
# Mount HIRA Matriculation School

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**CLASS**

## GRADE 8

**PROJECT TITLE**

# WHICH APPENDAGE CAPTIVATE AND FURNISH ELEVATE NUTRIENTS.

**Title of the project**

**Which appendage captivate and furnish elevate nutrients.**

## Introduction

Cooking is an important daily activity, but the choice of utensil can affect the nutrient level of food. Some utensils preserve vitamins and minerals, while others may reduce them. For example, clay pots retain vitamins because of slow cooking, and cast-iron pans add iron to the food. Stainless steel is mostly neutral, aluminum may react and reduce nutrients, while non-stick pans can release harmful substances at high heat.

Utensils also affect storage. Clay pots keep water cool and add minerals, while aluminum may react with acidic foods.

This project mainly studies the effect of different utensils on nutrient retention during cooking, with a short note on storage effects.

## Selection of Problem and Background Information

Many people do not realize that utensils can change the nutrient value of food. Nutrient loss is common in modern fast cooking methods, while traditional utensils like claand cast iron may help retain or even increase certain nutrients. Understanding this helps families make healthier choices.

## Hypothesis

My hypothesis questions about this topic follows:

1. Does the type of utensil material (e.g., Kansa/bronze, copper, cast iron, stainless steel) affect nutrient retention during cooking?

2. Do utensils made from specific materials (e.g., copper, Kansa/bronze) enhance nutrient absorption or provide additional health benefits?

3. Can cooking with cast iron utensils increase iron intake and improve nutritional value?

4. Do stainless steel utensils preserve nutrients better than reactive materials (e.g., aluminum, copper)?

5. How does the nutrient retention of brass utensils compare to other materials (e.g., Kansa/bronze, stainless steel)?

## Abstract

This project explores the effect of different cooking utensils on the nutrient value of food. Many nutrients such as vitamins and minerals are sensitive to heat and can be lost depending on the

material of the utensil. The utensils compared in this study include clay pots, stainless steel, aluminum, non-stick, and cast iron. The aim was to identify which utensil helps in retaining more nutrients and which causes higher nutrient loss during cooking.

Food samples were prepared under similar conditions in each type of utensil, and the nutrient changes were observed. The results showed that clay and cast iron utensils preserved nutrients more effectively and even added beneficial minerals like iron, while aluminum and non-stick utensils caused greater nutrient loss. This study highlights that choosing the right utensil is important for healthy cooking and maintaining the nutritional value of food.

Additionally, pH testing helps to confirm the chemical changes that occur during cooking. This project highlights the importance of cooking methods and utensil selection in maintaining the nutritional value of everyday foods. And also it evaluates additional health benefits due to their antimicrobial and anti-inflammatory properties. Cast iron utensils provide iron fortification, while stainless steel utensils are durable and non-reactive. Our findings suggest that the choice of cooking utensils can significantly impact nutrient retention and overall health benefits. This study provides insights for selecting cooking utensils that optimize nutrient retention and promote healthy cooking practices.

**Keywords:** Cooking utensils, Nutrient retention, Kansa/bronze, brass, copper, cast iron, stainless steel.

## What are characteristic of each utensils?

### 1. Clay Pots

- Porous – allows slow cooking and moisture retention.
- Natural minerals – can add calcium, magnesium, and iron to food.
- Even heating – prevents burning, keeps nutrients intact.
- Eco-friendly but fragile (can break easily).

### Stainless Steel

- Durable and non-reactive – doesn't react with acidic foods.
- Retains most nutrients if food is not overcooked.
- No extra minerals added to food.
- Needs oil/water to prevent sticking.

### 3.Aluminum

- Light weight and cheap.
- Good conductor of heat – food cooks fast, but nutrients (esp. vitamins) may break down due to high heat.
- Reacts with acidic foods (like tomato, lemon, grapes, Orange, etc) – can cause leaching of aluminum into food.
- Not ideal for nutrient preservation.

**4. Non-stick (Teflon-coated)**

- Smooth surface – needs less oil.
- Does not add minerals to food.
- High heat damages coating – can release harmful chemicals.
- Nutrients may be lost if overheated.

**5. Cast Iron**

- Excellent heat retention – cooks food evenly.
- Adds iron to food – especially beneficial for people with anemia.
- Long-lasting and strong.
- Requires seasoning (oiling) to prevent rust.

**6. Brass Utensils**

**1. Durable:** Brass utensils are known for their durability and resistance to corrosion.
**2. Heat Conductor:** It is a good heat conductor, allowing for even cooking.
**3. Nutrient Retention:** It utensils retain nearly 93% of nutrients.
**4. Antimicrobial Properties:** Copper in brass has antimicrobial properties.

**7.Copper Utensils**
**1. Excellent Heat Conductor:** It is an excellent heat conductor, ideal for cooking.
**2. Antimicrobial Properties:** It has antimicrobial properties, reducing bacterial growth.
**3. Anti-Inflammatory:** It has anti-inflammatory properties, relieving joint pain.
**4. Water Purification:** It purifies water, making it safe for consumption.

**8. Kansa/Bronze Utensils**
**1. High Nutrient Retention:** It utensils retain nearly 97% of nutrients.
**2. Improved Gut Health:** It acid content in food, promoting digestive health.
**3. Reduced Inflammation:** It helps reduce inflammation and improves memory.
**4. Durable:** It utensils are durable and long-lasting.

## Objective

- To test which utensils preserve the maximum nutrients while cooking the same food.
- To compare traditional (clay, cast iron) and modern (stainless steel, aluminum, non-stick) utensils.
- To create awareness about healthy cooking practices.

**A) Primary**

- Evaluate the effectiveness of different utensil materials (e.g., Kansa/bronze, copper, cast iron, stainless steel, brass) in retaining nutrients during cooking.

**B) Secondary**

- Compare the nutrient retention capabilities of various utensil materials.
- Investigate the potential health benefits of cooking with specific utensil materials (e.g., antimicrobial properties of copper).
- Provide insights for selecting cooking utensils that optimize nutrient retention and promote healthy cooking practices.

**C) Ultimate Goal**

- To inform consumers, chefs, and healthcare professionals about the impact of utensil choice on nutrient retention and overall health, enabling them to make informed decisions about cooking utensils and practices.

## Guiding Principle

Nutrient retention depends on:

- Heat conduction and distribution of the utensil.
- Reaction between the utensil material and the food.
- Time and temperature of cooking.

Traditional slow cooking often helps preserve more vitamins and minerals.

- Follow a systematic approach to evaluating nutrient retention.
- Compare nutrient retention among different utensil materials.
- Draw conclusions based on empirical evidence.
- Ensure research is relevant to real-world cooking practices.
- Consider practical constraints and limitations.
- Ensure findings are applicable to various cooking.

**i)Experiment 1 – Spinach**

A) Independent Variables

Type of utensil used for cooking spinach (e.g., Steel, Clay, Aluminium, Copper, Brass, Bronze)

- Cooking time (short vs long boiling)
- Adding / not adding salt after cooking

B) Dependent Variables

- Vitamin C content in spinach

- Iron availability in spinach
- Colour and texture changes (indicator of nutrient loss)

**ii)Experiment 2 – Lemon Juice**


A)Independent Variables

- Heating lemon juice vs keeping it raw
- Duration of heating
- Type of utensil used for heating

B)Dependent Variables

- Vitamin C level in lemon juice
- Taste change (sourness reduction as indicator of citric acid loss)
- Colour change (as nutrients degrade)

## Materials required

- Spinach leaves (or any green leafy vegetable, same quantity for each test)
- Water
- Salt (small amount, same for all samples)
- Clay pot
- Cast-iron pan
- Stainless steel pot
- Aluminum pot
- Non-stick pan
- Brass, Bronze pot
- Stove

- Bowls for collection
- Fresh lemon juice (50 ml × 5 utensils)
- Vinegar (50 ml × 5 utensils)
- pH strips / pH meter
- Containers with lids (for storing samples)
- Notebook & camera for observations

## Procedure

1.First I added equal amount of spinach on each utensils

2. Then , Divide it into 5 equal samples.
3. Cook each sample in a different utensil (clay, cast iron, stainless steel, aluminum, non-stick).
4. Use the same amount of water, salt, and cooking time for each sample.

5. Observe changes in color, texture, and taste.

6. (Optional simple test) Compare water left after cooking — darker water may show more nutrient loss.

7. Record all observations in a table.

**Then I will take Experiment 2-lemon juice with vinegar**

1. Collect 50 ml lemon juice and 50 ml vinegar for each utensil (stainless steel, clay pot, Aluminium, non-stick pan, cast iron, Brass, Bronze).

2. Record the pH before heating using pH strips or a pH meter.

3. Heat each sample separately in the utensils until a gentle boil appears, and keep it for 1 minute.

4. Allow all samples to cool, then measure and record the pH after heating.

5. Observe and note changes in colour, sourness, and Vitamin C level (only lemon juice has Vitamin C, vinegar does not).

6. Store the cooked samples in covered containers at room temperature.

7. After storage, again check the pH, colour, sourness, and any spoilage signs.

8. Take clear photos at each stage and keep them labelled (e.g., "Lemon – Clay Pot" or "Vinegar – Aluminium").

9. Record all values in an observation table for comparison of lemon juice and vinegar in different utensils.
In future I will proceed experiment with Orange juice, and some other methods of cooking.

## Data Analysis

- Compare which spinach looks greener and fresher (better vitamin retention).
- Note if iron-rich utensils (cast iron) change the color or taste.
- Check if aluminum or non-stick shows more nutrient loss.
- Create a comparison chart of results.

**pH Values**

- Experiment 1 – Spinach
- Raw spinach (blended in water) → pH ~6.0–7.0 (almost neutral, slightly acidic or basic depending on soil where it grew).
- After cooking spinach in water → pH ~6.5–7.5 (cooking releases minerals, making it slightly more alkaline).

- Spinach + lemon juice added after cooking → pH ~3.0–4.0 (becomes acidic due to citric acid in lemon).

- Experiment 2 – Lemon Juice

- Fresh lemon juice → pH ~2.0–3.0 (highly acidic).

- After heating lemon juice → pH ~2.2–3.5 (slight increase because some citric acid breaks down).

I will

## Risk Factors and Safety

1.Handle hot utensils carefully to avoid burns.

2.Do not overheat non-stick pans, as fumes may be harmful.

3.Avoid aluminum with acidic food.

4.Use clean utensils to prevent contamination.

5.Adult supervision is required while cooking.

## Bibliography

### Links

https://medlineplus.gov/ency/article/002461.htm

https://shopwithpraylady.com/blogs/news/which-cooking-utensil-material-is-best-for
health?srsltid=AfmBOoq4BmCaqV2dplae4SwDn1l0mHnS2kWrAbv6TZT6HsTWX0xYkvDO

**Books and Articles**

Nutrient Retention Handbook: A comprehensive guide to nutrient retention in different water body types, including streams, rivers, lakes, and reservoirs.

Every Nutrient is Sacred: Developing a Nutrient Retention Paradigm to Aid Global Food Security* by Steve Lapidge (2016): Discusses the importance of nutrient retention in ensuring global food security.

Nutrient Retention on ScienceDirect: Explores the preservation of vitamins and other nutrients in food during postharvest storage and cooking processes.

XSEED content book Grade 6 to 9

**Research Papers**

Nutrient Transformation In Retention Detention Ponds Receiving Highway Runoff: Investigates nutrient removal efficiencies and transformation in retention/detention ponds.

Nutrient retention and loss during ecosystem succession: revisiting a classic paradigm: Examines the relationship between nutrient retention and biomass accumulation in terrestrial ecosystems.

**Online Resources**

Grafiati: Offers lists of relevant articles, books, theses, and conference reports on nutrient retention and related topics.

RePEc: Provides access to research papers and articles on nutrient retention, including "Every nutrient is sacred: developing a nutrient retention paradigm to aid global food security".

**Studies**

Effect of Non-Thermal Processing on Nutrient Retention in Dairy and Food Products: Explores the impact of non-thermal processing methods on nutrient retention.

Nutrient Retention on Fiveable: Discusses the importance of nutrient retention in soil fertility and plant growth.