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Effect of feeding practices on quality and Aflatoxin levels of milk in Bungoma County, Kenya

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Abstract
As a crucial dietary component, milk provides significant nutritional benefits but carries health risks if contaminated. Aflatoxin contamination in dairy products has repeatedly breached the World Health Organization's safety thresholds in Kenya, particularly in Bungoma County. Addressing this issue is crucial for ensuring public health and supporting the dairy sector's economic viability. To contribute to public safety, there in need to get more data showing the link between animal feed quality and the quality and safety of milk in handling outlets. Therefore, this study aimed to determine the effect of feeding practices on nutritional quality and aflatoxin levels of milk in Kitinda and Kaptama milk collection centres in Bungoma County, Kenya. In this study milk was sampled from 25 dairy farmers affiliated with the Kaptama and Kitinda cooperatives. Milk quality parameters including raw milk butterfat and protein content, as well as milk density were analysed using the Gerber, Kjeldahl, and lactometer methods, respectively. Aflatoxin levels were determined through enzyme-linked immunosorbent assay (ELISA). The findings revealed significant variations in these parameters, with crude protein content ranging from 2.257% to 4.572% and butterfat levels between 2.450% and 3.550%, indicative of the impact of dietary factors. Aflatoxin assessments showed that 30.77% of samples from Kitinda and 23.53% from Kaptama exceeded the recommended aflatoxin threshold, which is 20µg/kg, highlighting a severe public health risk. Statistical analysis, including Pearson correlation, established a strong positive correlation ($r=0.749$, $p<0.01$) between aflatoxin levels in feed and milk. The variability in milk quality parameters suggests the potential impact of dietary factors. The presence of aflatoxins above safe limits in many samples indicates the need for improved feed quality and storage practices. The correlation analysis underscored a significant relationship between aflatoxin in feed and milk, suggesting that feed quality directly influences milk safety. This study concludes that a long-term approach is necessary to ensure safe and high-quality milk.

Keywords: Aflatoxins, butterfat, milk density, protein, safety standards

Introduction
Milk fat and protein production are influenced by rumen fermentation, where butyrate and other volatile fatty acids play essential roles. Acetate and β-hydroxy butyrate contribute significantly to milk fat content (Garamu, 2019) [6]. Rumen microbes convert dietary protein into microbial protein, supplying amino acids for milk protein synthesis. However, balancing energy and protein intake is crucial, as high-energy diets may reduce milk fat levels. Additionally, milk density depends on its composition, which can be affected by the cow's diet, impacting overall milk quality (Garamu, 2019) [6].

Milk, a fundamental component of diets worldwide, has substantial nutritional advantages but can pose serious health hazards if poorly handled (Pereira, 2014) [21]. Of all the dangers mentioned, aflatoxins pose a very high level of harm (Shibabaw, 2023) [5]. The toxins are synthesized by the *Aspergillus* genus of fungi, particularly *Aspergillus flavus* and *Aspergillus parasiticus* (Navale *et al*., 2021) [17]. Milk becomes contaminated when dairy cattle consume contaminated feed, which can lead to serious health hazards such as liver cancer, immunological diseases, and developmental abnormalities in children (Girma *et al*., 2014) [7]. The resilience of these poisons, especially in the face of elevated temperatures, hinders endeavours to guarantee milk safety.

Globally, aflatoxins in milk have been acknowledged as a significant concern (Jallow *et al*., 2021) [10]. According to MoALF (2019), the dairy business in Kenya plays a crucial role in the agricultural economy, supporting the livelihoods of millions of people and providing

nutritional benefits to the densely populated regions. Nevertheless, the integrity of this essential food item has been damaged due to repeated occurrences of aflatoxin contamination. A study conducted in Kenya showed that many dairy products surpassed the aflatoxin thresholds (50 µg/kg) suggested by the World Health Organization (Hell *et al*., 2010) [9].

The situation in Bungoma County, Kenya, namely in Kaptama and Kitinda milk collection is as severe. Studies by Sirma (2020) [24] suggest that insufficient agricultural practices and sub-par feed quality worsen aflatoxins in these regions. The milk collection centres in these locations play a crucial role in quality control, serving as the first line of defence in identifying and addressing aflatoxin contamination. These centres are responsible for stringent testing processes and ensuring adherence to both local and international safety requirements. Efficient aflatoxin control in Kaptama and Kitinda requires frequent testing, strict adherence to safety limits, and extensive education for farmers on appropriate feed storage and handling practices to avoid fungal contamination (Sirma, 2020) [24]. It is crucial to improve these practices to enhance milk safety and quality, which will safeguard public health and support the expansion and profitability of the local dairy business. Therefore, this study aimed to determine milk quality parameters and safety in Kitinda and Kaptama milk collection centres**.**

Materials and Methods

Study Area

This study was carried out in Bungoma County, Kenya, a central point of attention of the research covering dairy farmers who are members of Kaptama and Kitinda cooperative societies. The County's location is 340º 20' and 350º 15' East and 0º 28' and 10º 30' North. The County's area estimate is 3032.4 km^2. Bungoma County borders Uganda to the northwest, while to the northeast border is Trans-Nzoia County; Busia County is located to the west and southwest, while Kakamega County lies to the east and southeast. The County records 400 and 1800 mm as its lowest and highest monthly rainfall, while 0º and 32º are its lowest and highest annual temperature readings (Bungoma CIDP, 2018-2022).

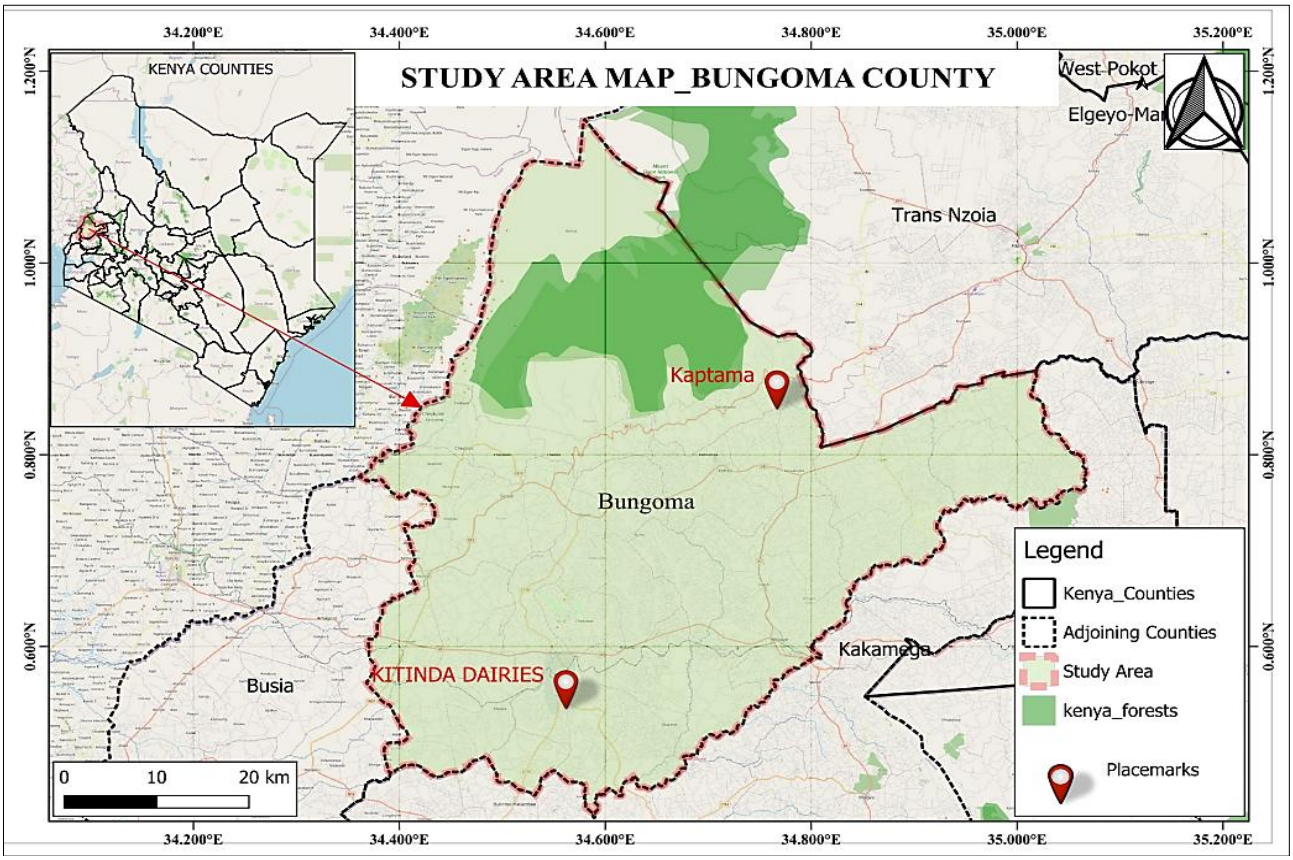

Fig 1: Map of Bungoma County showing the study site. Source: Kenya Institute of Surveying and Mapping (KISM, 2024)

Sample Collection

About 25 milk samples (10 mls) were obtained from 12 farmers in Kitinda and 13 farmers in Kaptama milk collection centers placed in plastic sampling bottles and transported using cooler boxes at 4 °C. Additionally, 25 feed samples (1 kg each) were subsequently collected from similar farmers as milk samples and placed in khaki bags and transported to Egerton University Animal Science Laboratory for butterfat, density, protein, and aflatoxins analysis using specific reference methods.

Determination of Butterfat in Raw Milk: Rapid determination of fat in milk was done using Centrifugal Separation of Fat Volumetric Gerber Method (Richardson, 1985) [22] (Helica Bosystems,Santa Ana, CA, USA). Gerber acid 10 ml, (Sulphuric acid with a specific gravity 1.84 at 20 °C) was measured in the butyrometer. Additionally, 10.75 ml milk was added to it. Amylalcohol (1 ml) was added to break the emulsion. The sulphuric acid dissolved the milk fat in it after breaking the fat globule membrane through its coagulating effect on proteins. The fat dissolved in the acid

was separated through centrifugal force rotating at 219.1 g, the reading was taken in the stem of the butyrometer.

Determination of Crude Protein content in Raw Milk: Raw milk protein analysis was done using the Kjeldahl method (Davide, 1973) [28]. Milk samples (0.2 g) were weighed and added into Kjeldahl digestion tubes. Concentrated sulphuric acid (10 ml) was added into each tube along with one selenium tablet (acting as a catalyst for each case). The samples were digested in a digester at 445 °C for 3 hours. After digestion, the samples were cooled to 25 °C temperature, and then distilled using a Kjeldahl distillation unit (Helica Bosystems, Santa Ana, CA, USA). The distillate was collected in a 15 ml solution of 0.1 M HCl, to which a mixed indicator of methyl red and methylene blue had been added. The collected HCl was titrated against 0.1 N NaOH. The crude protein content was calculated as follows:

$$\% \text{ Crude protein} = (V_2 - V_1) \times M \times 14 \times 6.25 / W$$

Where V_2 is the volume of HCl used for the test portion
V_1 is the volume of HCl used for the blank test
M is the molarity of acid
W is the weight of the test portion

Determination of Density of the Raw Milk
The density of raw milk was determined using a lactometer method according to Richardson (1985) [22]. A clean, dry glass jar was filled about 2/3 of its volume with milk. The milk was poured down along the sides of the jar to avoid the incorporation of air. The lactometer (Helica Bosystems, Santa Ana, CA, USA) was gently lowered into the milk, ensuring it floated freely without touching the sides of the jar. Milk was added to the brim of the jar. The lactometer reading was read at the top of the meniscus within one minute. The temperature of the milk was recorded.

Determination of M1 aflatoxins in raw cow milk
Sample preparation
An aliquot of raw cow milk was placed in a refrigerated temperature (4 °C) overnight to allow the fat globules to rise to the surface resulting in a natural "creaming" effect. The upper fatty layer was removed by aspiration and transferred into the clean mid-plasma in a microtube for the assay.

ELISA Assay Procedure
The reagents were brought to room temperature (25 °C) using a cool box before use, and the content of the PBS-Tween packet (Helica Bosystems and Santa Ana, CA, USA) was reconstituted with distilled water into a 1-litre container. One mixing well was placed in a microwell holder for each Standard and Sample to be tested. Twice the number of Antibody Coated Microtiter Wells (Helica Bosystems and Santa Ana, CA, USA) was placed in another microwell holder. Aliquots of 1.2 mL from each standard and sample were transferred into (1000 µL) microtubes. Using an 8-multichannel pipettor, 200 µL aliquots of the standards and samples were transferred from the microtubes into the Antibody Coated Wells (Helica Bosystems and Santa Ana, CA, USA) in duplicate, and incubated at for 20 minutes for the first incubation. The contents from the microwells were then emptied into a discard basin. The wells were washed by filling with the reconstituted PBS-Tween wash buffer and then decanting the buffer into the discard basin. This was repeated for a total of three washings. The wells were then tapped face down on a layer of absorbent paper. Another 200 µL aliquots of the standards and samples were transferred and a second 20-minute incubation followed. Concurrently, 150 µL of each standard or sample was dispensed into each mixing well, and 150 µL of the conjugate was added to each well. The mixture was mixed by priming the pipettor at least 3 times. Volumes were adjusted when running singlets. The locations of each Standard and Sample were recorded throughout the test. After the second incubation, the plate was washed by repeating the earlier washing steps. Next, 100 µL of the conjugate mixture from each mixing well was transferred to a corresponding antibody-coated well and incubated for another 20 minutes, covered to avoid direct light. The contents from the microwells were decanted into a discard basin again. The wells were washed by filling them with the reconstituted PBS-Tween wash buffer and then decanting the buffer into the discard basin. This was repeated for a total of five washings. The wells were tapped face down on a layer of absorbent paper. A 100 µL of enzyme-substrate (TMB) was added to each well, and the wells were incubated for 10 minutes, and covered to avoid direct light due to the light sensitivity of the TMB substrate. After incubation, 100 µL of stop solution was added, causing the blue color to change to yellow. Finally, the optical density (OD) of each microwell was read with a microplate reader at 450 nm using an air blank or a differential filter of 630 nm.

Determination of Total aflatoxins in feed
Sample Preparation
According to manufacturer's, a bottle containing deionized or distilled water was placed in a water bath set at 40°C. The bottle was allowed to pre-warm for 1 hour to reach the temperature uniformly before use. Ground sample (5.0 ± 0.2 g) were weighed into an extraction cup. A precise scale was used to maintain accuracy. Two capsules of Hydro extraction buffer (Catalogue #928XB001) (Helica Bosystems and Santa Ana, CA, USA) were added to the extraction cup containing the ground sample. Pre-warmed deionized or distilled water (25 mL) was added to the cup to cover the capsules. The capsules were allowed to soften for 5 minutes, ensuring the buffer would mix well with the sample. The cup was hand-shaken vigorously for 2 to 3 minutes to thoroughly mix the sample with the extraction buffer. This step was crucial for the effective extraction of the materials of interest. The mixture (1 mL) from the extraction cup was transferred into a microcentrifuge tube.
The tube was centrifuged at 219.1 g for 1 minute to separate the supernatant from particulates. Using a new pipette tip, 700 µL of clean deionized or distilled water was transferred into a clean microcentrifuge tube. The supernatant (100 mL) from the previous step was added to the tube containing the water. The solution was vortexed for a few seconds to ensure thorough mixing. The final step diluted the sample to a ratio of 1:40, which was appropriate for the ELISA method.

Assay Procedure
All reagents and samples were brought to 25 °C before use as per ELISA manufacturer's instructions, and the sample preparation was performed at 25 °C. The PBS-Tween packet

was reconstituted by gently washing the contents with distilled water into a 1-litre container. One green-marked mixing well was removed for each sample, and an additional six green-marked mixing wells were taken out for six standards. Double the number of antibody-coated wells needed were removed, with unused wells returned to the foil pack along with desiccant to maintain their condition. Each reagent bottle was swirled to mix the contents thoroughly before use. Conjugate from the green-capped bottle was dispensed, adding 200 µL into each green-marked mixing well. Using a 100 µL pipettor with a fresh pipette tip for each addition, 100 µL of standards and samples were added to the respective, green-marked mixing wells. The contents were mixed by using an 8-channel pipettor to pipette the liquid up and down three times to mix, and then 100 µL were transferred from each mixing well into the antibody-coated wells. The volume in the mixing wells was sufficient to run each standard or sample in duplicate.

The preparations were incubated for 15 minutes at room temperature. After incubation, the contents of the wells were discarded into a discard basin. The wells were then filled and emptied with PBS-Tween wash buffer five times to ensure thorough washing. After the final wash, the wells were tapped face down on a layer of absorbent towels to remove any residual buffer. Substrate reagent from the blue-capped bottle was added to each well, using an 8-channel pipettor to dispense 100 µL. The wells were then incubated in subdued light at room temperature for 5 minutes. The reaction was stopped by adding 100 µL of stop solution from the red-capped bottle, matching the order and pace of the substrate addition. Finally, the optical density (OD) of each microwell was measured using a microplate reader equipped (Helica Bosystems and Santa Ana, CA, USA) with a 450 nm filter, conducted within 10 minutes of adding the stop solution to ensure accuracy in the readings. This procedure ensured that the experimental conditions were controlled and consistent for optimal results.

Statistical Analysis

Data obtained were analyzed using Excel and various graphs were generated to elaborate the findings. Pearson correlation analysis was used to elaborate on the correlation between aflatoxin in feeds and milk at (p<0.05) significance level.

Results

Milk Quality Parameters

The samples from 12 different farmers in Kitinda milk collection centres showed significant differences (p<0.05) in crude protein, butterfat, and density as shown in Table 4.1. The crude protein content ranged from 2.257% Kitinda 2(KTD2) to 4.225% Kitinda 5(KTD5). Butterfat content varied significantly (p<0.05) with 2.5% Kitinda 12(KTD12) as the lowest while Kitinda 1(KTD1) was the highest with 3.4%. There was no significant difference (p>0.05) in density.

Table 4.1: Milk Quality and safety parameters analysis from 12 farmers in Kitinda

Sample	Crude Protein (%)	Butterfat (%)	Density(g/cm^3)	AFM1(µg/kg)	Total AF(µg/kg)
KTD1	3.356^{ab}	3.400^{a}	1.027^{bc}	510.7024	72.43339
KTD2	2.257^{c}	2.550^{fg}	1.026^{bc}	706.4979	2.48013
KTD3	3.500^{ab}	2.900^{cde}	1.027^{bc}	27.59411	3.431099
KTD4	3.067^{bc}	2.650^{fg}	1.025^{e}	3.245964	2.160466
KTD5	4.225^{a}	2.650^{fg}	1.027^{bc}	8.946678	2.547904
KTD6	2.951^{bc}	2.950^{bcd}	1.028^{a}	560.9281	54.94629
KTD7	4.109^{a}	2.750^{def}	1.027^{c}	583.2436	5.349014
KTD8	2.720^{bc}	2.550^{fg}	1.024^{e}	17.60196	32.17325
KTD9	3.647^{ab}	2.700^{efg}	1.029^{e}	2.064722	2.871726
KTD10	3.414^{ab}	3.100^{bc}	1.028^{a}	4.1926	1.324459
KTD11	3.125^{bc}	3.150^{b}	1.028^{a}	10.1935	2.412922
KTD12	3.125^{bc}	2.500^{g}	1.025^{e}	0.000	0.000
Ave	3.291	2.821	1.027	202.934	15.178
SD	0.528	0.270	0.001	277.170	23.470
SEM	0.181	0.040	0.000	0.000	0.000
p-value	<.0001	<.0001	<.0001	<.0001	<.0001

$^{a, b, c, d, e, f, g}$ means in the same column with different superscripts are significantly different at p<0.05) KTD= Kitinda and 1,2,3….12= 12 different sampled farmers, Ave= average, SD= standard deviation

The analysis of quality indicators (Crude protein, butterfat, and density) from samples collected from 13 farmers in Kaptama reveals statistically significant variations (p<0.05) among the samples as shown in Table 4.2. The crude protein content exhibited significant variations (p<0.05), ranging from a low value of 2.430% in sample KTM10 to a high value of 4.572% in sample KTM3. The butterfat concentration exhibited significant variance (p<0.05), ranging from 2.450% in samples KTM6 and KTM10 to 3.550% in sample KTM5. The density values varied between 1.025 in samples KTM4, KTM7, and KTM10, and 1.030 in samples KTM5 and KTM11.

Table 4.2: Milk Quality and safety parameters analysis from 13 farmers in Kaptama

Sample	Crude Protein (%)	Butterfat (%)	Density (g/cm$^{3)}$	AFM1(µg/kg)	Total (µg/kg)
KTM1	4.167^{a}	3.350^{d}	1.0287^{c}	560.9281	87.1428
KTM2	2.604^{bc}	2.900^{g}	1.0267^{d}	832.4809	3.29422
KTM3	4.572^{a}	3.050^{f}	1.029^{ab}	13.73016	4.443101
KTM4	3.704^{ab}	2.700^{h}	1.025^{e}	20.9206	3.269543
KTM5	3.588^{abc}	3.550^{a}	1.030^{ab}	11.27983	53.16964
KTM6	2.546^{bc}	2.450^{i}	1.028^{cd}	49.79994	65.12169
KTM7	3.414^{abc}	2.700^{h}	1.025^{e}	48.066	29.77031
KTM8	3.762^{ab}	3.150^{e}	1.027^{d}	2.819976	3.608137
KTM9	4.514^{a}	3.450^{bc}	1.029^{ab}	44.48113	2.731415
KTM10	2.430^{c}	2.450^{i}	1.025^{e}	848.6603	4.511939
KTM11	4.167^{a}	3.500^{ab}	1.030^{a}	20.51247	3.749449
KTM12	3.646^{abc}	3.050^{f}	1.027^{cd}	88.48283	3.331356
KTM13	3.704^{ab}	3.400^{cd}	1.028^{bc}	66.6546	4.360973
Ave	3.601	3.054	1.028	200.678	20.654
SD	0.678	0.374	0.002	306.200	27.910
SEM	0.236	0.019	0.000	0.000	0.000
p-value	<.0001	<.0001	<.0001	<.0001	<.0001

$^{a, b, c, d, e, f, g,h,i}$ means in the same column with different superscripts are significantly different at p<0.05) KTM= Kaptama and 1,2,3….12= 12 different sampled farmers, Ave= average, SD= standard deviation

Discussion

Milk Quality

The comparative analysis of milk quality from samples collected from farmers in Kitinda and Kaptama provides a rich dataset for examining differences in crude protein, butterfat, and density. The results indicate statistically significant variations in these parameters, which are crucial for assessing nutritional value and processing quality in dairy products. In Kitinda, crude protein content varied from 2.257% to 4.225%, with the highest values reported in samples KTD5 and KTD7. This variability could be attributed to differences in cattle diet or genetics that affect protein synthesis. Kaptama showed a similar trend in protein variation, ranging from 2.430% to 4.572%, with the highest protein level observed in sample KTM3. Previous research has highlighted that milk protein levels can be influenced by factors such as cattle breed, feed quality, and feeding regimen (Larsen *et al*., 2010; Leiber *et al*., 2015; Alothman *et al*., 2019) [13, 14, 3]. The data from both regions suggest that some farmers might have superior feeding strategies or cattle breeds that are genetically predisposed to higher protein production.

Butterfat content, another critical quality parameter, also showed significant differences within both regions. In Kitinda, butterfat levels ranged from 2.5% (KTD12) to 3.4% (KTD1). In Kaptama, these levels were slightly wider, from 2.450% (KTM6, KTM10) to 3.550% (KTM5). The variation in butterfat content is typically influenced by the stage of lactation and diet, specifically the fat content in the diet (O'Callaghan, 2018). These differences are critical for the dairy industry as they affect product processing and marketability. The density of milk, which reflects its total solids content, showed no significant variation in Kitinda but did vary in Kaptama. Factors affecting milk density include the solids content (both fats and proteins) and potential adulteration practices such as water addition. Seasonal changes can also influence milk density by altering the water content in fodder and subsequently in the milk itself (Parmar *et al*., 2020) [20]. These findings are consistent with global trends where milk composition exhibits regional variations due to environmental conditions, cattle breeds, and farming practices (Tyasi *et al*., 2015) [26]. The implications of these findings are significant for local dairy farming and product development. They highlight the need for targeted interventions that could include farmer education on best practices, improvements in cattle genetics, and perhaps the formation of cooperative groups to standardize milk quality. Such efforts could enhance both the nutritional value of milk and its commercial viability.

Aflatoxins in feed and milk

The recommended amount of total aflatoxins in feeds is usually 20 µg/kg (Thakur, *et al*., 2022) [25]. From the study, the majority of the samples had levels that were within the required standards (69.23% and 76.47%) in Kitinda and Kaptama, respectively, as shown in Figure 4.1. However, Kitinda recorded the highest levels (30.77%) of aflatoxins above the recommended range. On the other hand, Kaptama had (23.53%). The significant proportion of animal feed samples exhibiting total aflatoxin contamination exceeding the international threshold indicates a potential long-term exposure of animals and individuals to aflatoxins through their diets (Kamala *et al*., 2018; Kotinagu *et al*., 2015) [11, 12]. From the study, the high percentages (30.77%, 23.53%) in Kitinda and Kaptama respectively corroborates results from Makori *et al*. (2019) [15] who found that inadequate postharvest handling methods of animal feeds by both suppliers and consumers could have contributed to higher levels of aflatoxin contamination. Furthermore, inefficient processing methods, such as inadequately drying animal feed materials and improper differentiation between infected and uncontaminated raw animal feed materials (Shabani *et al*., 2015) [23], also contribute to the increased presence of aflatoxin throughout the supply chain.

The level of aflatoxins M1 that is recommended in raw milk is typically 50 µg/kg (Zebib *et al*., 2022) [27]. According to the findings of the study, the majority of the samples had levels that were within the recommended limits (61.54% and 70.59%) in Kitinda and Kaptama, respectively as shown in Figure 4.2. On the other hand, Kitinda had the highest amounts of aflatoxins at 38.46%, which is significantly higher than the permitted threshold. Kaptama, on the other hand, had a percentage of 29.41% of the M1 aflatoxins as a result of variation in diets.

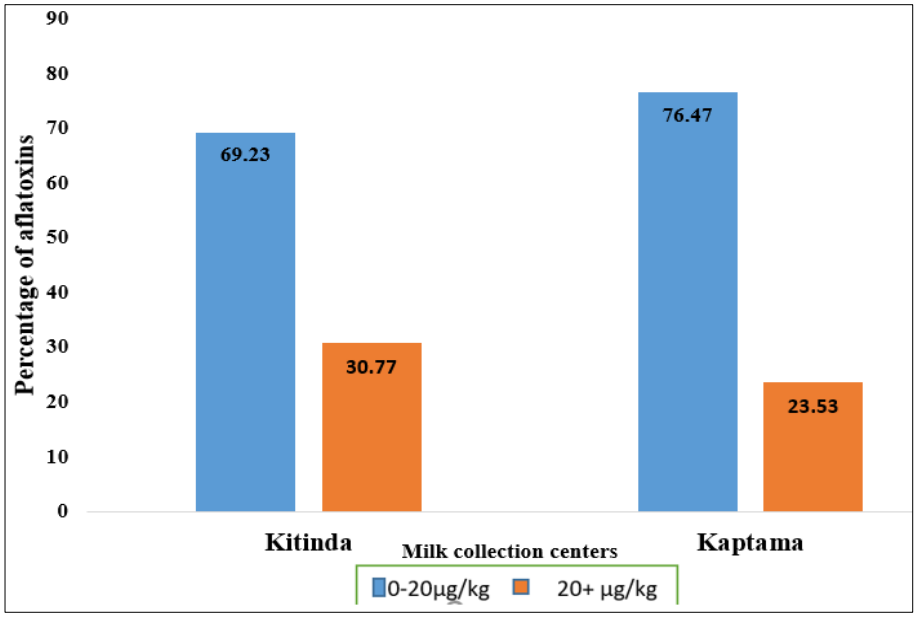

Fig 4.1: A graph showing the total aflatoxins in feeds in Kaptama and Kitinda

The results of this study is above the previous findings by Mutiga *et al*. (2015) [16] who found that raw milk from western Kenya had 15% aflatoxins above the recommended levels. Moreover, the disparity in contamination levels between the two locations may potentially indicate distinct local differences in the storage and handling methods of animal feed. This argument corroborates the report by Gizachew *et al*. (2016) [8], who discovered that poor storage results in the occurrence of aflatoxins in feeds and milk.

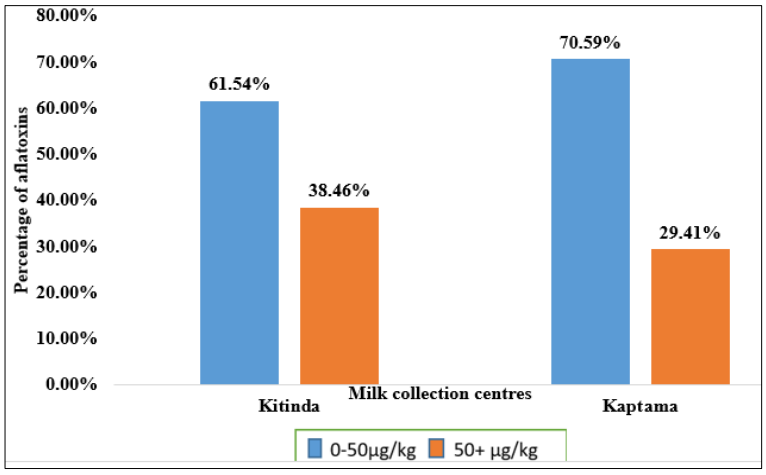

Fig 2.2: Aflatoxins (M1) in raw milk from Kitinda and Kaptama MCCs

Correlation analysis of Aflatoxins in feeds and milk

Aflatoxin levels in feed and milk were all investigated for associations using Pearson correlation analysis. There was a significant difference between feed and milk ($p > 0.01$), indicating a strong association between the two (Table 4.3).

Table 4 1. Pearson correlation for total aflatoxins in feed and milk

	Feed	Milk
Feed	1	.749**
Milk	.749**	1

**Correlation is significant at the 0.01 level (2-tailed correlation).

The strong Pearson correlation coefficient of 0.749 indicates a strong positive correlation between aflatoxin levels in feed and milk. These results corroborate the findings by Admasu *et al*. (2021) [1] who discovered a strong correction between aflatoxins in feed and AFM1 in raw milk. Additionally, Bahrami *et al*. (2016) [4] stressed how feed quality directly affected the safety of milk. The role of this correlation shows how aflatoxins, powerful carcinogens produced by *Aspergillus* fungi, contaminate the dairy supply chain, creating significant health risks.

Akbar *et al*. (2020) [2] concluded that feed was the key factor that determined the quality and safety of dairy products. Their analysis of the aflatoxin contamination on several dairy farms yielded a similar positive correlation between aflatoxin levels in feed and milk, thus outlining the strength of the argument. The parallel here suggests a consistent trend across farms situated in different geographic locations and couching various farming practices, which ultimately emphasizes the universal nature concerning aflatoxin contamination in dairy production.

Conclusion

In conclusion, this study identified significant variations in milk quality parameters like crude protein, butterfat, and

density, highlighting the influence of factors in diet. However, the most critical finding concerns the presence of aflatoxin contamination in both feed and milk, exceeding recommended safety limits. This poses potential health risks to consumers. A long-term approach is necessary to ensure safe and high-quality milk. This includes educating farmers on proper feed storage practices to minimize aflatoxin growth, implementing stricter milk safety standards, and exploring strategies to improve milk quality through better feeding practices.

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