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"Fruit Juices Spoilage In The Juices Processing Industry And Ways To Prevent It Through Co-Operative Sectors"

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Abstract

Fruit juices have become essential commodities in the global market. The demands for value-added fruit juices have increased among global consumers. People are seeing these fruit juices as essential mediums of achieving goals of good health, convenience, and high nutrition. There are some risks associated with the intake of these fruit juices as the risk of food-borne microbial contaminations and spoilage of juices can affect the good health of customers. In addition, heat-sensitive modules, lactic acid bacteria, poor packaging, and yeasts can degrade the quality of juices. Looking into these concerns, contemporary manufacturers are taking the help of different technologically advanced cooperative sectors and using different non-thermal substitute techniques to prevent spoilage.

Keywords: Spoilage, Microorganism, Pasteurization, Non-Thermal Process.

1. Introduction

1.1 Research Background

Demands of the customers regarding nutritious fruit juices have augmented in the last few years due to small contented cholesterol, fat, and sodium. On the other hand, a high concentration of polyphenols, antioxidants, and vitamin C is also a reason behind the growing demands of those nutritious fruit juices. Spoilage of fruit juices and pathogenic microorganisms are considered major challenges for the public health authorities and the fruit juice industry. The manufacturers use different kinds of chemical preservatives like potassium sorbate and sodium benzoate with the purpose of prolonging the shelf-life of the fruit juices. Nowadays, consumers are demanding safe and fresh fruit juices without chemical preservatives. This particular consumer demand has influenced the manufacturers of fruit juices to use natural preservatives like essential oils, bacteriocins, phenolic compounds, and organic acids. Hence, it is important to acknowledge that the current social customs and modern chemically preservation methods are leading to an increase in disease outbreaks and spoilage of fruit juices. To prevent this, manufacturers of fruit juices are using

different practices and methods. The manufacturers are also taking the help of different co-operative sectors in order to prevent this spoilage.

1.2 Aims and Objectives

Aims

The aim of this research is to evaluate the reasons behind the spoilage of fruit juices in the food processing industry. The roles of the co-operative sectors in this prevention are also analysed in this research article.

Objectives

- To examine the reasons behind the spoilage of fruit juices in the processing industry.
- To identify the ways to prevent the spoilage of the fruit juices with the help of different co-operative sectors.

2. Literature Review

2.1 Concept of Fruit Juice Spoilage

Change in taste or smell or appearance of the fruit juices, which makes it unacceptable to the customers, is determined as fruit juice spoilage. The proliferation of osmophilic micro-flora and natural acid-tolerant is considered as the major reason behind the spoilage of fruit juices. After several investigations, it is identified that fresh fruit juices are highly vulnerable to damage because the fluid substances used in the manufacturing of the juices are in touch with the microorganisms and air (Synder & Worobo, 2018). In addition, heat-sensitive modules, lactic acid bacteria, and yeasts are important indicators for the quality of the used resources and raw materials. Different artificial and chemically-linked pasteurization materials are the major reasons behind the spoilage of fruit juices. Now, the manufacturers are using different techniques to inhibit this spoilage of fruit juices. The prevention technique includes Thermal Pasteurization, High-Pressure Homogenization, Pulsed Electric fields, UV or Ultraviolet Technology, and Ultrasound, etc. The manufacturers are also taking assistance from different co-operative industries to prevent this spoilage.

2.2 Reasons behind the Fruit Juice Spoilage

Yeasts can be considered as one of the major reasons behind the spoilage of fruit juices. Yeasts can grow at low pH, low water activity, and high sugar absorption. Fruit juices are rich in complex

nitrogen and simple carbohydrate sources. These are ideal substrates for years. The presence of yeast in the fruit juices may lead to catastrophes in the pasteurization and sanitation process. Yeats are also responsible for creating flocculation, clumping, pellicles, and turbidity. Yeats also create pectinesterases, which is the reason behind the degradation of pectin causing organic acids, acetaldehyde, and spoilage. This results in fermentation (Sahu & Bala, 2017). These reactions are entirely responsible for the damage of the fruit juices.

Moulds are accountable for the damage of fruit juices. Moulds are aerobic and these moulds grow at high sugar concentrations and low pH. Moulds are usually divided into two types in response to the thermal treatment. These two categories are heat resistant and heat-labile. These moulds generate mycotoxins and these are serious threats to human health. Major mycotoxins linked with the fruit juices are citrinin, ochratoxin, byssochlamic acid, and patulin (Colonna et al., 2017). Findings of patulin in the fruit juices indicate that the product is of poor quality and it can affect the good health of people.

The presence of bacteria also can be the reason behind the decomposition of fruit juices. Bacteria are evident in fruit juices due to low pH. Different acid-tolerant bacteria like acetic acid bacteria, lactic acid bacteria, clostridium, bacillus SP, pseudomonas SP, and erwinia SP, etc. are reported as deteriorative in the fruit juices (Rico-Munoz, 2017). The presence of these bacteria affects the quality and freshness of fruit juices. Hence, these are also major reasons behind the spoilage.

Pathogenic microorganisms are also considered as major reasons behind the spoilage of fruit juices. Different faces are used in the contamination of the fruit surfaces. The presence of these faces also can infect the washing water, which permits the internationalization of foodborne pathogens. This process helps the fruit juices to survive under different acidic conditions. However, the existence of different pathogens in fruit juices is one of the major reasons behind the spoilage of fruit juices and food-borne outbreaks (Kaczmarek et al., 2019). Every year, people in different developed and developing nations are getting affected by the consumption of unpasteurized fruit juices. Hence, it is important here to acknowledge that pathogenic microorganisms are the major reasons behind the spoilage. It is identified that pathogenic microorganisms mostly take place in the street vended unpasteurized and low-quality fruit juices.

2.3 Methods adopted by the Manufacturers to prevent this Spoilage

Nowadays, different types of techniques are used by manufacturers to stop the spoilage of fruit juices. There are several systems to mitigate the challenge of pathogenic and non-pathogenic micro-flora, such as water activity, freezing, chilling, packaging, modified atmosphere, the addition of natural antimicrobials, non-thermal physical techniques, pasteurization, and modified atmosphere packaging. Thermal processing is considered the most common and most evident technique to escalate the shelf-life of fruit juices. Thermal pasteurization is considered as a widely accepted technique for the manufacturers of fruit juices to avert damage and progress the shelf-life of fruit juices. The standard pasteurization temperature is highly effective against Salmonella and E. coli (Pornpukdeewattana et al., 2020). However, this particular process y damages physiochemical properties and nutritional properties of fruit juices. Currently, the manufacturers are considering different non-thermal perspectives like High-Pressure Homogenization, Pulsed Electric fields, High Hydrostatic Pressure, UV or Ultraviolet Technology, and Ultrasound, etc. to enhance the safety and quality of fruit juices. Some of these preferred techniques are briefed below.

First of all, High Hydrostatic Pressure is widely used in this contemporary era for the manufacturing of fruit juices. This particular procedure has effective potential to minimize the microbial load of packaged fruit juices, which is necessary for the improvement of the shelf-life of fruit juices (Salomao, 2018).

Secondly, High-Pressure Homogenization is also considered an important contemporary technique to shrink the risk of spoilage of fruit juices. This process is carried out by the pumping of liquid through the homogenizing valve at high pressure over 100 MPa (Aneja et al., 2014). This process deactivates microorganisms by damaging the structural integrity coupled with an unexpected rise in temperature formed in this method.

Thirdly, Pulsed Electric Field is also considered an important contemporary technique considered by the manufacturers to prevent the damage of fruit juices. This process involves the implication of high concentration electric field pulses for short period. This Pulsed Electric Field Method is conducted by the deactivation of microorganisms in fruit juices (Shi et al., 2021).

Fourthly, the manufacturers of this contemporary era are also considering Ultraviolet Technology in the manufacturing process of fruit juices in order to destroy the microorganisms on the packaging as well as surfaces (Berni et al., 2017). This process is also used to disinfect the water, which is necessary to prevent microbial load in different fruit juices.

Last but not the least; Power Ultrasound Method is also considered by the manufacturers of this contemporary business environment to prevent spoilage of fruit juices. The use of this technique allows the manufacturers to damage the DNA of microorganisms, which is necessary for the improvement of the shelf-life of fruit juices (Ribes et al., 2018).

3. Research Methodology

3.1 Research Philosophy

Interpretivism research philosophy has been considered in this research work. It is justified to select the interpretivism philosophy because it can allow the researchers to analyse and interpret the data collected from relevant sources depending on the individual knowledge level and judgment skill. This interpretivism research philosophy will also allow developing new knowledge regarding reasons behind the spoilage of fruit juices and the roles of different co-operative sectors to prevent it.

3.2 Research Approach

A deductive approach has been adopted by the researcher in this research work for determining the causal impact of the Proliferation of osmophilic micro-flora and natural acid-tolerant on fruit juice spoilage. This deductive research approach will help the researcher in developing important hypotheses depending on collected information on reasons behind the spoilage of fruit juices and roles of different co-operative sectors to prevent it.

3.3 Research Design

Exploratory research design has been considered by the researcher in this research work. It is justified to select an exploratory research design because it will allow the researcher to explore relevant information on authentic data sources regarding reasons behind the spoilage of fruit juices and roles of different co-operative sectors to prevent it. As of now, very limited studies and investigations were conducted on this research topic. Therefore, the selection of exploratory research design will be suitable for findings new concepts on the roles of contemporary co-operative sectors in preventing the risk of fruit juice spoilage.

3.4 Data Collection and Data Analysis

The researcher has considered the secondary data-gathering technique in this research work. It is justified to select a secondary data collection process because it will help the researcher to gather sufficient relevant information from the existing data sources in the limited time period. Journal

articles and research reports are considered in this study to collect quality secondary information. In terms of data analysis, the thematic data analysis technique has been adopted by the research as it will assist the researcher to develop the right theme for this study depending on different existing and new concepts for enhancement of appropriate research outcomes.

3.5 Sampling Method

In this research work, the purposive sampling method has been considered by the researcher. This sampling method will allow the researcher to consider relevant data sources, which are suitable for the achievement of the developed research objective. This purposive sampling method will also allow the researcher to select data samples depending on the nature of the research topic and individual knowledge level. Hence, it is justified here to select the purposive sampling method.

4. Results and Discussions

4.1 Results of Analysis

Theme: The Manufacturers are Taking Help of Different Co-Operative Sectors to Prevent Spoilage of Fruit Juices.

Different non-thermal alternative processing sectors are helping manufacturers to use advanced technological applications to avoid spoilage of fruit juices. The fruit juice companies of this contemporary era are trying to apply techniques like High-Pressure Homogenization, Pulsed Electric fields, High Hydrostatic Pressure, UV or Ultraviolet Technology, and Ultrasound, etc. in order to prevent spoilage (Salomao, 2018). Nowadays, the manufacturers do not prefer the traditional thermal processes due to the poor impact on the good health of consumers.

4.2 Discussion of Analysis

The example of Ultra High Pressure or High-Pressure Processing Technique can be discussed here. The use of Ultra High Pressure or High-Pressure Processing Technique with the help of non-thermal co-operative industries is allowing the manufacturers to pack the fruit juices within a cylindrical pressure vessel with a speed between 100 and 800 MPa (Rico-Munoz, 2017). This emerging alternative technology is allowing the manufacturers to meet the food safety goals of fruit juices by inactivating deadly bacteria. Similarly, this alternative technique also allows the manufacturers to inactive the spoilage organisms like yeasts effectively.

Apart from Ultra High Pressure or High-Pressure Processing Technique, the manufacturers are taking help of non-thermal alternative processing sectors to apply technologically advanced Pulsed Electric Field System. This is the most effective commercially available alternative system from the co-operative sectors, which is helping the manufacturers to maintain food preservation and standard quality aims. This Pulsed Electric Field System also allows the co-operative technological sectors to assist the manufacturers of fruit juices to inactivate the spoilage microbes (Food-Safety, 2021). As a result, the shelf-life of the fruit juices significantly increases.

5. Recommendations

The manufacturers of fruit juices need to follow some important and basic principles to prevent spoilage. First of all, it will be important for the manufacturers to preserve the nutrients of fruit juices effectively for 48-72 hours. A maximum self-life of important nutrients of fruits lies between 48 and 72 hours. Hence, the manufacturers need to maintain a good preservation system in order to maintain the shelf life of important nutrients and the freshness of the juices.

Secondly, the manufacturers need to ensure that low RPM juicers are used in the manufacturing process. Comparative Low Rotations per Minute Sets will generate less heat. This low RPM technique is important for storing juices maintaining high quality as it can help the manufacturers and processors to delay or prevent the decomposition process (Navan Foods, 2020). Hence, it will be effective for the manufacturers to take care of the shelf-life of the product and prevent the risk of spoilage of the juices.

Thirdly, the manufacturers need to include natural ingredients in the juices instead of havoc use of artificial flavors. The artificial ingredients and flavors are full of chemical formulas, which can be easily damaged. Hence, quality and natural ingredients will definitely help in overcoming the chances of spoilage.

Last but not the least; it is important to ensure that the juice containers are airtight and vacuum sealed. The use of advanced technology from third-party packaging companies can ensure high-quality packaging, which can easily help in preventing the spoilage of fresh fruit juices.

6. Conclusion

The microbial contamination and spoilage of fruit juices are a serious concern for the food processing industry. From the above analysis and discussions, it is clear that fresh fruit juices are

highly inclined towards spoilage as the fluid contents and chemicals used in the manufacturing of the juices are in contact with the microorganisms and air. Hence, it is subject to spoilage of the juices. In addition, heat-sensitive modules, lactic acid bacteria, and yeasts are known to be responsible indicators for the degradation of the quality of the used resources and raw materials. Various artificial and chemically-linked pasteurization substances are the major reasons behind the spoilage. Now, the manufacturers are using different alternative techniques to preclude this spoilage of fruit juices with the help of different co-operative sectors. The alternative prevention technique includes Thermal Pasteurization, High-Pressure Homogenization, Pulsed Electric Field, UV or Ultraviolet Technology, and Ultrasound, etc. The fruit juice companies are also taking the help of different co-operative industries to prevent this spoilage through a non-thermal substitute process. This process is helping the manufacturers to maintain a long-term shelf-life and freshness of fruit juices.

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