Effect of provitamin A-biofortified maize diet on the consumer acceptability of chicken meat


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Background

- Vitamin A is a fat soluble micronutrient needed for normal growth and development, reproduction, vision and immunity (Preedy, 2012).

- Vitamin A deficiency (VAD) occurs when vitamin A in the liver is below 20 µg/g (Sommer & Davidson, 2002).

- 25% of the top 20 countries in the world affected by VAD are in the SADC region (Muthayya et al., 2013).

- VAD is prevalent among rural communities (Rocheford, 2014).

- The underlying causes of VAD in these areas are mainly due food and nutrition insecurity.
Problem statement

• Maize is a leading staple in southern Africa- biofortification of maize with provitamin A is being evaluated as a cost-effective strategy to address VAD.

• In southern Africa, the traditional acceptable maize type for human consumption is the white maize grain, while yellow types are used as feed.

• Unfortunately, white maize grain is devoid of vitamin A.

• There is low consumer acceptance of provitamin A-biofortified maize (PABM)
  – dislike the yellow colour, aroma and flavour of PABM (Pillay et al., 2011; Muzhingi et al., 2008).
Provitamin A-biofortified maize
Objective and hypothesis

- The objective of the study was to determine the effect of PABM feed on consumer acceptability of chicken meat.

- The hypothesis tested was that PABM does not affect consumer acceptability of chicken meat.
Materials and Methods

- 13-week old cockerels were used
- Two maize-based diets were used
  - low vitamin A (LVA) - white maize and
  - high vitamin A (HVA) – yellow PABM
- HP326-6 maize bred by the ACCI, UKZN
- Four pens were used for each diet
- 8 birds per pen
Indigenous chickens
Materials and methods…

- After 7 weeks, four birds from each pen were slaughtered.
- The birds were scalded in hot water.
- Thighs and drumsticks were stored at -20°C for 2 weeks.
- Meat samples thawed and stored at 4°C before it was used for sensory evaluation.
Sample Preparation for sensory evaluation

- Meat samples were cooked according to the traditional way in Mkambathini community.
- The meat samples were shallow fried in vegetable oil for 10 minutes.
- Water, salt and spices were added and it was cooked for another 25 minutes.
- Skin and bones from the meat samples were removed and cut into small samples of approximately 15g.
- The samples were served in a random order according to a Random permutation of Nine.
- Consumer acceptability was determined using a preference test and 5-point pictorial hedonic scale.
Consumer panel and sensory tests

- 60 consumer panellists were recruited from a rural community in Mkambathini Municipality, KwaZulu-Natal province, South Africa
- Community generally of low socio-economic status, vulnerable to malnutrition, including VAD
- Community active in small-scale poultry production, largely indigenous chickens
- Participation in the study was voluntary- consent form signed
- Panellists selected on the basis that they were regular consumers of indigenous chickens
- Paired preference test and 5-point pictorial hedonic scale used
### Definition of attributes for sensory analysis of chicken legs from Ovambo chicken fed biofortified provitamin A maize and white maize

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Taste</td>
<td>1 = very bad; 2 = bad; 3 = average; Typical cooked chicken meat taste</td>
</tr>
<tr>
<td></td>
<td>4 = good; 5 = very good</td>
</tr>
<tr>
<td>Texture</td>
<td>1 = very bad; 2 = bad; 3 = average; Typical cooked chicken meat texture</td>
</tr>
<tr>
<td></td>
<td>4 = good; 5 = very good</td>
</tr>
<tr>
<td>Aroma</td>
<td>1 = very bad; 2 = bad; 3 = average; Typical cooked chicken meat aroma</td>
</tr>
<tr>
<td></td>
<td>4 = good; 5 = very good</td>
</tr>
<tr>
<td>Colour</td>
<td>1 = very bad; 2 = bad; 3 = average; Typical acceptable cooked chicken meat colour</td>
</tr>
<tr>
<td></td>
<td>4 = good; 5 = very good</td>
</tr>
<tr>
<td>General acceptability</td>
<td>1 = very bad; 2 = bad; 3 = average; Overall likeness of the cooked chicken meat</td>
</tr>
<tr>
<td></td>
<td>3 = average; 4 = good; 5 = very good</td>
</tr>
</tbody>
</table>
Pictorial 5-point hedonic scale

Very bad | Bad | Average | Good | Very good
Statistical analysis

• The statistical analyses of the parameters, sensory characteristics were analyzed by multivariate of General linear Model (GLM).
• Least Significant Difference (LSD) was used for comparison of means.
• All statistical analyses were made using SAS software (SAS 9.2).
## Results and Discussion

Table 1. Demographic profile of the consumer panel

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Percentage (%)</th>
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</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>78.8</td>
</tr>
<tr>
<td>Female</td>
<td>21.2</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;31 years old</td>
<td>50.0</td>
</tr>
<tr>
<td>30-50 years old</td>
<td>30.8</td>
</tr>
<tr>
<td>&gt;50 years old</td>
<td>19.2</td>
</tr>
</tbody>
</table>
Results and Discussion

**Figure 1.** Effect of diet, gender and age of consumers on the taste of chicken meat. LVA: Low vitamin A (control), HVA: High vitamin A maize, f: female, m: male
Figure 2. Effect of diet, gender and age of consumers on the texture of chicken meat
LVA: Low vitamin A (control), HVA: High vitamin A maize, f: female, m: male
Results and Discussion

Figure 3. Effect of diet, gender and age of consumers on the colour of chicken meat
LVA: Low vitamin A (control), HVA: High vitamin A maize, f: female, m: male
Results and Discussion

Figure 4. Effect of diet, gender and age of consumers on the aroma of chicken meat
LVA: Low vitamin A (control), HVA: High vitamin A maize, f: female, m: male
Results and Discussion

**Figure 5.** Effect of diet, gender and age of consumers on the acceptability of chicken meat
LVA: Low vitamin A (control), HVA: High vitamin A maize, f: female, m: male
Conclusion

- The result of the preference test and sensory characteristics indicate that the type of maize (LVA or HVA) used to feed the Ovambo chicken has no overall influence on the consumer’s preference of the chicken meat.

- The influence of age and sex of the consumer on the rating of the chicken meat also has no overall effect on their preferences.

- The HVA diet fed to indigenous chickens does not influence the acceptability of the chicken meat by VAD consumers.

- Indigenous chickens fed provitamin A biofortified maize can be a possible strategy for curbing VAD in southern Africa regions where there is low acceptability provitamin A biofortified maize for human consumption.
THANK YOU