Are guaiacol and halophenols the only ones to blame for the off-flavour spoilage by *Alicyclobacillus* spp.?

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1 INTRODUCTION

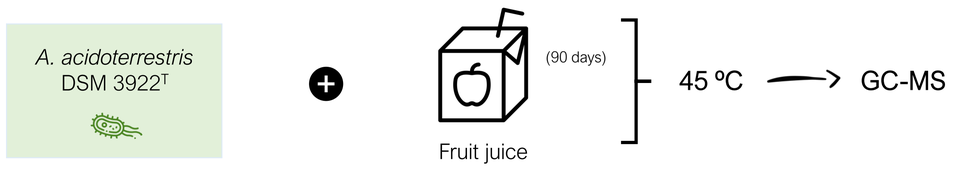
Industries that produce or use fruit-based products have faced several spoilage events, resulting in economic losses caused by product recalls and loss of consumer confidence.

Some of these events correlate to the presence of *Alicyclobacillus* (ACB) in food products since they can produce off-flavours and odours in the final products. Guaiacol (2-methoxyphenol) and halophenols (2,6-dichlorophenol – 2,6-DCP – and 2,6-dibromophenol – 2,6-DBP) have been widely explored as the major culprits of off-flavour spoilage by ACB and used to define spoilage ACB species. However, additional compounds might be correlated with these spoilage events.

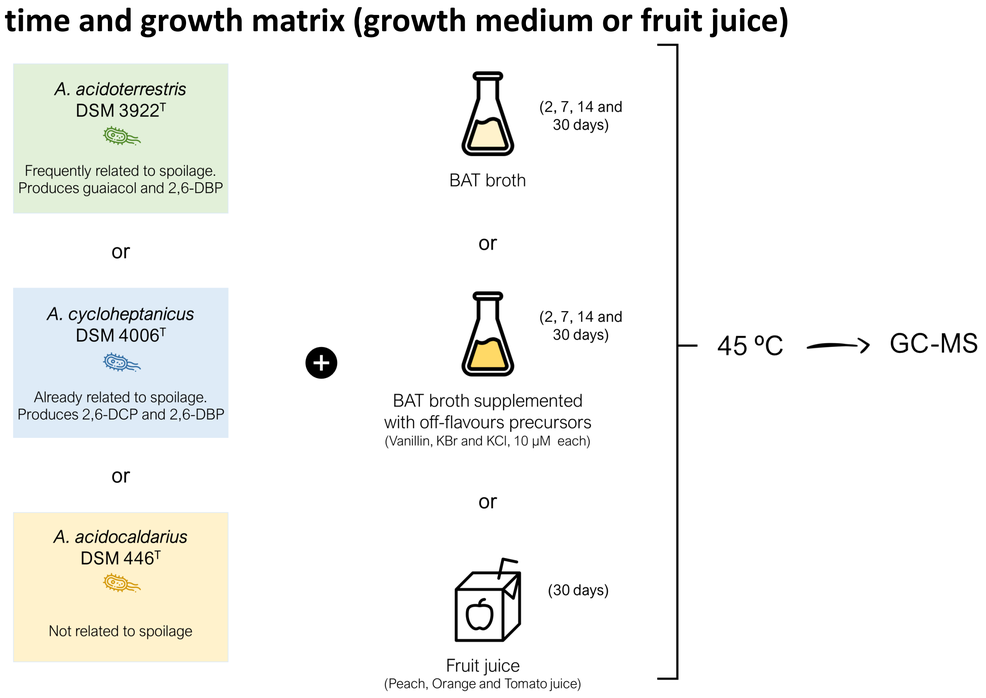
In this work, volatile metabolites produced by distinct ACB species were identified by GC-MS and investigated as potential spoilage-related compounds.

2 METHODS

I. Identification of off-flavours present in a fruit juice sample spoiled with ACB

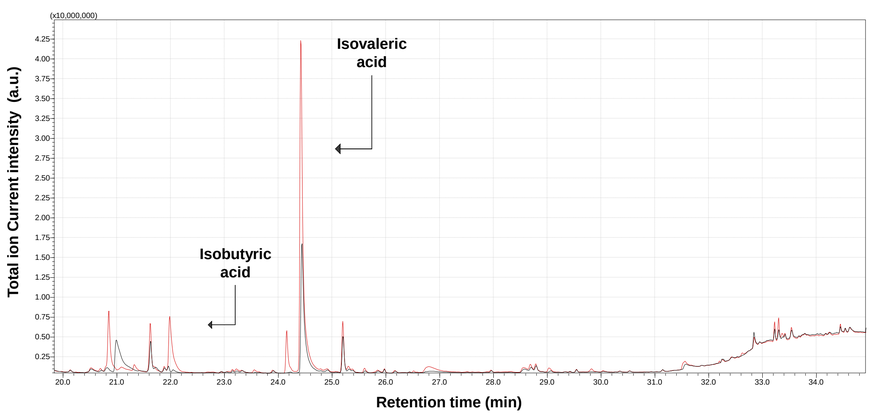


II. Identification and quantification of off-flavours produced by ACB depending on species, time and growth matrix (growth medium or fruit juice)

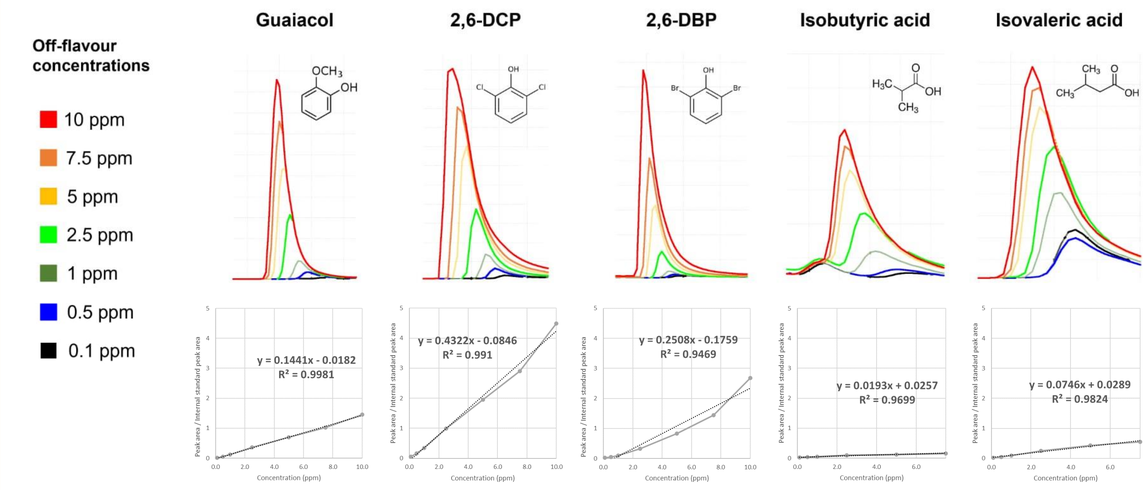


3 RESULTS

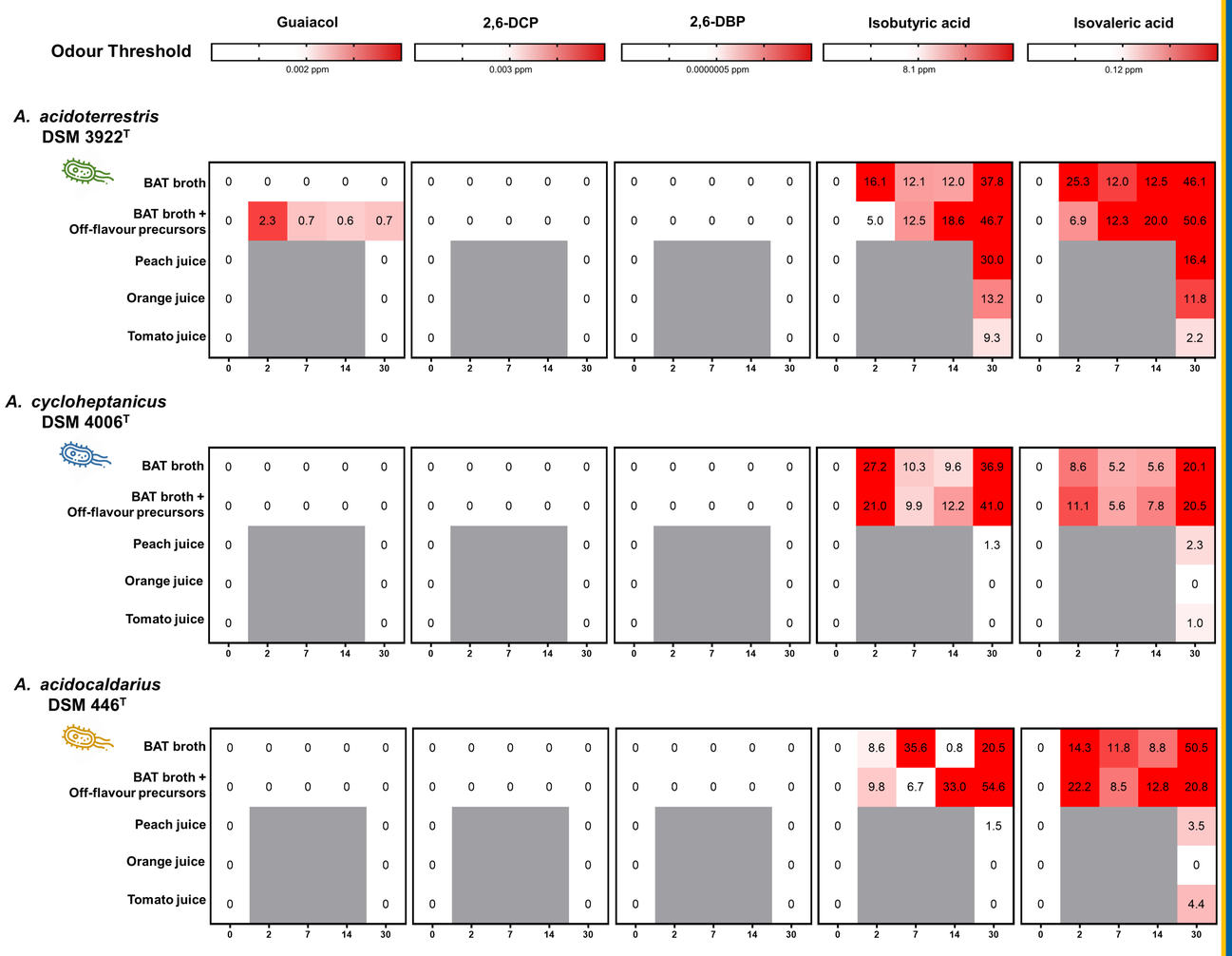
I. Off-flavours produced in a fruit juice sample with *Alicyclobacillus* spp.



II. Calibration curve for the quantification of the selected off-flavours



III. Off-flavours production in ppm depending on ACB species, time and growth matrix (growth medium or fruit juice)



4 CONCLUSIONS

In an artificially spoiled fruit juice with ACB, the expected guaiacol or halophenols were not identified, while **cheesy odours** were detected.

For the first time, isobutyric acid and isovaleric acid were identified as additional off-flavours responsible for fruit juice spoilage.

Guaiacol:
- Only detected in supplemented laboratory medium by *A. acidoterrestris*, after 2 days of incubation
- Not detected in any other condition tested

Halophenols (2,6-DCP and 2,6-DBP):
- Not detected in any of the conditions tested (laboratory medium or fruit juices)

Isobutyric acid:
- Produced by all species above the odour threshold, in laboratory medium
- Only detected above the odour threshold in fruit juices by *A. acidoterrestris*

Isovaleric acid:
- Produced by all species above the odour threshold, in laboratory medium and fruit juices, except for orange juice by *A. cycloheptanicus* and *A. acidocaldarius*

The **spoilage potential** of *A. **cycloheptanicus*** **and *A. acidocaldarius*** appears to be **dependent on the growth matrix** and mainly related to the production of isovaleric acid.

However, ***A. acidoterrestris*** presented a **transversal spoilage** potential not due to the previously described off-flavours but with the production of the newly described isobutyric and isovaleric acids.

The risk assessment currently used in the industry for ACB control should be revised to accommodate these new findings.

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