

Shrimp

Revised 2018

Thermal Properties

| | English | Metric |
|------------------------------|----------------|----------------|
| Moisture, % | 75.86 | -- |
| Protein, % | 20.31 | -- |
| Fat, % | 1.73 | -- |
| Carbohydrate, % | 0.91 | -- |
| Fiber, % | 0.0 | -- |
| Ash, % | 1.20 | -- |
| Specific Heat Above Freezing | 0.87 Btu/lb*°F | 3.65 kJ/(kg*K) |
| Specific Heat Below Freezing | 0.52 Btu/lb*°F | 2.16 kJ/(kg*K) |
| Latent Heat of Fusion | 109 Btu/lb | 253 kJ/kg |

Storage Conditions

| FRESH STORAGE | | |
|--|---------------------------------------|-----------------------|
| | Temperature | Expected Storage Life |
| Aquaculture produced, heads on | 35-42°F (2-6°C) in ice | 5 days maximum |
| Whole | 35-42°F (2-6°C) in ice | 3 days maximum |
| Headless | 35-42°F (2-6°C) in ice | 5 days maximum |
| Peeled | 32°F (0°C) or in ice at 32°F (0°C) | 5 days maximum |
| Peeled and Deveined | 32°F (0°C) or in ice at 32°F (0°C) | 5 days maximum |
| FROZEN STORAGE AT 0°F (-18°C) | | |
| | | Expected Storage Life |
| Whole or headless, block frozen, 24% glaze | | 12-13 months* |
| Peeled or peeled and deveined, IQF | 15% glaze | 4- 6 months** |
| | 24% glaze | 6- 8 months** |
| Breaded | Raw | 12 months |
| | Cooked | 12 months |
| Cooked | Waxed carton, overwrapped, 24% glaze | 8-12 months |
| | Waxed carton, overwrapped, not glazed | 2 months |

| | | |
|--|------------------------|-----------|
| | Sealed can | 12 months |
| | Vacuum sealed can | 12 months |
| | Water pack, sealed can | 12 months |

*Heavily glazed, packaged, block frozen shrimp can have a high quality storage life of 55 weeks at -10°F (-23°C) and 76 weeks at -20°F (-29°C).

**Block frozen shrimp may keep 3-6 months longer.

The expected storage periods cited are based on good quality raw material, handled by good commercial practices, and periods of time stated are from time of catching, processing, or freezing.

Handling

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| Whole Shrimp | Should have heads removed as soon as possible after catching, as this part spoils rapidly. The shrimp should be washed thoroughly after heading and before packing in ice. |
| Headless Fresh Shrimp | Should be packed in crushed melting ice and held in a room maintained between 40 and 50°F (4.4 and 10°C). Good drainage must be provided to prevent accumulation of melted ice, which includes proteolytic enzymes. At lower temperatures, the ice doesn't melt fast enough to flow over the product to keep shrimp wet. If not wet, a dark brown color develops and black spots appear. Higher room temperatures shorten storage life. Shrimp should be mixed with ice in equal parts and re-iced frequently to keep melting water running over the shrimp. |
| Peeled and Peeled Deveined Fresh Shrimp | Should be packed in slush ice and held in a room maintained at 35-42°F (2-6°C). They are much less likely to develop black spots, since the enzyme(s) that cause this are on the shell and shell membrane. If packaged in moisture-vapor-proof containers, they may be held without icing in rooms maintained at 32°F (0°C). |
| Cooked Shrimp | Are usually peeled first and then cooked in salt brine or a marinated solution, layered in crushed ice, frequently in cans with perforated bottoms, and stored at 32°F (0°C). Cooked shrimp lose quality rapidly, but are not subject to black spot development because heating destroys the enzyme(s) causing black spot formation. The principal quality loss is the development of off-odors and flavors. Cooked shrimp should have a longer shelf life than its raw counterpart, since heat will destroy inherent enzymes and bacteria. Any handling of cooked product may introduce a serious health risk. Equipment and ice must be clean and hygienic procedures must be used. |
| Breaded and Cooked Breaded Shrimp | Must be frozen immediately after processing and held at 0°F (-18°C). |

Diseases & Injuries

| | |
|-------------------|---|
| Black Spot | <p>Shrimp affected with black spot will have one or more black spots or bands at the base of the shell segments or across the back where the shell segments overlap. In severe cases, much of the exterior of the shrimp becomes black and the interior becomes a mushy mass. It was at first believed that microorganisms or a mold were the cause of black spot, but studies in the 1950s showed that the discoloration is caused by enzymes that are found within the shrimp.</p> <p>Control: Black spot can be minimized by using proper handling practices, namely icing the shrimp thoroughly and keeping them at temperatures close to 32°F (0°C). Washing of shrimp in a 1.25% sodium bisulfite solution for 1 minute is effective in retarding black spot formation. Sulfiting agents are considered incidental if they have no technical effect in food and are present at less than 10 ppm. If the total amount of sulfiting agent is 10ppm or greater it must be listed as an ingredient on the product label.</p> |
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Chemical Ice for Shrimp Preservation

Bacterial decomposition and attendant undesirable odors and black spot development are important factors of quality loss in fresh shrimp handling and storage. Several investigations have been made on the use of antibacterial and antimelanosis (black spot) chemicals incorporated into ice to retard these undesirable changes. Antibiotics, ascorbic acid-citric acid mixtures, sodium bisulfite, and other materials, plus combinations of these, have been utilized. However, the results to date indicate that none of these materials can be relied upon to extend the expected storage life of the product more than 1-2 days. It should be noted that the use of chemical ice by the warehouse is not an assurance of longer keeping quality. It should be further noted that the use of antibiotics are not approved by the FDA

Application of any chemical for purposes of extending shelf life is governed by U.S. federal regulations. Warehousemen should notify the owner of the shrimp immediately upon discovery of out-of-condition shrimp and not attempt to apply chemicals or preservatives.

Freezing

The primary requirement for packing top quality shrimp and shrimp products is to reduce the time interval between time of catching and finished freezing to a minimum. The longer this time interval, the darker and tougher the product will be. Moisture-vapor-proof package materials, or their equivalent, are a necessity to prevent drying out and discoloration. The equivalent of protective packaging materials is glazing with water or a weak salt brine. However, glazing must be continuous over each piece and re-glazing done when the protective film evaporates.

Cryogenic (Liquid N or CO₂) freezing is more common for this high value product than for others, not only because of improved quality resulting from the more rapid freezing rate, but also because of reduction in drip loss which makes up for the increased cost.

Frozen Storage

The primary changes in frozen shrimp are oxidation and dehydration. A good glaze will help to prevent or delay both of these quality defects. Dehydration, commonly called freezer burn, results from poor packaging, lack of glaze, and temperature fluctuations in cold storage. Systems with minimal temperature changes and which can hold very low temperatures are best. Individually quick frozen (IQF) shrimp are more subject to dehydration and quality loss during frozen storage than are block frozen shrimp.

Temperature of storage, packaging, and glazing have a very significant effect on shelf life. Shrimp stored at -20°F (-28.9°C) in a 5-lb (2.3-kg) carton with glaze kept 40% longer than those stored at 0 or -10°F (-18 or -23.3°C).

| Shelf Life Data, in Weeks, before a Product was First Found Significantly Different from a Control Sample | | | | |
|---|---------------------|----------------|----------------|--|
| Product | Weeks of Storage at | | | Determinant Attribute |
| | -18°C 0°F | -23°C -10°F | -29°C -20°F | |
| Cod fillets (cello wrapped in 5-lb [2.7-kg] packs) | 15 | 35 | 77 | Texture at 0°F (flavor at -10 and -20°F) |
| Salmon, whole dressed (glazed) | 37 | 42 | 70 | Flavor and color |
| Shrimp, green headless (glazed in 5-lb [2.7-kg] cartons) | 55 | 55 | 76 | Flavor |
| Alaska Pollack Surimi blocks | 5 | 10 | 26 | Strain value |

Freeze Dried Shrimp

Peeled, deveined, cooked shrimp is frozen and dehydrated in a vacuum chamber without thawing until only 10% or less of its moisture remains. Packed in moisture-proof packages or cans, it retains its quality and color well for short periods of time without the necessity of cool temperatures. Research is in progress to determine what temperatures are ideal for protracted storage periods. It reconstitutes quickly with the addition of water and does not need re-cooking. Institutional outlets are the primary markets for the product at this time.

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