PHYSICAL COMPONENTS, YIELD AND WEIGHT LOSS OF SNAIL MEAT PRODUCTS

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ABSTRACT

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The components of snail (i.e., meat, shell, waste and fluid) were obtained from 120 snails bought from Ekiuwa market in Edo State. The snails were starved (no feeds) for 24 hours to empty the gut, weighed to obtain live weight, killed and separated into components and reweighed separately. Total smoking losses were determined by the difference between pre and post weight measurements. The results showed the mean weight of 120 snails was 346 g and which was composed of 143.163 g (41.3%) edible portion which is meat, 103.679 g (29.8%) as shell, 54.23g (15.6%) waste (digestive system and organs) and 45.78 g (13.2%) fluid (blood, slime and water). The correlation coefficient for the measurement was 0.77 for edible portion, 0.75 for shell, 0.59 for the waste and 0.44 for fluid. The yield of unseasoned-fried snail product (37.8% yield and 62.2% weight loss) was not significantly different from the seasoned oven-dried snail product (42.1% yield and 57.9% weight loss) while seasoned smoked-dried product (57.4% yield and 42.6% weight loss) was significantly different from seasoned-fried product (50.2% yield and 49.8%weight loss). Unseasoned fried product had the highest weight loss (62.2%) and consequently the lowest product yield (37.8%).

Keywords: Snail, meat curing, processing, preservation

INTRODUCTION

The meat (edible part or foot) is the most important part of the snail because it is consumed for its nutritional values. The meat can be extracted, stored cold and sold to consumers. The meat could also be processed into stable, convenient, ready-to-eat, available products (fried, stewed, smoked, boiled and oven-dried). The fluid from snail is used for treating wounds and diseases (Cobbinah et al., 2008). It has cooling effect, hence it is used to reduce pain in male circumcision and it also restores virility and fertility (Cobbinah et al., 2008). A recent study has also shown that the glandular substances from edible snails cause agglutination of certain bacteria; this could be of value against a variety of ailments including whooping cough (Cobbinah et al., 2008). The shells are mostly used as ornament and for liming the soil.

Snail is also one of the micro livestock that has attracted attention among farmers in Nigeria (Adesope, 2000; Akinnusi, 2002) and products from snail belong to foodstuff with high nutritional value containing food energy, high quality proteins, vitamins and minerals (Tremlova, 2001). According to Aboua (1995), Archachatina marginata meat contains 1.41% calcium while the shell contains 0.53% calcium and is a good source of magnesium and potassium (Awesu, 1990; Adeyeye, 1996; Akinnusi, 2002 and Ejidike, 2002). The consumption of snail meat by rural communities is governed more by culture than by social status (Ebenso, 2003). Snail meat is high in protein (37-51%) compared to that of guinea pig (20.3%), poultry (18.3%), fish (18%), cattle 17.5%), sheep (16.4%), and swine (14.5%).

Proximate analysis of wild snails (Helix pomatia L.) showed that they are rich in major minerals, protein and low in lipids (Özogul and Olgunoglu, 2005). Thus, snail meat gains an advantage over others (Yildirim et al., 2004). Investigation by Akinnusi (1998) revealed that snail meat contains 70% of water while its dry matter is high in essential amino acids such as lysine, leucine, arginine, tryptophan and 30% minerals. Snail is also a source of calcium ortho phosphate, a chemical substrate for curing kidney diseases (Imevbore and Ademosun, 1988). Considerable attention has been directed on studies relating to snail meat evaluation and its component parts (Ajayi et al., 1978). Information on the size and weight of edible portion of snail can greatly assist in more efficient marketing or pricing of such animal products. Snail component e.g. shell could be used to determine the weight of its meat and consequently the yield. Hence, this work intends to determine the relationship between snail components and yield in order to provide information for commercial production of snail products.

MATERIALS AND METHODS

Collection of samples

One hundred and twenty matured African Giant snails (Archachatina marginata) were purchased from local market in Benin City, Nigeria.
Killing of snail
The snails were starved (no feeds) for 24 hours to empty the gut, weighed, killed with a kitchen knife and separated into shell, foot (edible portion), waste and fluid.

Cure formulation
In this study, snails were cured in a prepared pickle solution containing 1.5% salt, 1.5% sugar, 0.5% thyme, 0.30% nutmeg, 0.30% ginger, 1.50% red pepper, 0.05% sodium sorbate, 0.05% sodium tripolyphosphate, 0.50% curry, 1.50% onion as shown in Table 1 for 24 hours in refrigeration temperature, before processing snails by frying, smoke-drying and oven-drying. However, the control was devoid of spices before frying.

Table 1: Pickle Formulation

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Percentage (%)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar</td>
<td>1.50</td>
<td>45</td>
</tr>
<tr>
<td>Salt</td>
<td>1.50</td>
<td>45</td>
</tr>
<tr>
<td>Thyme</td>
<td>0.50</td>
<td>15</td>
</tr>
<tr>
<td>Nutmeg</td>
<td>0.30</td>
<td>9</td>
</tr>
<tr>
<td>Ginger</td>
<td>0.30</td>
<td>9</td>
</tr>
<tr>
<td>Redpepper</td>
<td>1.50</td>
<td>45</td>
</tr>
<tr>
<td>Sodium sorbate</td>
<td>0.05</td>
<td>1.5</td>
</tr>
<tr>
<td>Sodium tripolyphosphate</td>
<td>0.05</td>
<td>1.5</td>
</tr>
<tr>
<td>Curry</td>
<td>0.5</td>
<td>15</td>
</tr>
<tr>
<td>Onion</td>
<td>1.50</td>
<td>45</td>
</tr>
<tr>
<td>Water</td>
<td>91.85</td>
<td>2755.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>3000g</strong></td>
</tr>
</tbody>
</table>

Processing methods
Smoke–drying
Pickle cured snail meat were smoke-dried at 80°C for 2 hours 15 minutes in a smoking kiln at Kilishi factory, Ekenwan campus. Each snail meat was spread out with stick in a traditional bush meat processing manner to increase the surface area of the meat exposed to smoke and heat. The meat samples were spread on racks in the smoking kiln to ensure uniform smoking and drying of the individual product. Initial weights of snail meat prior to smoking were taken and weights after smoking were equally recorded.

Frying
Pickle cured snails were fried at 170°C for 30 minutes in a deep pan fryer using Soya oil. 15 minutes into frying, meats were removed from oil, allowed to cooled and weighed. The oil was then preheated before the meats were refried for another 15 minutes, cool and reweighed.

Oven-drying
Pickle cured snail meats were oven-dried at 90°C for 4 hour 30 min using electric oven. The racks inside the oven were wrapped with foil paper before the meats were spread on them. At every 45 minutes interval, meats were removed, cooled and weighed.

Yield and weight loss
The total cooking losses were determined by the difference between pre and post weight measurements during smoking process. The yield was calculated by subtracting the total smoking losses in percentage from 100.

\[
\text{Weight loss} = \frac{\text{Weight of raw meat} - \text{Weight of smoke meat}}{\text{Weight of raw meat}} \times 100
\]

\[
\text{Yield} = 100 - \text{Weight loss (\%)}
\]

Data analysis
Data generated were subjected to correlation and one way ANOVA in Randomized Complete Blocks design. Where significant differences existed, Duncan’s multiple range test was applied. Genstat statistical package 2005, 8TH edition (Genstat Procedure Library Release PL16) was used.

RESULTS AND DISCUSSION
Components of snail
The result in Fig. 1 showed that the mean weight of 120 snails was 346.85 g and this was composed of 143.16 g (or 41.3%) edible portion, 103.68 g (29.8%) as shell, 54.23 g (15.6%) waste (digestive system and organs) and 45.78 g (13.2%) fluid (blood, slime and water). The inedible portion accounts for 59% of the live weight of snail while the edible portion accounts for 41%. In the processing of snail, the various parts mentioned above are of commercial importance. The raw edible portion of snail could be kept frozen and made available to wholesalers, retailers and consumers. The raw meat could be processed as products such as smoke-dried snail, fried snail,
oven-dried snail etc. The inedible parts comprised shell and fluid. Shell used for liming acidic soil, whereas fluid is used in the treatment of human diseases, reduce pain in male circumcision, reduce pain during child birth and to restore fertility. Figures 2 to 5 showed that there are linear relationships between the liveweight of snail and its components as previously reported by Okonkwo and Anyaene (2009). The correlation coefficient for the measurement was 0.77 for edible portion (Fig. 2), 0.75 for shell (Fig. 3), 0.59 for the waste (Fig. 4) and 0.44 for fluid (Fig. 5) which were statistically significant (p<0.05). The above values indicated that the edible portion, shell, waste and fluid could be used to estimate the liveweight of snail up to 77%, 75%, 59% and 44% respectively. This implied that the liveweight of snail is closely related to its meat, shell, waste and fluid. The results of this work showed that edible portion of snail is 41%, this is greater than 38% obtained by Adegbite et al. (2006). Okonkwo and Anyaene (2009) reported that inedible part of snail accounts for over 60% while the edible part of snail is less than 40%.

Yield and weight loss of snail products
The results showed that there were significant differences (p<0.01) in the yield and weight losses of snail meat products based on the different processing methods applied. Table 2 showed that unseasoned-fried snail product (37.8% yield and 62.2% weight loss) was not significantly different from the seasoned oven-dried snail product (42.1% yield and 57.9% weight loss) while seasoned smoked-dried product (57.4% yield and 42.6% weight loss) was significantly different (p<0.05) from seasoned-fried product (50.2% yield and 49.79% weight loss). Unseasoned fried product had the highest weight loss (62.19%) and consequently the lowest product yield (37.8%). This could be attributed to the absence of curing agents such as sodium tripolyphosphate which enhances water holding capacity of product. Ikeme (1990) reported that sodium tripolyphosphate helps to increase the water holding capacity in processed meat. Seasoned smoke-dried product had the lowest weight loss (42.6%) and the highest yield (57.37%). The value is similar to that obtained for yield of smoked beef (56.4%) by Ebahnamiegbegbo et al. (2001). The yield increase in smoke-dried product is due to the use of sodium tripolyphosphate which increases the water holding capacity of the products. High yield is a positive indication of efficiency and profitability of production process. It therefore means that seasoning (which is the process of adding salt, herbs, or spices to food to enhance the flavour and meat quality) and smoke processing of snail meat could give the best yield.

CONCLUSION
Information on the size and weight of edible portion of snail can greatly assist in more efficient marketing or pricing of such animal products. This study showed that 41% of the whole snail is meat (edible portion) and 59% is the inedible portion (shell 29.8%, fluid13.2% and waste 15.6%). This work demonstrated that the liveweight of snail is closely related to its meat, shell, waste and fluid. Therefore, snail components such as shell could be used to determine the weight of its meat and consequently the yield. This is vital information for commercial production of snail. For yield, unseasoned fried product had the highest weight loss (62.19%) and consequently the lowest product yield (37.8%). Seasoned smoke-dried product had the lowest weight loss (42.6%) and the highest yield (57.4%). High yield is a positive indication of efficiency and profitability of production process. It therefore means that seasoning (which is the process of adding salt, herbs, or spices to food to enhance the flavour and meat quality) and smoke processing of snail meat could give the best yield.
Table 2: Yield and weight loss of snail meat products

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unseasoned Fried</th>
<th>Unseasoned Oven dried</th>
<th>Seasoned Fried</th>
<th>Seasoned Smoke dried</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight loss</td>
<td>62.19^a</td>
<td>57.88^a</td>
<td>49.79^b</td>
<td>42.63^c</td>
<td>1.49</td>
</tr>
<tr>
<td>Yield</td>
<td>37.81^c</td>
<td>42.12^c</td>
<td>50.21^b</td>
<td>57.37^a</td>
<td>1.49</td>
</tr>
</tbody>
</table>

Means having same superscript along the row are not significantly different (p>0.05).

Fig. 2: Relationship between whole snail and its meat portion

Fig. 3: Relationship between whole snail and its shell

Fig. 4: Relationship between whole snail and its waste

Fig. 5: Relationship between whole snail and its fluid

REFERENCES


