

Debate 2004'0831: Bt maize and mycotoxins, a second documentation

Dear Friends,

please respond to klaus.ammann@ips.unibe.ch, not to bernedebates@bio-scope.org

Debate 2004'0822: Bt maize and reduced mycotoxins provoked lots of comments and additions, which are summarized here, including an enhanced bibliography, it grew from 500 to nearly 1000 references. Thanks to all the contributors.

See the previous Berne Debate about maize and mycotoxins under:

<http://www.botanischergarten.ch/BerneDebates/Debate-2004-0822-Bt-maize-and-mycotoxins--a-documentation.pdf>

Correction: *Ustilago maydis*, Corn Smut in the US, Huitlacoche in Mexico are not containing toxic fumonisins.

Huitlacoche (or cuitlacoche) and fumonisins are not related. I was not able to find a single bibliographical record where any of the mycotoxins in question was related to *Ustilago maydis*,

but there is a lot of misleading information on the internet, see for instance:

<http://www.halfmoon.org/story/smut.html>

"Corn smut in the US a disease, in Mexico its a delicacy", but this does not mean, that the US consider corn smut as a disease because its toxic, only because there is no real market to sell the infected cobs which they sell in Mexico for a much higher prize (recently efforts in this direction have been made in the States).

Huitlacoche (or as a variant cuitlacoche) is caused by a fungus with the name of *Ustilago maydis*, its a basidiomycete Ustilaginales, Ustilaginaceae, the Genus *Ustilago* (Persoon) Roussel 1806

>From the *Ustilago maydis* database located and maintained at the Broad Institute at the MIT. http://www.broad.mit.edu/annotation/fungi/ustilago_maydis/

Ustilago maydis, the causal agent of corn smut disease, has been used for over 100 years as a model system for studying genetics and pathogen-host interactions. Recently, the fungus has emerged as an excellent experimental model for the molecular genetic analysis of phytopathogenesis, particularly in the characterization of infection-specific morphogenesis in response to signals from host plants.

Corn Ear Rot: a multitude of fungal infects of corn

When evaluating an ear rot problem, remember, certain ear rots are a warning sign to suspect toxins, but ear rots do not always lead to toxin problems. Many fungi are not known to produce toxins. Even those that can produce toxins do not always do so.

important Ear Rots:

see <http://www.ipm.iastate.edu/ipm/icm/1996/10-7-1996/earrotid.html>

(the complete index of plant diseases

<http://www.ipm.iastate.edu/ipm/icm/indices/plantdiseases.html>)

Fusarium verticilloides (synonym *F. moniforme*),

Fusarium verticilloides is an important mycotoxigenic fungus and is found wherever maize, its primary host, is cultivated. *F. verticilloides*, like most *Fusarium* species, produces the mycotoxin fusaric acid.

Aspergillus ear rot and storage mold. *Aspergillus flavus* and *A. parasiticus* can produce aflatoxins. They are generally known as storage fungi, but they can also cause ear rots in the field. *Aspergillus* is a gray-green, powdery mold. In Iowa, *Aspergillus* is much more common in hot, dry years. It can grow at temperatures higher than 90° F, and grain moisture content as low as 15 percent. The fungus can be detected in corn because it produces compounds that are fluorescent under black light, but this does not directly detect the presence of aflatoxins.

Cladosporium ear rot. *Cladosporium herbarum* and other species often infect kernels damaged by insects, hail, or frost. This fungus appears gray to black or very dark green, and can have a powdery appearance. It also causes black streaks in the kernels. This disease can be fairly common but usually does not cause extensive damage to the ears.

Diplodia ear rot. This fungus initially appears as a white mold beginning at the base of the ear. The mold and the kernels then turn a grayish brown color and rot the entire ear. Diplodia ear rot occurs most often in fields under reduced tillage where corn follows corn.

Gibberella ear rot is caused by the fungus *Gibberella zeae*, also known as *Fusarium graminearum*. It can be identified most readily by the red or pink color of the mold. In some cases, the color appears white. It usually begins at the tip of the ear. *Gibberella* will sometimes rot the entire ear. *Gibberella* ear rot infections occur more commonly when the weather is cool and wet after silking and through the late summer. *Gibberella* can produce vomitoxin and zearalenone.

Perfect images:

<http://www.ipm.iastate.edu/ipm/icm/1996/10-7-1996/earrotid.html>

Mycotoxins

Informativ webpages with lots of links:

<http://www.mold-help.org/fungalbionics.htm>

<http://www.oardc.ohio-state.edu/ohiofieldcropdisease/Mycotoxins/mycopagedefault.htm>

just one example on fumonisins:

Fumonisins are toxins produced by *Fusarium* species that grow on several agricultural commodities, mainly corn, in the field or during storage. The disease, Fusarium kernel rot of corn, is caused by *Fusarium verticillioides* and *F. proliferatum*, common producers of fumonisin.

More than ten chemical forms of fumonisins have been isolated, of which FB1 is the most prevalent in contaminated corn and is believed to be the most toxic.

Fusarium is also important in human medicine

<http://www.doctorfungus.org/thefungi/fusarium.htm>

So far the story (the previous debate infos not repeated here) about the Bt crops reducing mycotoxin contents.

A much wider, excellently documented perspective is given in

Gressel, J., Hanafi, A., Head, G., Marasas, W., Obilana, B., Ochanda, J., Souissi, T., & Tzotzos, G. (2004)

Major heretofore intractable biotic constraints to African food security that may be amenable to novel biotechnological solutions. *Crop Protection*, 23, 8, pp 661-689

<http://www.botanischergarten.ch/Mycotoxins/Gressel-African-bioconstraints.pdf>

see my comments in: <http://www.facultyof1000.com/article/nonpub48839/evaluation>
It should be noted that in developing countries the mycotoxin problems are serious due to infections in the field, but also due to the serious problems of post harvest diseases.

and finally a link to the enhanced, nearly doubled bibliography, it contains mycotoxin papers related to agriculture.

<http://www.botanischergarten.ch/Mycotoxins/Bibliography-Mycotoxins-20040827.pdf>

Bibliography extracted from the Web of Science 27. August 2004,
keywords maize, mycotoxin, fumonisin, transgenic, enhanced with lots of references and cross references from correspondence with Debate participants.

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