

OCHRATOXIN A DEGRADATION BY *BOTRYTIS CINEREA* LACCASE: EFFECT OF OENOLOGICAL FACTORS AND REDOX MEDIATORS

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INTRODUCTION



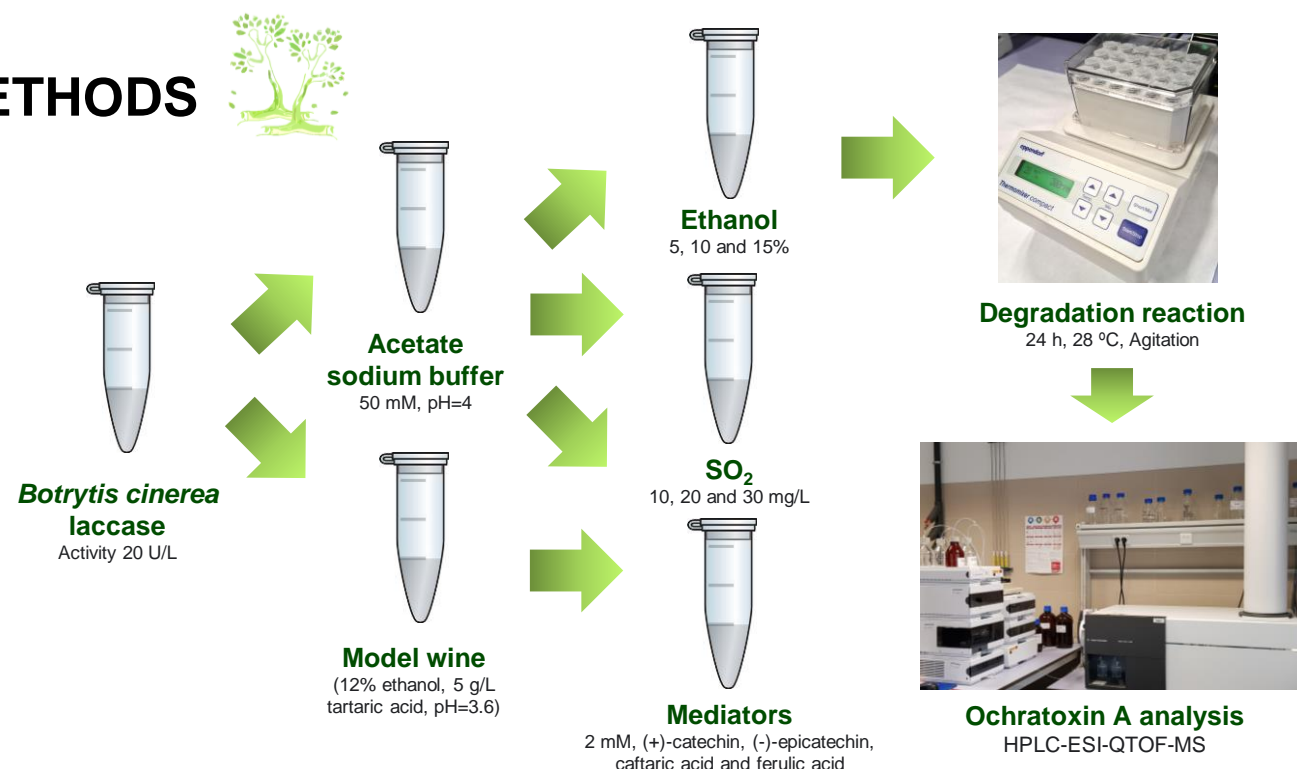
Ochratoxin A (OTA) is a potent mycotoxin produced by the secondary metabolisms of filamentous fungi. Several species of *Aspergillus* and *Penicillium* are the main source of this mycotoxin in grapes, and therefore in wine. Due to its risk to human health, different detoxification techniques have been developed in various kinds of foodstuffs. The use of fungal or bacterial laccases is a biological method to reduce the concentration of Ochratoxin A [1, 2]. Laccases are enzymes belonging to the blue multicopper oxidase family that catalyze a wide range of substrates, but some of them cannot be oxidized directly by these enzymes and require the use of redox mediators [3].

AIM

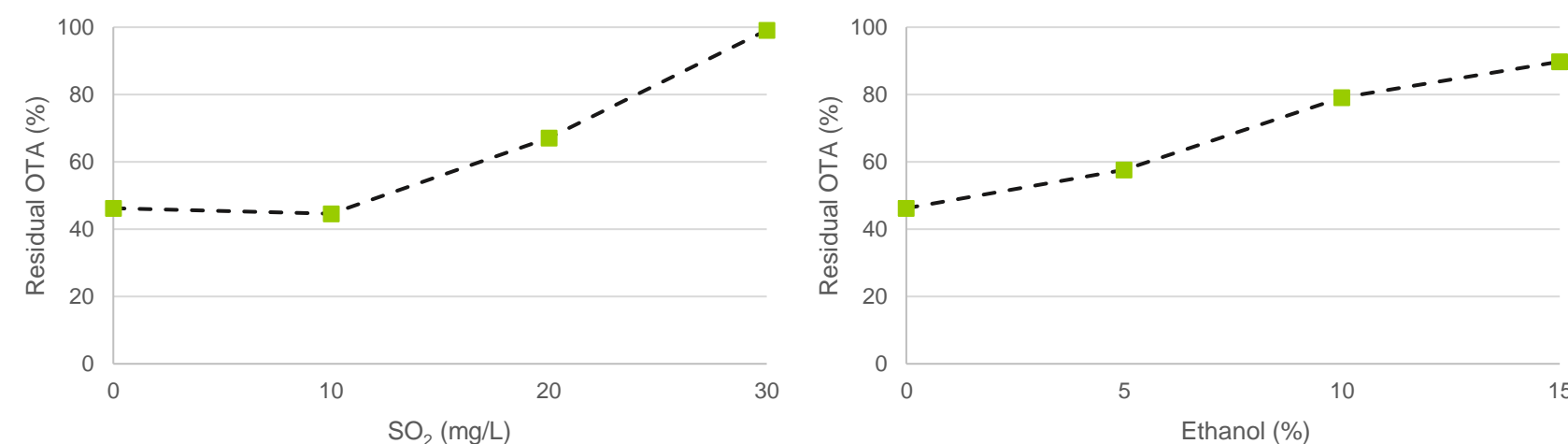
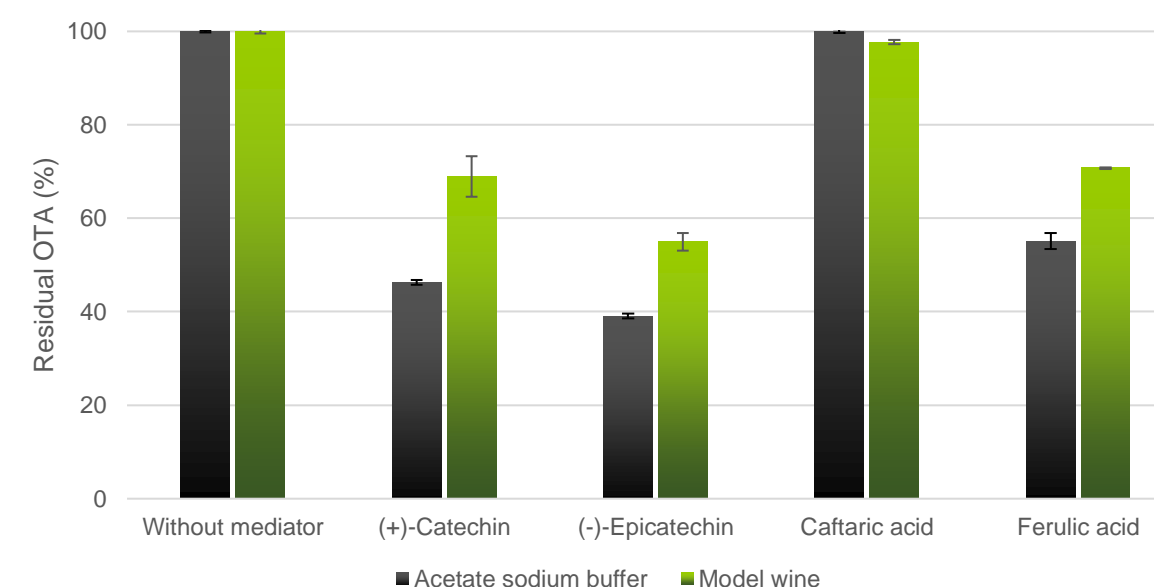


The aim of this work was to evaluate the effect of different oenological factors and natural mediators on the degradation of Ochratoxin A using *Botrytis cinerea* laccase.

METHODS



RESULTS



OTA cannot be oxidized directly by *Botrytis cinerea* laccase under these conditions. (-)-Epicatechin and (+)-catechin were the redox mediators with higher impact on the reduction of this mycotoxin. Using (+)-catechin as mediator in buffer, the degradation of OTA was completely inhibited by 30 mg of SO₂/L, while 10 mg of SO₂/L hardly caused any effect on the mycotoxin levels. A concentration of 15% of ethanol led to a 50% reduction in the activity of laccase over OTA.

REFERENCES

- Chen W, Li C, Zhang B, Zhou Z, Shen Y, Liao X, Yang J, Wang Y, Li X, Li Y, Shen XL. 2018. Advances in biodegradation of ochratoxin A-A review of the past five decades. *Frontiers in Microbiology* 9:1386.
- Loi M, Fanelli F, Liuzzi V, Logrieco A, Mulè G. 2017. Mycotoxin biotransformation by native and commercial enzymes: Present and future perspectives. *Toxins* 9:111.
- Gunne M. 2014. Identification and optimization of novel bacterial laccases. Ph.D. Thesis. Heinrich-Heine-Universität Düsseldorf.

CONCLUSIONS

Botrytis cinerea laccase permits to reduce the concentration of Ochratoxin A, but a redox mediator is necessary. SO₂ and ethanol have influence on the OTA degradation due to its inhibitory effect on laccase activity. These preliminary results may be a first step in finding biological alternative strategies to eliminate undesirable substances such as mycotoxins present in wine.

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