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SAFE SACHETS, FRESH GRAIN: A BAY LEAF- CLOVE HERBAL PRESERVATIVE FOR CHEMICAL - FREE FOOD STORAGE

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Abstract- In most households Atta (wheat flour), Pulses, grains and Maida (refined flour) are used daily to make chapati, bread, cakes and other food stuffs. Nonetheless, these products are likely to spoil when kept at a long storage period. Most prevalent are rancidity (poor scent resulting from the oxidation of natural oils within the flour), insect infestation (weevils, beetles, etc.), and fungal or mold growth as a result of moisture. In order to avoid the problems, chemical preservatives or pills are frequently used, yet these are not always safe in terms of health and many families avoid them. As a natural approach to solving this issue, the concept of applying small sachets woven out of filter paper (anything that resembles tea bags). Such sachets contain a blend of natural ingredients like bay leaves and cloves. Bay leaves are famous as insect-repelling and antifungal, whereas cloves contain a great quantity of eugenol, which is a substance with a pronounced antioxidant, antifungal, and insect-repelling properties. It is a low cost and simple method of doing it in an environmentally friendly manner.

Keywords-: Natural Preservatives, Food Safety, Shelf-Life Extension, Rancidity Prevention, Insect Repellent Activity, Bay Leaves, Cloves and Low-Cost Technology.

I. INTRODUCTION

One of the largest challenges of storage and packaging is food spoilage. Dry food substances such as cereals, pulses, flour, etc. get spoilt many times due to insects, moisture or due to growth of microbes. In order to address this issue, preservatives are typically employed, and most of them are

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chemical in market and can cause adverse health effects with a prolonged use. The past years, there is an increased interest among people in natural preservatives as they are safe, ecological and readily available. Bay leaves and cloves are the traditional spices among them and are well-known as natural preservatives. Bay leaves have antimicrobial and insect-repelling activity with essential oils such as eugenol and cineole. That is why humans tend to store bay leaves in containers of storage food items at home to avoid insect infestation. Compounds such as eugenol that are abundant in cloves are antifungal, antibacterial and antioxidants. Not only will they preserve food but they will also aid in rancidity retardation. The concept is affordable, user-friendly and applicable in both rural and urban homes. It also upholds the idea of adoption of smart villages, since it utilizes the traditional knowledge in a contemporary, convenient format to enhance food safety and minimize wastage.

II. Reason of using bay leaves and cloves:

1. Cloves (Syzygium aromaticum)

Principal active compounds*: Eugenol.*

Properties:

- Antioxidant - lengthens oxidation of oils in storage food items to prevent rancidity (poor smell/taste).
- Antimicrobial/Antifungal - prevents proliferation of fungi and bacteria that cause spoiling.
- Insecticidal effect - repels/Controls insects such as weevils and beetles.
- significant in the storage of food items.
- Both inhibits the microorganisms that cause spoilage and removes off-flavors to preserve the food items longer.

2. Bay Leaves (Laurus nobilis)

Principal active compounds: Cineole, Eugenol, Methyl eugenol, Linalool.

Properties:

- Insect repellent- bay leaves have long been stored in grain containers to keep bugs at bay.
- Antifungal/Antibacterial -prevents damp in food items.
- Aromatic oils provide es a natural preservative environment within the container.

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Significant in the storage of food:

- Repels insects in a non-toxic manner.
- Helps keep food stored fresh and hygienic.

Collaborative impact:

Wide-Spectrum Protection

Cloves also contain eugenol - potent antioxidant, antifungal, antibacterial. Bay leaves are rich in cineole, linalool and methyl eugenol - great insecticide as well as antifungal.

Synergistic Effect

Cloves do not allow oil oxidation (prevent rancidity) that bay leaves cannot. Bay leaves are also better insect indicators than cloves.

They are complements when used together - providing a wider and more powerful impact.

Safe and Edible

Both are very typical cooking spices, which are totally non-toxic and eatable. They have aroma, even though the traces that have been combined with food do not harm them.

Low-Cost + Readily Available

They are both low-cost and locally found in the markets or farms.

The way it fits in smart village adoption:

1. Local, Natural Ingredients Usage:

Clove and bay leaves can readily be obtained in villages; and frequently are cultivated in domestic gardens, or upon local farms. Villagers do not have to purchase expensive chemical preservatives - they can use natural resources in order to decrease spoilage.

2. Eco-friendly & Sustainable:

The sachets are chemical and biodegradable unlike the synthetic preservatives.

3. Low-cost, Income Generation:

These sachets can be prepared easily and sold by women self-help groups (SHGs) as well as by rural entrepreneurs.

4. Food Security & Storage:

One of the major problems in villages is spoilage because of the absence of refrigeration. Sachets prolong the shelf life of grains, spices or flour that may be stored, cutting down wastage.

III. SCIENTIFIC BASIS:

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• *Bay Leaf Oil Antifungal and Antioxidant Effects of Bay Leaf Oil.*

As Belasli et al. (2020) proved, Laurus nobilis (bay leaf) essential oil is effective antifungal, antioxygenic, and antioxidant.

That is why bay leaves are applied upon the sachets in order to make assure that there is no expiry of flour and grains in the shop.

• *Bay Leaves as Tasting repulsively.*

Chahal et al. (2016) have discovered the insecticidal value of the bay leaf essential oil on the stored pests on the wheat weevil's grain.

This is to indicate the act of inserting the bay leaves into the storage containers is making sure that there are no insects that would otherwise be realized by use of chemicals.

• *Tear-free MICR and Preservation Agent Clove Oil.*

Kumar et al. (2021) determined that the use of organism can prevent the spoilage of chickpea seed with clove oil. Linan-Atero et al. (2024) performed a review of clove essential oil and have shown that this substance possessed high antimicrobial, antifungal, and antioxidant activity. This research paper merely gives the reasons why cloves have the potential of reducing the rancidity, bacterial and fungal spoilage.

• *Clove and Bay Leaf Oil Blend.*

The authors were interested in bay leaf essential oil as a natural food preservative, and the authors established that a clove oil was able to inhibit lipid oxidation, microorganisms' growth in meat products (Ordoudi et al., 2022; Harmankaya et al., 2024).

• *Storage Long-term storage Controlled Release.*

The researchers of the work by Sousa et al. (2023) made research on the use of the controlled release of clove and pennyroyal oils in the storage of maize and found out that it reduced the damage in grains during their harvest. One can use this to prove your case of sachets where aroma chemical can gradually evaporate in containers by not having direct contact with food.

• Food Packaging Bay Leaves.

Bartolome et al. (2023) have already found out that extracted bay leaf can be used to prepare food preservation by using food coating that is edible. Padilha et al. (2024) discovered that grapes covered pectin coats using cloves oil, and this extended the shelf life of grapes.

Innovation / Novelty of the Research:

- It has been already demonstrated by many studies that cloves prevent fungus and spoilage in grains and that bay leaves can be used to keep insects off. Other researchers even applied such sophisticated techniques as clove oil nano emulsions in preserve food. However, such techniques are either laboratory based or expensive and cannot be used in the daily lives of the house hold.
- The novelty of this project is to mix cloves and bay leaves in such small tea bag-like sachets.

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These sachets gradually emit natural smell and compounds within the container protecting the food items against bad smell(rancidity), insects and fungus. This transforms a simple, low cost, greener process that anyone can carry out at home without use of chemicals.

Flowchart of sachet based natural preservation concept & Market opportunity identification for natural preservative sachets -

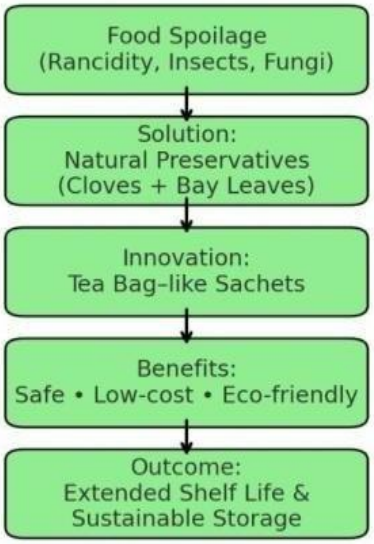


Table.1. Market opportunity identification for natural preservative sachets -

Keywords	*Ingredients*	*Market Opportunity Identification*
Natural Preservatives	Cloves, Bay Leaves	Rising demand for safe, chemical-free food storage methods
Antimicrobial Action	Essential oils in cloves & bay leaves	Very few natural antimicrobial storage sachets exist in the market

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II. CONCLUSION

A natural, safe and inexpensive method of food preservation is the sachet created with bay leaves and cloves. The two ingredients are highly antimicrobial and insect-repelling, which prevents stored foods such as grains, pulses, and flour and they do not involve the use of toxic chemicals. This is a straightforward technique that can prolong shelf life, decrease wastage and enhance healthy storage habits. With these natural preservative sachets, we will be in a position to offer a low-cost option to households, particularly in the villages and influence people to resort to the traditional ways in a new way. The presented project demonstrates that natural spices, such as bay leaves and cloves, can also be very significant in terms of food preservation and help to prove the concept of sustainable and environmentally.

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