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**Comparing the Effectiveness of Clementine (*Citrus clementina*) and
Calamansi (*Citrus microcarpa*) in Mold Prevention**

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CHAPTER 1

INTRODUCTION

Background of the study

Mold is a type of fungus that is found everywhere in nature. Some molds grow on wood, other tend to be found on decaying plant or animal matter, and some are most commonly found on food. Mold can produce toxic chemicals called mycotoxins. These can cause disease and even death, depending on the amount consumed, the length of exposure, and the age and health of the individual. It changes the appearance, taste and smell of the food it grows on, causing it to decay. (Healthline Media,2017).

As said by Cook, M. (2018), Bread molds thrive on bread because of the rich organic materials found in it. Sugar and carbohydrates fuel the growth of the mold spores. This is why bread left out in the open begins to grow visible mold in only five to seven days. The specific species of the bread mold depends on the type of spores that are present in the environment. On the other hand, preservatives decrease the likelihood of mold growth, as well as the growth of microorganisms.

Molds cause the spores from mold floating through the air land on bread and activate when moisture and temperature conditions are right. Bread mold prefers warm, moist and dark environments. And its types, although molds can be dry or slimy, the type of mold that afflicts bread is the dry, cotton-textured mold, which grows on bread. The color of each species of mold exhibits its own color (Tilden, E. 2018).

According to Medical News Today (2021), citrus fruits such as clementine and calamansi contains citric acid which acts as a preservative in many processed foods, keeping them fresh. It does this by slowing or helping prevent the formation of bacteria, mold, yeast and fungus. It retains the color, flavor, and texture of the food. This delays how quickly food spoils, increasing its shelf life. Additionally, it can help balance the pH level, or acidity, of a food or beverage. For example, when manufacturers add citric acid to wine, it improves low acidity and taste.

Like many other citrus fruits, calamansi is highly acidic. The pH of calamansi ranges from 2.4 to 2.6, depending on the specific country it is grown in, but even though it is highly acidic, it has been proven to help lower the level of acidity in the body (Kerri,2022). While clementine has a pH level of 9.0 once digested. Clementine are commonly mistaken for being an acidic food. While clementine has a chemically acidic pH outside of the human body, they are extremely alkaline once ingested and metabolized (Adriane, M. 2023).

Clementine is a small, orange, seedless citrus fruits and therefore contain both citric acid and ascorbic acid. In addition, Calamansi is a small citrus fruit, with a bright orange flesh and a peel that goes from green to orange as it ripens, the acid content of calamansi is known to slow down the oxidation of fresh-cut fruits and vegetables, thus preventing discoloration and acting as a preservative. The Philippines calamansi peel contained the highest amount of total phenolic acids. In addition, p-Coumaric acid was the dominant free phenolic acids, whereas ferulic acid was the main bound phenolic acid. This study aims to compare clementine and calamansi in terms of its smell, citric acid, appearance and effectivity (Elsevier,2012).

Statement of the Problem

This study aims to compare clementine (*Citrus clementina*) and calamansi (*Citrus microcarpa*) as the main ingredient in mold prevention. This study sought answers to the following questions:

1. Is the use of clementine (*Citrus clementina*) more effective compared to the use of calamansi (*Citrus microcarpa*) in mold prevention in terms of:
 - Smell
 - Appearance;
 - Ph level
2. Is there significance level of effectiveness between the clementine (*Citrus clementina*) and calamansi (*Citrus microcarpa*) in mold prevention in terms of:
 - Smell
 - Appearance;
 - Ph level

Hypothesis

- H₁: If there are no molds found in the bread when using clementine, then clementine is more effective than the calamansi.
- H₂: If there are no molds found in the bread when using calamansi, then calamansi is more effective than the clementine.

Significance of the Study

The following people will benefit from this research. For the students, this might help them grasp the importance of the effectiveness of clementine and calamansi in mold prevention. This will serve as a guide on knowing the information on how to prevent a mold. For the society, this might provide information about the effectiveness of citrus fruits in preventing molds, as well as promoting awareness about how to avoid bread molds. For the future research, this may act as a guide for them if they were to undertake the same study, and it could provide them with helpful information.

Scope and Delimitation

This study will focus on comparing of citrus fruits in which the variable is clementine along with calamansi in mold prevention. This research main goal is to see which of these variables would bring the desired outcome on the effectiveness of mold prevention.

Definition of Terms

The following terms are operationally defined to provide a common understanding in this investigatory project.

Clementine a small nearly seedless citrus fruit that is a hybrid between a tangerine and an orange.

Calamansi refers to a small citrus fruit with a bright orange flesh and a peel that goes from green to orange as it ripens.

Bread refers to a kind of baked food which is mainly made from flour and water.

Mold is a type of fungus that is found everywhere in nature.

Citrus fruit is a juicy fruit with a sharp taste such as clementine, calamansi, orange, grapefruit, and many more. There are rich in multiple nutrients such as vitamin C, flavonoids, and fiber.

Smell refers to the scent, odor, aroma mean the quality that makes a thing perceptible to the olfactory sense.

Citric acid is used in food as a flavoring agent and preservative.

pH level refers to the quantitative measure of the acidity or basicity of aqueous or other liquid solutions. pHs of less than 7 indicate acidity, whereas a pH of greater than 7 indicates a base.

CHAPTER II

METHODOLOGY

This chapter of this Science Investigatory Project (SIP) shows the research design and procedures on comparing clementine and calamansi in preventing of mold. There are two independent variables under this experimentation which are the clementine (*Citrus clementina*) and calamansi (*Citrus microcarpa*). The bread is the dependent variable. And the number of weeks will serve as the control variable.

This study uses a methodology, experimental research which will be divided into two phases, namely: Phase I – The preparation of the materials. Phase II – The step by step process of comparing the clementine and calamansi in preventing mold. Phase III – Application of clementine and calamansi to the loaves of bread. Phase IV – Evaluating the effectiveness of clementine and calamansi in mold prevention. Phase V – The proper disposal of materials being used.

Materials

The materials used in the experiment are six loaves of bread, clementine, calamansi, zip-lock, and litmus paper.

PHASE I – Preparation of the materials

The clementine and calamansi were bought from the public market. While the bread and zip-lock will be brought by one of the researchers.

PHASE II – The step by step process of comparing the clementine and calamansi in preventing mold.

Six loaves of bread will be gathered by the researchers. The bread is put in a zip-lock bag to ensure that no other pathogens could contaminate it. Then, seal the bag with the bread and leave it there for at least two days. The researchers used twelve pairs of calamansi and three pairs of clementine for this experiment.

PHASE III – Application of clementine and calamansi to the loaves of bread

Squeeze a little juice from the clementine and calamansi into the bread. Then, assess it using the litmus paper after 4 days to check the acidity of both the calamansi and clementine.

PHASE IV – Evaluating the effectiveness of clementine and calamansi in mold prevention

Observe the result and reaction of the loaves of bread that are being used after 1 week, 2 weeks, and 3 weeks.







PHASE V – The proper disposal of the materials being used

The researchers properly cleansed the materials that was beings used. Both the clementine and calamansi are disposed of by placing it in a plastic cellophane and properly disposing it in a bin.

CHAPTER III

RESULTS AND DISCUSSIONS

The following are the results of comparing both the clementine (*Citrus clementina*) and calamansi (*Citrus microcarpa*) in preventing mold at 1 week, 2 weeks, and 3 weeks.

TIME	1 WEEK	2 WEEKS	3 WEEKS
CLEMENTINE			
TIME	1 WEEK	2 WEEKS	3 WEEKS
CALAMANSI			

CHAPTER IV

CONCLUSION AND RECCOMENDATION

According to the findings, the two citrus fruits used in the six slices of breads, which are the clementine (*Citrus clementina*) and the calamansi (*Citrus microcarpa*) were proven to be effective at preventing mold at 1 week, 2 week and 3 weeks. The clementine and calamansi act as a diluent in this study, allowing the extract to be more effective.

Recommendations

The researchers will recommend to the future researchers:

1. To experiment other types of citrus fruits besides clementine and calamansi in preventing mold,
2. Avoid eating bread that can have some signs of mold because it may cause things like vomiting or stomach ache.
3. To choose a beneficial bread, look for varieties made from 100% whole-grain and/or sprouted-grain flours;
4. Make sure your bread is low in added sweeteners. A few good options include sourdough, rye, flax, and oat breads.

References

Study of Cook, M. (2018) Retrieved from https://sciencing.com/different-kinds-bread-mold-5956459.html?fbclid=IwAR1NZQJ9Dsve3-ahS_9xN1uM0hz-HsoJhaAtTcabA3eiUoICB0sfnT0uBN4

Healthline Media, (2017) Retrieved from https://www.healthline.com/nutrition/is-moldy-food-dangerous?fbclid=IwAR0_7DoG4AD_nw00j3rANrZJ24B7v7YmXkow6oF6kpIR9p_vuB36I-hOCz94#TOC_TITLE_HDR_8

Medical News Today, (2021) Retrieved from https://www.medicalnewstoday.com/articles/citric-acid?fbclid=IwAR2-M_6AtP0TupQyP6hpZwjICGMv9I0nrx_bBknYmgkSCfpBm5bNs7uAMOM

Study of Tilden, E. (2018) Retrieved from <https://sciencing.com/bread-mold-5811687.html>

Study of Adriane, M. (2023) Retrieved from https://www.healabel.com/clementine-benefits/?fbclid=IwAR1Pf10AADsDjYk8i_hqHkWvZ8Kvj9zqKrjeEWWrULAQCoqt1SQ9_z1e0Uk#:~:text=Clementines%20are%20alkaline.,9.0%20pH%20level%20once%20digested

Study of Kerri, (2022). Retrieved from <https://alkalineveganlounge.com/is-calamansi-alkaline/?fbclid=IwAR0BpzohTVANuarlhwf0z46fWyWn7n4g223fxDxUc73wgSBIJuddtVjKMI4>