

### Biochemical Composition of Strawberries in IQF Process

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#### ABSTRACT

Individual Quick Freezing (IQF) is a vital process for preserving the quality and nutritional value of fruits, berries, and vegetables. Successful IQF involves rapid freezing of the products, which prevents the formation of large ice crystals and preserves their texture, taste, and nutritional content

IQF technology has been around since the 1920s, but it has only recently undergone a significant change. One of the most significant advances in IQF has been the introduction of advanced refrigeration and freezing systems. These new technologies have made the process more efficient, cost-effective, and environmentally friendly.

Advanced refrigeration systems use natural or synthetic organic refrigerants that have a

lower ozone depletion potential and lower global warming potential. This disruptive technology has made it possible to reduce the environmental impact of the process and increase its efficiency.

Individual Quick Freezing (IQF) is a vital process for preserving the quality and nutritional value of fruits, berries, and vegetables. Successful IQF involves rapid freezing of the products, which prevents the formation of large ice crystals and preserves their texture, taste, and nutritional content. Among the various fruits and berries, strawberries are among the most popular and nutritious, and IQF plays a crucial role in maintaining their quality. The biochemical composition of strawberries varies depending on the variety, maturity, and growing conditions, making it an essential aspect to consider during IQF (Individual Quick Freezing) processing of the fruit.

The ripe strawberries contain about 5-8% sugars (fructose, glucose, sucrose), 0.5-1% organic acids (citric, malic, oxalic), 0.5-1.5% fiber, and about 90% water. Additionally, strawberries contain vitamins C, B1, B2, and B6, as well as minerals such as potassium, calcium, and magnesium.

During IQF processing, strawberries are washed, sorted, and frozen at a temperature of -40°C. This process helps to preserve the nutritional value and flavor of the fruit. The freezing process prevents the enzymatic and microbial degradation of the fruit, which is beneficial for the preservation of the fruit's quality.

IQF strawberries retain their shape, color, and texture after thawing, making them ideal for use in various food applications such as desserts, smoothies, and jams. The high sugar content of strawberries makes them ideal for use in sweetened products such as ice cream and yogurt, while the high pectin content makes them suitable for use in jams and jellies.

The IQF processing of strawberries is a convenient and versatile ingredient for food manufacturers and consumers alike, as it allows for the year-round availability of the fruit. The nutritional value and sensory quality of the fruit are preserved during the IQF process, making it an ideal ingredient for various food applications.

The IQF process involves several stages, including pre-treatment, freezing, and packaging. Pre-treatment can include washing, sorting, and slicing the fruits or vegetables to achieve uniform size and texture. After pre-treatment, the products are flash-frozen, which means they are exposed to very low temperatures for a short time, usually a few seconds. This rapid freezing is critical for preventing the formation of ice crystals, which can rupture the cell walls and degrade the quality of the product.

IQF has numerous advantages over other freezing methods. In contrast to conventional freezing, where fruits and vegetables are placed in a freezer at a low temperature, IQF can preserve the texture, flavor, and nutritional content of the products. This is because the frozen fruits and vegetables are not stuck together, which allows the consumer to use only the amount they need. Besides, the IQF process can reduce the need for preservatives, chemicals, and other additives, making the product healthier and more natural.

Recent advances in technology have improved the IQF process, making it more efficient, sustainable, and cost-effective. One such technology is the use of ultrasound waves to enhance the freezing process. Ultrasound waves help to remove trapped air and ice crystals from the product, which improves its quality and reduces processing time. Another emerging technology is the use of cryogenic freezing, where the product is exposed to liquid nitrogen or carbon dioxide, which reduces the freezing time and preserves quality. This approach has the added

benefit of being more energy-efficient, using less electricity and producing fewer emissions.

In conclusion, IQF is a crucial process for preserving the quality and nutritional content of fruits, berries, and vegetables, especially strawberries. The development of new technologies such as ultrasound and cryogenic freezing can enhance the IQF process and make it more efficient, sustainable, and cost-effective. Consumers can enjoy healthy, flavorful products that retain their natural taste and texture, while producers can reduce waste and increase profits. The potential benefits of IQF and its related technologies are enormous, and they have the potential to transform the food industry for the better.

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