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FORMULATION OF NATURAL PRESERVATIVE FOR NUTRITION ADDITION AND LONGER STORAGE OF CHICKEN MEAT

Mohammed Sajad P.K¹ Rehana Rasheed¹ Bharath Ganesan²

Department of Food Technology, K.S.Rangasamy College of Technology, Tiruchengode-637215, Namakkal, Tamil Nadu, India.

ABSTRACT

This research paper helps to formulate a natural preservative oil using Thyme oil, Apple skin oil, Clove oil, Bark of Cassia oil for nutrition addition and longer storage of chicken meat. This will reduce the use of sodium nitrate and sodium nitrites, and also decreases the risk of heart disease, diabetic and other chronic diseases. A natural preservation as an alternate for the commercially existing preservatives; the natural preservative contains naturally occurring compounds which have antimicrobial properties to prevent the growth of microorganisms. The antioxidant properties of the preservatives help in increasing the nutritive value of raw meat in a cost effective and without any artificial preservatives. The natural preservative can help to replace the chemical preservatives used. It implements the nutrition values and also implements the antimicrobial and antioxidant properties which are present in the essential oil to raw chicken meat. By this the nutrition value, antimicrobial and antioxidant properties of the chicken meat will be increasing and also helps to increase the shelf-life of the chicken meat. This paper also shows that chicken meat to which the oil is applied and kept at 5°C is consumable up to 10 days than the normal chicken meat or the marinated chicken meat. The growth of *E.coli* and the appearance of the chicken meat is also noted and from this it came to the conclusion that the meat to which the oil is been applied can withstand up to 10 days in 5°C.

Keywords: Preservatives, Antimicrobial property, Antioxidant

INTRODUCTION

India has the world's largest livestock population in comparison to other countries and 5.3 million MT of meat is consumed annually. India is the largest producer of Buffalo meat and second largest producer of goat meat, currently the meat processing levels in the poultry industry are 6%, while the meat industry has 21%. The Poultry meat industry is a vertically integrated high demand industry in India and matches the efficiency levels of many western countries. Governments of India has taken steps for modernization of municipal abattoirs to provide safe and hygienic meat to consumers.

The poultry sector in India has been extremely beneficial to the common man and has also contributed to earning foreign exchange through exports. Tamil Nadu ranks second in the country in the egg production with 10.8 billion eggs and also it accounts for 17.71% of the country's poultry population. More than 90% of poultry or poultry products exported from India come from Tamil Nadu. Tamil Nadu produced over 455 thousand metric tons of poultry meat in the recent past. Chicken meat live with certain bacterial pathogen within inside their body itself such as *Campylobacter*, *Salmonella* and *Escherichia coli*. These bacteria stay within the bird after it has been slaughtered and processed for sale. These are the main bacteria which causes the raw chicken meat to go bad more quickly than other meats such as beef, pork and lamb. These pathogens are present during the life of the chicken. Even after slaughtering process these pathogens are present inside the chicken meat due to which the raw chicken meat get spoil within 2 hrs.

Essential oils (EOs) derived from plants are rich sources of volatile terpenoids and phenolic compounds and they contain potential to inactivate pathogenic bacteria on contact and in the vapor phase. Fruit and vegetable skin have a polyphenolic compounds, terpenes and phenols with antimicrobial and antioxidant activity these flavoring plant essential oil components are generally regarded as safe. Apple skin contain polyphenols have the potential to be used commercially to protect food against contamination by pathogenic bacteria. Herb is made of structural materials and phytochemicals. The oil's smell stimulates our central nervous system. Essential oils can be used as a form of alternative medicine. Aromatic compound gives each oil its characteristic essence. Essential oils extracted through distillation (via steam and water) or mechanical methods. Cold pressing is one of the mechanical methods. Aromatic chemicals have been extracted from plants. The rise of antibiotic-resistant bacteria has renewed interest in the search for further compounds that can fight bacterial diseases. Essential oils have many applications outside from aromatherapy. Most of the essential oils are considered as safe in food. Blending of four types of essential oil like Thyme oil, Bark of cassia oil, Clove oil and Apple skin oil have the capability to inactivate the micro-organisms present in raw chicken.

Cloves, the aromatic flower buds of a tree in the family *Mystaceae*,. They are originated from the Maluku Island (or Moluccas) in Indonesia and are commonly used as a spice, flavoring or fragrance in consumer products, such as toothpaste, soaps, or cosmetic. It is available throughout the year owing to different harvest seasons across various countries. The oil which is been extracted from clove has some biological activities, such as antibacterial, antifungal, insecticidal and antioxidant properties, and is used traditionally as a savoring agent and antimicrobial material in food. In addition, it is also used as an antiseptic in oral infections. This essential oil has the capability to inhibit the growth of molds, yeasts and bacteria. The clove oil and its components have beneficial effects on common food source Gram-negative bacteria as *Escherichia coli*, *Salmonella* and *Pseudomonas aeruginosa*.

Cassia typically refers to cassia bark this is a type of spice which is made from the bark of East Asian evergreen trees. The oil extracted from this bark is investigated for anti-microbial property without changing concentration. The study declared that all the extracts had good inhibitory activity, improve insulin sensitivity, which might help blood sugar managing in people with diabetes. Peoples most commonly use cassia for diabetes and it is also used for prediabetes, obesity and many other uses. Antifungal activity of the extracted oil against *Aspergillus* showed the highest inhibitory growth. This exhibit that the extracts have broad spectrum activity and there is a possibility in treatment of infectious diseases. Essential oil has been used in treatment. The positive uses of the treatment are respiratory, gastrointestinal cardiovascular, and urinary disorder. Food and Drug Administration has accepted bark of cassia as a safe additive in foods.

Apple peel have been found to have very strong antioxidant activity and antimicrobial properties. The oil extracted from the apple skin exhibited a clear antimicrobial activity against salmonella and *E. coli*. The peel was found to possess a discrete activity. Antimicrobial properties of the oil extracted are related to the bioactive compounds of the apple peel are an important source of bioactive compounds like flavonoids, phenolic compounds, and anti-oxidants. Apple peel as a natural food additive has recently been suggested, due to their richness in polyphenols. Polyphenols are a very important part of our daily life diet plan. Polyphenols mostly present in fruit. Polyphenols potentially interact with biological systems. Polyphenols plays major role in preventing neurodegenerative diseases and cardiovascular disorders of humans. polyphenols have a strong antioxidant effect. Polyphenols also exhibit an antimicrobial activity in foods. Apple peel have been widely investigated as a good source of polyphenols.

Thyme is a type of herb of some members of the genus *Thymus* of aromatic perennial evergreen herbs. Thymes are relatives of the oregano genus *Origanum*, with both plants being mostly indigenous region. Thymes have culinary, medicinal, and ornamental uses, and the species most commonly cultivated and used for culinary purposes is *Thymus vulgaris*. The oil extracted from thyme, contains 20–54% thymol. It also contains a range of additional compounds. Thymol, is an antiseptic is an active ingredient in various commercially produced mouthwash. Before the advent of modern antibiotics, the oil of thyme was used to medicate bandages. Antibacterial activity of Thyme oils was tested against clinical bacterial strains of *Staphylococcus*, *Enterococcus*,

E. coli, *Pseudomonas* genera and *Salmonella*. Thyme essential oil reduces or eliminate foodborne bacteria. Thyme essential oil support heart health, and alleviate inflammation in the humans, among other benefits. Thyme oil very useful against breast cancer. Thyme oil was found to be effective at removing food- related bacteria and fungi. Thyme oil was an effective anti-inflammatory agent with cardioprotective capabilities in humans, making it potentially helpful for people with heart diseases.

Incredible amounts of people use coconut oil and for good reason. It has a delicate flavour, is readily accessible, and has a number of health advantages. It is also a very adaptable oil with many applications that you might not be aware of. Because to its MCT content, notably lauric acid, it possesses antibacterial and antifungal properties. About 50% of the MCTs in coconut oil are made up of the fatty acid lauric acid. It may have antimicrobial properties against pathogens like *Staphylococcus aureus*, *Streptococcus mutants*, *Streptococcus pyogenes*, *E. coli*, and *Helicobacter pylori*, according to research. Lauric acid may have bacteriostatic properties, according to studies. Without really destroying the bacteria, this chemical stops them from growing. It may also act as a bactericidal agent, which destroys some bacteria. Additionally, it might stop the development of microbes that harm plants.

MATERIALS AND METHODS

MATERIALS

Broiler chicken was used in this research. Along with the Clove, Bark of cassia, Apple peel, Thyme and Coconut oil, these materials are been used for the formulation of the natural preservative oil.

EXTRACTION OF OIL

All the four types of oil are extracted by using Simple Double Boiling Method in this research. The material from which the oil is to be extracted is taken at 15gm and then it is been boiled by using coconut oil of 150ml as solvent for 25-30min. All the oils are been prepared separately which is then left over for 24hrs. It is then strained and kept separately in different glass bottles.

COMPOSITION OF OIL

The composition of the oil is been done by blending all the four of the essential oil prepared at a particular proportion. The proportion of each oil has been selected by sensory evaluation with 9-point hedonic scale. The proportion at which each oil is been mixed is indicated in *Table 1*

Table 1. The Proportion Of The Oil

<u>OILS</u>	<u>PROPORTION</u>
Clove oil	30ml
Bark of Cassia oil	30ml
Apple peel oil	20ml
Thyme oil	20ml

ANTIMICROBIAL TEST OF THE FORMULATED OIL

The antimicrobial property of the oil is been tested by using Nutritive Agar in this research. The nutritive agar is poured into a petri dish and Hole Punched Plate Method is done. Into the hole of 0.5cm, 0.25ml of the formulated oil is been poured and another sterilized petri dish is been used for closing it. Parafilm is been used for enclosing it. At every 24 hr the growth of microorganism is been noted.

RESULT

QUALITY TESTING OF OIL

The testing of the quality of the oil has been done so that we will be able to find out whether the formulated oil is good for health or not. 1ml of the formulated oil has been taken to a test tube to which 4 ml of distilled water has been added and shake it well. To another test tube add 2ml of the above mixture and 2ml of conc. HCL. If the oil is having good quality, then the topmost portion of the oil remains in same color if not the topmost color changes to reddish- brown color.

SHELF-LIFE STUDY OF THE MEAT

The chicken meat of 120gm is first washed in tap water. Wipe it with cotton cloth to avoid the moisture content from the chicken meat. Divide the 120gm of chicken into 5 batches each as 24gm of chicken meat. Apply 0.7ml of the formulated oil to the 24gm of chicken meat. Pack it in boxes separately and mark in the top as 1, 3,5,7,9. Keep the packed tin in the chiller of a refrigerator at 5⁰C. On each marked days, the chicken meat from the respective tin has been taken and undergo microbial test by using cotton swab method in EMB agar for the detection of *E. coli*. By this we will be able to find out the Shelf-life of the preservative oil.

COMPARISON STUDY OF THE GROWTH OF *E. COLI* IN MARINATED MEAT, NORMAL MEAT AND OIL APPLIED MEAT.

The comparison between the Normal Meat, Marinated Meat and the Meat applied in Oil has been done. All the 3 sets of Meat has been kept in refrigerator for 5⁰C for 10 days. The changes happened in each day has been noted and the microbial growth of *E. coli* has been noted. It came to a conclusion that the marinated meat contains more the number of growth of *E. coli* on the 10th day and the oil applied meat contain the less number of growth of *E. coli*.

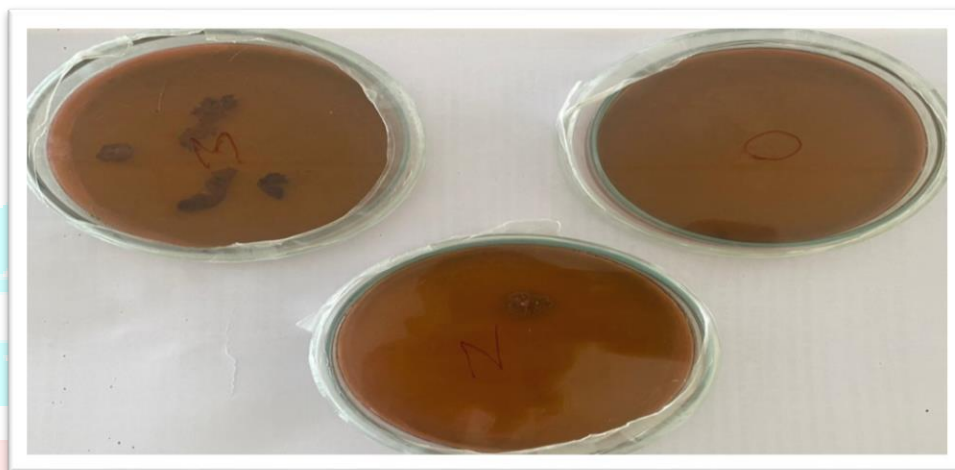


Fig1. Result of marinated meat, oil applied meat and the normal meat media after 10 days.

DISCUSSION

The Extraction of the essential oil has been usually done by distillation method, but here Double Boiling Method has been used. The oil which has been extracted by using Double Boiling Method has a different odor compared to Distillation Method. The color of the oil extracted by using Distillation method is usually transparent, but the color of the oil extracted by using Double Boiling Method has a pale yellow and pale brown. In Double Boiling Method using any edible oil is also added because of which the nutritional property of that oil is also has been present in the extracted oil. The shelf-life property of the oil extracted by using Double Boiling Method is more compared to the shelf-life of the oil extracted by using Distillation Method.

COMPARISON GRAPH FOR MARINATED MEAT, OIL APPLIED MEAT AND NORMAL MEAT BASED ON THE NUMBER OF THE GROWTH OF *E. coli*.

The below mentioned graph indicate the line graph which shows the growth of the *E. coli* up to 10 days. In this graph the line indicates the marinated meat, oil applied meat and normal meat. The variation of the lines shows the growth *E. coli* in each day. In this graph it shows that the growth of the *E. coli* starts in the marinated meat from the day 2 onwards, the growth of *E. coli* starts in the normal meat from the day 3 onwards and the growth of *E. coli* starts in the oil applied from day 8 onwards. In this graph it also shows the count of the growth of *E. coli* day by day happened in the chicken meat. From this it is clear that the growth of *E. coli* is more in marinated meat as well as normal meat which kept in 5C so it is difficult to consume up to 10th day, whereas the growth of *E. coli* is less in oil applied meat which shows that it is consumable up to 10th day.

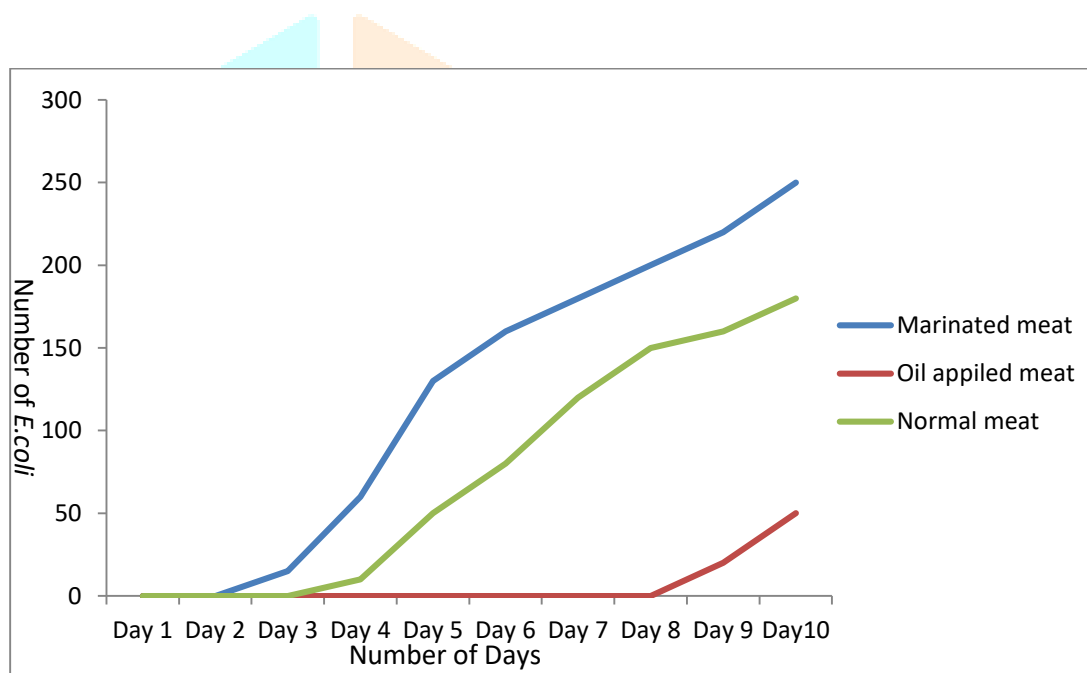


Fig2. COMPARISON GRAPH FOR MARINATED MEAT, OIL APPLIED MEAT AND NORMAL MEAT BASED ON THE NUMBER OF THE GROWTH OF *E. coli*.

COMPARISON FOR MARINATED MEAT, OIL APPLIED MEAT AND NORMAL MEAT BASED ON THE APPEARANCE OF THE MEAT.

The appearance changes happened to the marinated meat, normal meat and the oil applied meat upto the day 10th which is been kept in 5C. In this it shows that the marinated meat as well as the normal meat has more changes and get spoiled fastly whereas the oil applied meat withstands more compare to the other. On the first three days all the 3sets of chicken meat appeared to be normal in its color, odor and appearance. On the 4th and 5th day the normal meat is seem to be dull in color, sour in odor and watery in appearance whereas the marinated meat and oil applied meat remain to be normal. On the 6th day onwards the color, odor and the appearance of the normal meat changes to brown, pungent and slimy respectively. From the 6th to 8th day the

marinated meat changes its physical appearance to pale color, pungent odor and the fiber starts to break in appearance whereas the oil applied meat remains the same. On the last 2 days the marinated meat appeared to be in a whitish color and the fiber gets broken whereas the oil applied meat remains the same. This indicates that the oil applied meat can be used up to 10 days which has been kept at 5°C.

CONCLUSION

Natural preservatives are utilized in place of artificial preservatives thanks to their formulation. It applies the nutritional values as well as the antioxidant and antibacterial qualities found in the essential oil to the raw chicken meat. The nutritional value, antibacterial, and antioxidant characteristics of the chicken meat will rise as a result, and it also extends the meat's shelf life. As the nutrition value increases this chicken will be healthy and safe for the consumers. The method which is being implemented in this is in a simple way so that it will be helpful for the common people also to make and use in natural preservatives. For the preservation of wholesome and quickly spoiling meat and meat products, a number of natural substances have antibacterial and antioxidant effects. In recent years, the idea of bio protection or bio preservation of red meat, including poultry meat, has gained relevance. In order to assess the effectiveness of bio preservatives in extending the shelf life and enhancing the microbiological safety features of meat, more emphasis is placed on the isolation, characterization, and standardization of application levels and techniques. Meat and meat products are great sources of bioactive substances that can be consumed without altering one's diet. Due to their non-toxicity and several health advantages, natural preservatives are preferable to their synthetic equivalents. There are many plants and herbs in nature that may have preservation properties that might be used in food systems. One of the reasons restricting their use is the lack of systematic study and the accessibility of pertinent toxicity data. To assess their effectiveness in prolonging their shelf life and enhancing their microbiological elements of meat safety, more emphasis should be placed on isolation, characterization, standardization of application, and methods of bio preservation. Future research may concentrate on the potential of such systems to replace chemical preservatives in meat and meat products.

The formulation of the natural preservative helps to replace the chemical preservatives used. It implements the nutrition values and implements the antimicrobial and antioxidant properties which is present in the essential oil to the raw chicken meat. By this the nutrition value, antimicrobial and antioxidant properties of the chicken meat will be increasing and helps to increase the shelf-life of the chicken meat. As the nutrition value increases this chicken will be healthy and safe for the consumers. The method which is being implemented in this is in a simple way so that it will be helpful for the common people also to make and use in natural preservatives.

REFERENCE

1. Cohen N, Ennaji H, Bouchrif B, Hassar M, Karib H. Comparative study of microbiological quality of raw poultry meat at various seasons and for different slaughtering processes in Casablanca (Morocco). *Journal of Applied Poultry Research*. 2007;16(4):502–8.
2. Rokade JJ, Bhanja SK, Shinde AS, Darshana S, Bhaisare B, Mandal A. Evaluation of aspirin (ASA) in broiler chicken during hot dry summer using zoo technical, molecular and physio-biochemical tools. *Indian Journal of Animal Research*. 2016;(OF).
3. Tan MC, Chin NL, Yusof YA. A box–behnken design for determining the optimum experimental condition of cake batter mixing. *Food and Bioprocess Technology*. 2010;5(3):972–82.
4. Rouger A, Tresse O, Zagorec M. Bacterial contaminants of poultry meat: Sources, species, and Dynamics. *Microorganisms*. 2017;5(3):50.
5. Rouger A, Tresse O, Zagorec M. Bacterial contaminants of poultry meat: Sources, species, and Dynamics. *Microorganisms*. 2017;5(3):50.
6. Banaszak M, Biesek J, Adamski M. Research note: Growth and meat features of broiler chicken with the use of Halloysite as a technological additive to feed and peat litter. *Poultry Science*. 2022;101(1):101543.
7. Almanea A, El-Aziz GS, Ahmed MM. The potential gastrointestinal health benefits of thymus vulgaris essential oil: A Review. *Biomedical and Pharmacology Journal*. 2019;12(04):1793–9.
8. Khalid MU, Shabbir MA, Mustafa S, Hina S, Quddoos MY, Mahmood S, et al. Effect of apple peel as an antioxidant on the quality characteristics and oxidative stability of Mayonnaise. *Applied Food Research*. 2021;1(2):100023
9. Shelepov V, Uglov V, Boroday E, Poznyakovsky V. Chemical composition of Indigenous Raw Meats. *Foods and Raw Materials*. 2019;:412–8.
10. Zakarienė G, Rokaitytė A, Ramonaitė S, Novoslavskij A, Mulkytė K, Zaborskienė G, et al. The antimicrobial effect of spice-based marinades against campylobacter jejunion contaminated fresh broiler wings. *Journal of Food Science*. 2015;80(3).
- 11 Du W-X, Olsen CW, Avena-Bustillos RJ, McHugh TH, Levin CE, Friedman M. Effects of allspice, cinnamon, and clove bud essential oils in edible apple films on physical properties and antimicrobial activities. *Journal of Food Science*. 2009;74(7).

- 12 Arakeeb S, Hassanien F, Shaltout F, Homouda S. Natural preservatives in raw chicken meat. Benha Veterinary Medical Journal. 2019;37(1):41–5.
- 13 Salian V, Shetty P. Coconut oil and Virgin Coconut Oil: An insight into its oral and overall health benefits. JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH. 2018;
- 14 Chouaibi M. Preparation of oil-in-water (o/w) clove essential oil nanoemulsion: Characterization and stability. Clove (Syzygium Aromaticum). 2022;;559–71.
- 15 Ali A. Chemical composition, α -glucosidase inhibitory and anticancer activity of essential oil of thymus vulgaris leaves. Journal of Essential Oil Bearing Plants. 2021;24(4):695–703.

