



TEXTURAL AND SENSORY PROPERTIES OF OATMEAL ADDED LOW FAT SAUSAGE WITH DIFFERENT TYPES OF MEATS

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Background

Due to concerns with obesity and related diseases, consumers are looking for no fat or low fat meat products. With excessive fat reduction, however, the products desire bland and dry and texture can be hard, resulting in less accepted products by consumers. Fat substituents based on proteins and carbohydrates have been widely used in meat industry to overcome the problems. Oat and oat bran have shown promise for increasing yield and juice retention in meat. In addition, the constituents have been used in diets to control hypertension, diabetes, and health disease.

Objectives

The objectives of this research were to evaluate how the addition of oatmeal affects the properties and acceptability of low fat sausages and to compare the effectiveness of incorporated oatmeal on sausages prepared with different types of meats such as beef, pork, and chicken.

Materials and methods

Sausage preparation : Beef, pork, and chicken were purchased from a local market and trimmed to reduce fat content before grinding through a 3mm plate. The moisture contents of all types of meats were adjusted to 60% and oatmeal was hydrated to provide 60% moisture content. This was done to ensure that any differences observed for added oatmeal would not be biased by differing moisture content. 10% hydrated oatmeal was added to each meat in a basis of total weight. The low fat content sausages were also prepared without addition of oatmeal. For each batch, meat, hydrated, and ingredient were mixed thoroughly using mixer. After mixing, the mixture were stuffed into artificial cellulose casing with diameter of about 30mm using a stuffer. The sausages were then held for 24hrs at 4°C to allow for ingredient equilibrium. The sausage samples were cooked 30min in a steam chamber (SAA10, Absury, Germany) until the center temperature of the sausage reached 70°C.

Proximate analysis and cooking yield : Moisture, fat, and protein content were determined in triplicate for raw and cooked products using AOAC methods (AOAC, 1990). The weight of each sausage was measured before and after cooking to determine cooking yield, which was defined as the cooked weight divided by uncooked weight then multiply by 100.

TPA (texture profile analysis) : Before analysis, cooked sausages were equilibrated at room temperature (20°C) for 1 hr. Sausages were cored into a cylinder with 1 cm diameter and cut with 1.5 cm height using a sharp edged knife. TPA was performed by compressing the sample between parallel plates in a Universal Testing Machine (Model 3343) to 70% of the original height in two consecutive cycles at a crosshead speed 100mm/min. From the resulting twice/deformation curves, the textural parameter of hardness, cohesiveness, springiness, brittleness, gumminess, and chewiness were calculated.

Sensory evaluation : A 10-member trained sensory panel evaluated the low fat sausages for color, aroma, flavor, off-flavor, juiciness, tenderness, and overall acceptability. Sausages were served in random order to panelists. They evaluated each sample on 9 point hedonic scale (1=extremely, 9=extremely strong).

Statistical analysis : The data were analyzed using statistical analysis systems (SAS, 1999). To evaluate the differences among treatments, data were analyzed by analysis of variance (ANOVA) and Duncan's multiple range test.



Results and discussion

The proximate composition of sausage samples with or without oatmeal is shown in table 1. Fat contents in different sausages ranged from 3.94 to 5.22% and protein content ranged from 20.40 to 26.47%. In general, fat and protein contents for beef, pork, and chicken were slightly reduced by the addition of oatmeal ($P < 0.05$). There was no significant difference in cooking yield among samples. This indicates that neither meat types nor addition of oatmeal affect cooking yield. Table 2 shown TPA of the sausages with different types of meats and with/or without oatmeal. Generally, there was significant difference in texture attributes such as hardness, cohesiveness, among sausages sample with different meat type ($P < 0.05$). For examples, sausages from beef showed highest values in hardness, cohesiveness, chewiness, while chicken did lowest ones. On the other hand, brittleness, hardness, gummness and chewiness for all sausages decreased by addition of oatmeal while cohesiveness increased. The textural properties the sausage of prepared with beef were most affected by addition of oatmeal. Table 3 shown sensory evaluations of the sausages with different types of meats and with/or without oatmeal. There was significant difference in color, aroma, tenderness and acceptability among sausages prepared with different types of meats ($P < 0.05$). Tenderness value was decreased by addition of oatmeal. Consequently, the addition of oatmeal improved textural attributes such as juiciness and tenderness, leading to better acceptability, compared to low fat content sausages.

Conclusions

Fat and protein contents of trimmed low fat sausages were further reduced by the addition of oatmeal. The oatmeal-added sausages improved textural properties such as juiciness, tenderness compared to low fat content sausages. This leads to better acceptability to trained sensory panels. The low fat sausage prepared with beef was most affected by the addition of oatmeal.

References

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Table 1. Proximate analysis and cooking yield in low fat sausages with/without hydrated oatmeal

Treatments	Moisture (%)	Fat (%)	Protein (%)	Cooking yield (%)
*Beef	59.17 ^{BC}	4.66	26.47 ^A	97.32
*Pork	58.87 ^C	5.22	25.76 ^A	97.63
*Chicken	61.73 ^A	4.97	24.02 ^B	97.72
Beef + 10% hydrated oatmeal	58.33 ^C	4.94	20.87 ^C	97.10
Pork + 10% hydrated oatmeal	60.86 ^{AB}	4.83	20.40 ^C	96.89
Chicken + 10% hydrated oatmeal	61.70 ^A	3.94	20.55 ^C	97.64

• ^{ABC}: Means in the same column with identical letters are significantly different ($p < 0.05$).

• * : Control; without hydrated oatmeal

Table 2. TPA (texture profile analysis) in low fat sausages with/without hydrated oatmeal

Treatments	Brittleness (kgf)	Hardness (kgf)	Cohesiveness (%)	Springiness (mm)	Gumminess (kg)	Chewiness (kg*mm)
*Beef	0.46 ^A	0.63 ^A	56.79 ^B	14.00 ^D	35.64 ^A	498.66 ^A
*Pork	0.36 ^B	0.51 ^B	55.96 ^B	14.17 ^C	28.59 ^B	406.77 ^B
*Chicken	0.36 ^B	0.40 ^C	49.69 ^C	13.99 ^D	20.09 ^C	281.09 ^C
Beef + 10% hydrated oatmeal	0.19 ^D	0.27 ^D	61.77 ^A	14.52 ^A	14.52 ^D	233.04 ^D
Pork + 10% hydrated oatmeal	0.22 ^{CD}	0.28 ^D	57.77 ^B	14.41 ^B	16.12 ^D	232.16 ^D
Chicken + 10% hydrated oatmeal	0.26 ^C	0.31 ^D	49.33 ^C	14.10 ^C	15.74 ^D	221.76 ^D

• ^{ABCD}: Means in the same column with identical letters are significantly different ($p < 0.05$).

• * : Control; without hydrated oatmeal

Table 3. Sensory evaluation in low fat sausages with/without hydrated oatmeal

Treatments	Color	Aroma	Flavor	Off-flavor	Juiciness	Tenderness	Acceptability
*Beef	8.65 ^A	6.78 ^A	6.35	0.58	3.93	4.68 ^A	3.95 ^C
*Pork	6.30 ^B	5.10 ^{AB}	4.65	0.50	4.63	4.45 ^A	4.60 ^{BC}
*Chicken	4.20 ^{CD}	4.10 ^B	4.38	0.80	5.38	4.78 ^A	5.28 ^{ABC}
Beef + 10% hydrated oatmeal	7.13 ^{AB}	6.53 ^A	4.65	0.60	5.98	1.48 ^B	5.70 ^{AB}
Pork + 10% hydrated oatmeal	5.50 ^{BC}	5.78 ^{AB}	4.18	0.43	5.60	1.95 ^B	5.80 ^{AB}
Chicken + 10% hydrated oatmeal	3.70 ^D	5.23 ^{AB}	3.20	0.26	5.58	2.15 ^B	6.63 ^A

• ^{ABCD}: Means in the same column with identical letters are significantly different ($p < 0.05$).

• * : Control; without hydrated oatmeal

• Aroma (1-3 : weak, 4-6 : moderate, 7-9 : strong), flavor (1-3 : weak, 4-6 : moderate, 7-9 : strong), juiciness (1-3 : small, 4-6 : moderate, 7-9 : large), tenderness (1-3 : tough, 4-6 : moderate, 7-9 : tender), off-flavor (1-3 : weak, 4-6 : moderate, 7-9 : strong) and acceptability (1-3 : dislike, 4-6 : moderate, 7-9 : like).