NEW INSIGHTS FOR MYCOTOXIN MITIGATION IN THE MAIZE CHAIN

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BACKGROUND

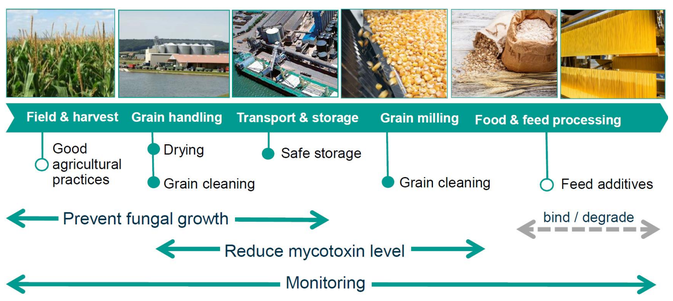
Mycotoxins are a risk for consumers due their severe health effects such as liver impairments, carcinogenic and genotoxic properties.

In Europe, the predominant mycotoxins on maize (*Zea mays L.*) crops are produced by *Fusarium*.

In particular, fumonisins were the most frequently detected in maize harvested in South Europe as a result of fungal infection by *Fusarium verticillioides*.

To minimize the risk of maize mycotoxin accumulation, an integrated value chain approach is needed, starting from good agricultural practices in the field, to control measures on post-harvest management, to prevent mycotoxin production during storage and over the process industry, until final consumption (Figure 1).

Figure 1 – A value chain approach for preventing and reducing mycotoxins (from Buhler, 2019)



APPROACH

In the scope of QUALIMILHO multiactor project (Operational Group), multi-mycotoxin determination methods were implemented based on a Biochip Chemiluminescent Immunoassay[1] for screening and on a liquid chromatography coupled with mass spectrometry[2] for confirmation.

The ongoing studies are investigating the levels of mycotoxin contamination in the field and remediation tools for post-harvest reduction.

Different maize varieties were analyzed from INOVMilho[3] trials and samples collected in farms, nine suspected contaminated ears by visual inspection were separated from the healthy material, the images were recorded and levels of multi-mycotoxin quantified.

RESULTS

The levels of mycotoxin obtained from Biochip Chemiluminescent Immunoassay reveals only fumonisins and significant higher levels for suspected six ears compared with the remain sample (Table 1, Figure 2). In the case of P0933 maize variety and in two suspected ears (Figure 3) the differences in fumonisins levels are negligible.

Figure 3 –Suspected contaminated ears with fumonisins < 1000 µg/Kg

P0933 (1,2,3)

Table1 - Biochip Chemiluminescent Immunoassay Fumonisins B1+B2 (µg/kg) data for 9 suspected contaminated ears and correspondent remain sample

Sample code	Fumonisins B1+B2 (µg/kg)
UA1	<125
Suspected ear	>1000
JC3	530
Suspected ear	>1000
JC5-1	<125
Suspected ear	>1000
JC5-2	<125
Suspected ear	>1000
AL1	235
Suspected ear	>1000
AL3	153
Suspected ear	>1000
P0933-1	<125
Suspected ear	<125
P0933-2	<125
Suspected ear	252
P0933-3	<125
Suspected ear	813

Figure 2 –Suspected contaminated ears with fumonisins > 1000 µg/Kg

UA1

JC3

JC5-1

JC5-2

AL1

AL3

Factors impacting in fumonisin concentration

- *Fusarium* species generally infect through wounds
- Most wounds on maize caused by insect damage (e.g. European corn borer)
- Combination of efficient cleaning technologies to remove contaminated fractions

CONCLUSIONS

Adequate management of insect damage is essential for decrease *Fusarium* contamination in field and subsequent grain cleaning has great impact in mycotoxin reduction along the maize chain.

The data obtained can be useful for the development of specific optical sensors applied in the elimination of mould-infected grains, one efficient tool for reducing the level of mycotoxins contamination in the maize chain.

REFERENCES

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[2] Silva AS, Brites C, **Vila Pouca A,** Barbosa J, Freitas A (2019). UHPLC-ToF-MS method for determination of multi-mycotoxins in maize: Development and validation. *Current Research in Food Science* 1:1-7.

[3] INOVMilho- Portuguese Center for Competence in Maize and Sorghum Cultures (Coruche).

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