Probabilistic models for the effect of temperature, water activity and sodium metabisulphite concentration on the growth and OTA production boundaries of *Aspergillus carbonarius* isolated from Greek wine grapes

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Abstract

Black Aspergilli and in particular *A. carbonarius* have a central role in OTA contamination of grapes. Climatic factors could lead to fungal contamination and increase the risk of mycotoxins in these products.

Purpose: To develop a probabilistic modeling approach to determine the growth and OTA production boundaries of an *Aspergillus carbonarius* isolate on a synthetic grape juice medium as a function of water activity (a_w), temperature and sodium metabisulphite (NaMBS) concentration.

Methods: A full factorial design was implemented to assess the effect of diverse combinations of a_w (0.88, 0.90, 0.93, 0.98), temperature (15, 20, 25, 30, 35°C) and NaMBS (0, 50, 100, 150 ppm) on the growth rate and OTA production for a period of up to 28 days. Fungal growth was measured as changes of fungal diameter over time whereas OTA was determined by HPLC.

Results: No fungal growth and OTA was detected at 15°C and 0.88 a_w irrespective of NaMBH concentration. The highest level of NaMBS was effective to suppress growth and OTA production at all temperatures and a_w in the range of 0.88-0.93. In lower NaMBS levels growth and OTA production can occur at progressively decreasing a_w at all temperatures assayed. The degree of agreement between predictions and observations was 94.3% and 86.1% for OTA and growth boundaries, respectively.

Significance: Information on fungal-food ecosystem relations is indispensable to assess the risk of contamination of grapes by *A. carbonarius* and it could be employed in HACCP implementation plans.

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