A Palatability Test of Cat Healthy Foods Containing Gambier (*Uncaria gambir* Roxb.) and *Chlorella* sp.

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Abstract. The gambier (*Uncaria gambir* Roxb.) and *Chlorella* sp. are known to demonstrate high antioxidant activity. *Chlorella* sp. is a microorganism known as a natural supplement for increasing body resistance. Antioxidants in cat foods are crucial for treating various cat ailments. This study determined the palatability of cat healthy foods containing gambier and *Chlorella* sp. using a completely randomized design (CRD). Cat feeding treatments using gambier powder and *Chlorella* sp. are described as follows: treatment A = cat food containing 0.1% *Chlorella* sp.; treatment B = cat food containing 0.1% gambir; treatment C = cat food containing 0.1% *Chlorella* sp. and 0.1% gambier (1:1); and treatment D = commercial cat food. The results showed that the protein content of the cat healthy foods ranged from 37.2% to 37.8%, higher than the commercial cat food (25.7%). The cats that consumed food containing gambier and *Chlorella* sp. showed the highest daily weight gain. The addition of herring-roe powder and *Chlorella* sp. powder to the healthy food did not affect the palatability of the healthy food.

Keywords: Gambier; *Chlorella* sp.; paint; palatability

1 Introduction

Domesticated cats (*Felis domesticus*) are animals that have been domesticated and living side by side with humans. They are often considered to be friends and even family by humans. They are generally kept by owners as pets. The high effect of the attachment of a pet cat to humans is indicated by an empathy score, in which case women's empathy score is higher than men's. Various breeds of cats are adopted as pets. Nowadays, keeping cats has become a trend and lifestyle, especially for people in urban areas, because of cats' cute and adorable behavior.

Just like other living creatures, cats must be fed regularly to be healthy and to have good development. In recent years, cat maintenance does not require any specialized care because various ready-to-eat foods for animals, including cats and other animals, are readily available, making it easier for animal lovers to take care of them. However, people are not fully aware of cats' welfare. According to cat behavior experts, there are several mistakes that cat owners often make in keeping these animals. Such mistakes can cause problems in cat maintenance and behavior. The mistakes that are often found in keeping pet cats include diet portion or nutritional content that is not in accordance with cats' needs, which can interfere with cats' health and cause diseases such as obesity, diabetes, colic, and nutritional imbalance [1]. Understanding the relationship between food composition and several intrinsic variables of

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cat dietary preferences will be useful in improving the formulation of pet diets, allowing to meet the physiological and hedonic needs of domestic cats [2].

Currently, many commercial dry food products are produced with various aromas and tastes, making it easy for owners to provide food for their cats. However, taste alone is not enough because cat foods must contain balanced nutrition to stimulate growth and prevent diseases [3]. A good cat food should be filled with complex nutrients, preferable, appropriate in the volume consumed with the needs, safe, easily digestable by pets, and good for the immune system [4].

Many cat food products on the market are likable to cats because of their aroma, but their compositions and nutritional values vary greatly. Insufficient intake of nutrients such as protein and vitamins will cause stunted growth. Cats are carnivorous animals that require high protein as an energy source, with a crude protein intake need of 30–52%. At minimum a cat requires 30% protein, 9% fat, 0.5% ascorbic acid, 0.02% arachidonic acid, 9000 IU/kg vitamin A, 0.02 mg/kg B12, 5 mg/kg thiamine (B1) and minerals such as iron, zinc, and selenium to increase endurance [5].

Cats that eat the wrong food will not be able to digest their food properly. One of the digestive diseases that often attack cats, especially kittens, is colic, which is a gastrointestinal (GI) tract disease. Colic can occur as a result of wrong feeding or changes in food quality, resulting in the accumulation of gas in the stomach characterized by abdominal pain. Colic can also occur due to ingestion of toxic food substances or due to bacteria, viruses, parasites, and other systemic diseases. Cats suffering from colic show the following symptoms: abdominal pain that leads to crying or whining, bloated stomach, hard belly, arched back with feet tucked in, weakness or sluggishness, loss of appetite, restlessness, and thrashing around on the floor [6].

Holistic veterinarians may prescribe herbal remedies to reduce the use of chemical drugs or may do chemical drugs in combination with herbs that contain antioxidants because antioxidants are able to deflate a gassy stomach and prevent fluid retention in the body. Indonesia's nature has a fairly large wealth of biodiversity that can be used for cat food. To explore this natural wealth to develop a cat healthy food, further research is needed. This will give the cat healthy food some medicinal properties and make it likable to cats.

Several herbs have been investigated as alternative treatments for digestive problems, including chamomile [7]. However, other herbs that also contain antioxidants, such as gambier and microalgae, especially from the *Sprulina* and *Chlorella* species, have not been widely studied for treatments in cats.

The gambier plant (*Uncaria gambir* Roxb.) is an Indonesian plant that is commonly found in Lima Puluh Kota Regency, West Sumatra Province, Indonesia, and is a major regional export commodity. High levels of polyphenolic compounds, especially catechins, cause the gambier to have good antioxidant activity. The main components of the gambier include catechu tannic acid (2–50%), catechin (7–33%), and pyrocatechol (20–30%) [8]. The catechins present in the gambier have antioxidant activity and are used as antibacterial and antidiabetic agents [9]. Clinical studies have demonstrated the beneficial effects of catechins due to their antioxidant properties. Catechins affect molecular mechanisms, treat acute diarrhea, treat dysentery, relieve strep throat, and treat other heat disorders. Consuming gambier is also good for heart health because it acts as an antioxidant [10].

Microalgae are single-celled aquatic organisms. Microalgae such as *Spirulina* sp. and *Chlorella* sp. have been widely used as supplements for humans but not as supplements, snacks, and complete food for cats. The product may contain macronutrients as a source of DHA (docosahexaenoic acid) [11]. It was also stated by [12] that microalgae can be a functional food

and a food supplement that is good for health because it is rich in certain proteins and has a physiological function. Microalgae contain various nutrients such as proteins, carbohydrates, unsaturated fatty acids, vitamins, minerals, amino acids, chlorophyl, enzymes, fiber, and phenolic compounds [13]. Microalgae also function as antimicrobials, natural antioxidants, anticholesterols, anticancers, antivirals, and fungicides in addition to containing growth hormones [14]. The microalgae *Chlorella* sp. contain high protein at 51–58% [15]. Previous research on humans, mice, and poultry has shown that *Chlorella* sp. has antioxidant content that is good for increasing body resistance [16]. *Chlorella* sp. tablets and powder marketed for dogs and cats are claimed to be effective, support immunity, and detoxify the body. *Chlorella* sp. is believed to cleanse the bodies of dogs and cats from accumulated toxic chemicals from the environment, processed foods, and preventive and therapeutic drugs [13].

This study determined the potential of gambier and *Chlorella* sp. as well as their combination to be cat healthy foods in terms of nutritional content and palatability.

2 Methodology

This research was to determine the nutritional content and palatability of cat healthy foods.

a. Experimental Animals

Twelve stray cats with body weights ranging from 1.9 kg to 2.4 kg that lived and roamed in the Pulutan Permai Tanjung Pati housing complex were used in this study. Stray cats were chosen as experimental animals because they were not used to a fixed diet, so they could eat whatever they came across. Because stray cats were considered to be a random, homogeneous, objective sample, it was hoped that objective results could be obtained. Maintenance was carried out for 30 days and prelim for 10 days.

b. Research Materials

The cat foods tested in this study were dry foods. Cats were housed in individual cages with a battery system and given drinking water *ad libitum*. The cages were cleaned every day to keep the environment clean, and the leftover feed was collected for weighing. The ingredients needed for the cat healthy foods were chicken liver, eggs, fish, wheat flour, liquid margarine, gambier powder, and *Chlorella* sp. powder. The equipment pieces required were blender, plastic sheet, oven, and mould.

c. Making process

Chicken liver and fish were mixed in a blender, and then eggs were added. After the aforesaid ingredents were mixed, flour was added little by little, followed by margarine, gambier powder, and *Chlorella* sp. powder. The dough as moulded 1 cm long, 0.5 cm wide, and 0.2 cm thick and then dried in an oven at a temperature of 60 °C for 4–6 hours. A flow chart of the cat health food making is shown in Figure 1.

d. Experimental design and data analysis

This study used a completely randomized design (CRD). As treatments, there were 4 types of cat foods given in 3 replications: A = food containing 0.1% *Chlorella* sp.; B = food containing 0.1% gambier; C = food containing 0.1% *Chlorella* sp. and 0.1% gambier (1:1); and D = commercial cat food. The data obtained during the study were analyzed statistically using an analysis of variance according to the design used. To see the difference between treatments, further testing with DMRT was conducted at a level of 5%. All analyses were performed using the procedure of [19]. The data were processed using SPSS version 20.

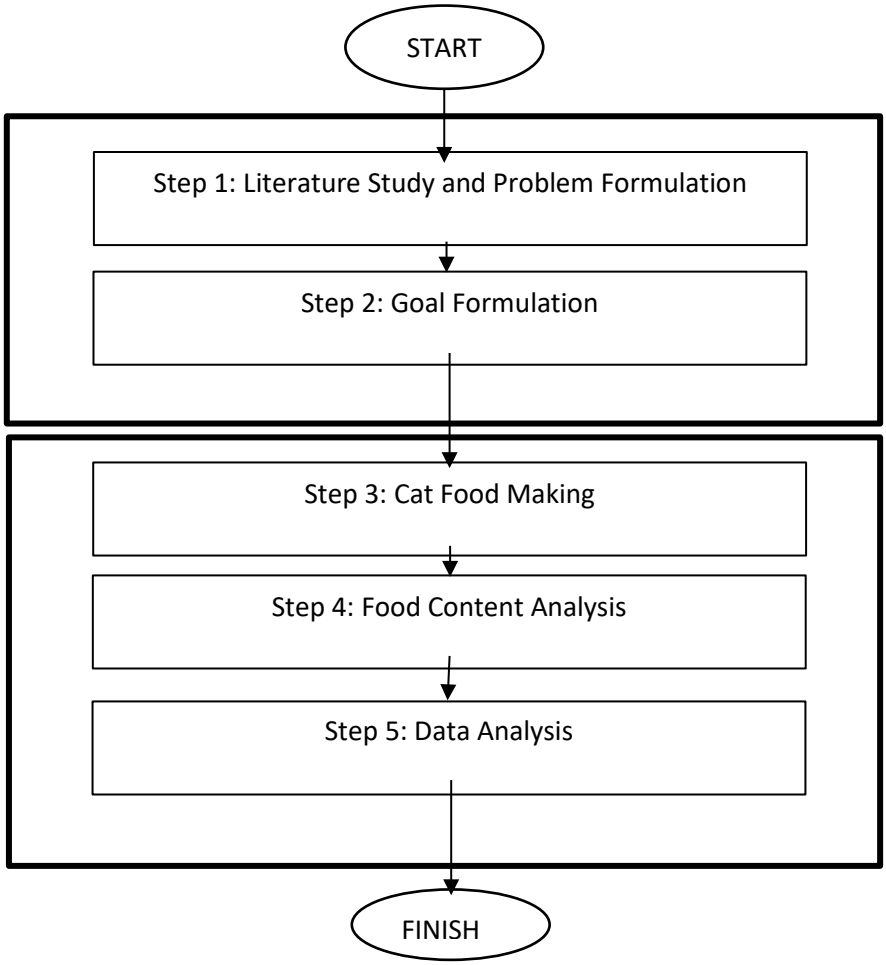

Figure 1. Flow chart of cat healthy food making

Observation of variables
Analysis of the nutritional content of the cat foods given as treatments
Organoleptic test (conducted by 20 panelists-cat hobbyists)
Palatability test seen from the cat's preference (tested on 12 cats)
Observation of the average weight gain of cats during 30 days

3 Results and Discussion

a. Cat food production

A (*Chlorella* cat food) B (Gambier cat food) C (La-gam cat food)

Figure 2. Cat healthy food

Figure 2 shows the cat foods used in the research. The dough was moulded in small triangles with a side length of 8 mm and a thickness of 3 mm. One cat food formula (500 grams of wet food) was produced 60% or approximately 300 grams as dry food.

b. Testing of the nutritional content of the cat healthy foods

Table 1. Nutritional content of the cat healthy foods

Treatment	Nutritional content			
	Protein	Carbohydrate	Fat	Coarse fiber
A	37.8	52.8	2.1	8.3
B	37.2	53.3	2.0	8.3
C	37.4	53.2	2.0	8.3
D	25.7	62.4	2.4	9.9

Based on Table 1, the protein content of the cat healthy foods was higher than that of the commercial cat food because they were formulated from selected food ingredients that contained high protein and are preferrable to cats, namely eggs, chicken liver, and fish as well as gambier and *Chlorella* sp. supplements. Therefore, the protein content of the cat healthy foods has met the standards for cat needs, which is at least 30% [5][7].

c. Organoleptic test, palatability, and daily weight gain

Table 2. Organoleptic test, palatability, and daily weight gain of cats

Treatment	Evaluation				
	Color	Aroma	Texture	Palatability	Daily weight gain (g)
A	Brown	Strong enough	Hard	3.93 [a]	2.70 [a]
B	Brown	less strong	Hard	3.59 [a]	2.69 [a]
C	Brown	Strong enough	Hard	3.87 [a]	2.74 [a]
D	Brown	Very strong	Hard	4.02 [a]	2.70 [a]

Palatability assessment: 1) Dislike very much, 2) Dislike, 3) Like, 4) Like very much, 5) like very much

Organoleptically, the color and texture of the cat foods formulated in this research did not differ from that of the commercial cat food. The aroma of cat foods tends to be fishy. The fish aroma of the commercial food was very strong. The aroma of the cat foods containing *Chlorella* sp. (A) and a mix of *Chlorella* and gambier (C) was quite strong. This might be due

to the aroma of *Chlorella* sp. itself which tends to be fishy and likable to cats. Meanwhile, the aroma of the cat food containing gambier flour (B) was less strong. The fish aroma of the commercial food was very strong because its composition contained added fish flavoring, but it was evident that the protein content of the commercial cat food was low.

It is known that cats strongly prefer the smell of fish. In terms of palatability, the cats were very fond of the commercial food because the fish aroma was stronger. The palatability values of the cat foods formulated in this study ranged from 3.59 to 3.93, which were lower than the value of the commercial feed (4.02) but not statistically significant.

Treatment A, which contained *Chlorella* sp., was quite likable because *Chlorella* sp. is a little fishy in aroma. Meanwhile, the palatability value of the cat food containing gambier was the lowest because gambier is plain in aroma and slightly bitter in taste.

It can be concluded that, organoleptically, the color and texture of the cat food formulated in this research were almost the same as those of the commercial food. However, in terms of aroma, the cat foods formulated were not as strong as the commercial cat food.

Based on Table 2, the cats' daily weight gains ranged from 2.69 to 2.74 grams per day. Statistically, the palatability and daily weight gain resulted by the four treatments were insignificant, meaning that the cats' level of preference for food was linear with daily weight gain. Treatment C that contained *Chlorella* sp. and gambier generated the greatest weight gain (2.74 g). This was because the protein content of *Chlorella* sp. is quite high, that is, 51–58% [15]. Microalgae also contain antioxidants, antimicrobials, and growth hormone [16] which can trigger cat growth. Figure 3 shows the relationship between palatability and daily weight gain.

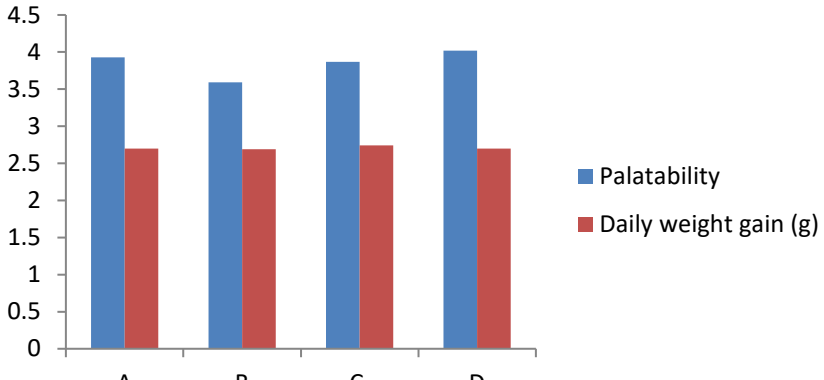

Figure 3. Relationship between palatability and daily weight gain

Cat owners show their affection and love by providing the best food and paying attention to the health of their cats. However, few people pay attention to the nutritional quality of cats' foods. There are many commercial foods with various nutritional variations available on the market, but they are not enough for cats' needs, especially in terms of protein. Based on the results of this study, the protein content of the commercial food was only 25.7%, which did not meet standard requirements [5]. Cats need certain nutrients, not certain foods. Feeding cats with a great amount of food to make them fat and adorable is wrong because it can result in obesity, diabetes, constipation, and colic.

According to the results of this study, cat foods containing *Chlorella* sp. and gambier can be declared as healthy foods because *Chlorella* sp. contains antioxidant and antibacterial

properties as well as growth hormone while gambier contains antioxidant and anti-diarrheal compounds. In addition, these healthy foods are quite likable to cats.

4 Conclusion

Based on the research results, it can be oncluded that gambier and *Chlorella* sp. can be added to cat foods for cat health without reducing palatability.

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