorate, Egypt. Int. J. Agric. Biol. 9:807-815.

Babu, BK, Saikia, R and Arora, DK. 2010 Molecular characterization and diagnosis of *Macrophomina phaseolina*: a charcoal rot fungus. In: Gherbawy, Y. and Voigt, K. (eds) *Molecular Identification of Fungi*. Springer, Berlin/Heidelberg, Germany, pp. 179–193.

Beas-Fernández, R., A. De Santiago A., Hernandez-Delgado, S. and Mayec-Pérez, N. 2006. Characterizacion of Mexican and non-Mexican isolates of *Macrophomina phaseolina* base on morphological characteristics, pathogenicity on vean sedes and endoglucanase genes. J. of Plant pathology 88:53-60.

Hawatema, MS. and Hameed, KM. 2006. Morphological and molecular studies on charcoal rot (*Mcrophomina phaseolina*) in Jordan. Phytopathology 96:S46-S47.

Karunanithi, K, Muthusamy, M, and Seetharaman, K. 1999. Cultural and pathogenic variability among the isolates of *Macrophomina phaseolina* causing root rot of sesamun. Plant Dis. Res. 14:113-117.

Mayek-Perez, N, Lopez-Castaneda, C, and Acosta-Gallegos, JA. 1997. Validation in vitro cultural characteristics of *Macrophomina phaseolina* isolates and its virulence on common bean. Agrociencia 31:187-195.

Mertely, J, Seijo, T. and Peres, N. 2005. First report of *Macrophomina phaseolina* causing a crown rot of strawberry in Florida. *Plant Disease* 89, 434–434.

Mihail, JD., and Taylor, SJ. 1995. Interpreting variability among isolates of *Macrophomina phaseolina* in pathogenicity, pycnidium production, and chlorate utilization. Can. J. Bot 73:1596-1603.

Omar, MR, Abd-Elsalam, KA, Aly, AA, El-Samawaty, AMA, and Verreet, JA. 2007. Diversity of *Macrophomina phaseolina* from cotton in Egypt: Analysis of pathogenicity, chlorate phenotypes, and molecular characterization, Z. Pflanzenk. Planzen. 114:196-204.

Pearson, CAS., Leslie, JF, and Schwenk, FW. 1986. Variable chlorate resistance in Macrophomina phaseolina from corn, soybean and soil. Phytopathology 76:646−649.

Puahalla, JE, Spieth, PT. 1985. A comparison of heterokaryosis and vegetative incompability among varieties fo *Gibberella fujikuroi (Fusarium moniliforme)*. Exp. Mycol.9: 39-47

Su, G, Suh, SO, Schneider, RW and Russin, JS. 2001. Host specialization in the charcoal rot fungus, *Macrophomina phaseolina*. *Phytopathology* 91, 120–126.

Sutton BC. 1980. The coelomycetes: fungi imperfecti with pycnidia, acervuli and stromata, *Commonw Mycol Inst Assoc Appl Biol, Kew*, England p696.

Zveibil, A. and Freeman, S. 2005. First report of crown and root rot in strawberry caused by *Macrophomina phaseolina* in Israel. *Plant Disease* 89, 1014–1014.