The Effect of Addition of Chicken Feet and Neck Bone Flour towards Nutritional Value of Cookies

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Abstract. This study aimed to determine the chemical content of cookies with the addition of chicken feet flour and chicken neck bones flour of these cookies. The experimental design used was a completely randomized design (CRD) with 3 treatments and 3 replications. The treatment given is T0 (wheat flour); T1 (wheat flour + feet flour); and T2 (flour + neck bone flour). Variables measured include water, ash, fat, protein, carbohydrate, calcium, and phosphor. The data obtained were analyzed using variance analysis followed by the Smallest Significant Difference Test (LSD). The results of the variance analysis showed that the addition of chicken feet flour and neck bones flour had a significant effect (P <0.05) on ash content; fat; protein; carbohydrate; calcium and phosphor.

Keywords: chicken feet, cookies, flour, neck bones, nutrition.

1. Introduction
It cannot be denied that livestock business has promising prospects to be developed. It happens because of the high demand for livestock products, especially the demand for meat. 36.68% of meat needs are supplied from poultry meat, especially chicken [1]. However, as with other businesses, chicken farms also produce follow-up results that can be a source of environmental pollution if not used properly. One third of the process of cutting and processing is meat as the main product, for the rest is waste and the by-products that need further handling so that it does not become waste that is not utilized.
The results of livestock that are still limited in processing include feet and chicken neck bones. Casey et al. [2] stated that feet have 3.5-4.0% of body weight and neck bones have 2.5-3.0% of the chicken's live weight and both are usually used for animal feed or soup mixtures. The processing of feet and chicken neck bones into new products is felt to be able to increase economic value, besides processing feet and chicken neck bones into flour can maintain the nutritional content and increase its shelf life. The making of feet flour and chicken neck bone is one of the efforts to diversify the product. Utilization of feet and chicken neck bones into commercial food can not be separated from the content possessed by the two by-products of the livestock. [3] stated that the dominant nutrient content in feet and chicken neck bones is protein content, which is feet flour containing 52.44% and neck flour containing 46.13%, for mineral starch containing 4.31% flour calcium and 2.47% phosphorus and neck flour contain 3.82% calcium and 2.39% phosphorus.

Cookies are one type of biscuit made from soft dough, and high in fat content. Its texture is crisp, practical, easy to make, and has a relatively longer shelf life. As a result, it makes cookies liked much by everyone. In the manufacturing process, cookies generally use raw materials of wheat flour which have low levels of gluten-forming proteins, so to increase protein levels in cookies it is necessary to add other ingredients that have high protein content. Therefore, addition of cereal flour and chicken neck bones in cookies products are expected to increase protein and mineral cookies.

2. Methodology
The raw materials used to make feet flour and chicken neck bone. The ingredients used for making cookies are wheat flour, powder skim milk, chicken eggs, margarine, sugar flour, salt and baking soda. The equipment used in making cookies is baked oven, scales, mixers, baking pans, wood grinders, cake molds, knives, basins, spatulas, food processors and other tools needed in making cookies. The equipment used in the manufacture of feet flour and chicken cartilage milled are knives, presto tools, grinders, fluid bed dryers, containers, pans and disk mills.

The experimental design used in this study was a Completely Randomized Design (CRD) with 3 treatments and 3 replications, as follows: T0 = Cookies with wheat flour; T1 = Cookies with the addition of 30 g chicken feet flour; and T2 = Cookies with the addition of 30 g chicken neck bone flour. The mathematical model used is Complete Random Design (CRD) according to [4].

3. Result and Discussion
Based on the results of the study, the nutritional content of cookies with the use of feet flour and chicken neck bone is presented in the table below:

| Nutritional composition | Cookies (%) | T0      | T1      | T2      |
|-------------------------|-------------|---------|---------|---------|
| Water                   | 3,81a       | 3,22a   | 3,83a   |
| Ash                     | 1,53a       | 4,95b   | 4,57b   |
| Fat                     | 21,47a      | 26,10c  | 23,97b  |
| Protein                 | 6,49a       | 15,15b  | 16,18c  |
| Carbohydrate            | 66,73b      | 50,58a  | 51,45b  |
| Calcium                 | 0,03a       | 1,04c   | 0,94b   |
| Phosphor                | 0,07a       | 0,51b   | 0,53b   |
Water

Based on the results of variance, it was shown that the use of feet flour and chicken neck had no significant effect on the water content of cookies (P > 0.05). The value of water content in cookies ranges between 3.22-3.83% / kg (Table 1) according to the Quality Requirements of Cookies [5]. The maximum quality requirements for water content in cookies are 5% b / b. Water content is one of the important parameters for food, because it can affect the appearance, texture, and flavor of food. Water content can also determine the freshness and durability of food because it is related to the development of bacteria, mold, and yeast, so that it will affect the storability of food ingredients [6]. High or low water content is influenced by the process of making cookies. As mentioned by [7], the amount of water content in the weight of the material shows the water content contained in the material. The low water content of a food is one of the factors that can make food durable, the low water content in a food affects the slow rate of food damage due to microbiological, chemical and enzymatic processes.

Ash

Based on the results of variance, it was shown that the utilization of feet flour and chicken neck bones had a significant effect on the ash content of cookies (P < 0.05). Based on Table 1, it can be seen that T1 has the highest ash level of 4.95% / bk, T2 has ash level of 4.57% / bk whereas T0 has the lowest ash level of 1.53% / bk. The use of feet and neck flour can increase the ash level in cookies, this is presumably due to feet flour and neck having high mineral content. Apriyantono et al.[8] stated that the ash level of a food is related to the mineral content of the food. In addition, Nisar et al.[9] believed that ash level roughly describes the mineral content of a food ingredient. The greater the ash level of a food, the higher the minerals contained by these foods.

Fat

Based on the results of variance, it was shown that the use of feet flour and chicken neck had a significant effect on the fat content of cookies (P < 0.05). Based on Table 1, it can be seen that T1 has the highest fat content, which is 26.10% / bk, T2 has a fat content of 23.97% / bk whereas T0 has the lowest fat content of 21.47% / bk. The use of feet and neck flour can increase fat content in cookies. The average fat content in cookies ranges from 21.47-26.10% / bk (Table 1) according to the Quality Requirements of Cookies [5]. Minimum quality requirements for fat content in cookies are 9.5% b. / k. The research conducted by [7] showed that the average fat content of snacks with broiler neck bone flour ranges from 21.87 - 24.85% / month. Utilization of broiler neck bone flour can enrich fat in the snack products produced.

Protein

Based on the results of variance, it was shown that the utilization of feet flour and chicken neck bones had a significant effect on protein cookies levels (P <0.05). Based on Table 1, it can be seen that T2 has the highest protein content of 16.18% / liter, T1 has a protein content of 15.15% / liter while T0 has the lowest protein content of 6.49% / bk. The use of feet and neck flour can increase protein levels in cookies, the high levels of T1 and T2 proteins are caused by collagen contained in feet and chicken neck. This is in accordance with the opinion of [10] who stated that the protein contained in chicken neck bone flour is mostly a type of collagen protein, because collagen is the main component of tendons, ligaments, bones and cartilage. The average results of protein levels in cookies each ranged from 6.49-16.18% / liter (Table 1) according to the Quality Requirements of Cookies [5], minimum quality requirements for protein content in cookies are 6% b / k. Based on the results, protein levels in cookies meet these quality requirements.
Carbohydrate

Based on the results of variance, it was shown that the utilization of chicken feet flour and chicken neck bones had a significant effect on carbohydrate cookies levels (P < 0.05). Based on Table 1, it can be seen that T0 has the highest carbohydrate level, which is 66.73% / liter, T2 has a carbohydrate level of 51.45% / liter while T1 has the lowest carbohydrate content of 50.58% / bk (Table 1). The utilization of buckwheat and neck flour reduced carbohydrate levels in cookies, this was allegedly because at T0 more wheat flour utilization (90.95 g) compared to T1 and T2 (60.95 g) so that it affected the carbohydrate content of cookies. [11] stated that carbohydrate is the largest component in wheat flour, while the carbohydrate content in bone meal comes from collagen. Furthermore, [7] explained that the use of feet flour and neck will reduce carbohydrate levels, the higher the percentage of feet flour and neck, the lower the carbohydrate content this is due to the relatively large amount of chicken feet flour and neck bones flour that will bind protein, fat and minerals in chicken feet flour and neck bones flour so that it affects the decrease in carbohydrate content of the products produced.

Calcium

Based on the results of variance, it was shown that the utilization of chicken feet flour and chicken neck bones flour had a significant effect on calcium cookies levels (P < 0.05). Based on Table 1, it can be seen that T1 has the highest calcium level, which is 1.04% / ck, T2 has a calcium content of 0.94% / bk whereas T0 has the lowest calcium content of 0.03% / bk. The utilization of feet and neck flour can increase calcium levels in cookies, this is presumably because feet flour used in making cookies has a high calcium level which is 4.31% / bk, as well as neck flour has calcium content of 3.82% / bk so that when both flour is used as ingredients for cookies it will also increase the calcium level of cookies. As explained by [6], most calcium is assembled and concentrated in bones and teeth. Same study was obtained by [7] who believed that the higher the level of utilization of chicken neck flour, calcium levels will increase, presumably because calcium levels in broiler neck bones are high so that the utilization of broiler neck flour can increase the calcium content of the snacks produced. High calcium content in broiler neck bone flour is due to broiler neck flour inorganic matrix consisting of crystals of calcium phosphate salts. The crystals of these salts are stored in an organic matrix between collagen fibers in the bone. Besides, this calcium levels are high because calcium is the most abundant mineral in the body.

Phosphor

Based on the results of variance, it was shown that the use of feet flour and chicken neck had a significant effect on the level of phosphorus cookies (P < 0.05). Based on Table 1, it can be seen that T2 has the highest phosphorus level, which is 0.53% / liter, T1 has a phosphorus level of 0.51% / liter while T0 has the lowest calcium content of 0.07% / bk. The utilization of chicken feet and neck bones flour can increase the phosphorus level in cookies, this is presumably because the clam flour used in making cookies has a high level of phosphorus which is 2.47% / bk, as well as neck flour has a phosphorus level of 2.39% / bk so that when both chicken feet and neck bones flour are used as ingredients for making cookies, they will also increase the level of phosphorus cookies. [7] stated that phosphorus is the second largest mineral after calcium and is present in bone. High levels of phosphorus in bone meal are caused because in bone meal there is an inorganic matrix consisting of crystals of calcium phosphate salts. The crystals of these salts are stored in an organic matrix between collagen fibers in the bone.
4. Conclusion
Cookies with addition chicken feet flour contain water content of 3.22%; ash 4.95%; fat 26.10%; protein 15.15%; carbohydrates 50.58%; calcium 1.04% and phosphor 0.51%, while cookies with addition of neck flour contain water content 3.83%; ash 4.57%; fat 23.97%; protein 16.18%; carbohydrate 51.45%; calcium 0.94% and phosphor 0.53%. Statistically, the addition of chicken feet and neck bones flour had a significant effect (P <0.05) on ash, fat, protein, carbohydrate, calcium and phosphor levels and did not have a significant effect (P > 0.05) on moisture and fiber content cookies.

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