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Development and Quality Evaluation of Nutritious and Healthy Biscuits for Dogs

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ABSTRACT: *Pet food awareness among people is increasing day by day due to humanization trends towards pets. The pet owners are searching for various quality pet foods having different tastes. Therefore, there is an increase demand of premium products i.e. organic, raw and natural pet foods which are giving lots of choices for pet owners. The present study entails the preparation of dog biscuits by using cheap and organic sources. Orange, apple and banana peels were used in the preparation of dog biscuits in order to utilize fruits wastes. Nutritional, heavy metals and aflatoxins analyses was done to evaluate useful aspects of biscuits for dogs. Aflatoxins were absent in biscuits and heavy metals were also within permissible levels showing harmlessness of biscuits for pet dog. The biscuits were offered to pet dogs for sensory evaluation and were found acceptable. The results from nutritional analysis showed that the prepared biscuits for dog are a nutritive food having enough high calories of 407.55 Kcal/100g in order to fulfill dietary requirements of dogs. It was concluded that prepared biscuits for dogs were nutritionally fit for dog's health.*

Keywords: *Nutritional analysis, Aflatoxins, Heavy metals, dogs, biscuits*

INTRODUCTION

Pet dogs are being treated everywhere in the world as "family members" now-a-days. Pet food industry is multimillion businesses as the commercial dog foods are too costly to provide to pet dogs by common people (Deuri et al., 2019). There are so many commercial dog foods available in market with respect to dog age, breed type and life stages. In Pakistan the trend of setting pet food industries is on the rise as people have now became aware.

Dog biscuit is taken as full diet supplement for pet dogs and other pet animals. Dog biscuits are likely as hard and dry entity. A proper diet and its nutritional aspects are very important for dog's good health. It is much needed that biscuits have proper amount of nutrients and other ingredients (Akinrinmade and

Akinrinde, 2011). Common dog biscuits typically contain between about 60-70% wheat flour (Scaglione and Gellman, 1988). Normally dog biscuits are composed of food grade cellulose, salt, best binder to hold the whole matrix and flavors and taste enhancers.

The dog biscuits are prepared by ingredients of low calories so that they can be consumed by a dog in large amount without creating obesity problem (Andersen and Harpe, 1990). Pet manufacturer have art to mix different blends in appropriate proportions of meat cuts, vegetables, cereals, fish, minerals and vitamins. The nutritionally balanced pet food is prepared by pet food manufactures so that pet can enjoy delicious balanced diet. There are so many choices for pet owners to prepare pet food of great quality by mixing raw materials for wet and dry formulations for pet treats.

Dog biscuits are ready to eat pet food product which are conveniently prepared and are inexpensive. The dietary principles and digestives requirements are kept in mind while selecting ingredients and preparing biscuits (Kulkarni, 1997). Wheat flour, sugar, salt, baking powder, milk and different flavors are main ingredients for biscuits making (Obasi et al., 2012). Peels powders play an important role in enhancing nutritional aspects. The apple peels help manage oxidative stress and maintain inflammation within the normal range. Banana peels are also useful from nutrition point of view as they contain 6-9% protein (dry matter) and 20-30% fiber. Similarly, orange peels are the source of vitamins A and C and contain antioxidants which are helpful in boosting immunity. These are useful for medicinal purpose as well e.g. in flu, colds and infections (Wolfe et al., 2003; Kalpna and Mital, 2011).

Different manufacturers of numerous pet foods are preparing complementary; dry snacks, treats or raw and wet foods for dogs (Beynen, 2020). There is lack of study regarding pet food and this study is the first step towards developing and evaluating dog food. This study was carried out with the objectives of formulating an edible dog-food in biscuits form using locally available ingredients in Pakistan at lower price level, which confirm the main nutritional requirements. It is designed as such that all nutritional and energy requirements are kept in mind and the use of peels of different fruits and meat in preparation of biscuits is worth mentioning aspect in biscuits composition in order to add different important nutrients.

MATERIALS AND METHODS

Fresh fruits (Orange, apple and banana) were purchased from local market of Lahore. The fruits were peeled off. The peels were taken and washed carefully with water to remove dust and other particles. All the peels were then dried with neat cloth. The dried peels were then kept in drying oven for 12 hours at 70 ºC. The dried peels were

grinded to fine powder. The list of ingredients have shown in Table 1.

Table 1: List of ingredients for the preparation of biscuits for dogs

Sr. No.	Name of Ingredients	Percentage (%)
1	All purpose flour	32
2	Wheat Flour	15
3	Baking powder	0.4
4	Butter	5
5	Sugar	20
6	Milk	7
7	Orange peel powder	2
8	Apple peel powder	2
9	Banana peel powder	2
10	Salt	1
11	Meat pieces	3
12	Vanilla Essence	0.2
13	Cocoa Powder	0.4
14	Egg	7.5
15	Oil	2.5

Eggs, milk and sugar were firstly well batted and then all the ingredients were well mixed to get fine dough. The dough was rolled out on a thick sheet and was cut with a cutter in different desired shapes. The unused dough was again pressed and same procedure of rolling was repeated and biscuits were cut in different shapes. The tray was covered greased by oil and covered with butter paper which again was greased by oil and biscuits were placed for baking in preheated oven for 10 minutes at 180°C till the biscuits became golden brown.

Evaluation of Physico-Chemical Parameters

1. pH Determination

5% solution of the biscuits was prepared using water and pH was checked by pH meter.

2. Nutritional Analysis

The nutritional composition of the dog biscuits was determined and all the experiments were carried out in the laboratories of Food Department, PCSIR Laboratories Complex Lahore, Pakistan. The dog biscuits were grinded to fine powder and packed in air-tight polythene bag and were labeled for nutritional analysis. The percentages of moisture content, crude fire, ash and crude protein in the dog biscuits were determined by using official methods (AOAC, 1990). 5g of biscuits in powder form were weighed and placed in hot air oven at 130°C to a constant or at equilibrium weight. After three hours, the difference in weight was recorded as the moisture content and percentage was calculated. 0.5g of the powdered biscuit sample was weighed and placed in a pre-weighed china

crucible and ignited in an ash furnace maintained at 550°C till the fine ash was obtained. The percentage ash was calculated. The nitrogen contents were determined by using micro-Kjeldahl method and then multiplied by 6.25 to estimate the crude protein contents in biscuit samples. Percentage of carbohydrate was also calculated by the difference as depicted (AOAC, 1990).

3. Determination of Heavy Metal Contamination

The solution was prepared by taking 1g ash. The sample in crucible was taken, ignited and then placed in furnace. The obtained ash was dissolved in distilled water by adding nitric acid then filtered to make volume 100 ml using distilled water. Different metals (Lead, Cadmium, Copper, Nickel, Cobalt, Zinc and Mercury) were then measured by Atomic Absorption Spectrophotometer alongwith their respective standards (Bhowmik et al., 2008). Arsenic was determined by using Inductively Coupled Plasma.

4. Aflatoxin Determination

Aflatoxins in biscuits were determined by using thin layer chromatographic technique (Nisa et al., 2012). Aflatoxins were analyzed (Begum, 1985) in prepared biscuits for dog. 50g of biscuits in powdered form were taken and 250ml chloroform was added and then shaken for 30minutes. Then 50ml of sample solution was taken and dried on water bath. Volume was prepared and spotting was done on TLC plate as in depicted method (Romer, 1976). The different concentrations of standard were compared with the sample extract for the aflatoxin determination (AOAC, 2005). Total aflatoxins (AFB1+AFB2+AFG1+AFG2) were determined by given formula (Zahra et al., 2020).

$$\text{Aflatoxin B1 } (\mu g/kg) = \frac{S \times Y \times V}{W \times Z}$$

RESULTS AND DISCUSSION

The prepared dog biscuits were analyzed for its physicochemical and nutritional aspects. Presence of heavy metals in biscuits may have venomous effects on human health. So, the determination of heavy metals in biscuits was necessary. Analysis of heavy metals includes lead, cadmium, copper, nickel, cobalt, zinc, arsenic and mercury. The results are given in Table 2**.**

Table 2: Results of Physico-Chemical tests of prepared dog biscuits

Sr. No.	Parameter	Values
1.	pH	6.78±0.05
2.	Lead	ND
3.	Cadmium	ND
4.	Copper	ND
5.	Nickel	ND
6.	Cobalt	ND
7.	Zinc	0.1 ±0.01 ppb
8.	Arsenic	0.2 ±0.01 ppb
9.	Mercury	ND

*ND = Not Detected

The nutritional analysis results showed that the prepared dog biscuits may be considered as a nutritive and potential food entity as having high calories of 407.55±0.1 Kcal/100g in order to fulfill the dietary requirements.

Table 3: Results of Nutritional Analysis of prepared dog biscuits

Sr. No.	Parameter	Values
1.	Moisture (%)	7.70 ± 0.05
2.	Ash (%)	0.95 ± 0.02
3.	Protein (%)	8.18 ± 0.05
4.	Fat (%)	8.67 ± 0.05
5.	Fiber (%)	0.30 ± 0.01
6.	Carbohydrates (%)	74.20 ± 0.1
7.	Energy (Kcal/ 100g)	407.55 ± 0.1

Aflatoxins are the fungal metabolites which are declared as carcinogenic species by International Agency of Cancer on Research. These may affect biscuits quality to greater extent and also human health may affect (Zahra et al., 2015). In this study, prepared biscuits were found safe for dog consumption as there was no contamination of aflatoxins. It was depicted by all parameters that dog biscuits are secure for dog's health (Table 4).

Table 4. Aflatoxin Analysis of Dog Food Biscuits

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

From this study it was obtained that the prepared biscuits are novel and distinctively provide good results for dog consumption with good calories.

CONCLUSION

The day by day increasing reliance on dogs for sanctuary and companion is thought to be responsible for the remarkable growth of the pet food industry, with analogous amplifying of demand for dog food by pet owners and dog breeders. The present work is focused on preparation of dog biscuits with best nutritional values. The nutritional analysis showed its efficacy for dogs use. No harmful metal was detected in prepared biscuits for dogs. To the best of our acquaintance, information on label claims of nutritional adequacy by pet food industries in Pakistan has not yet been validated.

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