PREVENTION OF OCCURANCE OF SELECTED MYCOTOXINS IN FEED WAREHOUSE FOR MILKING COWS

Nada Marković[1], Srđan Kovačević[2]

[1]*Administration for inspection affairs of Montenegro, inspector for hydrocarbons, Razvršje,130Oktobarske Revolucije, Podgorica*
[2]*Department of Environmental Engineering and Occupational Health and Safety, Faculty of Technical Sciences, University of Novi Sad, Trg Dositeja Obradovića 6, 21000 Novi Sad, Republic of Serbia*
e-mail: nadamarkovic71@t-com.me

Abstract
The aim of this work was to examine the presence of Fusarium toxins in feed for milking cows in summer and winter. Food samples for milking cows were sampled from a cow farm in the vicinity of Nikšić, Montenegro, in winter and summer. The determined concentrations of the examined mycotoxins in the food samples for feeding milking cows were lower than the maximum allowed concentrations prescribed by the Regular Acts of Montenegro. The obtained results indicate that there was no significant difference in the concentrations of the tested mycotoxins in the food for feeding milking cows during the summer and winter periods, which suggests that with good production and storage practices, food can be protected from mycotoxicological contamination, and cow's milk and meat.

Introduction
Mycotoxins are toxic, secondary metabolites of toxin-producing species of mold [1]. So far, several hundred mycotoxins have been discovered, which are produced mainly by molds from the genera Aspergillus, Penicillium, Fusarium and Alternaria [2]. Available scientific literature indicates that during recent years the occurrence of climate changes has been recorded, which has shown a great impact on the appearance of mycotoxins[4]. .
Fusarium toxins represent the most dominant group of mycotoxins, the most important representatives of this group in our country are Deoxynivalenol (DON) and Zearalenone (ZEA) [3].
Mycotoxins in humans and animals can cause alimentary diseases accompanied by mutagenic, carcinogenic, teratogenic, estrogenic, dermatoxic, immunosuppressive and neurological effects, and can also lead to death [3]. The presence of mycotoxins in food can cause great economic losses [3].
When it comes to animal feed, a special problem is storage, because during inadequate storage, the development of toxic mold species and the production of mycotoxins can occur[5]. In Republic of Montenegro, there is a lack of tests of this type, so the aim of this work was to examine the presence of Fusarium toxins in food for milking cows in both summer and winter.

Experimental
The determination of the DON content in feed for milking cows was performed on a liquid chromatograph with a Shimadzu RF 10 Axl fluorescent detector, analytical column Kinetex EVO C 18 150X 4.6 MM was used for chromatographic separation. A liquid chromatograph with a Quatro Micro API mass spectrometer was used for ZEA analysis. For the preparation of samples for ZEA and DON analysis, sample purification was used on an SPE column (C18 and aluminum oxide in a 3:1 ratio). Which was prepared by filling a polypropylene syringe with a capacity of 6 ml with 0.2 g of silica gel C18 and 0.6 g of neutral aluminum oxide.

Deionized water was used to prepare all solutions.
15 food samples were sampled in the winter and in the summer period in 2019. The following food for milking cows was tested: universal mixture for feeding animals, wheat feed flour, corn mixed feed flour, corn noodles, corn grits, mercantile corn.

Results and discussion

The presence of DON was determined in nine samples, corn feed and wheat cattle meal were contaminated, as well as a mixture for feeding milking cows, the DON concentrations obtained were in the range of 0.2 to 1.8 mg/kg, but according to current legal regulations, no sample was contaminated with this toxin more than MDK. In the winter period, the DON content obtained indicated the same high percentage of positive samples, namely 60%, DON concentrations ranged from 0.2 to 5,3 mg/kg, but no sample exceeded the permitted concentration.

Table number 1. Result of testing the concentration of DON in feed the summer

Number sample	Sample type	Content DON (mg/kg)
1	universal mixture for feeding animals	0,3- 0,07
2	wheat feed flour	1,0-0,21
3	corn mixed feed flour	1,5-0.26
4	corn noodles	0.2-0,003
5	corn grits	1,8-0,33
6	mercantile corn	0,7-0,14

Table number 2. Result of testing the concentration of DON in feed the winter

Number sample	Sample type	Content DON (mg/kg)
1	universal mixture for feeding animals	0,3- 0,04
2	wheat feed flour	1,0-0,21
3	corn mixed feed flour	1,5-0.26
4	corn noodles	5,3-0,42
5	corn grits	1,8-0,35
6	mercantile corn	0,2-0,03

The presence of ZEA was determined in corn and corn-based products, the concentrations of this toxin were in the range of 0.02 to 0.3 mg/kg, in the summer period, while the concentrations during the winter were from 0.02 to 0.11 mg/kg, the maximum concentration of ZEA allowed by the Rulebook of Montenegro is 2 mg/kg in cereals except corn, while in corn and corn products the MDK is 3 mg/kg.

Table number 3. Result of testing the concentration of ZEA in feed the summer

Number sample	Sample type	Content ZEA (mg/kg)
1	universal mixture for feeding animals	0,070- 0,015
2	wheat feed flour	0,280-0,028
3	corn mixed feed flour	0.300-0.060
4	corn noodles	0.02-0,004
5	corn grits	0,030-0,005
6	mercantile corn	0,020-0,004

Table number 4. Result of testing the concentration of ZEA in feed during the winter

Number sample	Sample type	Content ZEA (mg/kg)
1	universal mixture for feeding animals	0,02- 0,003
2	wheat feed flour	0,06-0,011
3	corn mixed feed flour	0.03-0.005
4	corn noodles	0.02-0,004
5	corn grits	0,02-0,003
6	mercantile corn	0,11-0,024

Conclusion

The obtained results show that there was no great difference in mycotoxin concentrations in winter and summer, also these results show that good production and storage practices can protect animal feed from mycotoxins. The employees of the farm from which the food samples were taken paid special attention to the storage of animal feed, well-dried grains were stored, the warehouse was frequently ventilated, as well as temperature control.

Records were also kept on the order of food consumption, after the consumption of one batch of food, the warehouse was disinfected, and special attention was paid to the education of the staff employed on the farm on how to store and store food for milking cows.

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References

[1] J. D. Miller J.D. Factros affecting the occurrence of fumonisims in corn. Abstract of papers (p.21) International Conference on the toxicology of Fumonisin, June 28-30, (1999).

[2] M. Peraica, B. Radić, A. Lucić, M. Pavlović, Toxic effects of mycotoksins in humans. Bulletin of the World Health Organization, 77 (9), (1999) 754 -766.

[3] J.He, T. Zhhou, C. Young, J. Boind, M. Scott, Chemical and biological transformations for detoxification of trichothecene mycotoxins in human and animal food chains:a review.Technologu Foof Control. (2010) 21,67-76.

[4] S. Iqbal, M. Asi, S. Jinap .,Variation of aflatoxin M1 contamination in milk and milk product s collected during winter and summer seasons. Food Control. (2013)

[5] R. A. Shelby, D.G. White, E.M. Bauske Differential fumonisin production in maize hybrids. Plant Dis. 78, (1994) 582 - 584.