

CHEMICAL AND ORGANOLEPTIC CHARACTERISTICS OF FRESH SAUSAGE WITH DIFFERENT LEVELS OF DUCK MEAT

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ABSTRACT

Composite samples from Pekin ducks were used to compare the acceptability of four sausage formulas using different levels of pork and duck meat and to assess the chemical composition of the different sausage formulas. Significant differences were obtained for moisture, ether extract or crude fat and crude protein; pH and ash contents were essentially similar in all sausage formulas. The higher the amount of backfat and lean meat added, the higher were the ether and protein contents. Formula II, containing 70% duck meat, had the highest score for color while Formula III, containing 60% duck meat, had the highest score for flavor. The proportion of 50% duck meat and 50% pork backfat (Formula IV) received significantly the highest scores in color, flavor, tenderness than other formulations, including the control (70% pork lean + 30% pork fat).

INTRODUCTION

Protein malnutrition is prevalent in the Philippines. This is due to shortage of food animal, inefficient food distribution, and a background of preference for or prejudice against some foods. The last one is true in the case of duck meat due to its

strong flavor. For this reason, duck raisers have concentrated on egg production and usually sell the birds only when these are in their unproductive stage. At this stage, the ducks have tough meat, which make them inferior over other meats.

Fresh sausages are traditionally

made from pork. However, it is possible to substitute pork with duck meat to make use of culled ducks to increase the consumption of duck meat and extend the supply of pork. Ducks are nutritious as "red" meats and have high lean percentage ranging from 58.61 to 61.14% based on the liveweight (Hayes & Marion, 1973). This increases as the age increases (Stadelman & Meinert, 1977).

Fresh sausage processing requires the addition of many spices and this might blend with the strong flavor of duck meat. Other processing techniques could also be employed to improve duck meat flavor making the product more acceptable to the consumers and erase their psychological bias.

Although some studies have been done on the utilization of duck meat as manifested in some recipes, limited studies have been conducted on the utilization of culled ducks. This study, therefore, was undertaken to: (1) compare the acceptability of fresh sausage using different levels of pork and duck meat, and (2) assess the chemical composition of the different sausage formulas.

MATERIALS AND METHODS

Composite samples of 15 Pekin ducks of mixed sexes, pork lean from two hind legs, and backfat were used in this study.

Regular procedures for slaughtering and eviscerating ducks were

followed. After evisceration, the duck carcasses were chilled for 24 hr at 2-4 C. After chilling, the carcasses were deboned and the lean meat was stored at -20 C prior to actual processing.

Preparation of Meat Samples. — Four kilograms of pork lean from two hams were chilled at 2-4 C for 24 hr, after which the meat was freed of connective tissues and fat. The chilled lean was cut into cubes before passing through a chopper plate with metric perforations. The ground meat was mixed thoroughly and representative samples were taken for physical and chemical analyses. The rest of the ground meat was stored in the freezer at -20 C.

Nine kilograms of backfat was cut into cubes and mixed thoroughly. Representative samples were also taken for physical and chemical analyses. The remaining pork fat cubes were stored in the freezer (-20 C).

Seven kilograms of duck lean meat from fifteen 2-year old Pekin ducks were prepared and stored in the same manner as the pork lean. Representative samples were also taken for analyses.

Product Formulation — Four sausage formulas were prepared representing formulas I as the control, (70% pork lean meat and 30% pork fat), II (70% duck meat and 30% pork fat), III (60% duck meat and 40% pork

fat), and IV (50% duck meat and 50% pork fat). The sausages were prepared based on the pretested sausage formula used in the Meat Division, University of the Philippines at Los Baños, College, Laguna.

Product Preparation. — Vinegar was added to the ground lean meat and allowed to stand for one hour at room temperature, after which, fat was added and mixed thoroughly. The prague powder was dissolved in a small amount of water and then mixed with the lean fat mixture. This mixture was finally added with a solution made up of all remaining dry and liquid ingredients.

The whole mixture was blended thoroughly by hand and then allowed to cure in the refrigerator for two days. Remixing was done daily to allow the meat to absorb the mixture evenly. After the second day of curing, samples for physical and chemical analyses were taken. The remaining mixture was stuffed manually in a synthetic casing which was pre-soaked in tap water for two hours. Uniform links of approximately 6 cm long were made. The sausages were covered with aluminum tin foil and kept in the refrigerator ready for sensory evaluation.

Sensory Evaluation. — Samples from each formula were panfried in 80 ml of vegetable oil under a moderate heat. Each sausage was

sliced and served to 10 members of a taste panel for evaluation.

RESULTS AND DISCUSSION

Chemical Composition

The analyses showed that duck meat is similar to pork lean in chemical composition. However, duck meat had higher values for pH, moisture, and protein contents than pork, but had lower values for ether extract and ash contents. The higher ether extract of pork might be attributed to the 3,600 Digestive Energy (DE) and 13% protein fed to the animals.

Table 1 shows the chemical composition of the four sausage formulas. Analyses of variance showed highly significant differences among the formulas, except for the mean pH values and percent ash.

Highly significant differences were observed in the moisture content of sausage formulas II, III and IV containing 70, 60 and 50% duck meat, respectively. The results indicated that the amount of lean had a direct relationship to the percentage of moisture and protein. The higher the percentage of lean meat, the higher were the moisture and protein contents. Bull (1951) reported that lean or muscle tissue, including the binding and connective tissue, contains approximately 75% water.

Table 1. Mean values for chemical characteristics of the four sausage formulas ¹

Parameter	Formula				Mean
	I	II	III	IV	
pH	6.80	6.79	6.79	6.79	6.79
Moisture, %	52.66d	55.21c	49.08b	42.83a	49.97
Ether extract, %	27.28a	24.93a	32.08b	39.51c	30.95
Protein, %	12.73d	12.68cd	11.56b	10.19a	11.79
Ash, %	1.80	1.96	1.80	1.83	1.80

¹ Mean in the same row followed by the same letters are not significantly different at 5% level using Duncan's Multiple Range Test.

The amount of backfat added had an influence on the percent ether extract obtained in the sausage formulas. Formula 2 had the highest moisture content but had the lowest ether extract. The result supports the findings of Esguerra (1972) that an inverse relationship exists between moisture and crude fat contents.

Formula I (70% pork lean) had the highest protein content and was significantly different from formula III and IV but insignificantly different from formula II. The differences could be explained by the variations in meat content (Brandly, 1960).

Sensory Evaluation

The mean taste panel scores for

the four sausage formulas are presented in Table 2. Significant differences were found among the sausage formulas.

Color. Sausage formula II had the highest score on color, while formula I, the lowest. Color scores decreased as the duck meat percentage in the formula decreased.

Flavor. No significant differences in flavor scores were obtained among sausage formulas containing duck meat. However, formula I with 70% pork lean had a significantly different flavor score of 5.77 and had the lowest score, while formula III containing 60% duck meat had the highest score (6.70). Argañosa *et al.* (1975) also found the same proportions of chevon and backfat to be the most flavorful.

Table 2. Mean taste panel scores of the four sausage formulas¹

Parameter	Formula				Mean
	I	II	III	IV	
Color	6.45a	7.37c	7.15bc	7.02b	7.00
Flavor	5.77a	6.55b	6.70b	6.65b	6.42
Off-flavor	1.48	1.74	1.53	1.47	1.56
Saltiness	4.70	4.80	4.65	4.87	4.76
Tenderness	6.32a	6.72b	6.98bc	7.10c	6.78
Juiciness	5.48a	6.15b	6.48c	7.00d	6.28
General Acceptability	6.22a	6.80b	6.98b	7.02a	6.76

¹ Mean in the same row followed by the same letters are not significantly different at 5% level using Duncan's Multiple Range Test.

Off-Flavor. No perceptible off-flavor was found in all sausage formulas.

Saltiness. There was no significant difference found as to saltiness among the four sausage formulas. This can be expected since exactly the same amount of salt was added for all formulas. However, formula IV had the highest score and formula III, the lowest.

Tenderness. There was an increasing trend on tenderness scores from formula I to IV. Formula I was rated the most tender, while formula IV was the least tender. There was no single meat composition in these cooked fresh sausages which might have influenced the results of the tenderness evaluation. The results showed that the factors

affecting tenderness varied and are complex in nature.

Juiciness. Juiciness scores differed significantly among the four sausage formulas with increasing scores from formula I to IV (Table 2). Formula I containing 70% pork lean had the lowest juiciness score, while formula IV containing 50% duck meat and 50% backfat, had the highest score. This result could be expected, because the amount of fat has an influence on juiciness. Results further showed that treatment IV had the highest scores not only on juiciness but also on tenderness. This finding confirmed the results of Argañosa *et al.* (1975) and Ramsbottom *et al.* (1945), that juiciness and tenderness are closely related; the more tender the meat,

the more juicy it appears.

General Acceptability. Formula I was the least acceptable, while formula IV was the most acceptable. The general acceptability scores conformed with the other qualities evaluated. The results demonstrate

that duck meat is better than pork in the manufacture of fresh sausage provided the meat is soaked before processing. Duck meat flavor can be further modified by applying proper treatment.

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