



Original Article



Quality Assurance of Commercial Dog Food in Terms of Proximate and Aflatoxins Analysis

Naseem Zahra¹, Muhammad Khalid Saeed^{1*}, Shumaila Usman¹, Asma Saeed¹, Saima Nazir¹ and Ammara Yasmeen¹

¹Food and Biotechnology Research Centre, Pakistan Council of Scientific and Industrial Research Laboratories Complex, Lahore, Pakistan

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*Corresponding Author:

Muhammad Khalid Saeed
Food and Biotechnology Research Centre,
Pakistan Council of Scientific and Industrial
Research Laboratories Complex, Lahore,
Pakistan
rosefbrcl@gmail.com

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ABSTRACT

The domestication of the dog has been extensive and continues to grow, predominantly in terms of their dietary habits. Primarily, wild dogs depended exclusively on hunting for their food, but with the passage of time and domestication, they started consuming meals provided by humans. **Objective:** To evaluate the quality of dry dog food, focusing particularly on evaluating its aflatoxin contamination and proximate analysis comparable to established nutritional standards for dogs. **Methods:** This experimental research was conducted at the Food Department within the PCSIR Laboratories Complex in Lahore, Pakistan. The sample was chosen purposively to check the quality of pet dog food. The analysis included determining the moisture content, ash, crude fiber, and crude protein levels of the dog food using standardized methods. **Results:** The purchased dog food exhibited a protein content of $20.64 \pm 0.40\%$ and a calculated energy value of 376.50 ± 0.25 Kcal/100g. The results were evaluated against the nutrient benchmarks established by AAFCO (Association of American Feed Control Officials). The minimum protein level in adult dog food, calculated on a dry matter basis, must be no less than 18% according to AAFCO guidelines. **Conclusion:** Conspicuously, the analysis depicted that aflatoxins (B1, B2, G1, G2) were not present in the dog food, confirming its safe consumption by dogs based on the aflatoxin assessment. So, it was revealed that according to nutritional and aflatoxin analysis of dog food obtained from the market, it was for the dog's health.

INTRODUCTION

The increasing prevalence of pets in households is driving dynamic growth in the pet food market. Today, pet food is commonly utilized by numerous pet owners due to its ease, affordability, and accessibility, providing a trustworthy means of feeding pets throughout their lives. With an improved understanding of dogs' nutritional requirements, diets can now be tailored based on breed, age, and activity level. As dogs are often seen as integral members of the family, owners are increasingly focusing on the dietary needs of both their pets and themselves [1]. It is assumed that the pet food industry will be increasing at an annual rate of 2.6% [2]. The contamination by biological, physical

and chemical components in the food of animals can pose significant risks in that they may cause sickness or loss in animals; if appropriate controls in production are not taken [3]. The most common kind of pet food in the market is normally dry, hence quite convenient in storage and effectively satisfies the nutritional needs of pets. Under EU directives (EC 767/2009), a complete diet of whole pet food used as the only nutrient source over a prolonged time meets the complete dietary requirements of the given animals in terms of their species and their stage of life [4]. Consequently, it is imperative to assess the quality of pet food, and numerous studies have been conducted to

examine dog food [5, 6]. Another serious potential threat related to animal feed security is the occurrence of fungi and mycotoxins [7]. Comprehending the link between food, feed, and fungi is important for assessing the threat of mycotoxin infectivity. The studies have shown that these toxins in pet foods can present significant dangers to the health of pets, resulting in both severe and chronic poisoning based on the degree of contamination and the duration of contact [8]. The dogs, especially, are particularly vulnerable to the severe hepatotoxic impacts of aflatoxins [9]. Aflatoxins represent a class of tremendously harmful mycotoxins that can spoil various feed products, including commercially accessible dog food. This contamination presents a grave health threat to dogs, as aflatoxins are linked to many health issues such as liver damage, weakened immune response, and cancer. The study underscores the requirement of regular inspection for aflatoxin contamination in commercial dog food, mainly in repackaged products. It is necessary to uphold high hygiene standards during the storage and repackaging processes to prevent the formation of aflatoxins [10].

Despite the rapid expansion of the pet food market in Pakistan, limited independent laboratory-based evaluations have been conducted to verify the nutritional claims and safety standards of commercially available dog food. Most available data focus on international markets, while region-specific assessments of proximate composition and aflatoxin contamination remain scarce. Furthermore, there is insufficient published evidence comparing locally marketed products with established standards such as AAFCO guidelines. This gap highlights the need for systematic quality assessment of commercial dog food to ensure nutritional adequacy and safety for companion animals. This study aimed to assess the quality of dry food for adult dogs, focusing specifically on evaluating its proximate analysis and adherence to established nutritional guidelines for dogs.

METHODS

This experimental research was conducted at the Food Department within the PCSIR Laboratories Complex in Lahore, Pakistan. The sample was chosen purposively to check the quality of pet dog food. The dry dog food (1 kg) in pellet form was obtained from a supermarket in Lahore, Pakistan, to analyze the information regarding proximate aspects of packaging material (March to May 2025). The dog food sample was ground to a mesh size of 1mm and was stored in sealed plastic bags in a cool, dry location to conserve its nutritional quality. The sample was preserved till the experimental lab analysis. Analysis involved an

evaluation of moisture content, ash, crude fiber and crude protein contents of the dog food on standard standards. Dietary assessment of the reviewed pet food was determined using a dry matter (DM), crude protein (CP), crude fiber (CF) and crude ash (CA). All tests were done using the standardized methods with ISO 17025 [11] accreditation with guidance according to AOAC-2023 [12]. An amount of 10 g of the sample was dried in a hot air oven at 105°C until a stable weight was recorded, and the difference in the weight was recorded as moisture content. In case of ash content, 1g of sample was put in a pre-weighed porcelain crucible and ashed in an ashing furnace at 600°C until white ash formed and a stable weight was recorded. It determined the crude protein content as a result of multiplying the nitrogen value by 6.25 after assessing the nitrogen content through the micro-Kjeldahl procedure. Moreover, the carbohydrate content was assessed according to the guidelines established by AOAC-2023. The carbohydrate content (expressed as a percentage on a wet basis) is calculated by deducting the total percentages of crude protein, crude fat, ash, and moisture content from 100. Carbohydrate % (wet basis) = 100 - (% of crude protein + % of Crude fat + % ash content + % content of moisture). The incidence of aflatoxins in dog food was assessed using the thin-layer chromatographic method [13]. A 50g powdered sample was combined with 250ml of chloroform and shaken for 30 minutes. Subsequently, 50ml of the resulting solution was evaporated using a water bath. The volume was adjusted, and the sample was applied to a TLC plate as per the given procedure. Different concentrations of standards were utilized to compare against the sample extract for aflatoxin quantification (AOAC, 2023). The total aflatoxins (AFB1+AFB2+AFG1+AFG2) were calculated using the specific formula [14]. The formula for the detection of aflatoxin B1 is given below: $\text{Aflatoxin B1 (g/kg)} = S \times Y \times V / W \times Z$. Where, S=volume in L of aflatoxin standard which is equivalent intensity to Z=L of the sample, Y=Concentration of aflatoxin standard in g/mL, V=Volume in L of solvents requisite to dilute final sample extract, Z =Volume in L of extracted sample requisite to confer fluorescence intensity similar to that of S=L of the aflatoxin standard and W=Effective weight (in grams) of original sample contained in final extract.

RESULTS

According to the nutrient content guiding principle for dry dog food, the recommendations include a minimum of 26% crude protein, at least 15% crude fat, a maximum of 5% crude fiber, approximately 37% carbohydrates, around 7% minerals, and no more than 10% moisture. Nutrient profile for dog food intended for growth and reproduction, it is suggested that adult dogs get a minimum of 18% protein

and 5.5% fat on a dry matter basis (DMB), with a caloric density of 300 to 400 kilocalories of metabolizable energy (ME) per 100 grams of dry matter (DM) (Table 1).

Table 1: Proximate Assessment of Food for Pet Dog

Sr. No	Parameter (%)	Values
1	Moisture	7.00 ± 0.30
2	Ash	4.40 ± 0.09
3	Protein	20.64 ± 0.40
4	Fat	8.10 ± 0.50
5	Fibre	4.60 ± 0.20
6	Carbohydrates	55.26 ± 0.10
7	Energy (Kcal/ 100g)	376.50 ± 0.25

In this analysis, the product was checked for aflatoxin contamination and was found safe, as no contamination of aflatoxins was detected. This indicates that the dog food sample is safe for canine health (Table 2).

Table 2: Aflatoxin Assessment of Food for Dogs

Sr. No	Aflatoxins	Concentration (ppb)
1	B1	Not Detected
2	B2	Not Detected
3	G1	Not Detected
4	G2	Not Detected
5	Total Aflatoxins	Not Detected

DISCUSSION

The contemporary findings signify that the average levels of crude fat were found to be lacking, while crude protein, fiber and ash align closely with recommendations of AAFCO, 2014. Though, notably, dry dog food exhibited lower levels of crude protein according to the recommendation of Case *et al.* [15]. The moisture levels are less than 10% as per recommendations. The proximate analysis results showed that this dog food can be regarded as a high-calorie option, providing 376.50 ± 0.25 Kcal per 100g, to meet the dietary needs of dogs. The inadequate fat content in dry dog food may create a momentous threat, as fat serves as the main energy source and provides necessary fatty acids, while also being one of the most easily digestible nutrients. Additionally, fat enhances the palatability and quality of pet food. A considerable lack of fat in dry dog food may result in energy deficiencies, mostly for working dogs [16, 17]. Aflatoxins are harmful and cancer-causing fungal metabolites that can drastically impact food quality. The most prevalent aflatoxins include aflatoxin B1, B2, G1, and G2. The relation of aflatoxins with dietary lipids may lead to digestive issues, as it reduces the activity of digestive enzymes, resulting in a malabsorption syndrome [18]. The domestic dogs, similar to other household animals, are exposed to aflatoxin poisoning that may be found in their food, which poses a considerable threat to their health [19], while fatalities from aflatoxicosis are usually linked to extremely high concentrations of aflatoxin (ranging from

100 to 6700 ppb), there have also been instances of deaths occurring at lower levels of aflatoxin (between 13 and 91 ppb). In spite of the implemented protection protocols and protective measures designed to protect dog food components and ensure precise recipe preparation, incidents of food contamination by aflatoxins may lead to health issues and even fatalities among animals. Veterinarians play a crucial role in promptly identifying the negative health impacts linked to contaminated food products [20]. The well-timed communication with manufacturers and regulatory bodies, along with comprehensive documentation, sample collection, and analytical testing, will ease the validation or dismissal of potential toxic exposure to aflatoxins.

This study is limited by the analysis of a single commercially available dog food sample, which may not represent the overall market variability. Additionally, only proximate composition and aflatoxin contamination were assessed, without evaluating mineral balance, vitamin content, microbiological safety, or long-term health impacts. Future research should include a larger sample size across multiple brands and batches, incorporate broader toxicological and nutrient profiling, and conduct periodic surveillance studies. Such comprehensive evaluations would strengthen regulatory oversight and contribute to improved quality assurance in the pet food industry in Pakistan.

CONCLUSIONS

The growing reliance on dogs for camaraderie and consolation is believed to be a key factor driving the noteworthy growth of the pet food sector, which in turn has led to a consequent increase in demand for dog food among pet owners and breeders. To our knowledge, the claims regarding nutritional sufficiency made by pet food companies in Pakistan have not been carefully verified. Providing dog food without accurate information regarding nutrient concentrations cannot satisfactorily meet a dog's nutritional requirements. It is suggested that manufacturers should accurately declare the nutrient concentrations in their dog food products and ensure the quality of pet food in terms of toxins. The pet dog food free of any contamination may ensure the well-being of pet dogs.

Authors' Contribution

Conceptualization: NZ
 Methodology: SU, SN, AY
 Formal analysis: MKS, AS
 Writing and Drafting: NZ
 Review and Editing: NZ, SU, SN, AY, MKS, AS

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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