A COMPARISON OF BASIC TASTE MODALITIES, USING DESCRIPTIVE ANALYSIS, FOR VARYING LEVELS OF SODIUM AND KCL IN 2 MODEL SOUP SYSTEMS

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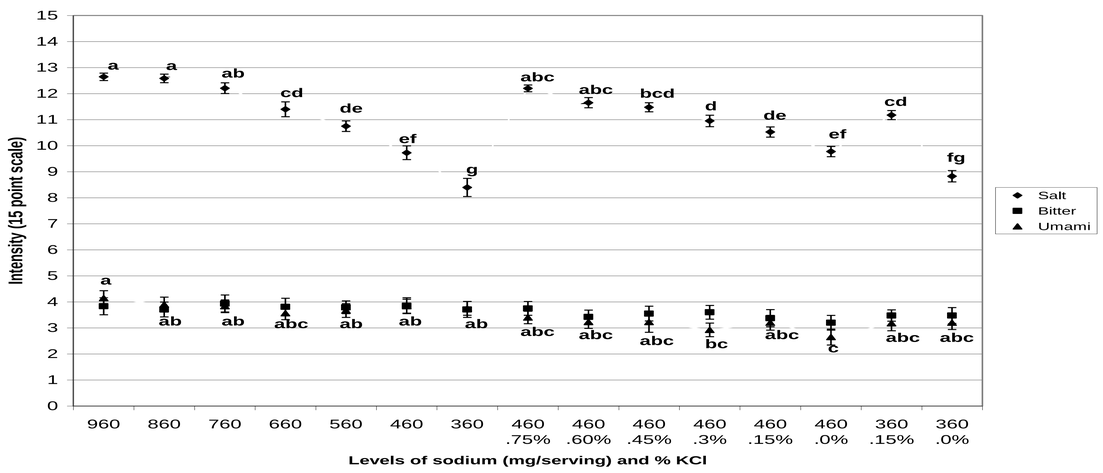
Background:
- Sodium is a looming health issue, which gives rise to more introductions of reduced sodium foods in the marketplace.
- KCl is the most common salt substitute, but many people detect a bitter taste associated with it.
- A blend of KCl and NaCl shows some promise for reducing sodium in foods.
  - NaCl in blend may help suppress bitterness of KCl.
  - NaCl can only mask bitterness up to a certain amount of KCl, and the amounts are product dependent.

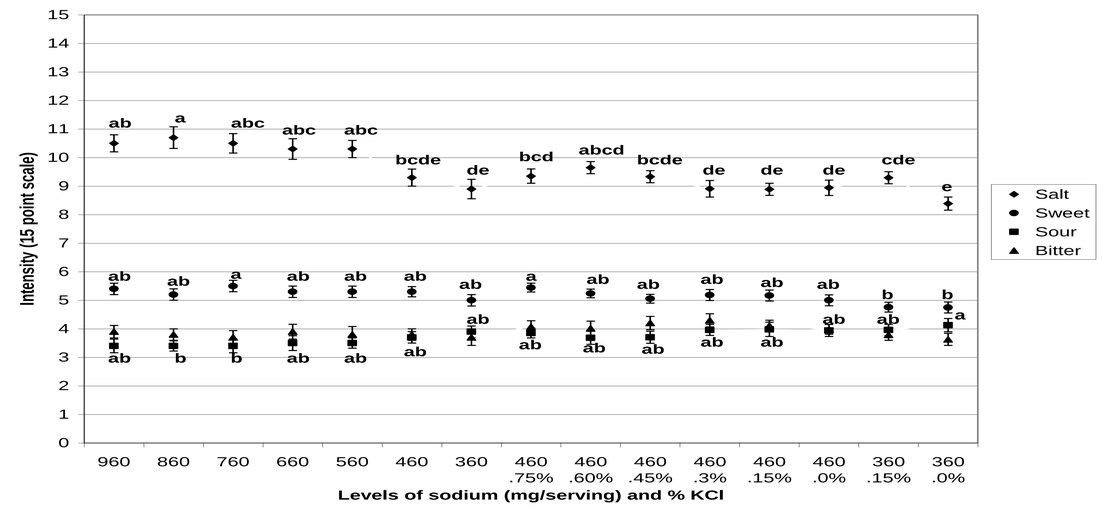
Objectives:
- To compare basic taste modality intensities when evaluating varying levels of sodium in model soup systems and model soup systems with a sodium baseline of 460mg sodium and increasing levels of KCl in order to understand the interaction of KCl on the perceived saltiness of NaCl.
- To better understand the degree to which KCl can be used in reducing sodium without adversely affecting the basic taste sensory properties.
- To understand the impact on perceived bitterness by increasing the levels of KCl (0.15% to 0.75%) in fixed sodium level (460mg sodium/230g serving for chicken broth and 460mg sodium/244g serving for tomato soup) model soup systems.

Methodology:
- n=9, highly trained descriptive panelists with an average of 8 years evaluating soup
- Utilized Sensory Spectrum® method, 15 point Universal Scale with 0.1 increments
- 1 hr. orientation prior to commencement of study. Basic taste references were shown as well as a sub-set range of chicken broth and tomato soup samples.
- Basic taste references were presented at the beginning of each taste session
- Panelists were served 1 oz. servings of each sample
- There was a 2 min. rest period between samples
- Filtered water and Nabisco Premium® Unsalted Top saltine crackers were used to cleanse the palate between samples.
- 3 replications, Williams Design with ANOVA analysis and Tukey's separation technique

Chicken Broth Results
- Decreasing sodium generally resulted in decreasing saltiness and the addition of KCL increased saltiness at moderate sodium levels (i.e. 460mg and 360 mg).
- The 960mg sample showed the highest salt intensity rating, however no significant differences were found compared to the following samples: 860mg, 760mg, 460mg + 0.75%KCl, and 460mg + 0.60%KCl.
- Salt intensity was significantly lower at 660mg and lower sodium levels; as well as at 460mg + 0.45%KCl and lower KCl levels.
- Umami is the only other taste modality, in which samples were significantly different from one another, however in not in any systematic way.
- No significant differences were found for sour (intensity range 3.5-3.8), bitter (intensity range 3.2-3.9) taste, or feeling factor metallic (intensity range 2.1-2.9).



Tomato Soup Results
- The decrease in sodium had less of an impact on saltiness and the impact of KCl on saltiness was low at moderate sodium levels (i.e. 460mg and 360mg).
  - The sodium level had to drop to 360mg sodium in order to be significantly different from 960mg.
  - The KCl level had to drop to 0.3% or lower in order to be statistically different from 960mg.
- Significant differences were found among the samples when comparing them to the 860mg, which had the highest salt intensity rating.
  - The 460mg + 0.60%KCl was the only KCl sample that was not rated significantly different in salt intensity, all other KCl samples were rated lower in salt intensity than the 860mg sample.
  - Additionally, the 460mg and 360mg were rated lower in salt intensity than the 860mg sample.
- There were a few differences rated among the samples for sweetness (intensity range 4.7-5.5) and sourness (intensity range 3.4-4.1), however in not in any systematic way.



Conclusions

Chicken Broth
- Decreasing sodium generally resulted in decreasing saltiness and the addition of KCl increased saltiness at moderate sodium levels (i.e. 460mg and 360 mg)
- A 48% sodium reduction without a significant loss of salt intensity or a significant increase in bitterness or metallic feeling factor is possible
- Possible to reduce the sodium to 460mg with the addition of either 0.60% KCl or 0.75% KCl

Tomato Soup
- The decrease in sodium had less of an impact on saltiness and the impact of KCL on saltiness was low at moderate sodium levels (i.e. 460mg and 360mg).
- A similar 48% sodium reduction was possible in tomato soup through either a straight sodium reduction to 460mg sodium or with the addition of 0.45% KCl, 0.60% KCl, or 0.75% KCl.

Practical Implications
- Higher levels of KCl should be explored when formulating reduced sodium soups.
- There is more latitude in KCl level when working with a more complex flavor system.

Additional Research Suggestions
- Time intensity method should be used in order to better understand the temporal profile of at least the salt and bitterness taste modalities.
- A full descriptive analysis profile would also be beneficial in order to understand if the addition of KCl had an impact on any of the other flavor attributes that were not incorporated into this study as well understanding the impact of reducing sodium on those same attributes