

A study of the role of Natural food preservatives and their effectiveness to improve food safety and shelf life

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Abstract

Food safety regulators, the food business, and consumers are all very concerned about food-borne illnesses. Natural preservatives are essential for extending the shelf life and improving food safety. Therefore, the purpose of this study was to evaluate the research on how natural preservatives may improve food safety and lengthen the shelf life of food products. According to the review study, there has been a lot of interest lately in natural antimicrobial compounds that prevent bacterial and fungal growth for higher quality and shelf life. Secondary metabolites of plants, animals, and microbes are primarily harvested and isolated as natural antimicrobials. More focus is being placed on plants as a source of natural antimicrobials, particularly herbs and spices. In addition to bacteriocins, microorganisms utilised in food fermentation also produce a variety of antimicrobial metabolites, such as organic acids, hydrogen peroxide, and diacetyl. Various antibacterial substances are present in products of animal origin, including milk and tissues. Before being used for the production of food products, natural antimicrobials are primarily isolated and purified. Natural preservatives' structures and functions may alter as a result of the extraction process and purification. The active components appear to be preserved when the optimal extraction technique is used in conjunction with little processing, such as straight mechanical extraction. The source, timing of harvest, and developmental stage may all have an impact on the activity of natural antimicrobials. A number of variables, such as the content of the food, the manner of preparation, and the storage conditions, have an impact on the efficacy of natural antimicrobial agents in food applications. Because they can reduce germ resistance and satisfy customer expectations for healthier foods, natural antimicrobials are secure.

Key Words: Natural preservatives, healthier foods, natural antimicrobials, shelf life of food.

Introduction

Research into their use in preserving perishable foods has been stimulated in recent decades by the rising demand for natural food preservatives. As a result of the fact that food-borne illnesses are a major concern for consumers, the food industry, and food safety authorities. Natural antibacterial substances that prolong product quality and shelf life by preventing bacterial and fungal growth. The biggest issues with food safety are food-borne pathogens such *Clostridium botulinum*, *Staphylococcus aureus*, *Campylobacter jejuni*, *Bacillus cereus*, *Listeria monocytogenes*, *Cryptosporidium hominis*, and *Escherichia coli* 0157:H7. Due to consumer demand for ready-to-eat or ready-to-cook foods and the desire to live a healthy lifestyle, consumption of fresh foods including fish, beef, and horticulture goods has surged. The shelf lives of fruits, vegetables, seafood, and meat are often short, necessitating the use of effective preservation techniques. Even in wealthy nations, incidents of food-borne illness are increasing as people switch from eating animal products to fresh foods like minimally processed fruits and vegetables. Changes in environmental conditions, food production methods, the global food trade, and the genetic makeup of the relevant pathogenic microbes are all contributing to new dangers. An surge in food-borne illnesses has paralleled the growth of the fresh-cut quick salad business because precutting the salad leaves releases nutrients that encourage microbial growth. The altered environment inside the packaging lessens aerobic deterioration, but it increases the aggressiveness of infections like *E. coli* 0157: H7. The short shelf life of these fresh foods and their connection to outbreaks of food-borne illness have led to ongoing market pressure to use synthetic chemicals as preservatives. There are therefore requests for the use of chemical additives as preservatives to stop food from rotting as a result of bacteria and the lipid oxidation process. Consumer awareness of the drawbacks of synthetic antibacterial and antioxidant chemicals and their connection to health issues in humans is growing. This is because artificial components are now more likely to cause issues including cancer, teratogenicity, liver, renal, cardiac, respiratory, or neurological problems. Consumers are calling for the partial or total removal of chemically produced preservatives, which are used to enhance the shelf life of foods, from products during this crisis. Utilizing natural food preservatives is quite safe. Natural food preservatives are often derived from sources that include plants, animals, and microorganisms. Natural preservatives are mostly used in the food business to stop the growth of unwanted

microbes. It is feasible to include plant antimicrobials into packaging, add them to food surfaces, or incorporate them into product composition. However, it also has a unique mode of action. In various food businesses, essential oils from plants, enzymes from animals, bacteriocins from microbes, organic acids, and naturally occurring polymers (chitosan) have all been employed. In order to improve future research study interventions and address the issue of food and nutrition insecurity, it is crucial to promote and comprehend the current situation regarding the potential for natural preservation to improve food safety and shelf life of fresh, minimally processed, and ready-to-eat foods.

Objectives

1. To study the types of preservatives
2. To study the role of preservative in increasing the food quality and shelf life of the food products.
3. To study positive health benefits of preservatives

Research Methodology

It is a methodical, theoretical evaluation of the approaches used in a field of study. It includes the theoretical examination of the body of procedures and rules related to a field of knowledge. It frequently includes ideas like stages, paradigms, theoretical models, and quantitative or qualitative methodologies. A methodology is not the same as a technique because it does not aim to offer solutions. Instead, a methodology provides the theoretical foundation for knowing which method, set of procedures, or best practices can be used in a particular situation, such as to calculate a particular outcome. The purpose of the survey questionnaire was to gather information to test the research hypotheses. The study investigates the many kinds of preservatives used by individuals in Pune. In addition, there were inquiries about the advantages and drawbacks of preservatives in terms of health. The purpose of the questionnaire was to determine whether Pune residents were aware of the various preservatives and their health advantages. Through this questionnaire, the essential information was gathered. The survey's target audience was Pune residents because they regularly come into contact with different preservatives.

Theoretical framework

Natural Preservatives

Oils have long been employed in natural food preservation methods for the food business. It is a naturally occurring substance used as a preservative in many foods. due to its capacity to prevent moisture from penetrating food goods. Additionally, oxidation processes are stopped, which promotes fungal growth and degradation. It is frequently used in pickling because it forms a coating on the food's surface, which inhibits the oxidation process. These extend the shelf life of foods that have been preserved, such as pickles.

Another all-natural preservative that aids in keeping food moist is salt. In order to prevent food from spoiling, it is also utilised in pickled foods. After adding salt, dried vegetables are preserved for a longer shelf life. To any cut vegetables, add salt.

The most effective natural method of food preservation is sugar. It keeps food's moisture in, lowering the risk of spoiling. Sugar is also routinely added to canned foods to extend their shelf life. Red chillies, thyme, rosemary, and oregano are a few examples of spices that are naturally utilised as food preservatives and are used to preserve a variety of foods. Additionally, the spices aid in preserving food for a longer period of time by preventing oxidation.

Vinegar is a form of citric juice that is used to preserve food as an antioxidant. Vinegar has been used for various purposes throughout history. This kind of antioxidant is typically produced through the fermentation of apples, grapes, dates, and other foods.

Garlic: Garlic has antiviral characteristics that help keep food fresher for longer. Garlic-coated food inhibits bacterial growth more than other preservatives do.

Another name for vitamin C that is essential for its anti-oxidant capabilities is ascorbic acid. For more than a month, lemon has been employed in pickling and other preserving processes.

Celery: This vegetable includes sodium nitrite, which stops the formation of microorganisms.

Food additives have advantages.

Additives Improve Food's Nutritive Value: There are various food additives that assist in enhancing or maintaining the nutritional value of food. Food additives can be roughly divided into those that are nutritional and those that are not. The nutritional additives boost the food's nutritive content, or value for growth, maintenance of life, or increasing the health and vitality of people and animals, as well as their usefulness in the manufacturing of food and feedstuffs.

They Increase Food Shelf Life: Food additives are essentially necessary to preserve food's freshness and flavour while keeping it safe and healthful to consume for an extended period of time. The most basic need for any living creature is food.

Enhancing food's flavour and aroma

The main purposes of food additives are to improve the flavour and aroma of food, preserve it, increase its shelf life, and add colour to it. These food additives, which may be synthetic or natural, are essentially added to the food to enhance or improve its flavour, consistency, and occasionally appearance. Additionally, some additives are beneficial to your health. These additives don't do any harm. However, some substances are harmful to your health. They might damage the consumer's body or have negative impacts. It should be noted that the majority of food additives are categorized and stored in separate categories based on their intended usage.

Food Additives Could Promote Weight Loss

Food enhancers and food additives are synonyms. They are employed to alter or enhance a food's flavour or consistency. Some food additives are beneficial for weight loss as well. You should be aware that numerous professional dieticians who specialise in weight loss and fitness approve of them and recommend them to their patients. Like nothing else, these chemicals aid in the body's excess fat burning. The dietary additives that aid in weight loss are said to work as fat blockers and don't have any extra calories.

Literature Review

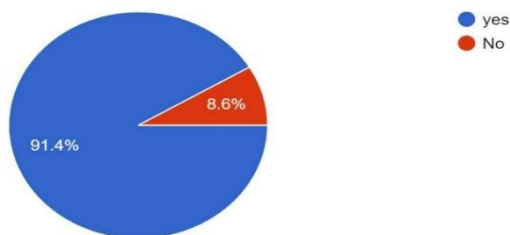
IJPSR, 2013 S.P. Anand*1 and N. Sati By preventing deterioration, preservatives extend the shelf life of food, cosmetics, and medications. Nitrites, nitrates, benzoates, and sulphur dioxide are antimicrobials that stop or slow the growth of bacteria, yeast, and moulds. Antioxidants like propyl gallate, butylated hydroxy toluene, and butylated hydroxy anisole all slow down or prevent the breakdown of fats and oils. Citric and erythorbic acids are anti-enzymatic preservatives that prevent food from ripening long after it has been harvested. Since the beginning of time, natural ingredients like salt, sugar, vinegar, and spices have been employed as preservatives. Today, chemical preservatives are more commonly utilised than natural ones [1]. A few of them are poisonous, and a number of others could have adverse effects that are fatal. According to research, artificial preservatives such nitrates, benzoates, sulfites, sorbates, parabens, formaldehyde, BHT, BHA, and many more can lead to major health risks like cancer, neurological damage, allergic reactions, asthma, hyperactivity, and hypersensitivity. Numerous natural preservatives derived from plants, animals, microorganisms, and minerals have antioxidant, antibacterial, and antienzymatic characteristics, according to research. Neem, rosemary, basil, and clove extracts are viable substitutes for their synthetic counterparts. This article intends to raise awareness about the negative consequences of chemical preservatives and suggests using natural preservatives for enhanced general health, medicinal efficacy, safety, and substance preservation [2]. Fernando Lidon and Maria Manuela Silva (Journal Citation Reports®, Clarivate Analytics, 2022) Food additives are manufactured or natural compounds that can be added in trace amounts to food to serve technological purposes such adding colour, sweetness, or lengthening shelf life. All food additives in the European Union are identified by an E number. Twenty-five categories of food additives have been defined based on technological functions. Food additives called preservatives, commonly referred to as antimicrobial agents, are used to prolong the shelf life of foods by protecting them from deterioration brought on by bacteria [3]. The potential of natural preservation, particularly the antimicrobial and antioxidation agents found in plants and animals, the use of natural edible coatings, and the factors affecting the antimicrobial activities of natural products, are, however, surprisingly understudied [4]. As a

result, the objective of this review was to compile the literature on the potential and role of natural food preservatives in enhancing food safety and shelf life. Possibilities of Natural Preservatives to Increase Food Safety and Shelf Life The transmission of food-borne viruses in food products cannot be stopped by using conventional food preservation techniques. The use of antimicrobials in the food industry has been made possible by the increased demand for food free of chemicals [5]. Antimicrobials are a cutting-edge technology that the food industry uses to increase food shelf life and solve issues about quality and safety [3]. Natural Antimicrobial Agents: While secondary metabolites may be waste products or be crucial for production, primary metabolites serve a critical function in the organism. Secondary metabolites with an antibacterial effect are natural antimicrobials. They can be extracted from a variety of sources, including plants (fruits, vegetables, seeds, herbs, and spices), animals (eggs, milk, and tissues), and microorganisms (fungi and bacteria) [6]. It has been found that secondary metabolites in plants can act as antimicrobials or disease-controlling agents [7]. Secondary metabolites are significant for usage in food products because of their antibacterial properties against pathogenic and spoilage microorganisms [8]. They are thought to be a better alternative to synthetic preservatives for food preservation because they exhibit antibacterial and antioxidant properties at the same time. Utilizing plant-based antibiotics Raw veggies, fruits, and herbs/spices all contain natural antimicrobials. Natural plant-derived compounds can be found in a variety of foods, such as marjoram, basil, oregano, rosemary, thyme, sage, clove, and cardamom, as well as in fruits and vegetables (garlic, pepper, onion, cabbage, and guava), seeds, and leaves (olive leaves, parsley, caraway, nutmeg, fennel, and grape seeds). Essential oils (Eos) and plant-based extracts have been used as food additives for a long time to enhance flavour and impart distinctive aromas, as well as to lengthen the shelf life of goods by reducing rancidity and microbiological contamination [9]. Because of the abundance of secondary metabolites present in these substances, particularly phenolic compounds, iso-flavonoids, terpenes, ketones, aliphatic alcohols, acids, and aldehydes, dangerous bacteria can be restricted or prevented from growing [10]. The microbe species, inoculum size, culture medium, extraction technique, and method for measuring antimicrobial activity are the key determinants of the antibacterial activity of compounds obtained from plants. Alkaloids, polyphenols, and terpenes are examples of plant-based chemicals that come from natural sources. Plants contain a wide variety of secondary

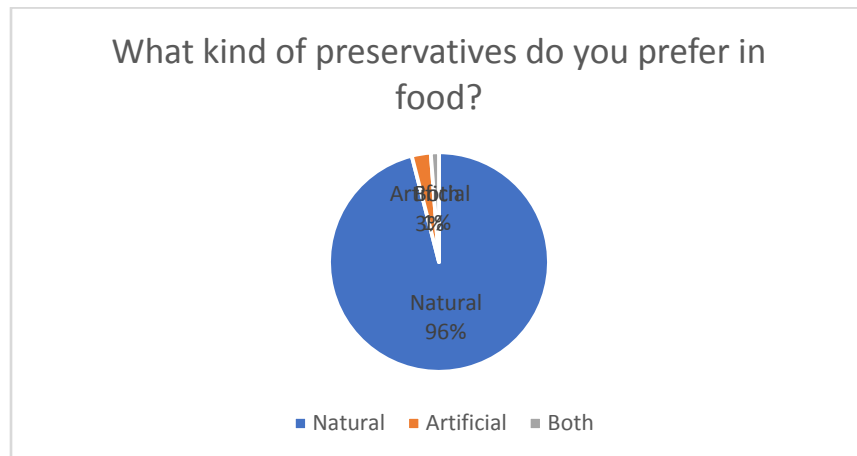
metabolites that shield them against herbivores and predators due to their biocidal effects against bacteria or herbivore repellence [11].

Data Analysis

Are you aware about the use of preservatives in food?

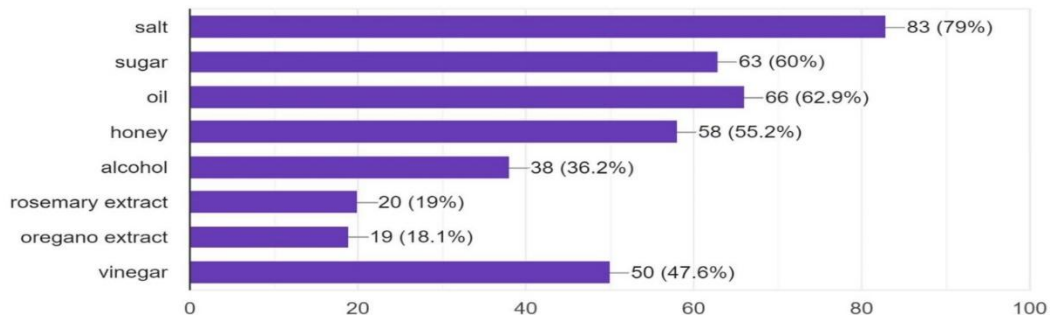


Out of 150 respondents, 91.4% students are aware about the natural preservatives in food, however 8.6% respondents are not familiar with the natural preservatives present in food

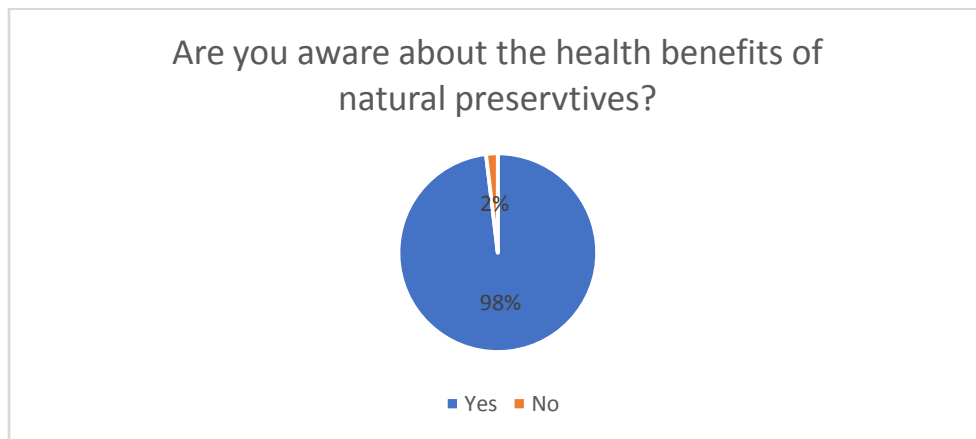


The pie chart represents the preference towards types of food preservatives. However, it's a clear selection of natural preservatives is seen as 96% people have expressed their pinion.

which are the natural preservatives you are aware about?

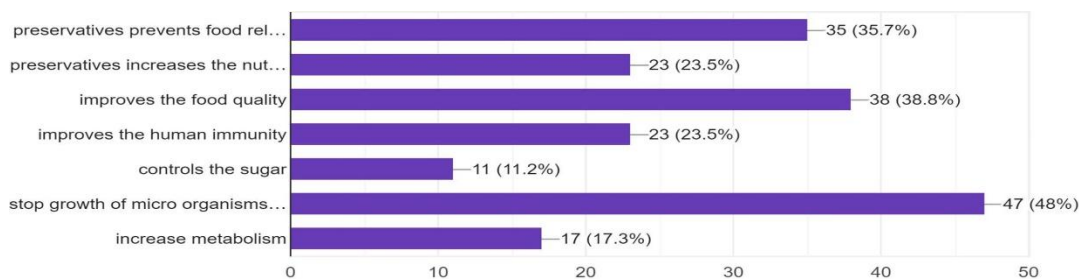


The most well-known natural preservative, according to respondents, is salt (83%), which is followed by oil (66%), and oregano extract (19%), whose use is not particularly frequent in most households.



Out of a total of 150 respondents, 98% are aware of the health benefits, compared to 2% who are unsure of the advantages of natural preservatives.

If yes then what are they?



The most widely recognized advantages of natural preservatives are, Controlled sugar increase (11%), followed by improved food quality (38%), is the benefit that is least well-known.

Conclusion

Natural substances ultimately look like a superior choice because they are derived from natural sources. Natural components are at least better tolerated by your body, making the majority of them suitable for you. The FDA and other organisations' investigation of both natural and artificial preservatives is encouraging. This implies that the food you're eating is being examined to determine whether it is safe to eat. Preservatives can keep food fresher for longer periods of time, extending its shelf life.

1. Food is preserved by the addition of preservatives to prevent spoiling brought on by bacteria, moulds, fungi, and yeast.
2. By prolonging the shelf life of food, preservers can keep it fresher for extended periods of time.
3. Food preservatives are also used to postpone rancidity and slow or avoid changes in colour, flavour, or texture.
4. Natural preservatives also provide colour and assist in lowering the price of food.
5. Natural food preservatives like vitamins and minerals provide nutrients to meals.
6. The improved nutritional value aids in enhancing and fortifying foods. Preservatives provide additional advantages, such as lowering food waste.

However one should remember that Natural preservatives like sugar and salt are safe to consume, but consuming them in large quantities has been associated with negative health impacts.

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