Standardization and Extrapolation of Icing Stability, Shelf Life, and Safety under Heat Abuse

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Standardization and extrapolation of icing stability, shelf life, and safety under heat abuse.

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Background
The Rapid Response Center of Kansas State Research & Extension was approached by multiple citizens with inquiries surrounding the shelf life, stability, and safety of icings used on baked goods. These icings are often used in bakery competitions found at state and county festivals where refrigeration is not an option. Home cooks wanted to know how long their icings would be stable sitting in the sun before the heat affected sensory characteristics as well as microbiological safety. Often times upon receiving these requests, the Rapid Response Center can not provide a complete answer to the request, and thus the need for a standardized database was derived.

Objective
To create a standardized database of icings based on compositional characteristics that can be referenced by Kansas State Research & Extension and Kansas citizens.

Results
The results of this project are still very primal and inconclusive. A complete and diverse range of recipes are desired so obtain the most accurate results. Table 1 below previews the initial data entry table into which all recipes are entered. Current work is being focused on constructing a central composite design which will help identify the trials of most significance. The central composite design will use the predictors of percent composition of dairy, and percent composition of sugar to formulate a response of A_w stability. Another design will be constructed using the same predictors along with a response of microbiological plate counts. These plates will conclude the number of CFU’s at varying degrees of heat abuse.

Conclusion
The most exciting component of this research is the real life implications that these results can provide for the citizens of Kansas. This project was sourced from the needs of Kansas citizens and the results will in turn benefit those who seek assistance. The creation of central composite diagrams will aid the Extension Agents such as Karen Blakeslee in the Rapid Response Center to effectively and accurately respond to inquiries that they receive.

### Table 1: Initial database of icings.

<table>
<thead>
<tr>
<th>Title</th>
<th>Source</th>
<th>Description</th>
<th>Measurement</th>
<th>Ingredient</th>
<th>1 oz evaporated milk</th>
<th>1 cup heavy cream</th>
<th>1 cup whole milk</th>
<th>1/2 tsp table salt</th>
<th>1/2 tsp sea salt</th>
<th>1/4 tsp vanilla extract</th>
<th>1/4 tsp cream cheese, softened</th>
<th>1/4 tsp salt</th>
<th>1/4 tsp heavy cream</th>
<th>1/4 tsp dark chocolate</th>
<th>1/4 tsp white chocolate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coconut Pecan Frosting</td>
<td>FF.dox</td>
<td>1 1/2 cup evaporated milk</td>
<td>1/4 tsp</td>
<td>confectioners sugar</td>
<td>4 1/2 oz chopped pecans</td>
<td>3 1/2 tsp light brown sugar</td>
<td>1/4 tsp</td>
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<td></td>
</tr>
<tr>
<td>Peanut Butter Cream Frosting</td>
<td>FF.dox</td>
<td>1 1/2 cup evaporated milk</td>
<td>1/4 tsp</td>
<td>confectioners sugar</td>
<td>3 1/2 tsp light brown sugar</td>
<td>1/4 tsp</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Simple Buttercream Frosting</td>
<td>FF.dox</td>
<td>1 1/2 cup evaporated milk</td>
<td>1/4 tsp</td>
<td>confectioners sugar</td>
<td>3 1/2 tsp light brown sugar</td>
<td>1/4 tsp</td>
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</tr>
<tr>
<td>Swig Sugar Cookie Frosting</td>
<td>FF.dox</td>
<td>1 cup evaporated milk</td>
<td>1/4 tsp</td>
<td>confectioners sugar</td>
<td>3 1/2 tsp light brown sugar</td>
<td>1/4 tsp</td>
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</tr>
</tbody>
</table>

Table 1: A preview of the initial database of icings.