Opinion

Frozen Foods Science and Its Emerging Market

Mateen Anwar1*, Zainab Hussain2

1 Food Technologist, Quality & Food Safety Auditor, Baskin Robbins KSA, Riyadh
2 Food Service Dietitian at SFC (Safe Food Caterers), Tabba Heart Institute (THI), Pakistan

Introduction

There are many ways to keep and maintain the quality of food by different preservation techniques, of which one of them is freezing the food.

Frozen food is the term related to freezing the food to preserve it from the time it is prepared to the time it is to be eaten by lowering the temperature to inhibit microorganism growth that can cause food spoilage. Freezing food slows down the decomposition by turning residual moisture into ice therefore discouraging the growth of most bacterial species.

Science behind Frozen Foods

Freezing is a quick and convenient way to preserve food at home and also at industrial scale [1].

Usually, the food is stored below 0 °F (-18 °C) to inactivate any microbes including bacteria, yeasts and molds present in food, therefore, food stored constantly at 0 °F (-18 °C) will always be safe. Freezing keeps food safe by slowing the movement of molecules, causing microbes to enter a dormant stage. The microbes don't die at that temperature, but they stop multiplying. Freezing preserves food for extended periods because it prevents the growth of microorganisms that cause both food spoilage and food borne illness. Once thawed, however, these microbes can again become active, multiplying under the right conditions to levels that can lead to food borne illness. Therefore, precautions are required after the frozen food is thawed to eliminate the multiplication of microorganisms. Since they can grow at about the same rate as microorganisms on fresh food, thawed items should be handled carefully as any perishable food. Controlled thawing is suggested in most of the food packing which is mandatory to follow so that the food is kept safe [2].

Frozen Food: Better or Not

Frozen products do not require any added preservatives because microorganisms do not grow when the temperature of the food is below −9.5 °C (15 °F), which is sufficient on its own in preventing food spoilage. Long-term preservation of food may call for food storage at even lower temperatures. Freezing food typically keeps items edible indefinitely. This method of food preservation may potentially preserve the greatest quantity of nutrients although taste and quality may diminish over time. Some items that stay tasty even after long freezing include poultry and meat, which are still good even after been frozen up to a year.

To maintain top nutritional quality in frozen fruits and vegetables, it is essential to follow directions and to store the frozen product at 0 °F (-18 °C) and to use it within suggested storage times. Frozen vegetables are nutritionally more reliable than fresh as freezing prevents sensitive vitamins and nutrients from being lost during transportation [3].

Are Frozen Foods Convenient?

Fresh fruits and vegetables as well as lean meats and whole grains are highly nutritious. But if you do not have the time to prepare fresh foods on a daily basis, it is a good idea to purchase a deep freezer and utilize frozen foods. One may think that frozen foods are unhealthy, but remember that the "quicker the better" does not mean unhealthy. Some of the fruits & vegetables are still available for us even out of season in form of frozen product. So it's a blessing of science that we can still have out of season fruits & vegetable available all over the year.

Frozen Foods Benefit over Other Preserved Foods:

As frozen produce is picked at its peak period, these foods maintain all the flavor and nutrients. Frozen foods keep longer than fresh refrigerated foods because the freezing process suspends enzyme activity to keep the food fresh longer than fresh or refrigerated products. Any frozen food product should be discarded after the expiration date and should be stored at 0 °F (-18 °C) temperature. Frozen foods also prevent the spread of microorganisms as they do not grow at the temperature necessary to cause illness.

*Corresponding author: Mateen Anwar, Food Technologist, Quality & Food Safety Auditor, Baskin Robbins, KSA, E-mail: mateenanwer@yahoo.com


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activity that causes the food to rot. Depending on the type of food, you can store it for several months without losing quality. Freezing suspends microbial and fungal activity in the food. As long as the food remains frozen, it is safe. With canned or jarred foods, minute leaks in the container could cause dangerous bacteria to grow without you realizing. These foods may become contaminated without changing the appearance of the container. Refrigeration slows the process, but there is still a risk of microbial or fungal growth [4].

**Effect of Frozen Food on Human Health:**

Frozen produce may actually be a suitable alternative to fresh fruits and vegetables, especially off-season. Frozen foods or meals, however, do not pack a nutritional punch. Sometimes, overloaded with fat, sugar, and sodium, they are a shortcut to meal but not a healthy one. Further, they are prone to food pathogens that can be lethal. Depending on the food, the level of reheating or cooking permissible may not be enough to destroy these pathogens. While all frozen foods are not infected, significant care needs to be taken to protect the consumer [2].

**What Nutrients Are Lost Due To Freezing?**

Freezing foods might lose some flavor but it can also be a very good way to preserve the nutritional value, texture and flavor of many foods. The initial quality of the food and the length of time between harvest and freezing are important factors. As long as the food was grown in a high-quality way (for example, organically grown) and was fairly fresh at the time of freezing, the overall nutrient retention in a frozen food can be quite high. In other words, many of the vitamins and minerals will keep fairly well in frozen foods.

Some of the phyto-nutrients found in food may also keep fairly well. For example, researches show that anthocyanin flavonoids can be well preserved during freezing. Even though they are rather delicate, a recent study found no significant reduction in the levels of anthocyanins in blueberries after three months of freezing [5].

One of the main concerns for nutrient loss associated with freezing seems to be related to the blanching process that often times occurs prior to freezing. About 25% of the vitamin C and a greater percentage of folate are lost during the blanching process that occurs before foods are frozen. About 10% of thiamin (vitamin B1) is also lost during blanching. It's important to remember that these percentages of nutrient loss are very general and can be different with different foods.

Storing frozen foods properly (0°F) for no more than 6 months will also help maintain the nutritional value of frozen foods.

**Vitamin Content of Frozen Foods:**

VITAMIN C: Usually lost in a higher concentration than any other vitamin.

VITAMIN B1 (THIAMIN): Thiamin is easily soluble in water and is destroyed by heat.

VITAMIN B2 (RIBOFLAVIN): It is commonly accepted that the loss of Riboflavin has to do with the preparation for freezing rather than the actual freezing process itself.

VITAMIN A (CAROTENE): There is little loss of carotene during preparation for freezing and freezing of most vegetables. Much of the vitamin loss is incurred during the extended storage period [6].

**Emerging Frozen Food Market:**

The freezing technique itself, just like the frozen food market, is developing to become faster, more efficient and more cost-effective. There are several reasons behind the growth of the frozen foods market such as the increase of the global population and scarcity of food in some regions. The increasing number of women who are working and have less time for cooking together with growing amount of one-person households determines the upward trend of the demand for frozen foods. Consumers are getting more aware that frozen food can, in many cases, be a better alternative for a healthy and convenient lifestyle compared to conventional fresh market. We see that demand and supply is growing in supermarkets with more space allocated for frozen products. The frozen food market consists of frozen fish, seafood, meat products, potato products, vegetables, fruit, pizza, ready meals, bakery products and desserts.

Frozen food packaging must maintain its integrity throughout machine filling, sealing, freezing, and storage, transportation, thawing, and often cooking. As many frozen foods are cooked in a microwave oven, manufacturers have developed packaging that can go straight from freezer to the microwave [7].

Among the main players on the market, Nestle is seen as the leader in frozen foods production, along with General Mills Inc., Heinz, Unilever Plc, McCain Foods, The Schwan Food Company, Iceland Foods Ltd., Birds Eye Foods and Tyson Foods as the biggest actors in the sector [8].

**Conclusion**

Even with the nutrients lost in the processes of freezing, canning and delivering fresh, fruits and vegetables still have a great deal of nutrients, along with fiber, phytochemicals and water. It is clear that the benefits of frozen food are now being increasingly recognized by retailers and consumers alike, so only time will tell what effect this will have on the cold supply chain [9].
References

5. Whfoods.com (2017) What nutrients are lost or destroyed by freezing?