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SILOSOLVE® FC may prevent the synthesis of some postharvest associated mycotoxins in maize silage

By: Ivan Eisner,
Senior Product Manager, Silage Inoculants

Take home message

SILOSOLVE® FC treated silage had significantly lower concentration of postharvest associated mycotoxin *Roquefortine C*.

Introduction

Silages can be contaminated with several mycotoxins. There are two types of mycotoxins usually observed in the silages. Preharvest contamination of forages by *Fusarium*, *Aspergillus* and *Alternaria* fungi can lead to contamination of silages with well known mycotoxins deoxynivalenol (DON), zearalenone (ZEA), fumonisins and aflatoxins. Postharvest spoilage is dominated by *Penicillium roqueforti*, *Penicillum paneum*, *Aspergillus fumigatus* and *Zygomycetes*. *P. roqueforti* and *P. paneum* are the most commonly found fungi in silage. Growth of *P. roqueforti* and *P. paneum* is often seen in silage either in layers, on the surface or as lumps in the middle of stacks. The colour is green often in grey or blue shades. *Roquerfortine C* and *Mycophenolic* acid are typical postharvest associated mycotoxins produced by *P. roqueforti* and *P. paneum*. Exposure to dietary mycotoxins can negatively affect health and performance of cattle. Therefore, the control of mycotoxins in the feed is very important from nutritional and safety points.

The recent study of Gallo *et al.* (2018) examined the effect of SILOSOLVE® FC treatment on fermentation, dry matter loss, aerobic stability and mycotoxins contamination of maize silage at two different densities.

Study design

Four treatments were prepared: untreated control at low density (132 ± 6 kg DM/m^3), untreated control at high density (186 ± 6 kg DM/m^3), SILOSOLVE® FC treated at low density and SILOSOLVE® FC treated at high density. The fermentation profile, aerobic stability, and DM losses were measured after 2, 4, 8, 16, and 32 days after ensiling. Chemical composition, microbial counts, and concentrations of mycotoxins were analyzed in the fresh and 32 days samples.

Results

Inoculation and use of a greater silage density improved aerobic stability of silages (data available in the original paper). The concentration of mycotoxins detected in the treatment is shown in Table 1.

There were several significant effects of SILOSOLVE® FC on mycotoxin contamination in the maize silage. The treated silages showed significantly lower concentration of *Roquerfortine C* after 32 days of ensiling. Both *Mycophenolic* acid and *Roquerfortine C* are postharvest associated mycotoxins produced by *Penicillium requerforti* and *P. paneum*. Conversely, greater contamination with fusaric acid (a preharvest mycotoxin produced by *Fusarium* spp.) were found in the SILOSOLVE® FC treated silage compared to control. At the same time, SILOSOLVE® FC significantly decreased the concentration of other *Fusarium* spp. associated mycotoxin *Fumonisin B2*.

Table 1: Effect of inoculation and forage density on the concentration of mycotoxins in maize silage before and after 32 days of ensiling*

Items µg/kg DM	Untreated			SILOSOLVE® FC		
	Before	LD	HD	Before	LD	HD
Aflatoxin B1	1.01	0.632	0.506	0.17	0.225	0.285
Fumonisin B1	4415	4263	4007	5276	3906	3380
Fumonisin B2	2188	491^a	334^a	3038	312^b	244^b
Fusaric acid	---	2915^a	2783^b	---	5187^c	3163^d
Mycophenolic acid	---	13.13	5.53	---	2.45	0
Roquerfortine C	---	16.90^a	28.72^a	---	2.15^b	4.63

* Values with different superscripts are different at $P<0.05$
LD – low density of 132 ± 6 kg DM/m^3
HD – high density of 186 ± 6 kg DM/m^3

Conclusions from the study

SILOSOLVE® FC contains two bacterial strains that work synergistically to reduce spoilage. *Lactococcus lactis* 0224 prevents the growth of yeasts and molds by eliminating residual oxygen. In addition, *Lactobacillus buchneri* preserves silage by producing acetic acid, which controls the growth of spoilage microorganisms and increases aerobic stability. The present study showed that SILOSOLVE® FC was able to prevent the synthesis of postharvest associated mycotoxin *Roquerfortine C*. The effect on field associated mycotoxins was not clear. Further research is needed to determine the mode of action and the effect of different bacterial strains on the mycotoxin concentration in different types of silage.

Chr. Hansen opinion

We acknowledge (and support) that an external institute has researched the impact of using our products as a mitigation tool to reduce mycotoxins. However, as this is a single study observation, Chr. Hansen does not claim any benefits in this direction of using SILOSOLVE® FC.

Reference

Gallo, A., Bernardes, T.F., Copani, G., Fortunati, P., Giuberti G., Bruschi, S., Bryan, K.A., Nielsen, N.G., Witt, K.L., Masoero, F., 2018. Effect of inoculation with *Lactobacillus buchneri* LB1819 and *Lactococcus lactis* O224 on fermentation and mycotoxin production in maize silage compacted at different densities. Anim. Feed Sci. Tech. 246, 36-45