The Impact of Sodium Reduction Strategies on the Sensory and Processing Characteristics of Meat Products

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INTRODUCTION
- Demand for reduced sodium foods continues to be a major trend for Canadian consumers.
- Sodium chloride reduction in processed meats can be challenging – required for functionality, microbial stability, sensory properties.
- Several salt replacers and flavour enhancers are on the market to aid in producing reduced sodium products.
- Objective of this study is to determine effect of 2 salt replacers, 1 savoury flavour enhancer and sodium chloride reduction on the functionality, microbial stability and sensory characteristics of restructured ham and turkey smokies.

MATERIALS & METHODS

Ham and turkey smokies processing formulations:
- Regular salt (RS)
- Low-salt (LS)
- Hams formulated to contain Ocean’s Flavor Sea Salts (OF45)
- Hams formulated to contain Ocean’s Flavor Sea Salts (OF60)
- LS ham formulated to contain Savoury Powder (SP)

The RS ham treatment was formulated to contain 2% NaCl, whereas in the RS smokies contained 1.8% NaCl.

In the experimental treatments NaCl level was either reduced (LS) or replaced 1:1 with salt substitutes (OF45, OF60, SP) to meet Health Check™ Program requirements (360 mg sodium per serving).

Processing:
- Restructured Ham
  - Meat: Inside rounds
  - Grinding 20 mm
  - Tumbling with brine (30%) under vacuum (-0.9 bar) for 75 min.
  - Stuffing fibrous casings (105 mm diam)
  - Thermal processing to 72°C
  - Cooling
  - Packaging

- Turkey Smokies
  - Meat: Turkey thighs, skin
  - Grinding 6 mm (thighs), 3 mm (skin)
  - Mixing for 75 min.
  - Stuffing hog casings (32 mm diam)
  - Thermal processing to 74°C
  - Cooling
  - Packaging
  - The products were stored at 2°C for 0, 4, 8 and 12 weeks until evaluation.

Product evaluation measurements:
- Physicochemical evaluation
- Sensory evaluation
- Microbial evaluation

RESULTS & CONCLUSIONS

Fig. 1. Mean hedonic scores for consumer acceptability of restructured ham (A) (N = 87) and turkey smokies (B) (N = 90) using a 9-pt hedonic scale. Mean scores sharing the same letter within an attribute do not differ significantly across treatments (Tukey's HSD test)

- The flavour and aftertaste of ham containing OF60 and OF45 was liked significantly less by consumers compared to all other treatments (p<0.05).

- The aftertaste of turkey smokies containing OF45 was liked significantly less compared to control (p<0.05).

- Results from trained panel evaluations indicate that ham containing OF60 and OF45 elicited significantly higher levels of bitterness and lower levels of saltiness compared to control (p<0.05). For turkey smokies, bitterness was significantly higher for OF45, and saltiness significantly lower for both OF60 and OF45 compared to control (data not shown).

- We postulate that the higher levels of bitterness perceived in samples containing OF60 and OF45 lead to decreased consumer acceptability of the flavour and aftertaste of these products.

- Since sodium has bitter inhibiting properties (Breslin & Beauchamp, 1995), we postulate that a lower level of sodium in OF60 and OF45 contributes to the increased bitterness perceived in products containing these salt replacers.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Expressible Moisture (%)</th>
<th>Na⁺ (mg)/serving</th>
<th>Expressible Moisture (%)</th>
<th>Na⁺ (mg)/serving</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Restructured Ham</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular Salt (control)</td>
<td>28.3^{b}</td>
<td>480.3^{a}</td>
<td>7.5^{b}</td>
<td>550.0^{a}</td>
</tr>
<tr>
<td>Low Salt</td>
<td>32.5^{a}</td>
<td>337.8^{b}</td>
<td>11.2^{a}</td>
<td>311.5^{c}</td>
</tr>
<tr>
<td>OF45</td>
<td>30.1^{ab}</td>
<td>337.3^{b}</td>
<td>10.7^{a}</td>
<td>350.2^{b}</td>
</tr>
<tr>
<td>OF60</td>
<td>30.1^{b}</td>
<td>248.3^{b}</td>
<td>8.4^{b}</td>
<td>290.6^{b}</td>
</tr>
<tr>
<td>Savoury Powder</td>
<td>31.3^{b}</td>
<td>334.1^{b}</td>
<td>10.9^{a}</td>
<td>333.7^{b}</td>
</tr>
</tbody>
</table>

p-value: 0.03 < 0.0001 < 0.0009 < 0.0001

Fig. 2. Mean values from triplicate measurements for expressible moisture (%) and sodium content (mg/serving) from restructured ham and turkey smokies treatments. Mean scores sharing the same letter within each column do not differ significantly.

- All non-control treatments met targeted sodium levels for deli meats under Health Check™ Program.

- Low Salt treatment in both meats elicited higher levels of expressible moisture (%) compared to control, and for OF45, OF60 and Savoury Powder in turkey smokies.

KEY FINDINGS
- Replacement of sodium with OF45 and OF60 can lead to undesirable levels of bitterness that lead to lower levels of consumer acceptability for flavour and aftertaste.

- Hydration properties can be affected by direct sodium reduction and/or the use of OF45, OF60 and Savoury Powder. However, these effects are product dependent, and thus, their use may be promising in some applications.

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