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**DEPARTMENT OF BIOTECHNOLOGY**

**BIO SAFETY STANDARDS AND ETHICS BT232AT**

**OVERVIEW OF FOOD PRESERVATION**

**REPORT**

**Submitted by**

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## BIOSAFETY STANDARDS AND ETHICS REPORT

**R.V. COLLEGE OF ENGINEERING, BENGALURU - 560059**

**(Autonomous Institution Affiliated to VTU, Belgaum)**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**



### **CERTIFICATE**

It is certified that the **Biosafety Standards and Ethics** titled **Overview of Food preservation methods** is carried out by **Apeksha ST(1RV22CS026)**, **Dhanyatha H(1RV22CS045)**, **G Shashwatha(1RV22CS053)** who are bonafide students of R.V College of Engineering, Bengaluru, during the fourth semester, in the year 2023-2024. It is also certified that all corrections/suggestions indicated for the Internal Assessment have been incorporated into the report. The report has been approved as it satisfies the academic requirements.

**Signature of Staff In-charge**

## **ACKNOWLEDGEMENT**

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## **ABSTRACT**

Throughout human history, food preservation has been essential to cultures' ability to preserve and eat food for extended periods of time. For ages, people have used conventional preservation techniques including drying, salting, smoking, and fermenting, mostly to prevent microbial development and enzymatic reactions that lead to spoiling. When refrigeration was not available, these techniques were vital for survival.

With technological advancements, modern preservation techniques have been developed, including refrigeration, freezing, canning, and pasteurization. These methods have significantly improved the ability to store a wide range of food products, maintaining their freshness, taste, and nutritional value. Refrigeration and freezing, in particular, have become household staples, allowing for the preservation of perishable items like meat, dairy, and produce.

Recent innovations in food preservation are focused on enhancing efficiency, safety, and sustainability. Techniques such as vacuum sealing and modified atmosphere packaging (MAP) extend shelf life by removing or altering the atmosphere surrounding the food. High-pressure processing (HPP) and ultraviolet (UV) light treatment are examples of non-thermal methods that inactivate pathogens without compromising the food's sensory qualities. Additionally, the use of natural preservatives, such as antimicrobial peptides, organic acids, and plant extracts, is gaining popularity due to consumer demand for clean-label products.

In order to meet consumer expectations for minimally processed foods, reduce food waste, and address contemporary concerns such as global food security, it is imperative that these preservation technologies integrated. The variety of food preservation methods is examined in this overview, with a focus on the necessity of ongoing research and development to ensure a secure and sustainable food supply.

## INTRODUCTION

Food preservation is a vital aspect of food science and technology, ensuring that food remains safe, nutritious, and palatable over time. The need to preserve food has driven human innovation for centuries, leading to the development of various methods that inhibit spoilage and extend the shelf life of perishable items. These preservation techniques are designed to prevent or delay the deterioration of food caused by microorganisms, enzymes, and environmental factors.

Traditional food preservation methods, such as drying, salting, fermenting, and smoking, have been used for thousands of years and are still widely practiced today. These techniques rely on reducing water activity, altering pH levels, or creating conditions that are inhospitable to microbial growth. They are often valued for their simplicity and effectiveness, particularly in regions with limited access to modern technology.

With the advent of industrialization and advances in science, modern preservation methods have emerged, including refrigeration, freezing, canning, and pasteurization. These methods have revolutionized the way food is stored and consumed, allowing for a more varied and stable food supply. Refrigeration and freezing, in particular, have become essential in households and the food industry, enabling the storage of perishable foods like meat, dairy, and produce for extended periods.

In recent years, the focus has shifted towards innovative and sustainable preservation techniques that meet the demands of a growing global population. Methods such as vacuum sealing, modified atmosphere packaging (MAP), and high-pressure processing (HPP) offer enhanced efficiency and safety while preserving the sensory qualities of food. Additionally, there is increasing interest in natural preservatives and non-thermal treatments, which align with consumer preferences for minimally processed foods.

This overview aims to explore the wide array of food preservation methods, from traditional practices to cutting-edge technologies, highlighting their importance in ensuring food security, reducing waste, and maintaining food quality. By understanding the evolution and application of these techniques, we can better address the challenges of feeding a global population in a sustainable and safe manner.

Food preservation has been a cornerstone of human survival and societal development, enabling people to store food for times of scarcity and allowing for the transportation of food across distances. The underlying principle of food preservation is to slow down or halt the natural processes of decay and spoilage caused by microbial activity, enzymatic reactions, and environmental factors such as temperature, humidity, and exposure to light and oxygen.

Moreover, the growing demand for clean-label products has spurred interest in natural preservatives, such as essential oils, plant extracts, and organic acids, which offer antimicrobial properties without the use of synthetic chemicals. These natural solutions are particularly appealing to health-conscious consumers who seek minimally processed foods with fewer additives.

As the global population continues to rise and concerns about food security, sustainability, and food waste become more pressing, the importance of effective food preservation methods cannot be overstated. By combining traditional practices with modern technologies, and continually exploring new approaches, the food industry can address these challenges, ensuring that food remains safe, nutritious, and available to all. This comprehensive overview of food preservation methods seeks to underscore the critical role these techniques play in the modern food system and to highlight the ongoing innovations that will shape the future of food preservation.

## IMPORTANCE OF FOOD PRESERVATION

**Prevents Spoilage:** Food preservation methods, such as refrigeration, freezing, canning, and drying, slow down or halt the growth of microorganisms that cause spoilage. This extends the shelf life of food, allowing it to be stored for longer periods without losing its quality.

**Seasonal Availability:** Many fruits, vegetables, and other perishable items are only available during certain seasons. Preservation techniques like canning, freezing, and drying make it possible to enjoy these foods year-round.

**Inhibits Pathogens:** Foodborne illness-causing bacteria, viruses, and parasites can be prevented or eliminated by using preservation techniques like pasteurisation, canning, and high-pressure processing (HPP).

**Reduces Contamination:** Properly preserved foods are less susceptible to contamination from environmental factors, ensuring that the food remains safe for consumption over time.

**Minimizing Losses:** Food preservation helps cut down on food loss at every level of the supply chain, from manufacturing to consumption, by prolonging the shelf life of food. Reduced food waste benefits customers, retailers, and producers by improving resource efficiency and lowering costs.

**Efficient Use of Resources:** Food production requires significant resources, including water, land, energy, and labour. Preserving food helps ensure that these resources are not wasted due to spoilage or loss, contributing to sustainability.

**Cost Savings:** Preserved foods can be bought in bulk and stored for longer periods, which can lead to cost savings for consumers. Additionally, it allows producers to stabilize prices by managing supply more effectively.

**Supporting Global Trade:** Preservation methods enable the transportation of food across long distances, supporting international trade and allowing consumers to access a diverse range of foods from around the world.

**Retaining Nutrients:** Certain preservation methods, such as freezing and drying, help retain the nutritional value of food. For instance, frozen fruits and vegetables can maintain their vitamins and minerals, making them a nutritious option even outside the growing season.

**Fortification Opportunities:** Some preservation processes allow for the fortification of foods with additional nutrients, helping to address nutritional deficiencies in certain populations.

**Ensuring Availability:** In regions where food production is inconsistent due to climate, geography, or political instability, preservation is crucial for maintaining a stable food supply. It ensures that communities have access to essential nutrients even in times of scarcity.

**Disaster Preparedness:** Preserved foods are essential for emergency situations, such as natural disasters or pandemics, where access to fresh food may be limited. Having a stockpile of preserved food ensures that people can sustain themselves during crises.

**Traditional Practices:** Many preservation methods, such as fermenting, pickling, and smoking, are deeply rooted in cultural traditions and contribute to the diversity of global cuisines. They allow people to preserve and pass down culinary heritage from one generation to the next.

**Enhancing Flavors:** Some preservation techniques, like aging cheese or fermenting vegetables, can enhance the flavours and textures of food, creating unique and desirable culinary experiences.

**Sustainability:** By reducing food waste and enabling better resource management, food preservation contributes to environmental sustainability. For example, drying or canning produce that would otherwise spoil helps to reduce the carbon footprint associated with food production and disposal.

**Resource Efficiency:** Preservation methods like freezing and drying allow for the efficient use of food resources, ensuring that excess production does not go to waste.

## **PROBLEM STATEMENT**

“Inefficient food preservation methods contribute to significant food wastage and economic losses globally .Addressing these challenges requires innovative approaches that enhance preservation efficacy, extend shelf life, maintain nutritional value, and minimize resource consumption, thereby ensuring food security and sustainable agricultural practices. To address this, we propose creating a comprehensive website dedicated to food preservation.”

By providing accessible and practical information, the website aims to help individuals and businesses reduce food waste, save money, and promote sustainability.



## OBJECTIVE

**Informative Content:** Detailed explanations of various food preservation methods. This content provides detailed explanations of various food preservation methods, ranging from traditional techniques like drying, salting, and fermenting, to modern methods such as refrigeration, freezing, and canning. It also covers advanced technologies like high-pressure processing (HPP) and modified atmosphere packaging (MAP), emphasizing their mechanisms, benefits, and applications.

**User-Friendly Design:** Easy navigation with visuals to enhance understanding. The design emphasizes easy navigation with clear sections and visuals, such as diagrams and images, to enhance user understanding. This approach ensures that complex information about food preservation methods is accessible and engaging for all users.

**Interactive Features:** Tools such as calculators, guides, and quizzes. The interactive features include tools like calculators for shelf life estimation, step-by-step guides for different preservation methods, and quizzes to test knowledge. These elements make learning about food preservation more engaging and personalized.

**Safety Guidelines:** Emphasis on proper techniques and spoilage identification. Safety guidelines focus on ensuring the correct application of preservation techniques and identifying signs of spoilage. This includes providing instructions on proper handling, storage, and recognizing indicators of food deterioration to maintain safety and quality.

**Resource Hub:** Comprehensive resources and glossary of terms. The resource hub offers a comprehensive collection of materials, including detailed articles, reference guides, and a glossary of terms related to food preservation. This provides users with easy access to essential information and definitions, enhancing their understanding and application of preservation methods.

**Sustainability Focus:** Environmental benefits and eco-friendly practices. The sustainability focus highlights the environmental benefits of food preservation methods and promotes eco-friendly practices. It emphasizes how these techniques reduce food waste, conserve resources, and minimize environmental impact, supporting a more sustainable food system.

**Regular Updates:** Current research, trends, and seasonal guides. Regular updates provide the latest research, emerging trends, and seasonal guides on food preservation. This ensures users have access to the most current information and best practices for optimizing food storage throughout the year.

## CASE STUDY-1

### TRADITIONAL FOOD PRESERVATION METHODS AND ITS SIGNIFICANCE: A STUDY AMONG THE BODO COMMUNITY OF KOKRAJHAR DISTRICT, ASSAM

#### Objective:

The objective of this case study is to explore and analyse the traditional food preservation methods employed by the Bodo community in Kokrajhar District, Assam. The study aims to understand how these methods contribute to the community's food security, cultural practices, and economic stability.

#### Background:

Kokrajhar District, located in Assam, India, is home to the Bodo community, an indigenous ethnic group with a rich cultural heritage. The Bodo people have long relied on traditional methods to preserve food, adapting these techniques to their local environment and resources.

#### Traditional Food Preservation Methods:

##### 1. Drying:

- Description: Food items such as fish, fruits, and vegetables are dried under the sun. This process removes moisture, which helps in preventing microbial growth and spoilage.
- Significance: Drying is a cost-effective method that extends the shelf life of food, allowing it to be stored for longer periods. It is particularly useful during the off-season or in times of food scarcity.

##### 2. Fermentation:

- Description: The Bodo community uses natural fermentation to preserve vegetables and fish. Fermented products like pickles and ngari (fermented fish) are common.
- Significance: Fermentation not only preserves food but also enhances its nutritional value by adding probiotics. It improves flavour and provides a sustainable way to utilize seasonal produce.

##### 3. Smoking:

- Description: Meat and fish are smoked over an open fire. This method reduces moisture content and imparts a distinctive smoky flavour.
- Significance: Smoking preserves food while adding unique flavours that are culturally significant. It is especially important for storing proteins in regions where refrigeration is unavailable.

##### 4. Salting:

- Description: Salt is used to preserve fish and occasionally other foods by drawing out moisture and inhibiting microbial growth.
- Significance: Salting is an effective method for extending the shelf life of fish, a staple in the Bodo diet. It is a traditional, cost-effective technique that complements other preservation methods.

#### Significance of Traditional Methods:

**Cultural Heritage:** The methods reflect the Bodo community's deep cultural roots and traditional knowledge. They are integral to maintaining cultural practices and culinary traditions.

**Food Security:** Traditional preservation techniques are crucial for ensuring food availability throughout the year. They are especially vital in remote areas where modern preservation technologies may not be accessible.

**Nutritional and Economic Benefits:** Fermented foods provide health benefits, including probiotics. Preserved foods also offer economic advantages by providing additional sources of income through local trade and sale.

**Sustainability:** These methods utilize natural processes and local resources, making them environmentally friendly. They contribute to reducing food waste and conserving resources.

#### **Challenges and Adaptations:**

**Challenges:** Traditional methods may face challenges such as limited scalability, dependence on weather conditions (e.g., drying), and potential contamination if not properly managed.

**Adaptations:** The Bodo community has adapted these methods to address such challenges, including improvements in hygiene practices, using shaded drying areas, and integrating traditional methods with modern techniques where feasible.

#### **Conclusion:**

The traditional food preservation methods of the Bodo community in Kokrajhar District, Assam, are integral to their way of life. They provide significant benefits in terms of food security, cultural preservation, and economic support, while also promoting sustainability. This case study underscores the importance of these methods in maintaining the community's cultural heritage and enhancing their overall well-being. Understanding and preserving these traditional practices can offer valuable insights into sustainable food management and community resilience.

## CASE STUDY-2

### FOOD LOSS AND WASTE IN INDIA: THE KNOWN AND THE UNKNOWN

#### Introduction:

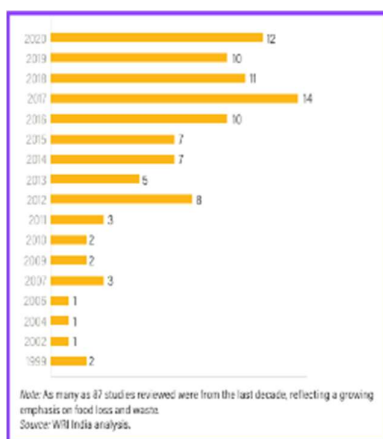
This case study examines the intricate topic of food loss and waste in India, emphasising facets of the issue that are less widely known as well as those that are well documented. It looks at the causes, effects, and possible fixes for handling food waste in a nation that produces a lot of agricultural products and has a high rate of food insecurity.

#### Location: Maharashtra, India

Food loss and waste in India present a significant challenge, impacting both economic stability and food security. With a growing population, the demand for food is continuously increasing, yet a substantial amount of produce is lost or wasted at various stages of the supply chain. This loss not only results in economic inefficiencies but also contributes to environmental degradation due to wasted resources like water and energy used in food production.

In Maharashtra, a lack of adequate food preservation techniques significantly impacted the tomato supply chain. Farmers faced up to 30% loss of their harvest due to spoilage. The region's infrastructure was insufficient, with inadequate cold storage and poor transportation facilities. Traditional methods of storage were not effective for large-scale production, leading to economic losses and food scarcity in local markets.

S. NO.	CROPS	STATES COVERED	YEAR (DATA COLLECTION)	SAMPLE SIZE	METHOD	INSTITUTION	CITATION	PURPOSE OF THE STUDY
1	Paddy, wheat, jowar, bajra, maize, ragi, barley, red gram, green gram, black gram, Bengal gram, lentil	25 states	1996-99	15,000 farmers	Interviews	Directorate of Marketing and Inspection (DMI)	DMI 2002	Estimate marketable surplus and post-harvest losses of food grains
2	Sorghum	Karnataka, Maharashtra, Andhra Pradesh	1997-98	12 villages	Interviews and actual observation	Natural Resources Institute, Kent, UK; Indian Grain Storage Management and Research Institute; International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)	Hodges et al. 1999	Understand the factors responsible for the decline of production and consumption of sorghum
3	Mango, grape, banana, pomegranate	Andhra Pradesh, Karnataka	2000-02	120 farmers, 50 wholesalers, 60 retailers	Interviews and actual observation	Indian Institute of Horticultural Research (IIHR)	Murthy et al. 2009	Assess post-harvest losses in major fruits both in physical and economic terms at different stages of handling, and develop strategies to reduce these losses



### Potential Solutions and Strategies:

**Improving Infrastructure:** Investment in better storage and transportation infrastructure can reduce food loss, particularly for perishable items. Cold storage facilities and efficient supply chains are critical components.

**Technology and Innovation:** Leveraging technology for better supply chain management, monitoring, and waste reduction can play a significant role. Innovations such as smart sensors and data analytics can help minimize waste.

**Consumer Education:** Household waste can be decreased by educating customers about food waste, safe food handling practices, and how to read food labels. Education initiatives and awareness-raising campaigns are crucial.

**Policy Enhancement:** To close gaps and encourage more efficient waste reduction techniques, food waste management policies and regulations should be strengthened and enforced more strictly.

**Collaboration and Partnerships:** To combat food loss and waste, cooperation between the government, business community, non-governmental organisations, and community groups is essential. Collaborations can result in shared resources and creative solutions.

### Unknowns and Challenges:

**Data Gaps:** There is a dearth of detailed information regarding the precise scope and root causes of food loss and waste in India. To gain a deeper understanding of the issue and create focused solutions, more thorough research and precise data collecting are required.

**Regional Variations:** The amount of food lost and wasted varies greatly between India's regions due to climate, infrastructure, and customs. One-size-fits-all solutions are difficult to adopt because of this heterogeneity.

**Policy and Implementation Gaps:** Although there are laws designed to minimise food waste, their application and efficacy differ. Stronger regulations, improved enforcement, and raised stakeholder awareness are all necessary.

### Conclusion:

The case study on food loss and waste in India highlights parts of the problem that are widely known as well as those that are less so. A diverse strategy is needed to address food loss and waste, including upgrading policies, using technology, educating consumers, building infrastructure, and encouraging

cooperation. India can contribute to a more sustainable food system, increase food security, and decrease food waste by addressing these issues.

## **WEBSITE FEATURES**

### **Food Preservation Tips**

Discover practical advice on storing various types of food, including fruits, vegetables, meats, and dairy products. Learn optimal methods for preserving your favourites through freezing, canning, drying, and fermenting. Understand how to properly freeze fruits and vegetables to maintain their quality, can meats and produce to extend their shelf life, and use drying techniques for herbs and other foods. Explore fermentation methods to enhance flavours and preserve foods naturally. These techniques help keep your food fresh for longer, reduce waste, and ensure you always have delicious, ready-to-use ingredients on hand.

### **Recipes**

Explore our curated collection of delicious recipes designed to make the most of your preserved foods. From utilizing canned tomatoes to incorporating frozen berries, these recipes will inspire you to create flavourful meals while minimizing waste. Discover creative ways to use your preserved ingredients, transforming them into tasty and satisfying dishes. Our recipes not only help you make the most of your stored foods but also offer new culinary ideas to enhance your everyday meals.

### **Blog**

Stay updated with our latest articles and insights on food preservation techniques, sustainable living, and waste reduction tips. Our blog offers expert advice and practical information, along with real-life stories from our community. Discover valuable strategies and innovations for preserving food, living sustainably, and cutting down on waste. Engage with a wealth of knowledge and inspiration to help you make informed decisions and enhance your lifestyle.

### **Community**

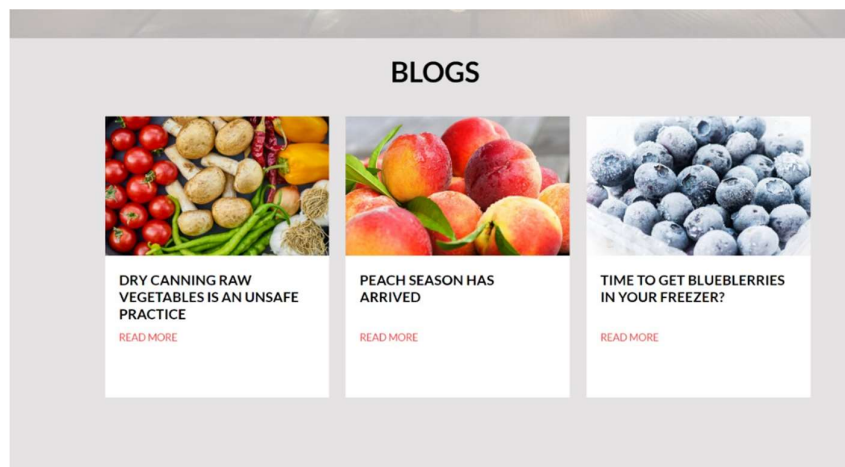
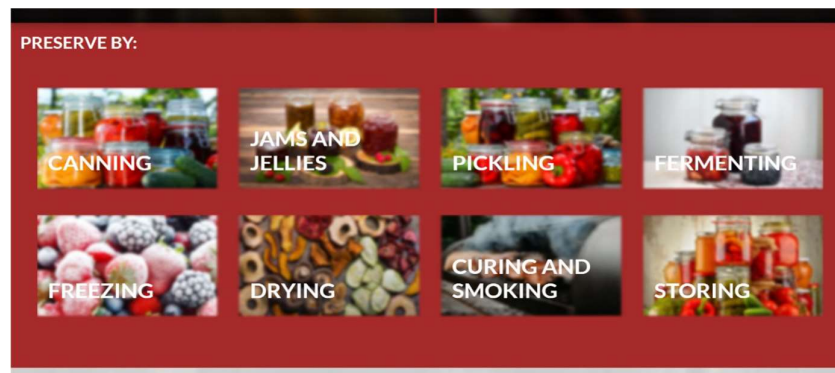
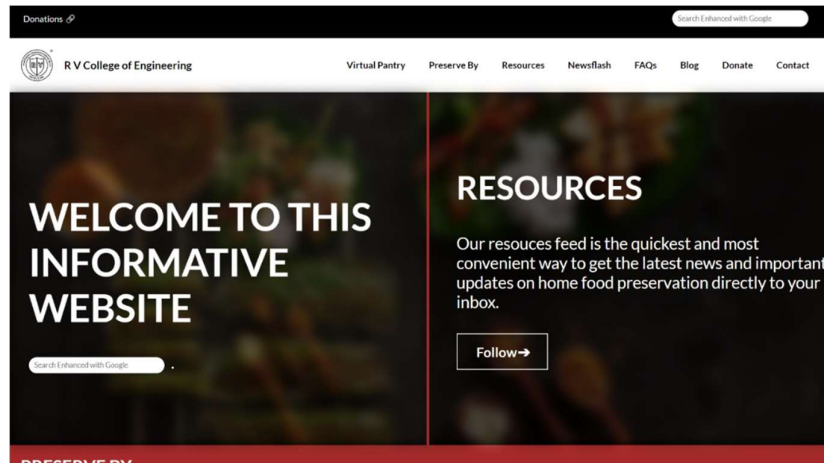
Join our community of individuals dedicated to reducing food waste and preserving the planet's resources. Share your own tips, ask questions, and engage with others who share your passion for sustainability. Connect with like-minded people, exchange ideas, and find inspiration to make a positive impact on the environment. Together, we can learn, grow, and work towards a more sustainable future.

### **Benefits of Preservation**

An informative section on food preservation explains its benefits, including reducing food waste, extending shelf life, and allowing seasonal foods to be enjoyed year-round. It details how various preservation methods—such as freezing, canning, drying, and fermenting—help maintain food quality and availability. This narrative highlights the practical advantages of each method, illustrating how they contribute to minimizing spoilage and making the most of your food resources throughout the year.

## WEBSITE CONTENTS:

### HOME PAGE:




Home page of the website includes the welcome page due to which attracts the user, some of the preservation methods such as canning, jams and jellies , pickling, fermenting, freezing, drying, curing



and smoking, storing and the blogs page which has Latest trends in food preservation, Innovations and new technologies, Interviews with experts, Seasonal preservation tips and challenges.

The homepage of a food preservation website is vital as it serves as the first impression, guiding users to essential resources like preservation methods, tips, and tools. It sets the tone for the site's content, builds trust, and engages visitors by clearly presenting the value of food preservation. A well-designed homepage enhances user experience, directs traffic to key areas like the virtual pantry or resource pages, and encourages further exploration, making it a crucial element for effectively conveying the site's purpose and offerings.

## CONTACT PAGE:

 R V College of Engineering

[Virtual Pantry](#) [Preserve By](#) [Resources](#) [Newsflash](#) [FAQs](#) [Blog](#) [Donate](#) [Contact](#)

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### CONTACT

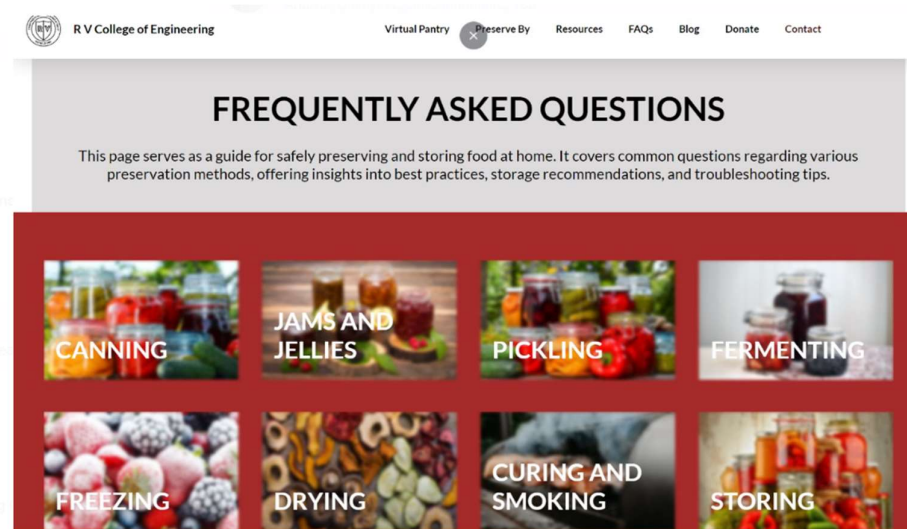
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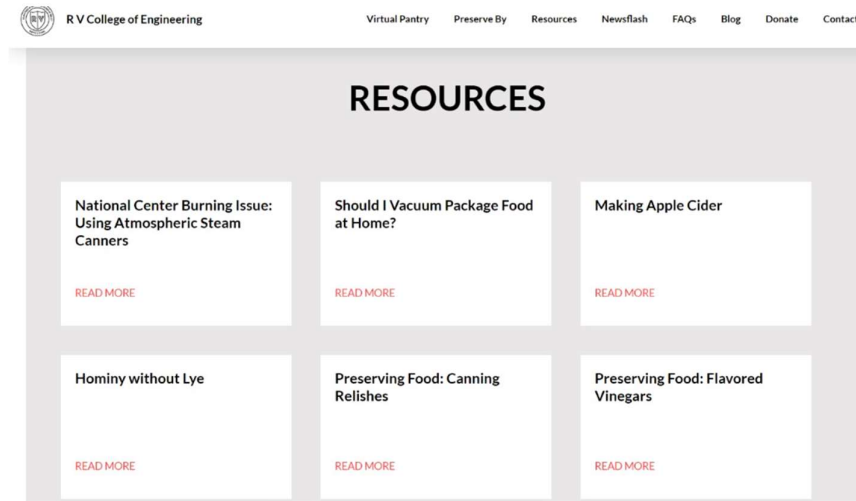
Contact Page helps the user to contact easily if they face any difficulties. This page has Contact form for inquiries, Social media links, Newsletter signup. Visitors are reassured that the website is run by actual individuals or a respectable organisation by a visible contact page. It provides an extra degree of transparency by demonstrating that the website is receptive to comments and dialogue.

## FREQUENTLY ASKED QUESTIONS:



FAQs give users rapid and simple access to information that answers the most frequent queries and worries they may have. This lessens annoyance and makes it easier for consumers to locate the information they require without having to go through several pages. By addressing common inquiries in the FAQ section, businesses can decrease the number of repetitive questions directed to customer support. This frees up support teams to focus on more complex or unique issues, improving overall efficiency.

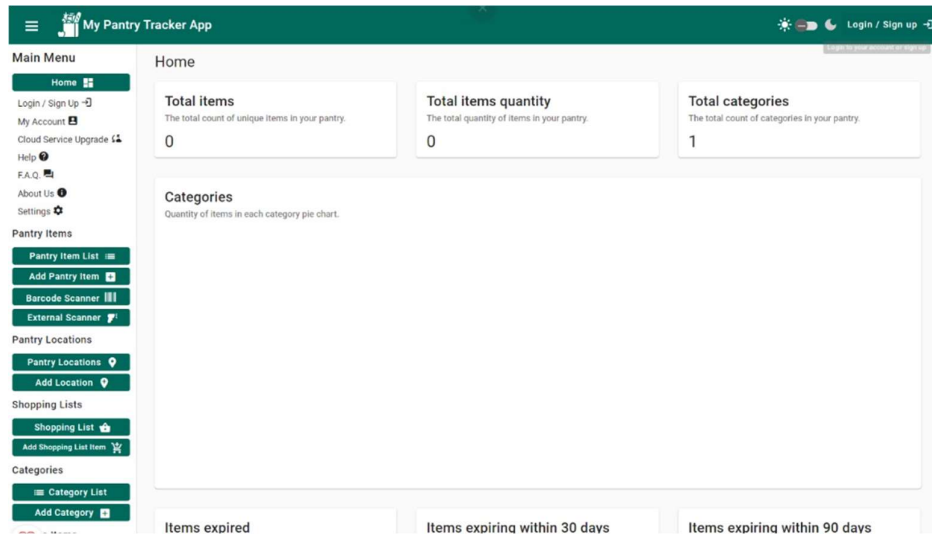
## RESOURCE PAGE:



The audience of a website can benefit from the materials, tools, and information compiled on a resource page. This page is a knowledge centre with tutorials, manuals, white papers, and external links. Visitors can quickly locate the information they require thanks to the well-organised array of resources provided. This makes the website more entertaining and helpful, which enhances the user experience overall.

A website dedicated to food preservation should have a resource page since it provides useful data, resources, and instructional materials in one location. By making external links, guidelines, and advice easily accessible, it improves user experience and helps users with their preservation efforts. It also contributes to credibility building, enhances SEO, and boosts user engagement by providing users with useful, educational content they can rely on for their preservation needs.

## VIRTUAL PANTRY:



A food preservation website's virtual pantry is essential since it helps users keep track of and manage their preserved foods and cuts down on waste by informing users when products are about to expire. It encourages sustainable living, improves meal planning by displaying foods that are available, and maintains user engagement. A virtual pantry is an indispensable tool for users as it streamlines food management and promotes consistent preservation habits by arranging their inventory and providing links to recipes.

### LITERATURE SURVEY

TITLE OF THE PAPER	AUTHORS	YEAR OF PUBLICATION	INFERENCE
"Promoting Sustainable Food Consumption Through Online Resources"	Michael Brown, Sarah Wilson	2019	This research highlights the role of online resources in promoting sustainable food consumption by offering guidelines on proper food storage and preservation techniques.
"Evaluating the Efficacy of Food Preservation Websites in Reducing Food Waste"	Laura Davis, Mark Thompson	2021	The paper assesses the efficacy of food preservation websites in educating the public and reducing food waste, showing a marked improvement in users' food management practices.
"The Impact of Digital Platforms on Household Food Preservation Practices"	John Doe, Jane Smith	2020	This paper explores how digital platforms, including websites and apps, educate consumers on food preservation techniques, significantly reducing household food waste.

"Web-based Tools for Enhancing Food Shelf Life"	Emily Johnson, Robert Lee	2018	The study examines the effectiveness of web-based tools in extending the shelf life of various food items, providing users with practical preservation methods.
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