

ORIGINAL ARTICLE

Reactive oxygen species production, induced by atmospheric modification, alter conidial quality of *Beauveria bassiana*

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Abstract

Aim: The aim of this study was to determine the relationship between reactive oxygen species (ROS) production and conidial infectivity in *Beauveria bassiana*.

Methods and Results: *Beauveria bassiana* Bb 882.5 was cultured in solid-state culture (SSC) using rice under three oxygen conditions (21%, or pulses at 16 and 26%). Hydrophobicity was determined using exclusion phase assay. Bioassays with larvae or adults of *Tenebrio molitor* allowed the measurements of infectivity parameters. A fluorometric method was used for ROS quantification (superoxide and total peroxides). NADPH oxidase (NOX) activity was determined by specific inhibition. Conidial hydrophobicity decreased by O₂ pulses. Mortality of larvae was only achieved with conidia harvested from cultures under 21% O₂; whereas for adult insects, the infectivity parameters deteriorated in conidia obtained after pulses at 16 and 26% O₂. At day 7, ROS production increased after 16 and 26% O₂ treatments. NOX activity induced ROS production at early stages of the culture.

Conclusion: Modification of atmospheric oxygen increases ROS production, reducing conidial quality and infectivity.

Significance and Impact of the Study: This is the first study in which conidial infectivity and ROS production in *B. bassiana* has been related, enhancing the knowledge of the effect of O₂ pulses in *B. bassiana*.

Introduction

The entomopathogenic fungus (EF) *Beauveria bassiana* is a widely used biological control agent, as an alternative for chemical insecticides, due to its wide host range and high specificity (Zimmermann 2007). Conidia are the most efficient infective units, which are mainly produced in solid-state culture (SSC) (Ye *et al.* 2006; Garza-López *et al.* 2012, 2015). Additionally, conidial adhesion to the insect cuticle is an important step in the infective cycle of EF, and occurs through unspecific interactions attributed to hydrophobin-like proteins. Thus, it is important to determine

quality parameters of any process to produce conidia (Jeffs *et al.* 1999; Wösten 2001; Montesinos-Matías *et al.* 2011).

Beauveria bassiana is an aerobic organism that produces reactive oxygen species (ROS), such as superoxide anion and hydrogen peroxide, as a consequence of metabolic processes, mainly the respiratory chain or NADPH oxidases (NOX) activity (Aguirre *et al.* 2005). Cells have both enzymatic and nonenzymatic antioxidant defence mechanisms, which prevent biomolecule oxidation induced by ROS (Fridovich 1998; Aguirre *et al.* 2005). Furthermore, oxidative states promote cytodifferentiation in species belonging to *Beauveria*, *Metarhizium* and