Investigating Aronia Berry Pomace Qualities to Utilize as Food Ingredient and Reduce Aronia Berry Waste

Abstract
Aronia is a berry native to the United States, particularly well adapted to Iowa. Aronia berries have five times the amount of antioxidants of cranberries and blueberries, and aronia pomace (pulp) has been shown to actually have a greater antioxidant concentration than the aronia berries themselves or the juice, with up to 19.5 g/kg of anthocyanins. Commonly and unfortunately referred to as the chokeberry, aronia has the potential for product development as a functional nutraceutical fruit crop despite low current consumer acceptance. This investigation into the utilization of aronia berry pomace resulted in the development of an application, specifically in muffins, to increase consumer acceptance and remove a current marketability of aronia and decrease food waste.

Objectives
- To research aronia berry pomace applications through the development of novel recipes and products
- To increase the marketability of aronia and decrease food waste
- To gain key technical and analytical skills involved in product development
- To use creativity in generating novel recipes and products for aronia berries

Methods and Results
The Product Development Process

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Observations</th>
<th>Next Steps</th>
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<tbody>
<tr>
<td>Initial Formulation: Fruit Pulp Muffin</td>
<td>Flavor: bland flavor with just aronia pomace,Texture: soft</td>
<td>New formulation of fruit-based muffin needed</td>
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<tr>
<td>Fruit Muffin</td>
<td>Aronia used as fruit, Flavor: bland with just aronia pomace, Texture: soft</td>
<td>Increase sugar, add inclusions</td>
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<tr>
<td>Aronia Pomace Muffin with Inclusions</td>
<td>Flavor: lacks flavor, Texture: soft, Layering of blueberries, Corn Starch and Flour</td>
<td>Continuous increase of sugar resulted in no improvement, Discontinue inclusion</td>
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<tr>
<td>Chocolate Chips</td>
<td>Flavor: great flavor, Texture: soft, Chocolate chips well-distributed</td>
<td>Add flour and starch for increased structure</td>
</tr>
<tr>
<td>Chocolate Chip Aronia Pomace Muffin with Additions</td>
<td>Flavor: great flavor, Texture: better, more firm, crumbs</td>
<td>Add more flour for increased structure</td>
</tr>
<tr>
<td>Final Formulation</td>
<td>Great flavor and texture</td>
<td></td>
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</tbody>
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Discussion
Challenges
- Premature Molding
- Water activity of pomace
- Water activity of muffins
- Weak flavor
- Increase sugar
- Inclusions
  - Elimination of blueberry
- Texture Challenges
  - Corn Starch
  - Added flour

Sustainability
- Pomace is produced in an unsustainable process
- Pomace is considered waste and byproduct of juicing
- Necessary shift to valuable ingredient in a sustainable product

Conclusion
Aronia berries are high in antioxidants, but are also high in astringency. While the undesirable flavor did not translate to muffin formulations, more ingredients were needed to provide flavor. Sugar and chocolate chips were added to the original aronia pomace muffin formulation. After achieving a desirable flavor, the soft texture of the muffin became apparent. More ingredients, including corn starch and flour were used to provide structure. The resulting formulation is a successful application of aronia pomace.

References