Title Predictive modelling of temperature and water activity (solutes) on the in vitro radial growth of *Botrytis cinerea* Pers

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Abstract

The objective of this work was to develop validated models predicting the 'in vitro' effect of a_w and temperature on the radial growth of *Botrytis cinerea*. The growth rate (g, mm d^{-1}) of *B. cinerea* was calculated at three incubation temperatures (25 °C, 15 °C, 5 °C) and six water activities (ranging from 0.995 to 0.890). The water activity was adjusted with glucose, NaCl, glycerol, or sorbitol. Statistical analysis showed a significant effect of temperature, solute, a_w, and their two- and three-way interactions on the growth rate. No growth was observed at $a_w = 0.93$ in the presence of NaCl or at 0.89 in the presence of a non-ionic solute. The maximum colony growth rate decreased when the incubation temperature and water activity was lowered. Secondary models, relating the colony growth rate with a_w or a_w and temperature were developed. Optimum a_w values for growth ranged from 0.981 to 0.987 in glycerol-, sorbitol-, or glucose-modified medium and were close to 1 in NaCl-modified medium. A quadratic polynomial equation was used to describe the combined effects of temperature and a_w on g (mm d^{-1}) in the presence of each solute. The highest and lowest radial growth rates were observed in models based on glucose and NaCl respectively, whatever the incubation temperature. All models prove to be good predictors of the growth rates of *B. cinerea* within the limits of experiments. The quadratic polynomial equation has bias factors of 0.957, 1.036, 0.950, and 0.860 and accuracy factors of 1.089, 1.070, 1.120 and 1.260 in media supplemented with glucose, NaCl, glycerol and sorbitol respectively. The results from modelling confirm the general finding that a_w has a greater influence on fungal growth than temperature.