Effect of additive on content of mycotoxins of grass silage

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Introduction. Silage is an increasingly important forage for cattle and horses. The quality of silage depends on fermentation of the material, but the ensiling process can be optimised with the use of additives. Several different additives can be used for making silage. Mycotoxin are poison produced by mold and occur frequently in a silage. Mycotoxins are frequently found in forage (silage) at low levels causing subclinical losses in performance. Sometimes concentrations of mycotoxins are encountered in silage which are high enough to cause several performance and health problems. Aflatoxin (AF), deoxynivalenol (DON), zearalenone (ZEN), fumonisin (FB) and T-2 toxins are of greatest concern in animal production. Effect of additives on silage fermentation, chemical composition and content of mycotoxins were also investigated.

Material and methods. Tested silages were prepared from the mixture of the first cut of red clover (*Trifolium pratence* L.) and timothy (*Phleum pratence* L.) 50% + 50%. The one part of silage material was wilted for 24 hours. The silage material was chopped into 2 cm pieces, mixed and conserved in 3 litre glass jars. The silage additives were biological starters (*L. plantarum* + *L. fermentum* - 10^7 cfu g^{-1}) and chemical additive AIV Pro (5 litres/ton). In 90 days the jars were opened for analysis. For the silage, fermentation quality was estimated based on the contents of mycotoxins. Samples were analysed for the content of DM, crude protein, ash and fibre (AOAC, 2005). Crude protein was analysed by Kjeldahl method with Kjeldec 2300 analyser. The NDF and ADF in the samples were determined with a fibre analyser ANKOM 220. The mycotoxin content was determined by the ELISA method with Ridascreen r FAST kits. Statistical analysis was performed for directly and wilted silage with the generalized linear model procedure of SAS.

Results and discussion. Chemical composition of silages is in the Table 1. In the first trial DM of silages was very low, but the second trial was the better. The fermentation characteristics indicated a good ensiling. The Table 2 shows the effect of several additives of silage on the mycotoxins content. The wilting of silage material increased the content of toxins (AF, ZEN, T-2 toxin and FB) (Table 2). The biological additive of silage increased the content of ZEN and DON. The drying of material on the field contaminated it.

Conclusions. The wilted silage material improved the DM concentration, and quality of fermentation, but increased the content of mycotoxins.

References

AOAC.2005. Official Methods of Analysis of AOAC INTERNATIONAL, 18th ed. Association of Official Analytical Chemists International. Gaithersburg, MD, USA.

Table 1. Average chemical composition of tested silages, g kg^{-1}

Silage treatment	Dry matter	Crude protein	Ash	NDF	ADF
Directly ensiling					
Control	140	153	109	485	263
Biological additive	171	161	86	409	266
Chemical additive	162	172	91	452	259
Wilted 24 hours					
Control	256	178	110	414	260
Biological additive	274	172	96	408	256
Chemical additive	295	172	94	409	242

Table 2. Mycotoxins content in silage, ppb

Treatment	Aflatoxin	Zearalenone	Deoxynivalenol	T-2 toxin	Fumonisin
Directly ensiling					
Control	0.8	97.2	317.7	1.6	30.8
Biol.additive	2.6	148.1	570.8	4.4	30.0
Chem.additive	1.7	128.2	356.1	4.3	38.8
24 h wilted					
Control	3.1	171.1	355.5	22.7	89.1
Biol.additive	4.1	245.4	457.3	24.7	84.7
Chem.additive	2.5	296.8	372.1	7.4	87.1
P					
C vs Biol	<0.001	0.015	<0.001	0.052	0.449
C vs Chem	0.012	0.015	0.286	0.136	0.269
CW vs Biol.W	0.394	0.009	0.003	0.427	0.370
CW vs Chem.W	0.132	0.003	0.356	0.029	0.478
C vs CW	<0.001	0.009	0.137	0.011	0.003
Biol, vs Biol.W	0.050	0.002	<0.001	0.034	0.001
Chem.vs Chem.W	0.054	<0.001	0.414	0.104	0.115