Research Article

Effects of psyllium husk utilization on the efficiency of feed utilization and the fecal hairballs elimination

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Abstract - The aim of this research is to examine the impact of psyllium husk utilization on the nutrition of cats and the reduction of fecal hairballs. A hybrid breed Maine coon x Persian cats totaling of 18 animals, mixed genders, with an average age of 2.58 ± 1.04 years and weight of 4.07 ± 1.22 kilograms were included in a randomized completely block design. All cats were assigned at random to receive three fiber-enriched food treatments such as, control (T1), using psyllium husk 1% (T2), and using 1% psyllium husk plus 6% cellulose (T3), water available for unrestricted access throughout the day, duration 30 days. From the study results it was found that the control group (T1) exhibited lower feed intake (g/d) compared to the fiber groups (T2, T3) (P = 0.022). In analyzing the feed intake (g/BW) the control group (T1) exhibited lower values relative to the groups that received fiber (T2, T3) (P = 0.049). The feces production (as-is basis) for the group receiving 1% psyllium husk (T2) recorded the highest value (P = 0.023), while considerably greater than the group that received psyllium husk plus cellulose (T3) (P = 0.032). Using of psyllium husk and cellulose did not influence the total trichobezoar levels (P > 0.05). This study concludes that incorporating psyllium husk at a concentration of 1% resulted in an increase in feed intake. Furthermore, the addition of psyllium husk can lead to an increase in wet fecal output.

Keywords: Cat, hairball, cellulose, fecal, psyllium husk

Received: 23rd September 2024
Revised: 23rd December 2024
Accepted: 24th December 2024

Citation: Sornsadanant, P., Kovitvadhi, A., Poungpong, K., & Kongmun, P. (2025). Effects of psyllium husk utilization on the efficiency of feed utilization and the fecal hairballs elimination. *Food Agricultural Sciences and Technology (FAST)*, *11*(3), 244-256. https://doi.org/10.14456/fast.2025.18

1. Introduction

Cat hairballs, also known as trichobezoars, are a common occurrence in domestic cats, resulting from the ingestion of hair during grooming. While often considered a normal physiological phenomenon, hairballs can sometimes lead to health issues such as gastrointestinal obstruction. Factors that influence the formation of hairballs include grooming habits and nutritional selections. Cats spend a significant amount of time grooming, which leads to the ingestion of loose hair. This hair can accumulate in the stomach and form a hairball, which is typically expelled through vomiting (Miltenburg et al., 2021). Approximately 10% of healthy cats regularly vomit hairballs, which is generally not a cause for concern unless it becomes excessive (German & German, 2013). While normal feline behavior is often considered, excessive hairball formation can lead to gastrointestinal obstruction and other health issues.

The composition of a cat's diet significantly affects hairball formation. Diets enriched with cellulose have been shown to reduce the incidence of hairball-related symptoms such as vomiting, retching, and coughing by promoting the excretion of hair through feces (Beynen et al., 2011). Research has documented various methodologies aimed at the prevention of trichobezoars in cats, encompassing nutritional supplements, herbal treatments (kelp and papaya), and diets enriched with dietary fiber. The formulations containing enzymes like bromelain, which can be ingested daily without adverse effects (Shields et al., 1999). Some remedies incorporate natural ingredients like kelp and papaya, which help promote the evacuation of hairballs through defecation (Nobuyuki, 2002). Increasing the fiber content in a cat's diet, such as through the addition of sugarcane fiber and keratinolytic enzymes, has been shown to reduce hairball excretion (Miltenburg et al., 2021). Similarly, cellulose-enriched diets can decrease the severity of hairball symptoms (Beynen et al., 2011).

Psyllium husk, derived from the seeds of the *Plantago ovata* plant, is a rich source of dietary fiber and has a complex chemical composition that contributes to its functional properties. Psyllium husk is predominantly composed of dietary fibers, particularly arabinoxylans, which constitute about 61.5% of its composition. These arabinoxylans are non-starch polysaccharides with a branched structure, primarily consisting of xylose and arabinose, with smaller amounts of rhamnose, glucose, and galactose (Waleed et al., 2022). The branched heteroxylan structure of psyllium husk is responsible for its high-water absorbability and gelling properties, making it an effective thickening agent (Ren et al., 2020). The protein content in psyllium husk is relatively low, with studies reporting values around 2.08% to 3.9%. The fat content is minimal, typically around 0.09% to 1.2% (Anitha & Hn, 2020). The dietary fiber content of psyllium husk is about 61.5%, which includes a mix of soluble and insoluble fibers (Waleed et al., 2022). The polysaccharides in psyllium husk are primarily composed of monosaccharides such as xylose (64.23%), arabinose (13.38%), rhamnose (1.43%), glucose (1.89%), and galactose (3.64%) (Patel et al., 2019). These low levels of protein and fat contribute to the husk's low caloric value, making it suitable for low-calorie dietary application. In the food industry, it is used to enhance the dietary fiber content of products like bread and cookies, improving their nutritional profile and sensory properties (Anitha & Hn, 2020).

Psyllium husk has been extensively studied for its health benefits in various animal models. These studies highlight its potential in improving digestive health, modulating gut microbiota, and offering protective effects against certain diseases. In cats, psyllium husk has been shown to significantly increase bowel movements, faecal moisture, and faecal score, indicating its effectiveness in managing constipation. The study demonstrated that a diet containing 6% psyllium resulted in softer faecal and more frequent defecation compared to a control diet with cellulose (Keller et al., 2024). In horses, psyllium husk is commonly used to mitigate sand accumulation in the large intestine, a condition prevalent in equids housed in sandy areas. The study found that while psyllium supplementation initially increased microbial degradation, its efficacy might reduce over time as the microbiome adapts (Po et al., 2023). In a study on rats with chronic kidney disease (CKD), psyllium husk improved gut microbiota composition and intestinal barrier function, which in turn reduced systemic inflammation and uremic toxins. This suggests its potential in managing CKD by targeting the gut-kidney axis (Hu et al., 2023) . Psyllium husk also showed hepatoprotective effects in rats with carbon tetrachloride-induced liver damage. It improved antioxidant enzyme levels and reduced liver lesions, indicating its role as a protective agent against hepatotoxicity (Mostafa et al., 2023; Wahid et al., 2020). In hypercholesterolemic rats, psyllium husk supplementation significantly improved lipid profiles by reducing serum cholesterol and triglyceride levels while increasing HDL-C. This suggests its potential in managing hyperlipidemia and associated cardiovascular risks (Rabeh et al., 2022).

Cellulose powder supplementation has been investigated as a potential method to reduce hairball formation in cats. The ingestion of cellulose, an insoluble fiber, can delay gastric emptying and increase intestinal transit rates, which may help in binding hair to food particles and promoting their excretion through feces. This mechanism suggests that cellulose could be effective in reducing the clinical symptoms associated with hairballs in cats. Beynen et al. (2011) demonstrated that a diet enriched with 4% cellulose significantly reduced the incidence of vomiting, retching, and coughing in cats by 79%, 91%, and 70%, respectively. This suggests that cellulose can effectively reduce the severity of hairball-related symptoms. The cellulose-induced increase in transit rate of digesta may facilitate the excretion of hair, thus preventing the formation of hairballs. Dietary fiber, including cellulose, plays a crucial role in maintaining gastrointestinal health by altering digesta, regulating digestion, and acting as a microbial energy source. These benefits extend beyond hairball management to overall gastrointestinal health (Moreno et al., 2022).

There is a scarcity of information concerning the effectiveness of psyllium husk in minimizing hairball formation in cats. Hence, the aim of this research was to investigate how adding psyllium husk to cat diet influences both fecal and hairball excretion to reduce hairball accumulation in cats.

2. Materials and methods

2.1 Animals, diet and experimental design

A hybrid breed Maine coon x Persian cats characterized by their long fur. A total of 18 animals, comprising both genders, with an average age of 2.58 ± 1.04 years and an average weight of 4.07 ± 1.22 kilograms were included in a randomized completely block design (RCBD), categorized based on body weight. Three experimental dry, expanded, complete and balanced maintenance diets designed for adult cats were used in the present study (Table 1). All cats were assigned at random to receive three distinct fiber-enriched food treatments such as, control group (T1), using psyllium husk 1% (T2) and using 1% psyllium husk plus 6% cellulose (T3), duration of 30 days. As shown in Table 1, all the experimental diets were formulated to satisfy the nutritional requirements of cats according to AAFCO (2020) and fed for cats based on energy requirement for maintenance per day.

All cats remained healthy throughout the study, based on physical examination. All cats were housed individually in cages measuring 75 cm in width, 110 cm in length, and 85 cm in height per cat, situated in a room maintained at a controlled temperature of 25 °C, with fresh drinking water provided consistently throughout the experimental duration. The room's lighting is activated for a total of 12 hours each day. The cats receive their meals twice daily and water fed *ad libitum*.

2.2 Body weight change, feed intake and complete blood count

This research was segmented into two distinct phases: an adaptation phase lasting 10 days and an experimental phase for 20 days. Every cat was weighed prior to the start of the experiment during both phases. During the experimental phase, the cats were weighed on day 0 and day 20, with measurements documented to analyze the variations in body weight throughout the duration of the experiment. During the experimental phase, the daily feed intake of each feline subject was recorded. The data collection and subsequent analysis were segmented into three distinct intervals: 0-10 days, 11-20 days, and 1-20 days, respectively, to facilitate the examination of the feed consumption patterns during each segment of the 20-day trial. Throughout the experimental phase, on days 0 and 20, each cat underwent a collection of a 1.5 mL blood sample for a complete blood count evaluation, which encompassed red blood cell count, white blood cell count, hemoglobin levels, packed cell volume, and platelet count, respectively.

2.3 Fecal production and trichobezoar

During the 20-day trial, daily feces samples were gathered from each cat to measure their weight. Subsequently, these samples were stored at -20 °C for further analysis to assess the quantity of cat hairballs, aiming to evaluate the effectiveness of hairball or trichobezoar elimination. The fecal hairball excretion was determined according to Loureiro et al. (2014). The feces were dissolved in water, then filtered through a 0.8 mm sieve and washed until only the hair was left. The hair was placed in an oven at 100 °C for 4 hours, after which it was weighed and documented. The feed underwent a chemical composition analysis in accordance with AOAC methods (AOAC, 2000).

2.4 Statistical analysis

All data were analyzed by using the General Linear Models (GLM) procedures (SAS Inst. Inc., Cary, NC) (SAS Institute Inc., 2023). Multiple comparisons among treatment means were performed by Duncan's New Multiple Range Test (DMRT) (Steel & Torrie, 1980). The contrast between groups and treatments was performed by orthogonal contrasts.

Table 1. Ingredients and chemical composition of experimental dietary treatments.

Ingredients (kg)	T1	T2	T3
Cereal & Grain (Rice, Corn, Soy)	60.49	59.29	53.19
Animal meal (Poultry, Fish)	25.50	25.50	25.50
Fat/oil & Flavour	11.30	11.50	11.60
Vitamins and Mineral	2.71	2.71	2.71
Psyllium husk	0.00	1.00	1.00
Cellulose	0.00	0.00	6.00
Total	100.00	100.00	100.00
Chemical Composition (%)			
Dry matter	91.50	91.50	91.50

Table 1. Ingredients and chemical composition of experimental dietary treatments. (cont.)

Ingredients (kg)	T1	T2	T3
Crude Protein	30.00	30.00	30.00
Fat	12.00	12.00	12.00
Crude Fiber	3.00	3.50	8.50
Ash	10.50	11.00	11.00
ME (Kcal/kg)	3,330.00	3,312.50	3,137.50

Note: T1 = Control group (no supplement), T2 = Supplement 1% of Psyllium husk, T3 = Supplement 1 % of Psyllium husk with 6% of cellulose.

3. Results

From Table 1, which displays the chemical composition of the feed across various treatments, it was observed that the quantity of crude fiber increased correspondingly with higher using psyllium husk and cellulose. Furthermore, it was noted that the energy levels of each formulation containing psyllium husk and cellulose (T2, T3) were lower than those of the control group (T1), with T3 exhibiting the lowest energy values.

From Table 2, it was observed that the addition of psyllium husk and cellulose did not produce any significant difference in body weight gain (P > 0.05). In this research, the feed consumption was monitored over three distinct periods: 1-10 days, 11-20 days, and 1-20 days, respectively. It was observed that feed intake (g/d) during the first 10 days varied significantly among the treatments (P = 0.042). The control group (T1) exhibited lower values compared to the fiber groups (T2, T3), with a statistically significant difference (P = 0.014). During the periods of 11-20 days and 1-20 days. It was noted that the control group (T1) exhibited lower values compared to the fiber groups (T2, T3), with statistical significance (P = 0.054, P = 0.022).

In analyzing the grams of feed intake per body weight (g/BW), it became evident that during the periods of 11-20 days and 1-20 days, statistically significant differences, with the control group (T1) exhibiting lower values relative to the groups that received fiber (T2, T3), which was found to be statistically significant (P = 0.045, P = 0.049). In the evaluation of feed intake measured in grams relative to metabolic body weight ($g/BW^{0.75}$), it was found that all three phases revealed significant statistical differences, with the control group (T1) manifesting considerably lower values than those of the fiber groups (T2, T3) (P = 0.040, P = 0.029, P = 0.033).

From Table 3, it was observed that the addition of psyllium husk and cellulose did not produce any significant changes in the complete blood count (P > 0.05). Measurements of red blood cells, white blood cells, hemoglobin, packed cell volume, and platelet count showed no differences among treatments and remained within the normal standard range for healthy cats. This study revealed no hematological irregularities that would impact the cats' health. Based on the findings of the complete blood count result, it can be inferred that adding psyllium husk and cellulose to cat food is safe and does not impact feline health.

From Table 4, it was observed that the impact of adding psyllium husk and cellulose on faeces output and faeces production per feed intake exhibited significant statistical differences among the treatments (P < 0.05). It was noted that the faeces production (as-is basis) for the group receiving 1% psyllium husk (T2) recorded the highest value (P = 0.023), while considerably greater than the group that received psyllium husk combined with cellulose (T3) (P = 0.032). In terms of faeces production (DM), the fiber groups (T2, T3) demonstrated higher values compared to the control group (T1) (P = 0.049). The production of faeces per feed intake indicated that, when analyzed on an as-is basis, the group administered a 1% psyllium husk (T2) demonstrated the highest quantitative value (P = 0.010), significantly exceeding the group that received a combination of psyllium husk and cellulose (T3) (P = 0.005). This study determined that the supplementation of psyllium husk and cellulose did not influence the total trichobenzoar levels (P > 0.05).

Table 2. The effects of Psyllium husk and cellulose utilization in cat diet on body weight gain, feed intake and digestibility.

Items	Experimental Treatments			SEM	P-value	Contrasts	
	T1	T2	T3			T1vsT2+T3	T2vsT3
Initial BW (kg)	3.46	3.49	3.70	0.295	0.291	0.335	0.214
Final BW (kg)	3.50	3.53	3.71	0.294	0.387	0.392	0.283
BW gain (kg)	0.04	0.04	0.01	0.055	0.888	0.811	0.680
Feed intake (g/d)							
1-10 days	439.83[a]	529.00[b]	541.00[b]	47.855	0.042	0.014	0.752
11-20 days	443.33	501.67	520.00	43.525	0.131	0.054	0.619
1-20 days	441.58	515.33	530.50	44.464	0.062	0.022	0.672
Feed intake (g/BW)							
1-10 days	129.27	157.10	163.48	21.600	0.159	0.065	0.719
11-20 days	128.31	148.59	156.16	16.469	0.107	0.045	0.547
1-20 days	128.79	152.85	159.82	18.908	0.130	0.049	0.641
Feed intake (g/$BW^{0.75}$)							
1-10 days	174.80	212.46	219.65	25.179	0.106	0.040	0.730
11-20 days	174.11	201.07	210.16	21.759	0.073	0.029	0.539
1-20 days	174.45	206.77	214.91	18.775	0.085	0.033	0.642

Note: [ab] Value in the same row with different superscripts differ (P < 0.05)
T1 = Control group, T2 = 1% of Psyllium husk, T3 = 1 % of Psyllium husk with 6% of cellulose.

Table 3. The effects of Psyllium husk and cellulose utilization in cat diet complete blood count.

Items	Experimental Treatments					Contrasts	
	T1	T2	T3	SEM	P-value	T1vsT2+T3	T2vsT3
Red blood cell (RBC, x 10^6/ µl)							
0 day	8.13	8.42	8.09	0.491	0.728	0.750	0.476
20 days	7.910	7.87	7.36	0.068	0.426	0.473	0.280
Mean	8.02	8.15	7.73	0.045	0.459	0.781	0.234
White blood cell (WBC, x 10^3/ µl)							
0 day	7.82	7.78	8.62	1.154	0.636	0.658	0.4105
20 days	7.80	7.43	7.60	1.409	0.971	0.834	0.915
Mean	7.81	7,61	8.11	1.214	0.912	0.962	0.677
Hemoglobin (Hb, g/dL)							
0 day	12.43	12.78	12.10	0.708	0.598	0.988	0.323
20 days	12.13	12.55	11.23	0.986	0.266	0.726	0.119
Mean	12.28	12.66	11.66	0.718	0.246	0.815	0.105
Packed cell volume (%)							
0 day	35.66	36.00	37.16	8.123	0.787	0.646	0.6113
20 days	36.83	38.16	34.16	2.102	0.264	0.116	0.749
Mean	36.25	37.66	35.08	2.012	0.300	0.928	0.130
Platelet count (x10^3 cells/µl)							
0 day	339.67	372.67	342.17	30.378	0.514	0.520	0.345
20 days	228.83	269.33	276.67	37.592	0.412	0.198	0.846
Mean	284.25	321.00	309.42	30.062	0.500	0.273	0.714

Note: T1 = Control group, T2 = 1% of Psyllium husk, T3 = 1% of Psyllium husk with 6% of cellulose.

Table 4. The effects of Psyllium husk and cellulose utilization in cat diet on faeces production and trichobezoar.

Items	Experimental Treatments			SEM	P-value	Contrasts	
	T1	T2	T3			T1vsT2+T3	T2vsT3
Faeces production							
As-is-basis (g/d)	263.83^b	372.83^a	283.17^b	49.444	0.023	0.067	0.032
DM (g/d)	56.85	81.59	89.36	15.504	0.132	0.049	0.620
% DM	23.05	21.83	31.21	4.471	0.114	0.381	0.057
Faeces production per feed intake, (g/100g of FI)							
As-is-basis	57.39^b	75.09^a	54.58^b	7.984	0.010	0.165	0.005
DM	12.73	16.43	17.17	2.753	0.302	0.135	0.805
Total trichobezoar							
DM (g/d)	4.08	4.08	2.77	1.017	0.300	0.474	0.172

Table 4. The effects of Psyllium husk and cellulose utilization in cat diet on faeces production and trichobezoar. (cont.)

Items	Experimental Treatments			SEM	P-value	Contrasts	
	T1	T2	T3			T1vsT2+T3	T2vsT3
DM (g/100g of FI)	0.93	0.82	0.54	0.208	0.166	0.170	0.175

Note: Value in the same row with different superscripts differ (P < 0.05)
T1 = Control group, T2 = 1% of Psyllium husk, T3 = 1 % of Psyllium husk with 6% of cellulose.

4. Discussions

From the findings of this investigation, it was determined that the use of psyllium husk and cellulose (T2, T3) significantly enhanced feed consumption due to the reduced energy concentrations present in the rations supplemented with these two forms of dietary fiber. Cellulose is an insoluble fiber that can affect satiety and food intake in cats. Studies have shown that the inclusion of cellulose in cat diets can lead to increased food intake, potentially due to its role in promoting satiety and altering gastrointestinal transit time (Loureiro et al., 2017). The increased intake may help maintain energy consumption levels despite the dilution of dietary energy density by fiber. Animals often increase their feed intake when consuming low-energy-density diets to compensate for the reduced caloric content. Cats tend to maintain their bulk intake when the caloric density of their diet is reduced, suggesting that they regulate their intake based on volume rather than caloric content. This behavior was observed in studies where cats maintained their food intake despite changes in caloric density, indicating a preference for maintaining a consistent volume of food intake (Kanarek, 1975). Similarly, diets with high soybean hulls (SBH) content did not negatively affect daily food intake, suggesting that fiber can be included without reducing palatability or intake (Detweiler et al., 2019). Despite increased food intake, the energy consumption remained similar across different fiber levels, indicating that fiber may promote satiety without significantly altering energy balance (Loureiro et al., 2017). This is crucial for managing weight and preventing obesity in domestic cats.

On the other hand, Psyllium husk, a dietary fiber, has been studied for its effects on feed intake patterns and nutritional status in domestic cats. Psyllium has been reported to reduce appetite in various studies, which could influence feeding behavior in cats. This effect is attributed to its ability to form a gel-like substance in the stomach, potentially leading to a feeling of fullness and reduced food intake (Pal & Radavelli-Bagatini, 2012). Psyllium husk has been noted to impart a roasted grain odor, earthy odor, and sunsik odor, which are generally considered less favorable in human food products when used in higher concentrations (Park & Yoon, 2023). These odors could potentially be off-putting to cats, who have a keen sense of smell. While the primary focus of psyllium husk studies has been on its effects on bowel movements, its impact on feed intake patterns is less directly addressed. However, the palatability of psyllium-enriched diets has been reported as excellent, suggesting that psyllium does not negatively affect feed intake in cats (Freiche et al., 2011).

According to the experiment findings, psyllium husk supplemented group (T2) succeeded in enhancing feed intake. Moreover, the psyllium husk supplemented group (T2) achieved the highest increase in manure weight (wet weight) was attributed to the water-absorbing properties of psyllium husk. A greater fecal weight indicates a higher moisture content within the faeces. From the findings of this investigation, it was determined that the administration of psyllium husk led to a statistically significant enhancement in the volume of faecal excretion (as-is-basis) in cats, attributable to mechanisms such as water retention, gel formation, and the characteristics of non-fermentable fiber. Psyllium husk is a soluble fiber that forms a viscous gel when hydrated. This gel traps water in the intestine, increasing stool water content and easing defecation. This mechanism is crucial for its laxative effect, as it helps soften stools and increase stool bulk, facilitating easier passage through the colon (Keller et al., 2024; McRorie et al., 2017). A study involving healthy neutered adult cats demonstrated that a diet containing 6% psyllium significantly increased the frequency of bowel movements compared to a control diet with cellulose. The psyllium diet resulted in softer feces, as indicated by higher faecal scores, and increased faecal wet weight and moisture content. This suggests that psyllium can effectively promote more regular defecation and improve faecal consistency in cats (Keller et al., 2024). In a separate uncontrolled study, a psyllium-enriched diet was shown to improve faecal consistency in cats with constipation. The diet was well-tolerated and led to significant improvements in faecal consistency, supporting the use of psyllium for managing constipation in cats (Freiche et al., 2011). Unlike many fibers, psyllium is not fermented in the human gut, which allows it to retain its gel-forming properties throughout the digestive tract. This resistance to fermentation ensures that psyllium maintains its water-holding capacity, contributing to increased stool bulk and moisture without causing excessive gas production (Gibb et al., 2023; McRorie et al., 2017). The fiber's low fermentability means it does not significantly alter the gut microbiota, but it does enhance the production of volatile fatty acids (VFAs) in the intestines, which are crucial for maintaining intestinal health. Although this study was conducted on dogs, it suggests that psyllium can stimulate the production of beneficial VFAs, which may also apply to cats (Mackei et al., 2022).

Although this research indicated that the application of psyllium husk utilization did not alter the removal of cat hairball, earlier investigations have noted the effects of suitable psyllium husk dosages on the regulation of hairball excretion in cats and its implications for their holistic health. A study demonstrated that cats fed a diet containing 6% psyllium showed increased bowel movements, higher faecal moisture, and softer faeces compared to a control diet with cellulose. This suggests that psyllium can facilitate the passage of hairballs by promoting regular defecation and improving stool consistency (Keller et al., 2024). A study examining the influence of dietary fiber levels on hairball excretion in cats found that diets with higher total dietary fiber (TdF) levels, including psyllium, significantly increased faecal hair excretion in long-haired cats. Specifically, diets with 11% and 15% TdF increased hair excretion by 81% and 113%, respectively, compared to a control diet with 6% TdF. This suggests that a diet containing psyllium and higher fiber levels can effectively reduce hairball formation in long-haired cats (Weber et al., 2015). A specific formulation of psyllium husk in a hairball removal ointment has been shown to effectively aid in the discharge of hairballs in pets. This formulation includes psyllium along with other components like *Raphanus sativus* and *Melica scabrosa*, which help prevent gastrointestinal blockages by promoting the digestion and expulsion of hairballs. The addition of psyllium enhances gastrointestinal motility, allowing hairballs to be expelled more efficiently without inducing diarrhea (Li, 2017). While the main emphasis is on managing hairballs, psyllium husk provides several other health advantages. Research indicates that it can enhance lipid profiles in different animal studies, hinting at possible cardiovascular benefits. For example, investigations involving hypercholesterolemic rats and guinea pigs have shown that psyllium may reduce LDL cholesterol levels and improve liver function, potentially contributing to overall wellness in cats (Fernandez et al., 1995; Rabeh et al., 2022).

5. Conclusions

The inclusion of psyllium husk at a concentration of 1% led to an enhancement in feed consumption and safety for cats. Furthermore, the addition of psyllium husk can lead to an increase in wet fecal output. Nevertheless, this study revealed that the incorporation of psyllium husk at a 1% level showed no significant effect on the elimination of hairballs in cats.

Animal ethics declaration

This study received authorization from the Animal Care and Use Committee for scientific research at Kasetsart University, ID: ACKU67-AGR-020.

Acknowledgements

This research acknowledges with gratitude the generous support received from Nutrix Public Company Limited, Thailand, in terms of funding and the provision of experimental facilities. Furthermore, we would like to recognize the Department of Animal Science, Faculty of Agriculture, Kasetsart University, for their essential support in laboratory analysis.

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