Dairy cows are ruminants, therefore the majority of their nutrients should come from forage. However, very often today the dairy cow diet is composed of more than 50% concentrates (based on dry matter). This is requested by the higher milk yield that cows are achieving nowadays, it is not so rare to see herds with milk production over 40 litres per day on average per lactating cow.

by Piotr Cierpinski, Dairy Specialist EMEA, Olmix, France.

www.olmix.com

To meet this high producing animal’s requirements for nutrients (especially for energy), more concentrates need to be included. The forages used in modern dairy cow’s nutrition have also changed, with more corn based raw materials and corn silage.

Corn is a great raw material in dairy cow nutrition; it has high and uniform nutritional quality (1.5MCal/kg DM on average), it is easy to cultivate and gives high yields (up to three times more tons of DM/ha than grass). That is why very often corn is cultivated on the same field year after year.

Mycotoxins in forage

In the field, forages are naturally in contact with various fungi, the most frequent of which is fusarium. Its growth depends on moisture levels (22-25% humidity in the plant) and temperature (>15°C).

Growing corn grains after corn (grains or silage) increases the risk of DON development in the crop, as the crop wastes are also contaminated with fusarium and carry the fungi from one year to another. That is also why no-till farming highly increases the risk of fusarium development as crop wastes will not be ploughed under, but will remain on the field’s surface and contaminate the next crop. The fungi itself is not a threat to the animal, but in stress conditions fusarium produces mycotoxins. All factors that alter the fungal development can trigger the production of secondary metabolites: mycotoxins. Therefore, forages are often contaminated by fusarium mycotoxins like trichothecenes (DON), zearalenone and fumonisins, with a variable level of contamination depending on climate and cultivation methods, etc. The quality of silage preservation (anaerobia, T°C, Aw, length of preservation) will also impact the further development of fusarium and storage mycotoxins under specific conditions (aflatoxins, ochratoxins).

Worldwide, approximately 25% of crops are affected by mycotoxins annually (CAST, 1989). According to Gallo et al., 2015, who presented a summary of mycotoxins detected in different raw materials, corn silage was contaminated with DON, the contamination level ranging from 146 up to 2919ppb. Based on Olmix/Laboceca’s forage mycotoxins analysis made from January 2013 to December 2016 (931 samples), 100% of corn silage samples were contaminated with more than two mycotoxins, 41% of grass silage, 62% of hay samples and 96% of straw samples were contaminated with more than two mycotoxins as well.

Fusariotoxins

Fusariotoxins are the most frequent mycotoxins in forages, but in contrast to grains, deoxynivalenol (DON) is not always the most frequent (Fig. 1).

Mycotoxins like zearalenone (ZEA) can be more often positive in grass silage and hay than DON. Nevertheless, the median level of DON is always the highest in all types of forage samples; corn silages having higher DON median level of contamination than straw, grass silage and hay.

Apart from fusariotoxins, our data also illustrate the specificity of grass to have endophytic toxins like ergot alkaloids (six alkaloid toxins are quantified) in contrast to corn silage and straw.

In this study Alternaria mycotoxins are not as rare as described in other studies as tenuazonic acid contaminates more than 20% of grass silage and hay samples. Regarding storage mycotoxins, as demonstrated in other studies, hay and straw are a good substrate for the development of Aspergillus versicolor. Consequently, the contamination in...
Steyergmatocystin is the highest in these types of forage, whereas aflatoxins and ochratoxins were almost not detected in the four types of forage tested. This unique wide study on mycotoxin contamination in forages is a first step in the identification and understanding of the different profiles of mycotoxin contamination in the main forage types.

The modern dairy cow

For many years, ruminants were considered to be less sensitive to mycotoxins compared to monogastric animals. However due to the rapid increase in average milk yield per cow in recent years, (according to Shook et al. 2006, average milk production per cow in USA has increased by 55% since 1980), and changes in dairy cow nutrition (more corn silage), dairy cows can be more susceptible to mycotoxins than in the past.

A good example of how big differences can be seen when comparing low and high producing dairy cows, is the publication from Churchill et al., 2016. He indicated that studies done with low producing cows (less than 30kg milk/day) milked two times daily, have shown a carry-over of 1-2% of the ingested AFBI into the milk (AFMI) but when they looked at cows being milked three times daily and producing greater than 30kg of milk per day, results showed milk carry-over of AFMI as high as 6.5%. These examples of aflatoxin transfer to milk shows how big differences can be seen when we compare low producing dairy cows, which we had in the past, and modern dairy cows.

How to protect our animals

The first of many solutions that can be used to decrease the mycotoxin risk in our feed is to choose raw material varieties resistant to Fusarium. It will help to control the risk on crops which are grown as main forage for dairy cows. Avoiding single crop farming and no tillage farming can greatly decrease the risk of mycotoxin contamination. The use of fungicides, where it can be applied effectively, is very important. When a problem in a farm is suspected to be related to mycotoxin contamination, there is one online tool available to predict the risk of this problem – the Olmix MycoEvaluatuer (www.olmix.com/en/myco-evaluator). The result obtained with this tool is then confirmed by the MycoScreen package, a set of tools to help customers adapt their mycotoxins analysis strategy in order to get confirmation of their suspicion.

This tool will also be helpful to interpret the mycotoxins analysis in order to take the right decision depending on the level of contamination.

If mycotoxin contamination is confirmed, one solution is to eliminate the contaminated raw material from the dairy cow’s diet. If it is corn silage or the main forage, which is the most frequent scenario, it is challenging to exclude it totally from the diet as with a decrease of mycotoxin contamination we also can decrease energy density and finally milk production.

To keep production on a good level and protect cows from the impact of mycotoxins an effective protection can be used. Olmix is a specialist in this area, as the company has developed new technologies to provide the largest spectrum of specific ingredients dedicated to fight against a variety of mycotoxins. All these technologies are included in a product called MMLS, which is micro-granulated to optimise protection of the cows by achieving better homogeneity in the TMR. All over the world MMLS proves its efficiency in the protection of dairy cows for better performances.

References are available from the author on request

All information only for export outside Europe, USA and Canada.