

Effect of Inadequate Drying on Moisture Content and Aflatoxin Concentration in Dried Local Corn Kernels in Iraqi Stores and Silo

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ABSTRACT

BACKGROUND: to ensure the quality and safety of corn must be free mycotoxigenic fungi because of these mycotoxins are high risk to feed contamination which it affect animal health and human health.

OBJECTIVE: The objective of this study is to bring to attention the inadequate drying effect on the moisture content and total aflatoxin concentration in dried corn kernels in Iraqi stores and silo under storage conditions.

MATERIALS AND METHODS: A total of 182 dried local corn kernels Samples were collected from Iraqi stores and silo in provinces and examined for moisture content test and aflatoxin test.

RESULTS: The results indicated moisture content values; 5% in 14 samples, 6% in 18 samples, 7% in 11 samples, 8% in 43 samples, 9% in 40 samples, 10% in 36 samples, 11% in 8 samples, 12% in 12 samples as well as non-occurrence of total aflatoxin in (127) samples at (70%), occurrence of total aflatoxin in (55) samples at (30%), according to the regulatory limit (20ppb) in Iraqi specification; acceptable samples were 163 samples of total samples (182 sample) at (90%) and non-acceptable samples 19 samples of total samples (182 sample) at (10%).

CONCLUSION: From this study, we conclude aflatoxin occurrence at moisture content less than 12% in Iraqi stores and silo because of inadequate drying for harvesting corn and inadequate storage conditions.

Keywords: Aflatoxin, Dried local corn kernels, Moisture content.

Introduction

Corn is a multipurpose crop used for food and animal feed as the primary raw material for the processing of poultry and cattle feed because it contains starch (72%), protein (10%), fat (4%) and providing an energy (365 Kcal/100 g). Corn

supplies B vitamins and essential minerals along with fiber [1], therefore, the corn is rich media for fungi growth and it's exposed to fungi infections during harvest and storage. Physical parameters such as moisture, humidity, temperature, PH, light and rainy days in a year during field and post-harvest stage as well as insect can influence fungi growth and production of mycotoxin to cause fungal contamination and loss of corn quality[2]. Moisture is most important parameters for fungal growth and mycotoxin production. Aflatoxins are carcinogenic metabolites produced by *Aspergillus flavus* and *Aspergillus parasiticus* and it's present in grains associated with food and feeds. Animals are exposed to aflatoxin via contaminated feeds consumption that is contaminated with aflatoxin producing fungal strains during growth, harvest and storage that reduced nutritional value and cause mycotoxins synthesis[3]. Symptoms of aflatoxin toxicity in animals range from death to chronic diseases, reproductive confusion, immune extinction, decreased production of milk and egg[4]. After harvest, the corn has high moisture content and should be dried as early as possible to prevent fungal infection which lead to deterioration of corn quality because of mycotoxin production, therefore, the corn must be in moisture content less than (12%) for safe storage, so final drying can maintain higher corn quality [5&6] because of aflatoxin contamination is encouraged by inadequate drying [7], therefore, it is necessary to prepare the animal feed from free mycotoxicogenic fungi corn, because of these mycotoxins are high risk to feed contamination which it affect animal health and human health.[2]In Iraq, the harvest corn dried by sunlight or mechanically. We noted the solution is more attention to dry the harvest corn kernels directly after the harvest and keep it during storage into a safe level of moisture content.

Materials and Methods

1. Sample collection

This study had conducted in the Directorate of Animal Resources / Department of Quality Control on Feed in Baghdad, Iraq.

A total of 182 representative samples (2 kg per sample) of dried local corn kernels were collected from Iraqi stores and silo in the provinces.

2. Moisture content test

To obtain the moisture content of corn kernels samples, 2g of ground corn kernels sample put in moisture advice provided from Sartorius Company, then record the results.

3. Aflatoxin Analysis

To evaluate total aflatoxin concentration, corn samples were subjected to quantitative analysis by using competitive direct enzyme-linked immunosorbent Assay (ELISA)[8]. The procedure was conducted according to manufacturer's instructions (Neogen. USA). In brief, 5g of the ground corn sample was extracted with 25 ml of 70% methanol. Afterwards, samples were shaken for 3 minutes and the extracts filtered through Whatman paper No.1. Then, 100 μ L of the diluted filtrate per well was used for aflatoxin testing by using Agri-Screen kit for

aflatoxin. Then, ELISA reader, which it provided from BioTek Company used to obtain the total aflatoxin concentration.

Results

In the present study, we have collected a total of 182dried local corn kernels samples. The results of the moisture content and total aflatoxin concentration showed different values as it is shown in table (1).

Table (1): moisture content values and total aflatoxin concentration in dried local corn kernels samples.

	moisture content values	No. of samples	Total aflatoxin Concentration (ppb)	No. of samples
1	5%	14	0.0	3
			5.3	10
			10.8	1
2	6%	18	5-15	14
			33-64	4
3	7%	11	0.0	6
			15	1
			36-68	4
4	8%	43	0.0	40
			6-16	2
			23	1
5	9%	40	0.0	34
			6-10	3
			24-90	3
6	10%	36	0.0	34
			125	2
7	11%	8	0.0	5
			3	1
			20-134	2
8	12%	12	0.0	5
			5-7	4
			20-55	3
	Total No. of samples	182		182

* Non-occurrence of total aflatoxin in 127 samples and Occurrence of total aflatoxin in 55 samples. According to the regulatory limit (20 ppb) in Iraqi specification: No. of acceptable samples = 163 samples and No. of non-acceptable samples = 19 samples.

Discussion

In the present study, we have collected (182) dried local corn kernels samples from Iraqi stores and silo in the provinces.

At first these samples tested for moisture content test because moisture is an important parameter for fungal growth and aflatoxin production then same samples tested for aflatoxin test. The results in table (1) showed the moisture content values ranged from (5% to 12%), which it within acceptable limits in Iraqi specification and non-occurrence of total aflatoxin in (127) samples of total samples (182 samples) at (70%) in all obtained moisture content values (5% to 12%) because of these moisture content values do not present optimal conditions for aflatoxin production if contamination of tested samples with producing fungi as it mentioned the reference [2] while total aflatoxin occurrence was in (55) samples of total samples (182 samples) at (30%) in all obtained moisture content values (5% to 12%); according to the regulatory limit (20 ppb) in Iraqi specification, the acceptable samples were (163) samples of total samples (182 samples) at (90%) and non-acceptable samples were (19) samples of total samples (182 samples) at (10%) but these results do not agree with optimal conditions for aflatoxin production in these moisture content values (5% to 12%) , taking into account these samples are dried and exposed to temperature, therefore, this indicate the initial moisture content values were within optimal conditions for aflatoxin production, which it more than (13.5% moisture), but after drying, the initial moisture content values decreased to obtained moisture content values (5% to 12%) and aflatoxin values did not decrease because aflatoxin is resistant to high temperature as it mentioned the reference [9].

From this study, we conclude corn kernels did not dry directly after the harvest to avoid of optimal conditions for aflatoxin production, which it more than (13.5% moisture) and this do not agree with Food and Agriculture Organization recommendations [5&6]; (it is necessary to dry the harvest corn directly after the harvest and keeping moisture content less than 12% under storage conditions), therefore, we note aflatoxin occurrence in dried local corn kernels at moisture content less than (12%) in Iraqi stores and silo because of inadequate drying for corn after harvest directly and inadequate storage conditions.

Conclusion:

Adequate drying for harvesting corn kernels and adequate storage conditions should be necessary for determination of quality and safety of harvest corn kernels and to be sure about quality and safety of harvest corn kernels must be assess microbiological evaluation and mycotoxin test.

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