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Short Communication

HACCP in Iranian Caviar

Yazdan Moradi

Iranian Fishery Research Organization (IFRO), Tehran, Iran

Abstract: There are twenty four existing sturgeon species world wide. Five of them live in the Caspian Sea and supply caviar: *Huso huso, Acipenser guelden staedtii, Acipenser persicus, Acipenser nudiventris, and Acipenser stellatus*. Caviar production has many processing steps. In the first the landed fish are numbered and washed several times, then gutted to remove roes and resultant roes are washed and strained through screens in order to remove any connective tissues. The next step of processing caviar is salting. The type of salt used depends on the customer's preference and the customs regulations of the purchasing country. Then caviar is filled in containers and the lid is placed on it with utmost caution to compact the mass and remove the contain air inside the container. At the end, a simple rubber band is pulled over the lid at the point contacting with the container. It should be noted that the liquid that seeps out of the container during storage is an indication of caviar's freshness. Iranian caviar has used HACCP for many years. In this article caviar HACCP will be described.

Key words: Sturgeon, Caviar, Processing, HACCP, Quality.

استخدام نظام الـ (HACCP) هاساب في الكافيار الإيراني

يازدان مورادي

المنظمة الإيرانية لأبحاث المصايد، طهران، إيران

ملخص: في العالم يوجد 24 جنس من أسماك الأسترجن. خمسة أجناس منهم تعيش في البحر الكاريبي وتعطي كافيار وتشمل: ***Huso huso*** ،***Acipenser guelden staedtii*** ،***Acipenser persicus*** ،***Acipenser nudiventris*** ،***Acipenser stellatus*** . تمر عملية إنتاج الكافيار بعدة خطوات تصنيعية تشمل أولا عمليات الإنزال حيث يتم العد والغسيل عدة مرات ثم فتح البطن وإزالة البيض الموجود بالمبياض ويغسل ثم يصفى للتخلص من الأنسجة الحشوية. وتشمل الخطوة التالية عملية التمليح ويعتمد نوع الملح المستخدم على متطلبات المستهلك ولوائح ونظم الجمارك للدولة المستوردة. يلي ذلك وضع الكافيار في حاويات تغطي بحرص شديد لضغط الكمية ونزع الهواء في النهاية. وفي النهاية يربط الغطاء بحلقة مرنة ويجب ملاحظة أن السوائل التي تنساب من الحاوية أثناء التخزين تعتبر دليل على أن الكافيار طازج. الكافيار الإيراني يستخدم HACCP (وهو نظام للأمن الغذائي لمنع انتشار المواد الخطرة على الصحة في المواد الغذائية) منذ سنوات عديدة، ويشتمل هذا البحث على وصف الـ HACCP المستخدم.

الكلمات المفتاحية: أسماك الاسترجن، الكافيار، التصنيع، هاساب، الجودة.

Introduction

The most valuable product prepared from Caspian Sturgeons is top-quality caviar. Fish eggs are developed in ovaries, which consist of a pair of symmetrical flat cylinders attached to the abdominal cavity along the vertebral column of female fish. The main part of the ovary is the connective tissues which hold the eggs and fat deposits. The ovaries are covered with a thin transparent film. Immature roes adhere tightly to the ovary tissues, but when ripe, they are easily separated from the connective tissues. This property is used

in the caviar production cycle by rubbing the ovaries through special sieves. The ovary size depends on the fish size and species, as well as the stage of the eggs ripeness. The weight of well developed ovaries in sturgeon females is about 20 % of the whole fish weight. In some cases the ripe ovaries can reach 30% of the fish weight. Granular caviar is usually prepared from ovaries which have achieved stage IV of maturation and have been removed from live sturgeons.

Separated eggs are graded for quality according to their color and size. Before salting the roes are washed with cleaned cool (8-10^{o}c) water to remove blood clots, crumpled eggs and slimy remains. The washed roes are sent to the vibrating sieve to remove residual water. The roe is processed with food grade salt, or a mixture of salt with preservatives, and packed in tins.

The essential technological requirements are a strict sanitary water regime thorough cleaning of technological equipment, fish and roe, using special disinfectants and devices, and constant medical checking of personnel.

Sturgeon caviar possesses high nutritional and biological value. Table 1 summarizes the protein, fat and energy value of granular caviars.

Table 1. Protein, fat, and energy values of granular caviar

Product	Per100 g of product		Energy value, Kcal /100 g
	Proteins	Fats	
Granular beluga caviar	27	14	237
Granular kaluga caviar	28	14	240
Granular sturgeon caviar	29	10	203
Granular stellate caviar	28	12	221

Studies show that caviar is a good source of essential and non-essential amino acids, vitamins (A, B, C, PP) and mineral elements, especially phosphorus. Beluga and Kaluga sturgeon caviars have light color and possess the high consumer acceptability and, correspondingly, a high price on all the world markets.

According to the Sturgeon Briefing (March 2000), in 1998 there were seven main caviar producers.

According to CITES Annual Reports, total volume production was 216 t in 1998. The largest producers were Iran (49%) and Russia (34%). The report added that in 1998, 95% of world caviar production was exported to the EU countries, Japan, Switzerland and the US. Switzerland was the world's largest caviar importer (24%), followed by France (19%) and Germany (17%). More than 90% of caviar came from the Caspian Sea basin.

Caviar from stellate sturgeon (*Acipenser stellatus*) is the most commonly used species in the caviar trade. It is accounted for 48 % of the traded species, followed by Russian sturgeon (*A. gueldenstadtii*), 31 %.

Total caviar export quotas for some sturgeon species are summarized in Table 2 (TRAFFIC EUROPE, February 7, 2001).

Table 2. Total caviar export quotas by species in 1998-2000(kg).

Scientific Name	English Name	1998 (kg)	1999 (kg)	2000 (kg)
Acipencer baerii	Siberian sturgeon	19000	2000	400
Acipenser gueldenstaedtii	Russian sturgeon	79100	66720	60840
Acipenser nudiventris	Ship sturgeon	3000	1500	5600
Acipenser pericus	Persian sturgeon	45000	53000	38000
Acipenser rutbenus	Sterlet		30	300
Acipenser scbrencki	Amur sturgeon	5483	4010	4510
Acipenser stellatus	Stellate sturgeon	135000	111800	94000
Huso dauricus	Kaluga sturgeon	8587	6930	9430
Huso Huso	Beluga	12900	16584	21500
TOTAL		308070	262574	234580

What is HACCP?

Hazard Analysis Critical Control Point (HACCP) is a food safety management system, for preventing public health hazards and the other risks related occuring during food chain production. It is a highly specialized and effective system of food quality safety control and has an approach which easily integrates into Total Quality Management or ISO 9000.

Developing HACCP assists companies to comply with legislation, supports due diligence and fulfils customer requirements for a food safety management system. The introduction of common food hygiene rules across the European Community through EEC Directive 93/43/ was achieved within the UK in 1995 by the Food Safety (General Food Hygiene) regulations, which legally require the HACCP approach. Industry guides to good hygienic practice are voluntary guides providing more detailed advice on complying with the regulations as they relate to specific sectors. Food safety should be given the highest priority; however companies are often short of time and appropriate personnel who require this training. especially in food safety, which needs to be widely disseminated throughout their company. Food safety management systems are much more likely to be effective if they are owned by all in production and management.

HACCP Application in Iranian Caviar

The following sequence of 12 steps is applicable for development of a caviar HACCP program. (Iranian Fisheries Co, 2000, Caviar production annual reports).

- Assemble HACCP team.
- Describe product.
- Identify intended use.
- Construct process flow diagram and schematic.
- On- site verification of flow diagram and plant schematic.
- List hazard associated with each step and analyze.
- Determination of critical control point (CCP).
- Establish critical limits.
- Establish monitoring procedures.
- Establish corrective actions.
- Establish verification procedures.
- Establish record keeping and documentation.

1- Assemble HACCP team:

The HACCP team is included by personnel who are directly involved in the daily processing activities and have the knowledge and expertise to develop a caviar HACCP plan, including: Microbiologist, food technologist, veterinarian, chemist, HACCP expert, and fisheries expert

2- Describe product:

Product name: Caviar
Raw material: Sturgeon fish roes
Food additives: Salt and preservatives
Packaging: 2 and 1 kg tin packs
Shelf life: Maximum one year
Storage: Keep cool at 0^{o} - - 3^{o}Ċ
How it is to be used: ready to eat

3- Identify intended use:

Caviar may be used by all people without any restriction, but because it is very expensive the amount of caviar consumption is very limited.

4- Construct process flow diagram:

The important process steps in caviar production are:

Catching fish
↓
Transporting to processing center
↓
Washing – gill cutting – rewashing
↓
Cutting fish abdomens
↓
Removing fish ovaries
↓
Cutting ovaries to small pieces
↓
Sieving ovary pieces
↓
Washing and draining
↓
Weighing fish eggs and salt
↓
Mixing
↓
Grading
↓
Packing
↓
Air evacuation and sealing
↓
Labeling
↓
Cold storing
↓
Examination
↓
Sampling and testing
↓
Distribution

5- On–site verification of flow diagram:

Once the flow diagram has been drafted, it is verified by an on site inspection for accuracy and completeness.

6- List hazards associated with each step and analyzing:

6-1– Hazard associated with raw material (fish ovary): Parasites, environmental and chemical contaminants.

6-2– Ppotential hazard associated with process: Pathogen growth and toxin production caused by time, temperature, abuse, contamination with chemical agents.

7- Determination of CCP:

In the caviar processing line, four points or steps are identified as CCP (Critical Control Points) namely: Fish receiving, roes washing, weighing of roes and additives, and time/ temperature controlling.

8- Establish critical limits:

For each CCP in the caviar HACCP plant one critical limit is determined that is used to distingue between safe and unsafe operating conditions at a CCP.

9- Establish monitoring procedures:

In the caviar HACCP plant, monitoring is a planned sequence of observation or measurements to asses whether a CCP is under control and to produce an accurate record for future use in verification, like time/temperature controlling.

10- Establish corrective action:

An important purpose of corrective actions in the caviar HACCP plant is to prevent caviar spoilage contamination. This may be hazardous if it reaches consumers. Where there is a deviation from established critical limits, corrective action are necessary.

11- Establish verification procedures:

In caviar HACCP plant verification is defined as those activities, other than monitoring, that determine the validity of the HACCP plan and that the system is operating according to the plan, like reviewing of CCP monitoring and corrective action records and final test reports.

12- Establish record keeping and documentation generally the records maintained for the caviar HACCP plan, including the following:

- A summary of Hazard Analysis, including the rationale for determining hazards and control measures.
- The HACCP plan: Listing of HACCP team, description of caviar, verified flow diagram, HACCP plan summary table that includes information of HACCP principles.

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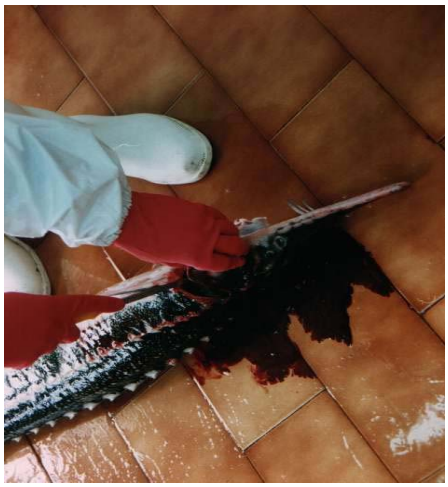
1- Catching Fish



2- Cutting Fish

3- Washing

4- Gutting

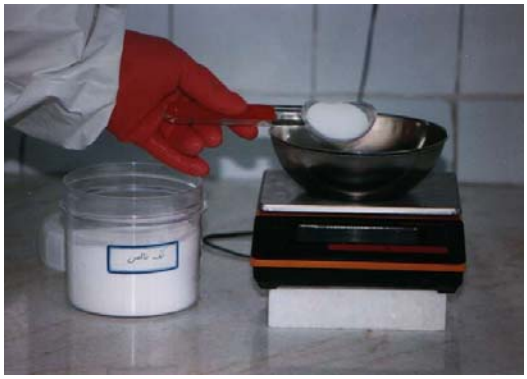
5- Removing fish ovary

6- Cutting to small pieces

7- Sieving

8- Washing the eggs

9- Weighing the eggs



10- Weighing salt

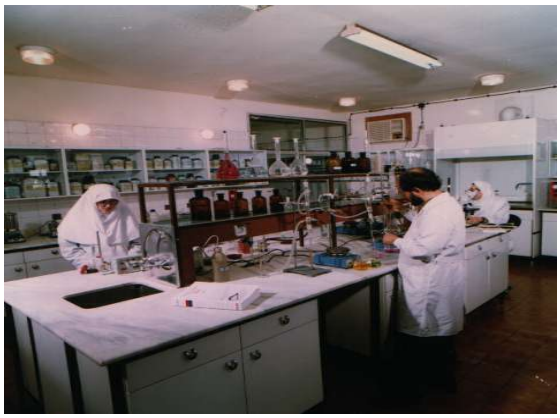
11- Mixing

12- Filling in to the can

13-Vacuuming by hand

14-Putting rubber band and label

15-Cold storing



16-Quality control