Methodical approaches of sampling in the identification and quantification of mycotoxins

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Mycotoxins (from the Greek Mukes - mushroom and toxicon - poison) are secondary metabolites of microscopic mold fungi that have pronounced toxic properties. They are not essential for the growth and development of microorganisms producing them. From a biological point of view, it is believed that mycotoxins perform functions in the metabolism of microscopic fungi aimed at survival and competitiveness in various ecological niches [5].

From the hygienic standpoint, these are especially dangerous toxic substances that contaminate raw materials and finished products. The high danger of mycotoxins is expressed in the fact that they have a toxic effect in extremely small quantities and are able to diffuse very intensively into the depths of the substrate [3].

You should pay attention to the fact that mycotoxins are practically not destroyed in the process of standard technological processing of contaminated raw materials [4].

The problem of correctly determining the number of mycotoxins lies in the fact that mycotoxins, as a rule, are extremely unevenly distributed in the mass of the substrate. In areas of mold growth, the concentration of mycotoxins can be very high. Even the best modern method of analysis will not reveal toxicity if the laborious routine sampling procedure is not followed [1].

The example shown at the World Forum on Mycotoxins in the Netherlands (2014) clearly shows the importance of proper sampling. Table 1 presents the results of the analysis of 10 samples of food peanuts, 5 kg each, taken from one batch.

Table 1. The content of aflatoxin B1 in different samples of peanuts of the same batch

Sample	Content of aflatoxin B1 (μg/kg)
1	0
2	3
3	13
4	0
5	19
6	41
7	43
8	0
9	0
10	69

That is, with the wrong approach, the specialist will assume that a sample of 5 kg taken from one place adequately reflects the quality of the batch of the product and the analysis of mycotoxins will be a waste of money and time. One of the most advanced and a successful method of sampling for analysis on the content of aflatoxin B1 is described in the EU Directive [2].

Table 2. Sampling rules depending on the lot size

Batch weight, t	Number of samples 300 g each
<0,1	10
0,1-0,2	15
0,2-0,5	20
0,5-1,0	30
1,0-2,0	40
2,0-5,0	60
5,0-10,0	80
10,0-15,0	100

From table 2 it can be seen that from a batch of 100 tons it is recommended to select 30 kg of product. Then they should be divided into three equal parts (10 kg each), finely ground and again thoroughly mixed. Only then can samples be taken for laboratory analysis, usually weighing 50–200 g.

In conclusion, it must be said that the most accurate analytical technique may give an incorrect date about the quality of the product if the correct sample preparation scheme is not applied.

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