Effectiveness of Preservatives in Tropical Muffins

By Perri Steinfield

Culinary Science 2015

Advisor: Rosemary Trout

Abstract

In this study a tropical muffin made with ingredients such as pineapples, bananas, and, non-fat yogurt will be prepared along with a preservative. The tropical and healthful ingredients in these muffins have high levels of water activity, which put the product at risk of spoilage quickly. Mold growth is the most frequent case of bakery product spoilage (Guynot et al.).

Preservatives such as Propionates, Sorbates, Benezoates, and Acetic acid are mold inhibitors that can also decrease the pH of baked products, extending shelf life. Typically these preservatives work better in low pH products (Guynot et al.).

Essential oils can also act as natural preservative. Essential oils are volatile natural substances containing organic compounds. They are made from aromatic plants and have a strong odour. Essential oils are known for their antimicrobial properties (Abay et al.). Samples made with the essential oils can be marketed as a clean label product, which would appeal to a mass market. Preservative will be dosed at 0.3%, and compared to a control. Samples will be observed and noted for sensory attributes to include texture, moisture and general appearance.

Background

The preservative used in this experiment was ALDO MSLG KFG, a product made by Lonza. Lonza is a Swiss Pharmabio and specialty ingredient company. In the functional ingredient category Lonza offers products that improve the appearance, feel, and functionality of foods and other goods. Found under the classification of specialty esters and emollients ALDO has several uses. The suggested applications include baked goods, shortenings, Dairy of specialty esters and emollients ALDO has several uses. The specialty ingredient company. In the functional ingredient category ALDO is a Glyceryl Monostearate. Glyceryl Monostearates are also known as monostearin, a mixture of Glyceryl Monostearate, glyceryl monopalmitate, and glyceryl esters of fatty acids found in commercial stearic acid. Glyceryl Monostearate is prepared by glycerolysis of fats and oils derived from edible sources or by esterification with glycerin of stearic acids derived from edible sources (FDA). The material safety data sheet (MSDS) that accompanies a sample of ALDO states the specific ingredients as mono, di, and tri glycerides, fatty acids, and water (Loza).

Glycerides are known to improve flavor perceptions in baked goods, similar to the way an addition of fat would effect a flavor profile. However a major difference the addition of a glyceride would make to a baked good that the addition of another fat may not be the retrogradation of crumb staling. Glycerides create a separation of the gluten starch interface and inhibit salting while producing a softer and more uniform crumb increasing the textural attributes of the product (Hebeda).

General suggested usage levels for glycerides in baked goods lie between 1% and 4% (Hebeda). The usage level suggested by Lonza is 4% to 6%, based on the weight of the fat in the formulation (Loza). In this experiment additional fats were removed form the formulation in order to increase the overall perceived healthfulness of the product. Therefore the calculation was based on the weight of an egg, the ingredient with the highest fat content.

Trial One Test

- One control made with no food additives
- A test made with ALDO
- 2.6g of ALDO (5% of the weight of an egg) added to the dry ingredients
- The product was made utilizing the muffin method
- Dry ingredients were scaled and mixed together
  - All-purpose flour, whole wheat flour, baking soda, baking powder, salt, cinnamon, and ALDO added to the test
  - Separately the wet ingredient were scaled and mixed together
    - Brown sugar, bananas, yogurt, honey, apple sauce, an egg, and milk
- The wet ingredients were added to the dry ingredients
- Finally pineapple and the zest of an orange were folded into the batter
- The batter was portioned into tins and baked at 325° for 20 minutes
- The muffins cooled and then packaged individually
- The muffins were observed each day for appearance, texture, taste, and scent until they spoiled

Trial Two Test

- One control made with no food additives
- A test made with ALDO
- The amount of ALDO used was doubled
- 5.2g of ALDO (10% of the weight of an egg) added to the dry ingredients
- The product was made utilizing the muffin method
- Dry ingredients were scaled and mixed together
  - All-purpose flour, whole wheat flour, baking soda, baking powder, salt, cinnamon, and ALDO added to the test
  - Separately the wet ingredient were scaled and mixed together
    - Brown sugar, bananas, yogurt, honey, apple sauce, an egg, and milk
- The wet ingredients were added to the dry ingredients
- Finally pineapple and the zest of an orange were folded into the batter
- The batter was portioned into tins and baked at 325° for 20 minutes
- The muffins cooled and then packaged individually
- The muffins were observed each day for appearance, texture, taste, and scent until they spoiled

Resources


Findings and Outcomes

- Trial one, day zero both products had optimal color, flavor, and scent
- The texture of the test muffin was superior to the control from day zero
- Attributes of both muffins declined as time went on
- Both muffins molded and became inedible on day three
- Degradation began when moisture appeared on the muffin tops (day two)
- This moisture altered mouth feel and taste perception
- ALDO assisted with the texture of the test muffin
- No significant difference in the shelf life of the product
- Trial two, day zero both products had optimal color, flavor, scent, and texture
- The test muffin was firm and bready
- The control acted similarly to trial one
- Moisture appear on the muffin top early on
- Both mouth feel and flavor profile were effected by the moisture
- Doubling the additive to 10% of the weight of an egg had negative effects on the texture and mouth feel
- The test lasted one extra day, slightly extending the shelf life of the product.

Future Research

ALDO is not an ideal additive to this product due to the lack fat in the formulation. Perhaps in conjunction with another additive it could improve the texture and extend the shelf life of the product. There is still much work to do when it comes to preservatives and food preservation processes. Identified customer trends state that consumers are looking for clean label products. New and innovative technologies will have to be explored in order to offer quality products with extended shelf lives.