

SENSORY EVALUATION OF BEEF SAUSAGE PRODUCED FROM SUBSTITUTING WHEAT FLOUR FOR SORGHUM FLOUR

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Abstract

Five batches of beef sausage at 500g each, were each measured and replicated thrice, wheat flour was substituted with sorghum flour as follows: Batch 1 (0% millet); Batch 2 (5% millet); Batch 3 (10% millet); Batch 4 (15% millet); Batch 5 (20% millet). Sensory characteristics of the sausages such as colour, flavor, juiciness, tenderness, overall flavor and overall acceptability were measured using a nine point hedonic scale of 1 = Dislike extremely to 9 = Like extremely. Data was subjected to one-way analysis of variance using SAS (2000) while differences between means were determined using the same statistical package. Result showed significant differences ($p < 0.05$) in all the parameters measured except saltiness. Batches 1 to 3 were scored high in overall flavour and acceptability of the beef sausage. It was concluded that up to 10% wheat flour substitution with sorghum flour is acceptable in beef sausage production.

Keywords: Beef, sausage, sorghum flour, wheat flour.

Introduction

Beef sausage is sausage made of beef. It is a food usually made from ground meat with added spices and stuffed in a casing, traditionally made from intestine, but sometimes synthetic (EAC, 2014). Sausages are economical because they are generally prepared from cheaper cuts of meat and by-products of meat industry. Wheat flour which is one of the conventionally used ingredient in sausage production is sometimes scarce due to its high usage in the bakery industry and this sometimes increases cost of production which invariably increases cost of purchase. Research has shown that a wide variety of sausages is possible through the manipulation of different variables such as meat formulation, processing temperature, types of casing, the use of unconventional recipe etc. Although wheat is the conventional flour used as fillers in sausage production so as to reduce the formulation cost (Belderok *et al.*, 2000), Ranken and Kill (1993) stressed that there are various other materials that have good water holding or meat binding properties. Abiola *et al.* (2009) reported up to 100% Wheat flour replacement by cassava flour also, Sanwo *et al.* (2011, 2013 and 2014) reported that considering nutrient composition, eating quality, sausage stability, and consumer acceptability, substituting wheat flour which takes 20% of the total sausage recipe, could be replaced up to 15, 15 and 10% by rice, plantain and millet flour respectively. However, by altering certain processing treatments or adding unconventional recipe, qualities such as texture and flavour, moisture content, tenderness, overall acceptability percentage yield and other attributes

within the products are affected and which sometimes influences consumer acceptability of the product. Therefore this study aimed at evaluating the sensory evaluation of beef sausage produced from substituting Wheat Flour for Sorghum Flour.

Materials and Methods

The experiment was carried out at the Meat Processing Unit Laboratory, Department of Animal Production and Health, University of Agriculture Abeokuta, Abeokuta. Sorghum grains was purchased, winnowed in an aluminum sieve tray of about 2mm aperture by blowing off all foreign material present, it was later sun-dried, milled into powder form and was sieved in a sieve frame clothed with about 100 μ m aperture screen which was stored until use.

Preparation of beef Sausage Five batches of beef sausage at 500g each, were each measured and replicated thrice, wheat flour was substituted with sorghum flour as follows. Batch 1 (0% millet); Batch 2 (5% millet); Batch 3 (10% millet); Batch 4 (15% millet); Batch 5 (20% millet). The beef was minced through a Kenwood processing machine (Hampshire U. K.). Equal amount of seasoning, water, vegetable oil, were added in equal amounts to each of the batches stuffed into cellulose casing. Sausages were fried till the internal temperature of sausage was 65 °C using vegetable oil.

Sensory Evaluation: Bite size portions of 10g each were served at room temperature to ten (10) trained panelists who awarded scores using a 9-point Hedonic scale of (1 = Dislike extremely, 2 =

Dislike very much, 3 = Dislike moderately, 4 = Dislike slightly, 5 = Intermediate, 6 = Like slightly, 7 = Like moderately, 8 = Like very much, 9 = Like extremely). Qualities such as colour, juiciness, meaty flavour, tenderness, saltiness, overall flavour and overall acceptability were scored.

Statistical Analyses: All data obtained were subjected to one-way analysis of variance using SAS (2000) while differences between means were determined using the same package.

Results and Discussion

All the sensory attributes evaluated were significantly different ($p < 0.05$) except for saltiness as shown in table 2. For colour, batch 2 sausage with 5% sorghum inclusion had the highest score (6.20) of being liked slightly compared to batch 5 with 20% sorghum which was disliked slightly. The creamy colour exhibited in the control sausage samples decreased while the redness in other batches increased with the level of sorghum inclusion which ultimately affected the sensory scores for colour. The above findings agree with the report of Crabtree and Dendy (1977) who observed that colour changes from white to red as the proportion of sorghum increases. The control sausage samples were scored to be slightly juicy, with juiciness level of (6.57) which can be ascribed to the visco-elastic properties of wheat protein (gluten) (Veraverbeke *et al.*, 2002), compared to batch 5 with 20% sorghum which had the lowest score of being very dry. This is in agreement with Brennan *et al.* (2004) who attributed reduction in juiciness of sorghum based products to reduced viscopasting properties and increased fibre content associated with sorghum flour. Meaty flavour at 0%, 5%, and 10% substitution levels were significantly ($P < 0.05$) the same in which panelists were indifferent to their meaty flavour, but 20% sorghum which had the lowest score (3.60) of being moderately bland. In terms of overall flavour and overall acceptability, 0%, 5%, and 10% batches were significantly the same in which panelists were also indifferent on this parameters. However, batch 5 had the lowest score of being slightly undesirable and moderately disliked in overall flavour and overall acceptability respectively. This results agrees with the report of Sanwo *et al.* (2014), who substituted wheat for millet. Therefore, up to 10% sorghum flour can substitute wheat flour which takes 20% of the total sausage recipe.

References

- Abiola, S.S and Ewebajo, O.O. (2009). Substituting of Wheat Flour for Cassava Flour in the Manufacture of Beef Sausage. *Journal for new generation Science Vol. 7 Issue 2 pp. 1-7.*
- Belderok, Bob & Hans Mesdag & Dingena A. Donner (2000). *Bread-Making Quality of Wheat*. Springer. Pp.3. ISBN 0-7923-6383-3.
- East African Community (EAC) (2014). The Mystery of What goes into Sausages. <http://www.bbc.com/future/story/20141017-just-what-goes-into-your-sausage>
- Ranken, M.D. and Kill, R.C. (1993): Food Industry Manual 23rd ed. Blakie Academic and Profession. pp. 23.
- Sanwo, K.A., Iposu, S.O., Olayemi, O and Adegbite, J.A. (2014). Effects of substituting Wheat flour with Millet flour in Beef sausage production. *Nigerian Journal of Animal Science*, 16(2) 338 – 334. Published by Animal Science Association of Nigeria. Available on www.animalscienceassociation.org.ng
- Sanwo, K. A.; Ibrahim, K.; Iposu, S. O.; and Adegbite, J. A. (2013) Effects of Substituting Wheat Flour with Plantain Flour in Beef Sausage Production. *Pacific Journal of Science and Technology* 14 (2): 473 - 478. Published by Akamai University Hilo Hawaii, USA. Available on <http://www.akamaiuniversity.us/PJST.htm> USA
- Sanwo, K. A.; Makanju, M. O.; Iposu, S. O.; and Adegbite, J. A. (2012) Effects of substituting rice flour as fillers for wheat flour at varying levels in beef sausage production. *Journal of Agriculture and Applied Science*. 8 (2): 118 - 121.
- SAS. (2000): Statistical Analysis System Version 9, SAS Institute Gary NC. USA
- Veraverbeke, W.S. and Delcour, J.A. (2002). *Journal of Food Science and Nutrition*. "Food Engineering"; Food Microbiology; Nutraceuticals and Functional Food", 42(3):179-208

Table 1: Recipe (%) of beef sausage

Ingredients (%)	Batches				
	1	2	3	4	5
Meat	60	60	60	60	60
Wheat flour	20	15	10	5	0
sorghum flour	0	5	10	15	20
Vegetable oil	6	6	6	6	6
Seasoning	2	2	2	2	2
Water	12	12	12	12	12
Total	100	100	100	100	100

Table 2: Sensory properties of beef sausage substituted with sorghum and wheat flours at various levels.

Sausage batches	Colour	Juiciness	Meaty flavour	Tenderness	saltiness	Overall Flavour	Overall Acceptability
1	5.53 ^{ab}	6.57 ^a	5.87 ^a	7.50 ^a	5.10	6.37 ^a	5.37 ^a
2	6.20 ^a	5.97 ^b	5.50 ^a	6.00 ^b	5.07	5.93 ^a	5.70 ^a
3	6.00 ^{ab}	4.97 ^c	5.53 ^a	5.37 ^b	5.27	5.90 ^a	5.60 ^a
4	5.40 ^{bc}	4.17 ^d	4.17 ^b	4.03 ^c	5.07	4.80 ^b	4.57 ^b
5	4.77 ^c	2.90 ^e	3.60 ^b	3.17 ^d	5.43	4.30 ^b	3.80 ^c
SEM	0.16	0.35	4.93	5.21	0.09	0.22	0.21

^{a,b,c,d} Means along the same column with different superscripts are significantly different at ($P < 0.05$).

SEM: Standard Error of Means.

Keys:

- 1: 0% sorghum flour; 20% Wheat flour (control).
 3: 10% sorghum flour; 0% Wheat flour
 5: 20% sorghum flour; 0% Wheat flour

- 2: 5% sorghum flour; 15% Wheat flour
 4: 15% sorghum flour; 5% Wheat flour