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# Abstract

The study was conducted to compared analyzed nutrient contents of kitten foods to the guaranteed analyses on packages. We collected three types of kitten foods and explored variation in chemical content of different types kitten foods available in the study area Uttara, Dhaka, Bangladesh. Chemical analyses of the sample were carried out in the triplicate for Moisture, Dry matter, Crude protein, Crude fiber, Ether extract and Total ash in the Animal Nutrition Laboratory, Chattogram Veterinary and Animal Sciences University, Chattogram, Bangladesh. The analytical result indicates that moisture, dry matter, crude protein, crude fiber, ether extract and total ash content significantly differed (p<0.01) and no significant (p>0.05) from one sample to another. DM contend varied from 92.022% to 93.961%, CP contend varied from 31.17% to 35.02%, CF contend varied from 1.035% to 1.9455%, EE varied from 7.04% to 8.40%, TA contend varied 6.63% from to 9.05%.

**Keywords:** Kitten food, Proximate analysis, DM%, CP%, CF%, EE% and TA%

# Introduction

Nowadays, the percentage of the population living in the urban areas has been increased and people are interested to keep pets for their own company which removes their loneliness(Stanley et al., 2014). It’s hard to know the exact number of cats around the globe, but recent statistics show us that it can be anywhere from 200 million to over 600 million including housecats, strays and feral cat (Michael, 2022). In first world countries, people fostering more cats than rest of the other countries people around 42.7 million US have at least one cat and lowest rate of cat ownership at 16.4 million in Columbia(Cvetkovska, 2022).However, there is no reliable source of information about the total cat population in Bangladesh.

In recent days, people are busy with their professional life. So, they prefer readymade commercial food than homemade food. People love to rear kitten than adult cat and kitten are more sensitive (Lundgren & M.A. Segal, 2022). After weaned young kittens need to eat frequently, at the 8weeks of age they need to fed about 5 meals a day and after 6 months the need of feed is decreased and usually give 2meals a day. After 8 to 10 weeks, they get regular kitten food in according to their age, size (in 5 lbs 320 kcal, 10 lbs 540 kcal, 15 lbs 740 kcal, 20 lbs 910 kcal), lifestyle and physical activities. (Dr. Coats Jennifer, 2022)**.**

A good quality kitten food has advantages over adult cat since it has been specially formulated for a kitten’s demanding nutritional requirements. Because of their rapid growth, any nutritional mistakes made during kitten hood will have severe, even irreversible consequences. For most kittens, growth is almost completed by six months age(Llera & Ward, 2022). Some food should be avoided 1) milk, cheese and others dairy products 2) chocolates 3) raw eggs, meat or fish 4) dog feed 5) bread and yeast 6) onion and garlic. (Cortinovis & Caloni, 2016)

Kittens are given kitten foods which manufactured for them are divided into two major groups; Dry food &Wet food. In Bangladesh there are some available commercial kitten foods like Smart Heart, Whiskas, Lara, Drools, Bonacibo, Reflex, Me-O etc. As a result of civilizing kitten owners intensify the importance of choosing food from a reliable producer. Proximate analysis represents an estimation of nutrient content and measures percentage moisture, crude protein, crude fat, ash and crude fiber. Carbohydrate content is then calculated by subtracting these 5 measured nutrients from 100%. Cat food need maximum percentage of crude protein (min.30%), crude fiber (max.4%) and crude fat, moisture as well as digestible energy related to TDN. The kitten required around 7.5g/100kcal protein (Heinze, n.d.).

For maintain good health of kitten, cat parents need to know proper nutrient value of commercially available food. It is necessary to estimate the quality and major nutrients in kitten food. So, the goal of the study is to analysis of proximate component of some available kitten food available in Bangladesh market and to compare with those mentioned in brand manufacturer.

# Materials and Methods

 When pet food manufacturers formulate and produce pet foods, there are two ways they can determine the level of nutrients present in the food. The first and most accurate way is to conduct a laboratory analysis of the finished product. Proximate analysis is a commonly used panel of tests that provides information about a select group of nutrients. The laboratory procedures involved in proximate analysis provide the percentages of moisture, crude protein, crude fat, ash (minerals), and fiber that are contained in the food. Nitrogen-free extract (NFE), which represents a rough estimate of the soluble carbohydrate fraction of the food, can be calculated by subtraction.

## Study area and period

The study was carried out in the Department of Animal Sciences and Nutrition, Faculty of Veterinary Medicine, Chattogram Veterinary and Animal Sciences University, Khushi, Chattogram-4202, Bangladesh in February- April 2022.

## Collection of samples:

The kitten food collected from different pet shop Specialized Pet Corner, Uttara, Dhaka. The sample was brought to the laboratory and ground to obtain a uniform size and kept in an airtight plastic bag.

## Proximate Analysis:

Proximate analysis of kitten food showed the following composition Dry Matter (DM), Moisture, Total Ash (TA), Crude Protein (CP), Crude Fiber (CF) and Ether Extract (EE) in Animal Nutrition laboratory, CVASU.

## Estimation of Dry Matter and Moisture:

In oven the Petridis was dried which was regulated at 105 c and was cooled in a desiccator and weighted. 10 gm of food sample was weighted into the Petridis and kept into the oven for 24 hours. The Petridis was removed from the oven with metal tong. After that it was cooled in desiccator and the final weight was taken after getting constant weight (Thiex, 2009).

 $DM\%=\frac{initial wt. -final wt.}{sample wt.}×100$

% Moisture = (100 - % DM)

## Estimation of Crude Protein (CP)

5 gm of sample was weighted and taken into a digestion tube. Then one spoonful of catalyzer mixer (KOH, NaOH, Se) was added there. 10 ml concentrated H2SO4 was also added, and the digestion flask was placed in Kzeldhal Digestion Set. After that heat was increased gradually and continued until clear residue (45 min to 1 hr) is formed. The flask was removed from the digestion set and then cooled. 10 ml 2% boric acid solution, 2 drops mixed indicator were taken in a conical flask. The conical flask was fitted in the collection arm of distillation set. 50 ml distilled H2O was added in the digestion tube and fitted in the distillation flask. 40 ml of 40% NaOH was added there and the distillation was continued up to 100ml. Then it was titrated against 0.1 N HCl. Titration was continued until the color was changed into pink. Then the reading of titration was taken. (Thiex, 2009).

 CP% $=\frac{\left(titer-initial\right)×N\% of HCl×14.007×6.25}{Sample weight}×100$

## Estimation of Crude Fiber (CF)

 2.0 gm sample was weighted accurately. Then 125 ml 1.25% H2SO4 solution in the beaker. Use 3-5 drops N-Octanol as antifoam agent. Then boil the sample until constant volume (30 min.). After that washed the sample with water 3 times to ensure it acid free and then add 125 ml 1.25% NaOH and 3-5 drops N-Octanol as antifoam agent. Then boil the sample until constant volume (30 min.). wash the reduce the above and wash with 1% HCl solution to make acid free. Drying the sample at 105 c and cooled in desiccator. Burn the sample until no smoke. Then the sample with crucible was cooled and transferred to the muffle furnace. After that sample was ignited at 550-600°C for 6-8 hours until white ash is produced. Weight the ash and deduct the value to get fiber weight.(Thiex, 2009).

 CF%$=\frac{wt. of crucible with fiber \&ash-wt.of crucible with ash}{sample wt.(1g)}×100$

## Estimation of Ash

The crucible was dried in hot air oven. It was cooled in Desiccator. After that the weight of the empty crucible was taken. 5gm of meat sample was placed in the crucible and it was burned. Burning was done until no smoke was produced in heater. Then the sample with crucible was cooled and transferred to the muffle furnace. After that sample was ignited at 550-600°C for 6-8 hours until white ash is produced. The furnace was cooled at 150°C and the sample was transferred to the desiccator and weight was taken (Thiex, 2009).

 Ash%$=\frac{wt.of crucible \& ash-wt of empty crucible}{wt of feed sample}×100$

## Estimation of Ether Extracts (EE)

Two-gram dry sample was taken in an extraction thimble having porosity, then placed in the Soxhlet flask. The cork of thimble was above the syphon tube. A receiving flask was weighted and fitted with Soxhlet apparatus and was placed in water bath at 500 to 600 C. Ether extract was poured down in to the soxlet flask. The flask was filled up to ¾th portion with ether and it was assured that water was running through the condenser. When extraction was over, the thimble with sample was removed and heated in the water bath to remove all the ether from receiving flask. The receiving flask was placed into the oven at 1050C to eliminate left of the ether and water. After drying, the flask was taken out and weighted (Thiex, 2009).

 EE%$=\frac{initial wt. -wt. after extraction}{sample wt}×100$

 Newborn kittens feed frequently, latching on to nurse once every 1-2 hours. Mimic this feeding schedule when bottle feeding, gradually reducing the feeding frequency to 4-6 feedings per day by the time your kitten reaches three weeks of age.

Kittens usually begin the weaning process around their 4th week. During this time, they’ll start gradually shifting from milk or formula onto a solid food diet, which delivers the protein, fatty acids, and nutrients that fuel their early development.

At 4 to 4.5 weeks of age, bottle feeders may start slowly transitioning their kitten to a diet of watered-down kitten food. Start by replacing some of his usual meals with a loose slurry of wet kitten food and kitten formula in a bottle, then gradually starting feeding your kitten from a bowl.

# Result

## Dry matter calculation

Brand 1:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no | Empty Petridis wt. | Sample wt. | Sample + Petridis wt.  | Total dry matter | average |
| 1 | 67.0990 gm | 10 gm | 76.4558 gm | 93.568% |  |
| 2 | 69.3121 gm | 10 gm | 78.6721 gm | 93.60% | 93.563% |
| 3 | 61.4509 gm | 10 gm | 70.8029 gm | 93.52% |  |

Brand 2:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no. | Empty Petridis wt | Sample wt. | Sample+ Petridis | Total dry matter | average |
| 1 | 48.4967 gm | 10 gm | 57.6989 gm | 92.022% |  |
| 2 | 45.2930 gm | 10 gm | 54.5194 gm | 92.264% | 92.124% |
| 3 | 38.3038 gm | 10 gm | 47.5123 gm | 92.085% |  |

Brand 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no. | Empty Petridis | Sample wt | Sample+ Petridis | Total dry matter | average |
| 1 | 43.1833 gm | 10 gm | 52.5656 gm | 93.823% |  |
| 2 | 47.2210 gm | 10 gm | 56.5878 gm | 93.668% | 93.817% |
| 3 | 48.4878 gm | 10 gm | 57.8839 gm | 93.961% |  |

## Total Crude Protein calculation

Brand 1:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Id no | Initial Reading | Final reading | Sample weight | Normality of HCl | CP | Average |
| 1 | 0 | 17.8 | 5 gm | 0.1% | 31.17% |  |
| 2 | 17.8 | 35.7 | 5 gm | 0.1% | 31.34% | 31.34% |
| 3 | 0 | 18 | 5 gm | 0.1% | 31.52% |  |

Brand 2:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Id no | Initial Reading | Final reading | Sample weight | Normality of HCl | CP | Average |
| 1 | 18.3 | 34.9 | 5 gm | 0.1% | 29.07% |  |
| 2 | 0 | 16.9 | 5 gm  | 0.1% | 29.56% | 29.35% |
| 3 | 16.9 | 33.7 | 5 gm | 0.1% | 29.42% |  |

Brand 3

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Id no | Initial Reading | Final reading | Sample weight | Normality of HCl | CP | Average |
| 1 | 0 | 19.5 | 5 gm | 0.1% | 34.14% |  |
| 2 | 19.5 | 39.5 | 5 gm | 0.1% | 35.02% | 34.5% |
| 3 | 0 | 19.8 | 5 gm | o.1% | 34.34% |  |

## Crude Fiber calculation

Brand 1:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no. | Empty crucible weight | Sample wt | Sample +crucible | CF | Average |
| 1 | 40.9466 gm | 2 gm | 40.9077 gm | 1.9455% |  |
| 2 | 35.2979 gm | 2 gm | 35.2648 gm | 1.65% | 1.77683% |
| 3 | 25.6723 gm | 2 gm | 25.6376 gm | 1.735% |  |

Brand 2:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no. | Empty crucible weight | Sample wt | Sample +crucible | CF | Average |
| 1 | 35.8442 gm | 2 gm | 35.8266 gm | 1.76% |  |
| 2 | 41.3622 gm  | 2 gm | 41.3389 gm | 1.16% | 1.318% |
| 3 | 17.4174 gm | 2 gm | 17.3967 gm | 1.035% |  |

Brand 3:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no. | Empty crucible weight | Sample wt | Sample +crucible | CF | Average |
| 1 | 27.5209 gm | 2 gm | 27.4901 gm | 1.54% |  |
| 2 | 29.3100 gm | 2 gm | 29.2795 gm | 1.525% | 1.498% |
| 3 | 19.1958 gm | 2 gm | 19.1672 gm | 1.43% |  |

## Total Ash calculation

Brand 1:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no. | Empty crucible weight | Sample wt | Sample +crucible | Ash | Average |
| 1 | 24.7880 gm | 3 gm | 25.0144 gm | 6.68% |  |
| 2 | 18.5630 gm | 3 gm | 18.7628 gm | 6.66% | 6.66% |
| 3 | 24.1376 gm | 3 gm | 24.3365 gm | 6.63% |  |

Brand 2:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no. | Empty crucible weight | Sample wt | Sample +crucible | Ash | Average |
| 1 | 25.6712 gm | 3 gm | 25.8978 gm | 7.55% |  |
| 2 | 25.8685 gm | 3 gm | 26.0955 gm | 7.57% | 7.56% |
| 3 | 25.0308 gm | 3 gm | 25.2573 gm | 7.55% |  |

Brand 3:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no. | Empty crucible weight | Sample wt | Sample +crucible | Ash | Average |
| 1 | 16.3722 gm | 3 gm | 16.6381 gm | 8.86% |  |
| 2 | 17.6004 gm | 3 gm | 17.8721 gm | 9.05% | 8.91% |
| 3 | 19.0808 gm | 3 gm | 19.3453 gm | 8.81% |  |

## Ether Extract calculation

Brand 1:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no. | Empty jar weight  | Sample weight | Sample + glass jar weight | EE | Average |
| 1 | 74.1881 gm | 2 gm | 74.3403 gm | 7.61% |  |
| 2 | 74.5095 gm | 2 gm | 74.6451 gm | 6.78% | 7.143% |
| 3 | 74.4323 gm | 2 gm | 74.5731 gm | 7.04% |  |

Brand 2:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no. | Empty jar weight | Sample wt | Sample + glass jar weight | EE | Average |
| 1 | 73.9802 gm | 2 gm | 74.1415 gm | 8.065% |  |
| 2 | 74.1858 gm | 2 gm | 74.3466 gm | 8.40% | 8.235% |
| 3 | 74.1374 gm | 2 gm | 74.2198 gm | 8.24% |  |

Brand 3:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Id no. | Empty jar weight | Sample wt | Sample + glass jar weight | EE | Average |
| 1 | 74.5074 gm | 2 gm | 74.6673 gm | 7.995% |  |
| 2 | 74.4328 gm | 2 gm | 74.5903 gm | 7.875% | 7.98% |
| 3 | 74.5705 gm | 2 gm | 74.7316 gm | 8.054% |  |

Most manufacturers would be expected, therefore to keep nutrient composition above labeled minima and below labeled maxima but difference between the labeled and actual analyses might vary among foods intended for different species, life or manufacturers. Differences above minima would be small where adding nutrients increase costs but larger where additional nutrients have to be included to provide a safety margin that allows for difference in ingredients and manufacturing condition Results of the proximate analysis of cat foods revealed that the mean values of DM%, CP%, CF%, EE%, and TA% were 93.167%, 31.73%, 1.531%, 7.786%, and 7.71%, respectively for different brands. All the brands met the minimum standards.

# Discussion:

Domestication and changes in human diets as a result of agricultural activities have caused a shift in dog and cat diets. The majority of Americans (69%) own at least one pet, with dogs (45%), cats (35%), and fish (9%) being the most popular among US adults. 88% of pet owners in the United States consider their pets to be members of their family (Ballard, 2019). Anthropomorphism in both dogs and cats has resulted in pet owners preferring pet foods that contain nutrients found in their regular diet and are manufactured in a way that maintains the nutritional integrity of the ingredients while ensuring a healthy life (Barnard, 2010). Food is a substrate for the GI microbiome of cats and dogs, and it plays an important role in regulating its composition and metabolism. In turn, the microbiome aids the host's nutrient digestion and the development of postbiotics, which are bacterially generated substances that can have an impact on pet health. As a result, pet owners can influence the microbiome of their cats and dogs by feeding them the right diet. However, there is a dearth of understanding of the influence these feeding choices have on the microbiome, and consequently on the general health of the cat. Pet foods are designed to provide the basic nutritional building blocks of carbohydrates, proteins, and fats, but they are increasingly incorporating microbiome-targeted components such as prebiotics and probiotics (Wernimont et al., 2020).  Microbiome now refers to both the bacterial cells themselves and their genetic material. Dehulled cereal grains like corn, wheat, oats, and barley; cereal byproducts like wheat madlings, wheat germ meal, and corn gluten meal; soybean products like soy grits; animal products like meat meal, meat and bone meal, meat byproducts, poultry byproducts, and fish meal; milk products like dried skim milk, dried whey; fats and oils like animal fat and groundnut cake; and supplements for minerals and vitamins (K Loosi & J Holder, 2018).

Veterinarians, pet owners, and other stakeholders should carefully assess the efficacy, sufficiency, and safety of pet diets. To promote products in the public sector, pet food producers in the US must adhere to a number of laws and regulations from various federal, state, and local organizations. Although there are numerous protocols in place to assist guarantee the safety and sufficiency of pet food, neither customers nor veterinarians may be aware of them. The objective of this article is to cover the pet food manufacturing processes that have been designed to help ensure safety and adequacy of pet meals in the Bangladesh. The veterinarian plays a crucial role in advising consumers regarding pet foods (Zicker, 2008).

A facilitative fat improves the palatability and texture of meals, provides a rich source of dietary calories and energy, and helps in the absorption of fat-soluble vitamins. Both lipid kinds can be consumed by dogs and cats without raising their risk of coronary artery disease, heart attacks, or strokes, which people are much more likely to experience. Unlike humans, dogs and cats frequently resist the onset of hypercholesterolemia and atherosclerosis. These fats provide food more flavor and texture, provide energy, and aid in the digestion of fat-soluble vitamins in dogs and cats (Bauer, 2006).

By preventing tartar, the friction produced by chewing dry food will help maintain the condition of your cat's teeth. It doesn't require refrigeration once opened, making it easier to keep than wet food. Additionally, since dry food can be left out longer, your cat can decide when to eat. Wet food might be a bit messy for cats, although dry food is typically simpler to clean up after.[16]

Many cat owners feed only dry food to their felines. "Dry food is fine as long as it is complete and balanced," says Dr. Kallfelz. Cans of cat food may cost more, while dry food may cost less and remain fresher for longer. Especially if they are prone to developing urinary tract blockages, cats that only consume dry food need to have access to plenty of fresh water. All cats should have access to fresh, clean water at all times (Morelli et al., 2021). According to the packaged label, the nutritional value of a dry kitten food should be 30-40 % CP, not less than 5% EE, 1.2-4 % CF, 7.5-9% Ash and no more than 10.0 % moisture (Hill et al., 2009). In our analysis, The CF was 1.531%, which was located in the range. The ash content was 7.71 %, which also in the permissible range and moisture was 7.84% which also in the range the CP percent was 31.73 %, which was similar to the suggested threshold. The EE was 7.786%, which was also in the required level.

The laboratory analysis revealed that the EE was lower than the indicated figure. The EE deficiency in dry cat food was concerning. A related study found that companion animal diets played a substantial effect in food palatability and texture [48]. Fiber is given to canine and feline diets to promote gastrointestinal fullness while decreasing calorie intake. One negative aspect of high-fiber diets is that stool volume increases. Because dogs are less willing to consume huge soft feces, this can be beneficial in treating coprophagia.   In our study, the CF % was found to be lower than the reported value.

 Although enzymes in the cats' gastrointestinal tract cannot break down dietary fiber into monosaccharide units for absorption in the small intestine, a portion of fiber may be digested by bacteria in the cats' large intestine. They create short-chain fatty acids and other end products by bacterial fermentation. Short-chain fatty acids are a vital energy source that work on the gastrointestinal tract's lining epithelium cells, and these fiber sources serve to maintain the health of the gastrointestinal tract (Wernimont et al., 2020)

Natural polysaccharides' function in intestinal fermentation. Specific intestinal microbes’ breakdown and ferment polysaccharides that can't be broken down by stomach and intestinal enzymes. Numerous oligosaccharides that are advantageous to host health are produced as a result of polysaccharide degradation. SCFAs and other metabolites are produced during the fermentation of polysaccharides and oligosaccharides. SCFAs are readily absorbed and support the IEC's immune system and barrier function. Polysaccharides, oligosaccharides, or metabolites like SCFAs may encourage the growth of specific intestinal bacteria during intestinal fermentation, changing the composition of the intestinal microbiota and impacting the health of the host. Abbreviations: IECs, intestinal epithelial cells; SCFAs, short-chain fatty acids; OSs, oligosaccharides (Zhang et al., 2018)

According to one published study, CF plays a significant role in controlling bowel movement, regulating immunological function, gut bacteria composition, diluting caloric density, contributing to reducing weight, and indirectly minimizing the incidence of obesity and diabetes mellitus in the pet population (Singh et al., 2017)

 It was also stated that a high fiber intake may impair the digestion and absorption of other nutrients. Minerals are the primary inorganic elements, accounting for just 4.0 percent of an animal's total body weight. To maintain the necessary conditions and preserve normal health, vital minerals must be present in the diet [20]. The cat needs optimal levels of calcium and phosphorous, however the optimal ratio of calcium to phosphorous in the ration has not yet been recognized.

The methionine (met) requirement of kittens is correlated with the concentration of dietary crude protein (CP).  the met requirement of growing kittens, unlike omnivores and herbivores studied, was not positively correlated with the concentration of dietary CP. food intake and possibly altered hormonal secretion play a role in this growth response (Strieker et al., 2007).

In these rations, the calcium: phosphorus ratio was 0.5-1.5. High dietary phosphorus (P) and low calcium-to-phosphorus ratio (Ca:P) are associated with kidney damage in cats. There are no established guidelines for dietary P maximum for cats (Summers et al., 2020).

# Conclusion

Balanced nutritional food is essential for improving kitten health. Regarding commercial kitten food, it's essential to pay attention to the nutritional concerns raised by the manufacturer. All of the kitten foods that we analyzed satisfied the nutritional needs according to the claim made on the label by the manufacturer. We need to analyze additional kitten food in detail in order to conduct a thorough study.

Most manufacturers would be expected, therefore, to keep nutrient composition above

guaranteed minima and below guaranteed maxima but differences between the guaranteed and actual

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analyses might vary among foods intended for different species, life stages or among manufacturers.

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