Effect of sugar, pectin and acid balance on the quality characteristics of pineapple (Ananas comosus) jam

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Abstract
Investigations were conducted on the effect of sugar concentration, pH balance and high methoxy pectin concentration on quality characteristics of pineapple jam using standard analytical methods. Addition of 50% sugar improved the colour and texture of the jam. Non-sugar jam was too soft, and could not hold their form. The jam balanced to pH 3.2 and 3.5 with the addition of lemon juice as a source of acid was of acceptable finished pH. Jam colour was not greatly affected by the incorporation of lemon juice. Addition of pectin had no significant effect on the pH of the finished jam. Sufficient pectin levels (0.5%) however improved the texture, gel formation and enhanced spreadability of the jam. Non-pectin jam was hard, tough and stiff and this was more evident in the 100% sugar with no pectin jam formulations. At 1.0% pectin concentration, spreadability of the jam was poor and colour became redder. Sensory rating of the pineapple jam indicated that addition of sugar generally improved the taste acceptability of jam. Results show that there is a significant difference (p \leq 0.5) in the jam formulations as a result of variations in concentrations of sugar, acid and pectin. For a good quality jam, a sugar concentration of at least 50%, with the addition of 0.5% pectin with pH between 3.2 and 3.5 would produce a jam of acceptable colour, spreadability, gel set and good taste as well.

Keywords: sugar, pectin, acid balance, pineapple jam

Introduction
Four ingredients are needed in the right amount and proportion for a successful fruit jam. These are fruit extract, sugar, sufficient pectin and acid. They ensure a good gel formation, which is an important quality characteristic of a good jam. The pineapple fruit contains some amount of sugar, pectin and acid. However, the amount and proportion present is not sufficient for a successful gel formation. The main objective of this study was to investigate the effect of ingredients balancing on the quality characteristics of pineapple jam.

Materials
Fresh pineapple fruits, lemon, and sugar were obtained from a market in Madina, a suburb of Accra, Ghana. The high methoxy pectin was from apple peel.

Pineapple jam preparation
The fruit was peeled with a knife removing stems, skins and pits. A Horbart cutter was used to cut the peeled fruits into smooth and consistent fresh pulp. The fruit pulp was boiled for about 10-15 minutes in a jacketed pan with consistent stirring. Sugar was dissolved in 250ml of water and boiled for 2 minutes before adding to the cooked pulp. About 25% of the stated amount of sugar was blended with the required amount of pectin and added to the boiling mixture. It was allowed to boil for 20-30 minutes depending on
the pectin content (boiling is reduced if the pectin content is high). When the jam was done, the stated amount of lemon juice was added.

**Method**
A 3×3×3 factorial experimental design was used with the principal factors investigated being levels of acid (pH 3.0, 3.2, and 3.5), levels of sugar concentration (0%, 50% and 100%) and levels of pectin (0.0%, 0.5% and 1.0%). Moisture, pH, and total carbohydrate content of the jam were determined using the procedure outlined in Egan et al [1]. The refrigerator test was used to test for thickness and gel set. Jam texture (firmness/hardness) was determined using a TA-XT2 Texture Analyzer (Stable Micro Systems, Surrey, England). Colour of the jam was measured with a Hunter Lab Colour Difference Meter (CDM) Model CR-300 (Minolta Camera Co. Ltd. Inc., Tokyo, Japan) using a porcelain plate with L=103.02, a=-0.07 and b=+1.57 reference tarr. Forty untrained panel evaluated the colour, spreadability, and taste of pineapple jam on a 15cm line scale. Statistical analysis was done using Statgraphics (Graphics Software Systems, STCC, Inc, Rockville, USA). The significant probability was set at p<0.05.

**Results and discussion**
Varying the concentrations of sugar, pectin and acid significantly (p<0.05) influenced the quality characteristics of the pineapple jam. Gel firmness of the non-sugar jam was lower compared to the jam formulations with added sugar. Addition of 50% sugar concentration was observed to improve jam colour (Table 1).

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<thead>
<tr>
<th>Sugar concentration (%)</th>
<th>Colour</th>
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<tbody>
<tr>
<td></td>
<td>L</td>
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<tr>
<td>0</td>
<td>61.82 ± 1.12</td>
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<tr>
<td>50</td>
<td>41.86 ± 1.67</td>
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<tr>
<td>100</td>
<td>39.37 ± 2.76</td>
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Table 1: Effect of sugar concentrations on the colour of pineapple jam

Addition of 0.5% pectin levels resulted in an improved texture, gel formation and enhanced spreadability of the pineapple jam. Acceptability test with regards to taste, colour and spreadability generally favored the sugar formulated jams

**Conclusion**
It was evident that though sugar, pectin and acid are essential in jam making, the effect of these ingredients balancing is significant on the quality characteristics of the final product. To establish a good quality pineapple jam, a sugar concentration of at least 50%, with the addition of 0.5% pectin with pH levels between 3.2 and 3.5 would produce a jam of acceptable colour, spreadability, gel set and good taste as well.

**References**