



Topic 8: From Field to Consumers: Challenges and Approaches to High-Quality Agricultural Products

Evaluation of biobased solutions for mycotoxin mitigation on stored maize

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Introduction



Objectives



Material and methods



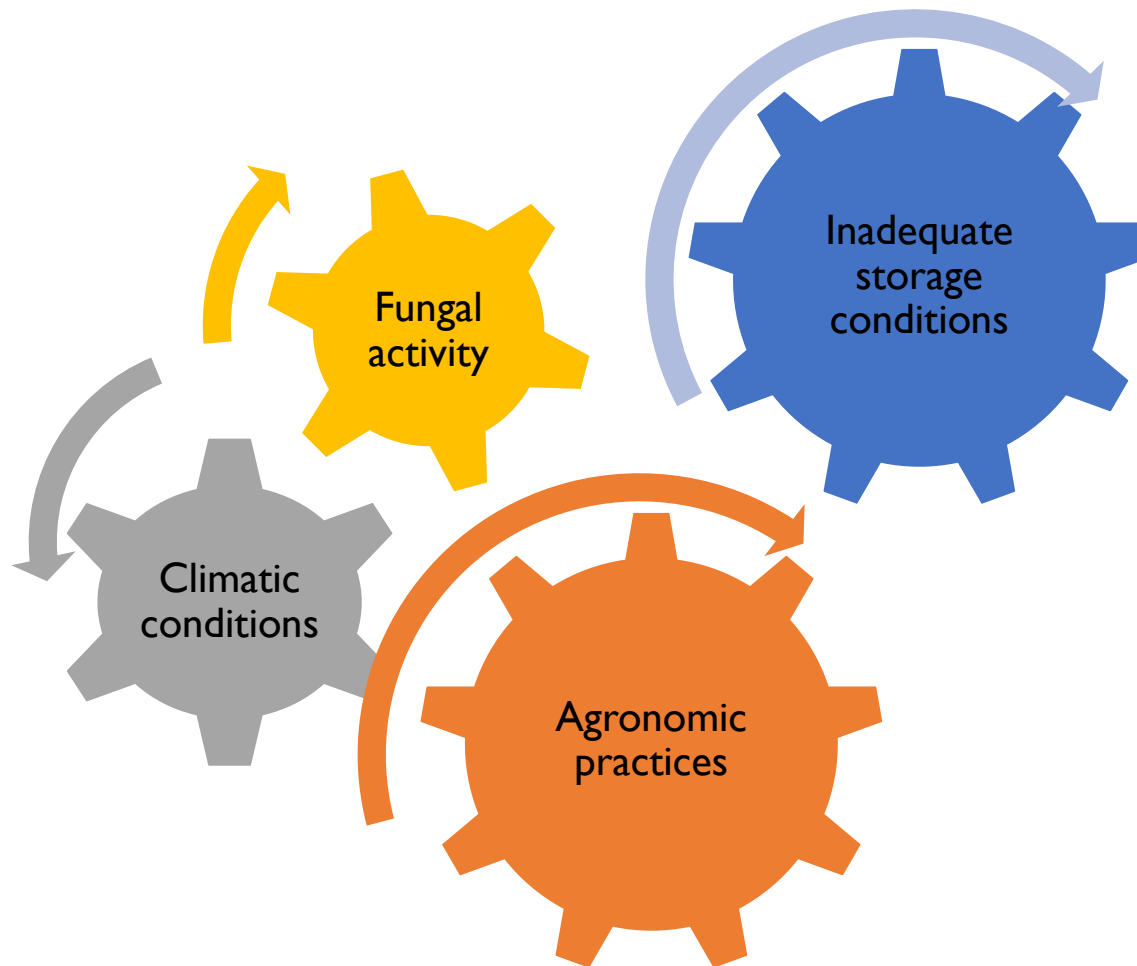
Results and discussion



Conclusion

Introduction

Mycotoxins' contamination may occur at field level, in farms after harvesting and during the storage process



Introduction

The search for biobased solutions as natural alternatives to mitigate the occurrence of mycotoxins is a current challenge



Mustard seeds

- Rich in glucosinolates
- Isothiocyanates molecules
- Fungicidal
- Bactericidal
- Insecticidal activity



Rice bran oil

- Anti-inflammatory
- Antimicrobial
- Antioxidant activity

Objectives



Evaluate the effect of biobased solutions

- mustard seeds
- rice bran oil

to mitigate the occurrence of mycotoxins on maize grains

stored for 10 months

Material and methods

Sampling

M1 - fertilization with macro- and micronutrients (N, P, and Zn) and a supplement with an antifungal treatment using F-BAC was applied

M1-T - 0.2 % (w/w) of seed mustard

M2 - no reinforcement treatment

M2-T - 1% (v/w) of rice bran oil

Determination of mycotoxins in samples

Extraction

The analytical procedure used to quantify the mycotoxins content of maize grains is described by Silva et al. [1].

UHPLC-ToF-MS Analysis

- Aflatoxins
- Fumonisin
- Toxin T2
- Zearalenone

quantified by method described by Silva et al. [1]

DON analysis

Detection and semi-quantitative screening of DON in maize were performed using the method described by Freitas et al. [2].

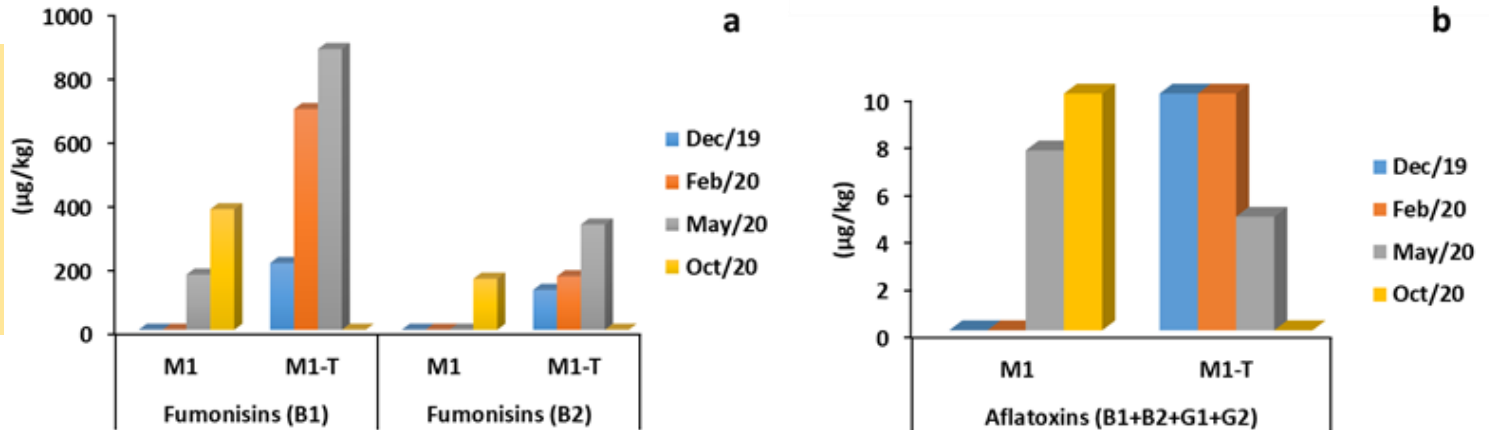
[1] Silva, A.S.; Brites, C.; Pouca, A.V.; Barbosa, J.; Freitas, A. UHPLC-ToF-MS method for determination of multi-mycotoxins in maize: Development and validation. *Curr. Res. Food Sci.* **2019**, *1*, 1–7, doi:10.1016/j.crf.2019.07.001.

[2] Freitas, A.; Barros, S.; Brites, C.; Barbosa, J.; Silva, A.S. Validation of a Biochip Chemiluminescent Immunoassay for Multi-Mycotoxins Screening in Maize (*Zea mays* L.). *Food Anal. Methods* **2019**, *12*, 2675–2684, doi:10.1007/s12161-019-01625-1.

Results and Discussion

Influence of mustard seeds treatment in stored maize

The levels of fumonisins and aflatoxins in M1 increased during the storage period.



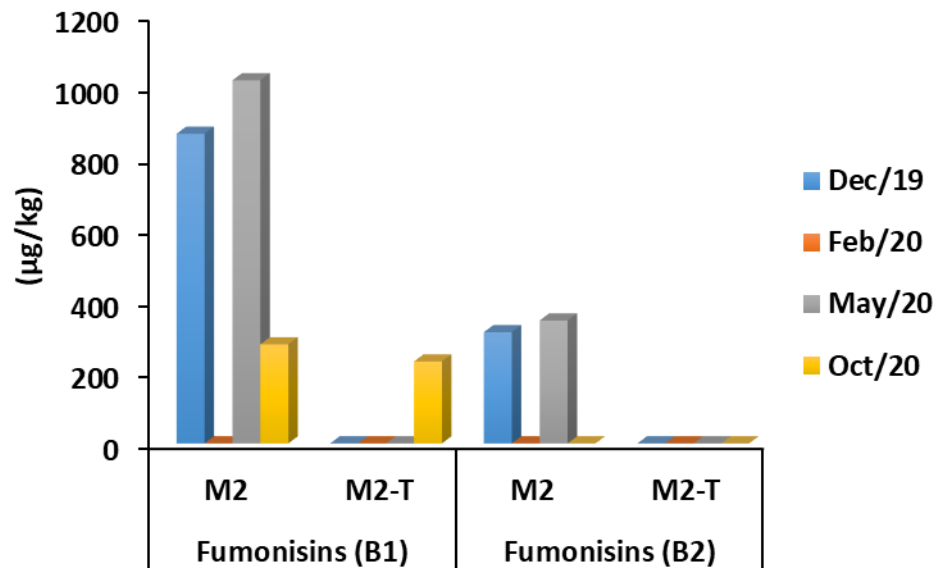
- ❑ Contents of fumonisins were below the limits established by the EU after 10 months of storage, the levels of aflatoxins exceeded the authorized limits of $10 \mu\text{g}/\text{kg}$.
- ❑ Unexpectedly, fumonisins seemed to have a higher tendency of increasing in M1-T barrel, however, after 10 months, no fumonisins B1 and B2 were detected.

Mustard treatment reduced the aflatoxins content in 50% between each measurement time:

- 2 months of storage, → $10 \mu\text{g}/\text{kg}$
- 5 months → $4.8 \mu\text{g}/\text{kg}$
- 10 months → no aflatoxins

Results and discussion

Influence of rice bran oil treatment in stored maize

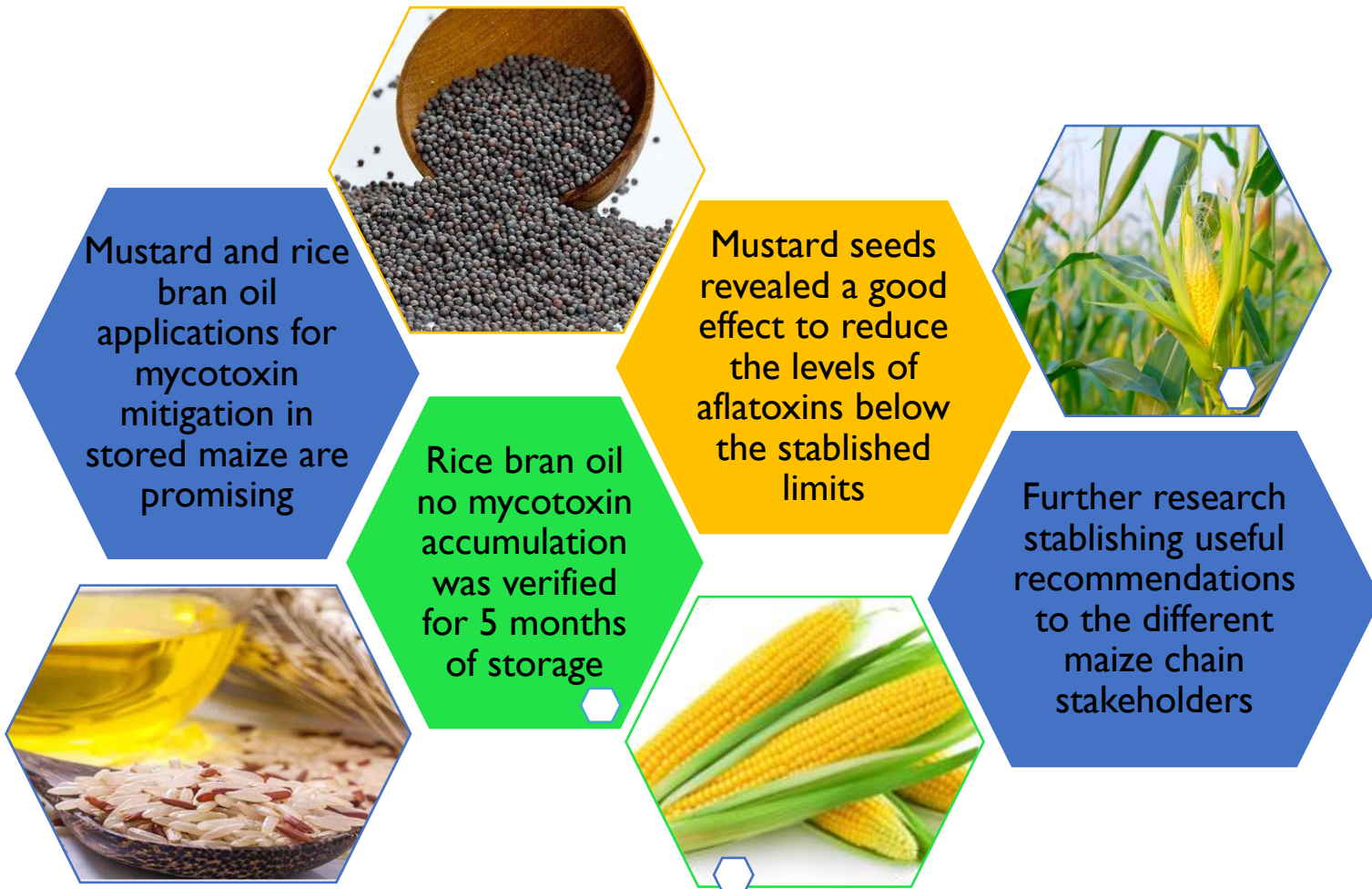


❑ M2 revealed high levels of fumonisins (B1), during the first 5 months of storage (May/20) and a reduction to 278 $\mu\text{g}/\text{kg}$ after 10 months of storage (Oct/20).

❑ Fumonisin B2 was not detected after 2 months and 10 months of storage

- ❑ Rice bran oil exhibited a positive effect to mitigate the accumulation of mycotoxins during storage in barrels.
- ❑ In the first 5 months of storage, no mycotoxins were not detected.
- ❑ Further experiments must be done, including a second application after 6 months of storage is expected to keep the effect of rice bran oil as an inhibitor of mycotoxins accumulation.

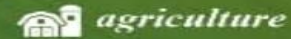
Conclusions



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Thank you for your attention

Acknowledgements

This research was funded by the National Funds by Rural Development Program through the Operational Group QUALIMILHO, New sustainable integration strategies that guarantee quality and safety in the national maize, PDR2020 n° 101-031295 (2017–2020). This work was also supported by FCT, Portuguese Foundation for Science and Technology through the R&D Unit, UIDB/04551/2020 (GREEN-IT, Bioresources for Sustainability), the projects UIDB/00211/2020 and UIDB/04033/2020.