

TECHNOLOGY OF MARMALADE PRODUCTION CONTAINING GINGER, LEMON, HONEY AND ASCORBIC ACID

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Abstract

This article examines the technology of marmalade production based on ginger, lemon, honey and ascorbic acid, which possess natural and functional properties. Due to the growing consumer demand for healthy products in the modern food industry, the creation of products rich in natural immunostimulants and vitamins is considered a pressing issue. The article analyzes marmalade production, the chemical composition of active substances in raw materials, stages of the technological process, and ways to ensure product quality. The synergistic effect of biologically active substances of ginger, lemon and honey, as well as ascorbic acid, was studied. The gel-forming properties of pectin substances in marmalade production, the influence of sugar concentration and temperature regimes on technological parameters were demonstrated. The organoleptic and physicochemical indicators of the product were analyzed, and the advantages of marmalade as a functional food product were evaluated.

Keywords

marmalade, ginger, lemon, honey, ascorbic acid, functional food, pectin, gel formation, immunostimulant, technology.

INTRODUCTION

In the modern food industry, the production of products that support a healthy lifestyle and possess natural and functional properties is one of the priority directions. Consumer demands for food products are constantly increasing worldwide, particularly interest in products enriched with natural ingredients, vitamins and biologically active substances is growing.

Confectionery products, especially marmalades, have a wide consumer audience, and there is a need to enrich their composition with natural and beneficial components. While traditional marmalade production technology is mainly based on the use of artificial colorants, flavorings and preservatives, nowadays the application of natural raw materials and functional additives is becoming widespread.

Ginger, lemon and honey have been used by humanity for thousands of years as products with medicinal and nutritional properties. The immunostimulant, antioxidant, antibacterial and other biologically active properties of these components have been scientifically confirmed. Ascorbic acid plays an important role in strengthening the immune system, providing antioxidant protection and regulating metabolic processes.

MAIN BODY

Chemical Composition and Properties of Ginger

Ginger is one of the medicinal plants widely used in the modern food industry. Its composition contains over 400 chemical compounds, the most important being gingerol, shogaol, zingiberene and essential oils. The main substances that provide ginger's pungent taste and distinctive aroma are gingerols, which belong to the phenolic compounds group.

Scientific research has proven ginger's powerful antioxidant, anti-inflammatory, antimicrobial and immunostimulant properties. Gingerols in ginger have the ability to neutralize free radicals and protect cells from oxidation processes. Additionally, ginger improves gastrointestinal function, facilitates food digestion and accelerates metabolism.

In marmalade production, ginger is used either raw or dried. Ginger extract or powder, along with giving the product a distinctive taste and aroma, also enhances its functional properties.

Chemical Composition and Significance of Lemon

Lemon belongs to the citrus fruit family and is rich in vitamin C (ascorbic acid), organic acids, pectin substances, flavonoids and essential oils. The amount of ascorbic acid in lemon is approximately 40-60 mg/100g, which satisfies a large portion of human daily requirements.

Lemon juice performs several important functions in marmalade production. First, it creates an acidic environment that activates the gel-forming process of pectin substances. Second, lemon acts as a natural preservative, extending the product's shelf life. Third, lemon's distinctive taste adds freshness and zest to the marmalade.

The essential oils in lemon peel give the product aromatic properties.

Composition and Technological Significance of Honey

Honey is a natural sweetening product containing 70-80% carbohydrates (glucose, fructose), vitamins (B group, vitamin C), minerals (potassium, magnesium, iron), enzymes and biologically active substances. Honey's composition varies depending on the type of flowers collected by bees.

Honey has a number of advantages in marmalade production. The fructose and glucose in honey have direct absorption capacity and are considered a quick energy source. Honey's antibacterial properties ensure the product's microbiological stability. The enzymes and antioxidants in honey increase the functional value of the product.

Technologically, honey provides moisturizing properties to the marmalade, prevents crystallization and ensures a soft texture of the product. Honey's hygroscopic property maintains the product's moisture content for a long time.

The Role of Ascorbic Acid

Ascorbic acid (vitamin C) is a water-soluble vitamin that is not synthesized in the human body and must be obtained externally. Vitamin C plays an important role in strengthening the immune system, collagen synthesis, improving iron absorption and providing antioxidant protection.

The additional addition of ascorbic acid in marmalade production serves several purposes. First, it enriches the product's vitamin content and elevates it to the level of a functional product. Second, ascorbic acid acts as a natural antioxidant, helping to preserve the product's color and taste.

Effect of Sugar and Honey Concentration

The concentration of sugar and honey in marmalade composition directly affects the product's texture, hardness, sweetness and storage capability. In the classic marmalade formula, the amount of dry matter constitutes 75-80%, which prevents microbial development and ensures long-term storage of the product.

Sugar has hydrophilic properties, binds water molecules and reduces the amount of free water. This process is carried out through osmotic pressure and stops the activity of microorganisms. Honey performs the same function, but the fructose in its composition has higher hygroscopic properties compared to sucrose.

The optimal sugar-honey ratio ensures the marmalade achieves the required strength and elasticity. Sugar has crystallization properties and gives structure to the product, while honey has a softening and moisturizing effect. Their combination creates a balanced texture.

pH Environment and Its Importance

In marmalade production, the pH environment is one of the critical parameters. The optimal pH range is between 2.8-3.5, which is necessary for the formation of pectin gel and the microbiological stability of the product.

Lemon juice naturally creates an acidic environment and brings the pH to the required level. In a low pH environment, pectin molecules have optimal

conformation and form a strong gel structure. Additionally, an acidic environment creates unfavorable conditions for most pathogenic and spoilage microorganisms.

High pH leads to weakening of the gel structure because covalent bonds are not formed between pectin molecules. Low pH causes hydrolysis of pectin and destruction of the gel structure.

The addition of ascorbic acid allows for regulation and stabilization of the pH environment.

Functional Properties and Health Effects

Marmalade containing ginger, lemon, honey and ascorbic acid as a functional food product has a number of beneficial properties:

Strengthening the immune system: Vitamin C and ginger's gingerols increase the activity of immune cells and strengthen the body's resistance.

Antioxidant protection: All components have antioxidant properties, neutralize free radicals and slow down cell aging.

Improving digestion: Ginger improves gastrointestinal function, eliminates nausea and increases appetite.

Anti-cold effect: Ginger and lemon have antibacterial and antiviral properties, providing protection against colds and flu.

Energy source: Honey and sugar are rapidly absorbed carbohydrate sources, providing energy for physical and mental activity.

Strengthening blood vessels: Vitamin C and lemon flavonoids strengthen blood vessel walls and reduce capillary permeability.

CONCLUSION

The technology of producing marmalade containing ginger, lemon, honey and ascorbic acid is considered promising in the direction of creating functional and natural products in the modern food industry.

The chemical composition and biologically active substances of ginger, lemon, honey and ascorbic acid give marmalade functional properties and transform it from a simple confectionery product into a health-promoting food product.

In conclusion, the technology of producing marmalade containing ginger, lemon, honey and ascorbic acid is scientifically based, feasible to implement, and economically efficient. This product provides an opportunity to expand the assortment of healthy and functional products in the food industry.

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