

Effect of a commercial purified detoxifier in the diet on the reproductive Parameters of a dairy herd naturally exposed to zearalenone

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Introduction

Raw ingredients and rations used in the diets of dairy cattle are substrates susceptible of being contaminated with toxicogenic fungi, capable of synthesizing different types of mycotoxins as a consequence of the interaction between fungi, the host and the environment. Normally, the synthesis of mycotoxins is the response of fungi to different factors, some of the most important being: mycotic group, substrate, pH, temperature, humidity, available oxygen and time.

Mycotoxins have the capacity to induce reproductive, digestive, dermic and respiratory problems and immunosuppression in cattle consuming them, thus seriously affecting productive processes.

Main mycotoxin affecting dairy cattle are: Aflatoxin B1 = AFB1, Zearalenone = ZEA, Deoxynivalenol o Vomitoxin = DON, T-2 toxin = T2, Fumonisin B1 = FB1 and Ochratoxin A = OTA.

Reproductive malfunctions in dairy herds are considered one of the areas of production that cause higher economic losses, but they are normally not properly evaluated. Zearalenone (ZEA), a mycotoxin belonging to the group of fusariotoxins, has the ability to directly affect reproductive parameters of dairy herds. It normally shows clinically in a variety of forms. The main alterations induced by ZEA are reflected on incidence of miscarriages, services over conception, fertility rate at first service, pregnancy rate, follicular cysts, infertility, dry-days, reabsorptions (insemination over gestation) and abortions. They all have a direct repercussion on the profitability of farms.

A practical tool available for the control of these mycotic processes is the use of mycotoxin detoxifiers with proven in vitro and in vivo efficacy and safety to bind the main mycotoxins affecting the productivity of dairy cattle such as Zearalenone. The efficacy and safety should be shown under strict testing protocols and backed by solid technical and scientific arguments.

Objective

To evaluate, under field conditions, the effect of a commercial purified mycotoxin detoxifier (1) on the reproductive parameters of a dairy herd naturally exposed to Zearalenone and other mycotoxins.

Material and Methods

This study was performed in a farm located in the highlands of Mexico, coordinates: 190 50' North and 980 59' West, at an altitude of 2.260 mts over sea level with a semi-cold, subhumid climate with rains in summer. The farm had 700 Holstein cows in production with a history of non-infectious reproductive problems.

Analysis for mycotoxin contamination of the different feedstuffs used in the farm before the start of the trial was performed with a ELISA RIDASCREEN® kit (R-Biopharm Rhone).

The commercial purified detoxifier (1) used had a consistent in vitro Zearalenone adsorption capacity ranging from 98.0 to 100% according to the quality certificates provided by the manufacturer batch to batch. The product was added at a dosage of 20g/head/day according to the manufacturer recommendations.

Two randomly assigned groups of cows in production, 350 cows each, were used.

Group A consumed the commercial detoxifier (1) at 20gr/cow/day added directly over the diet concentrate in the feeding area of the farm.

Group B remained as non-treated control.

Both groups were evaluated for their reproductive parameters over a period of 90 days.

Results and Discussion

Table 1 shows the results of the analysis for mycotoxin content of the different feedstuffs.

The analysis confirmed the presence of mycotoxins, with ZEA, T2 and OTA being the most prevalent. It is interesting to mention that reports in literature indicate that the Zearalenone contamination levels required to induce problems in reproductive parameters in dairy cattle are higher than those found in this study. Even so, levels from 58.6 to 101.8 ppb were sufficient to provoke reproductive disorders in cattle in this test. This would indicate the need to reevaluate mycotoxin recommended levels. More information is needed to establish real safety levels.

Table 2 shows the productive parameters of testing groups, after 90 days. As described in Table 2, group A, fed with the commercial detoxifier showed better reproductive performance than group B, negative control. This indicates that the product was capable of preventing the detrimental reproductive effects of Zearalenone naturally present in the diets.

Table1. Mycotoxin content in feedstuffs

SAMPLE ID	AFB1 ppb	T2 ppb	OTA ppb	ZEA ppb	FB1 ppb	DON ppb
Complete diet	0.0	0.0	2.4	84.9	0.0	0.0
Concentrate	6.5	95.2	0.0	58.6	0.0	0.0
Silage	1.8	0.0	159.6	101.8	0.0	0.0

Source: Records of Veterinary Clinical Diagnosis, case: DCV-04-2707

Table 2. Reproductive parameters

PARAMETERS	GROUP A Detoxifier	GROUP B Control	Difference
Insemination / Conception	3.09	3.35	-0.26
Gestating Cows	4.00 %	3.20 %	+0.80 %
Insemination at first service	46.0 %	44.2 %	+1.80 %
Conception at first Service	44.4 %	41.9 %	+2.50 %
Incidence of miscarriages	3.14 %	6.28 %	-3.14 %

Summary

The effect of the inclusion in the diet of a commercial purified detoxifier was evaluated on the reproductive performance of a dairy herd of 700 Holstein cows in production located in the highlands of Mexico. The herd showed a high incidence of non-infectious reproductive problems, suggesting the presence of Zearalenone based on the clinical experience of the authors of the study.

The presence of Zearalenone was confirmed by ELISA in the different feedstuffs in levels ranging from 58.6 to 159.6 ppb, together with presence of other mycotoxins such T2, AFB1 and OTA in levels medium to low. The herd then was divided randomly in two groups of cows in production, 350 cows each group. Group A was supplemented with a commercial purified detoxifier at a dosage of 20g/cow/day. Group B (control) was not supplemented. Reproductive parameters were recorded for a period of 90 days. The result of the study indicates that group A shown improvement in reproductive performance over group B in the following parameters:

- Insemination / Conception -0.26%
- Cows with diagnosed pregnancy +0.8%
- Fertility index at first service +3.0%
- Insemination at first service +1.8%
- Conception at first service +2.5%
- Incidence of miscarriages -3.14%

It is concluded that levels of Zearalenone found in this study, that would be considered low compared to those found in literature, are capable of affecting negatively reproductive parameters of the herd. The inclusion of the detoxifier in the diet reduced those effects significantly.

Conclusions

According to this study, the presence of ZEA in silage, concentrate and complete diets in concentrations ranging from 58.6 to 101.8 ppb, was sufficient to affect reproductive performance of the dairy herd. The use of the selected commercial purified detoxifier (1), with high ZEA adsorption capacity, significantly reduced the detrimental effects of the mycotoxin over the reproductive parameters of cattle.

References

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Rivera, R. et al. Resultado de las pruebas de detección de micotoxinas en ingredientes destinados al consumo de bovinos de leche en Mexico. BUIATRIA 2005
(1) Commercially known by the brands: MYCOAD AZ, MYCOAD ZT, COBIND AZ, TOXFREE