

# Reducing mycotoxin content in maize in Catalonia

## Summary

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The most relevant mycotoxins found on maize during the campaigns 2016 and 2017 have been: the fusaric acid, the fumonisin, the trichothecene and the zearalenone. The variety of maize have shown distinct tolerance to the fumonicines being the transgenic varieties the ones having the lowest risk of reaching intoxicated. Good practices in the field, such as applying rotations, controlling the seeding, collecting and hydrating dates without delays contribute to minimize the risk of contamination. The early detection of mycotoxigenic fungus and its mycotoxins as well as a proper evaluation of agronomic factors facilitate the application of preventive actions and the management of the field. The results obtained have been transferred by preparing informative open sessions and a guide for the field workers.

## Objectives

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The main objective of the project is to reduce the content of mycotoxins produced in the field by fungus *Fusarium* in maize from Catalonia.

The specific objectives are planned as follows:

- To evaluate the susceptibility of commercial hybrid maize.
- To determine the efficiency of good practices in the field.
- To saddle proper and fast protocols of the detection of contamination in order to apply preventive actions more efficiently.
- To transfer the results of the project to production sector.

## Description of project activities

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The project is divided into 7 main activities:

Activity 1. Elaboration of maps of risk in catalan production areas.

Activity 2. Evaluation of the sensibility of the variety of maize in mycotoxin.

Activity 3. Study of the impact of agriculture practices on the mycotoxin content.

Activity 4. Early detection of mycotoxin derived from fungus of the *Fusarium* genus in the cultivation of maize.

Activity 5. Study of the influence of the hydric stress on the final content of the grain in mycotoxin.

Activity 6. Determination of the content of mycotoxins in grain yield of maize in the main Catalans production, on the basis of analytics of farmers' fields areas.

Activity 7. Transfer of the results to technicians and farmers of the sectors involved.

## Final results and practical recommendations

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- The most frequent mycotoxins in maize identified within this project have been fusaric acid, fumonisines, trichothecenes (DON) and zearalenones (ZEA).
- The tolerance to mycotoxins has varied depending on the variety of maize. Some of the most susceptible ones to fumonisines are P1574, P1574Y and P1758Y.
- The transgenic variety derived from MON810 present often a content of fumonisines lower than its isogenic conventional ones.
- *Helicoverpa* sp. can also have a determinant role in the contamination by fumonisines.

- The climatology, mainly parameters such as temperature and raining frequency, is one of the most important factors controlling the content of mycotoxins. It is important to gain good prediction models and to study the risk of contamination before the recollection.
- The detection on field of fungus which potentially produce mycotoxins by using the in-situ PCR techniques, especially during pre-seeding periods, results useful for the management of the risk associated to the production of mycotoxins in maize.
- Normally, the content of mycotoxins rises while delaying the seeding and recollection periods.
- The delayed seeding with too many long cycles may show a higher content of mycotoxins in comparison to short cycles, because the delay of the growing period in favorable climatologically conditions provokes the development of fungus.
- A recommendation is to avoid the seeding of maize in monoculture.
- The stress, principally hydric type, facilitated the contamination of fumonisines.
- The application of the managing matrix for seedings proposed by Maiorano et al. (2009), which evaluates the risk of exposition to fumonisines, resulted satisfactory for varieties of conventional maize. The predictive model classified correctly the 86% and the 79% of the cases under study in Poal (Lleida) and La Tallada d'Empordà (Girona), respectively.
- The reflectance probe and the portable IR equipment (Bruker) have shown having potential applications to discriminate samples of maize with concentrations of fumonisines higher than 2000 µg/Kg. The results obtained during the project have been transferred to the production and transforming sector by organizing open sessions and by creating a guide of culture.

## Conclusions

To reduce the risk of mycotoxins on the field, the variety of maize needs to be accurately selected, such as transgenic species, and the seeding needs no excessive delays on the date of recollection, avoiding hydric stress and monocultures. The early determination of mycotoxigenic fungus and its mycotoxins, as well as the application of the model of risk evaluation depending on agronomic factors allows improving the efficiency and productivity of the agriculture exploitation, the quality of the food and the security of the feed destined to the animals. To dispose of the right information before recollection helps the application of preventive actions and the management of the collection periods in order to minimize the risk of contamination.

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### Keyword-category

Agricultural production system  
Farming practice  
Food quality / processing and nutrition  
Pest / disease control

### Territorial scope

<b>Province</b>	<b>County</b>
Lleida	Urgell
Girona	Osona
	Noguera
	Garrigues
	Baix Empordà
	Alt Urgell
	Alt Empordà

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### Project dissemination *(publications, seminars, multimedia...)*

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- Jornada tècnica. Blat de moro i Micotoxines. La Tallada d'Empordà (5 de setembre de 2017).
- Jornada tècnica. Cooperació per a la Innovació. Resultats dels Grups Operatius 2015. Sector Agrícola. Barcelona (21 de juny de 2017).

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### Pàgina web del projecte

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<http://www.esporc.com/projecte-micocat/>

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### Other project information

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Altres jornades de difusió:

- Jornada per ANOVE. La Tallada d'Empordà (12 de gener del 2017).
- XVI Jornada intercomarcal sobre el cultiu del panís. Reducció del contingut en micotoxines en panís gra i farratge. Mollerussa (23 febrer 2017).
- Jornada CESFAC, Cooperatives Agroalimentàries, MAGRAMA. Madrid (5 d'abril de 2017).

Difusió a revistes:

"Incidencia de determinadas prácticas de cultivo en el contenido final de micotoxinas en maíz" publicat a la revista Tierras de Castilla y León. Agricultura. 2017. Número 250.

"Investiguem com reduir les micotoxines en blat de moro" Revista de les cooperatives agràries. Número 82. Abril 2016. Pàgina 13.

"Una producció de blat de moro més sana". Extensius.cat. 10 de novembre de 2016.

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### Projecte period

### Approved budget

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Starting date (month-year): Gener 2016	<b>Total Budget:</b>	<b>268.011,28 €</b>
End date (month-year): Setembre 2017	<i>Funding source DARP:</i>	110.243,82 €
Project status: <i>Finalised</i>	<i>Funding source UE:</i>	83.166,39 €
	<i>Own funds:</i>	74.601,08 €

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*Basic regulation: Ordre ARP/258/2015, de 17 d'agost, per la qual s'aproven les bases reguladores dels ajuts a la cooperació per a la innovació a través del foment de la creació de grups operatius de l'Associació Europea per a la Innovació en matèria de productivitat i sostenibilitat agrícoles i la realització de projectes pilot innovadors per part d'aquests grups, i es convoquen els corresponents a 2015.*

*Id. projecte: 20 2015*