



SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore – 35

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DEPARTMENT OF FOOD TECHNOLOGY

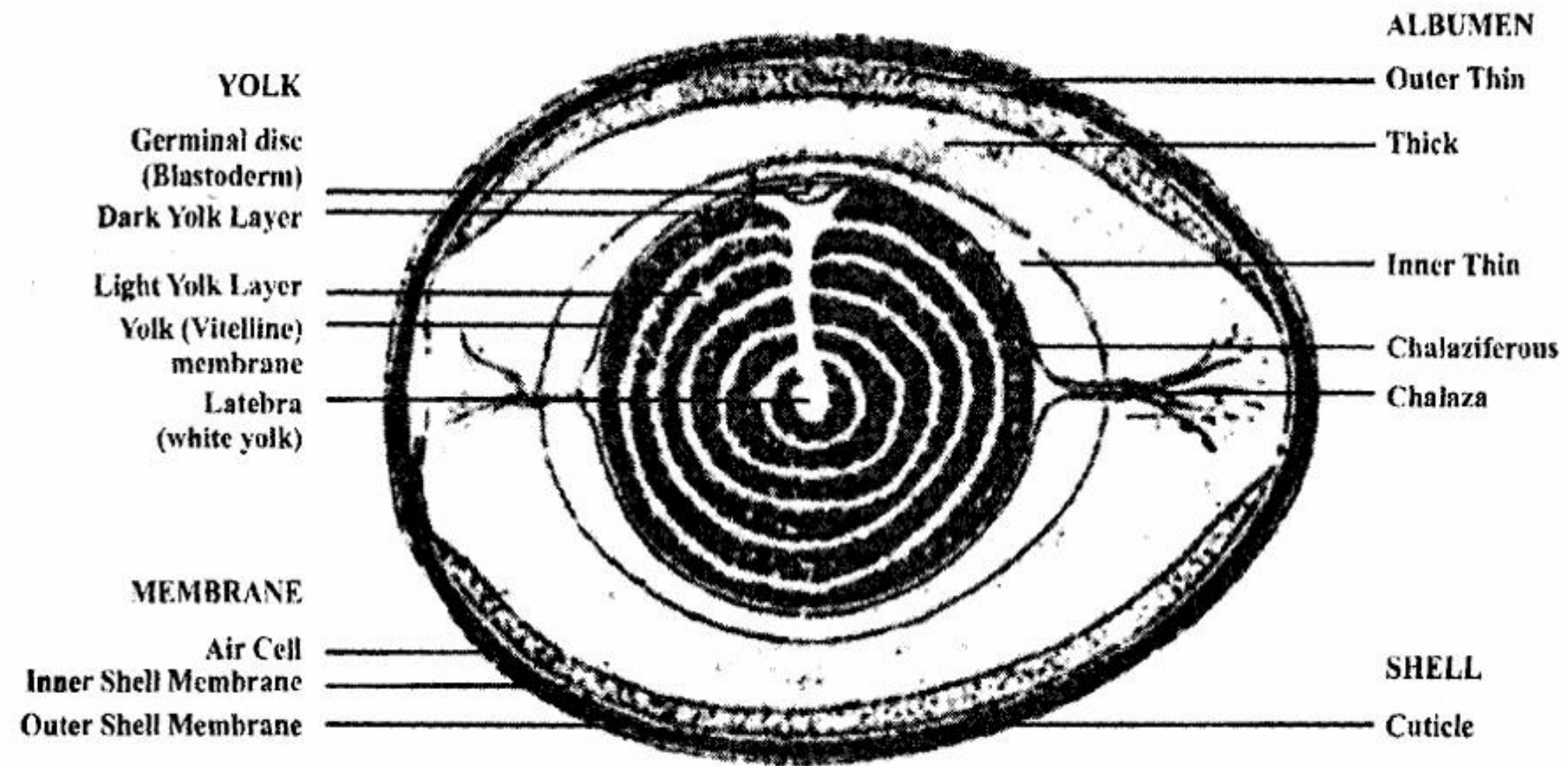
19FTE402 & MEAT, FISH AND POULTRY PROCESS TECHNOLOGY

Unit 4 – Egg Processing

**Topic :Structure, composition, nutritive value of
egg. Functional properties of eggs, Factors
affecting egg
quality .**



Structure of Egg





Structure of Egg



- ❖ Egg shell: It is the outer covering of an egg (constitutes 9 to 11 % of egg wt.) which consists of pores. The air gets in through the pores for the embryo to breathe. There are approximately 7,500 pores per egg. Size of pores is big at broader end of egg. The outer surface of the shell is covered with cuticle which seals the pores and checks outer temperature and prevents carbon-dioxide to escape from the egg. The shell also consists of inner and outer shell membrane. The air cell is formed between the shell membranes usually at the broader end of the egg. The outer shell membrane is the air cell membrane.



Structure of Egg



Albumen: The white portion or albumen of an egg (constitutes about 58 to 60 % of egg wt.) has three distinct layers of outer thin, middle dense and inner thin liquid. It is also consist of chalazae which is attached to chalaziferous layer. The chalaziferous layer is around the yolk.

Yolk: The yellow portion or yolk of an egg (constitutes around 3 1 % of egg wt.) has following layers:
Yolk consists of germinal disc, latebra, concentric rings of yolk material and vitelline membrane.



Structure of Egg



- i) Latebra: The white yolk which connects the g e d disc with the centre of the volk.
- ii) Light Yolk Colour: Where no dietary pigment is available
- iii) Dark yolk layer: The colour is dark yellow due to periodic deposition of carotenoid pigment.
- iv) Yolk membrane: It is also called as vitelline which surrounds the yolk
- v) Blastodisc/ Germinal disc: The germinal disc is known as blastoderm in fertile egg and blastodisc in infertile egg. It is located in cone portion of latebra, known as "Nucleus of Pander" which is connected with its neck to the centre of the volk. whales.



Structure of Egg



4) Air cell : There is no air cell in a fresh egg at the moment it is laid. The moment the contents contract following cooling, a slight vacuum is created drawing air through its pores and gives rise to an air cell between the two shell membranes. The size varies with duration of holding egg and the species of the bird.



Egg Spoilage and Contamination



Contamination source of egg

Various sources of contamination can contaminate eggs at various stages of production, handling, and storage. Some of the most common sources of contamination are as follows:

Bacteria

Salmonella: This bacterium can be present inside the egg if the hen that laid it was infected. It can contaminate before the shell forms.

Campylobacter, E. coli, and Listeria: These bacteria can also be contaminants, because of poor hygiene during production or processing.



Egg Spoilage and Contamination



Environment and handling

Dirty or Cracked Shells: Bacteria can enter through cracks in the shell or from the outside if the shell is dirty.

Cross-Contamination: Happens when eggs meet surfaces or tools that are contaminated with bacteria.

Hen health: If the hen laying the eggs is infected, the eggs themselves may be contaminated internally before they are laid.

Storage and temperature: Improper storage conditions, particularly when eggs are stored at temperatures favorable to bacteria



Egg Spoilage and Contamination



Non microbial spoilage of egg:

These include moisture loss which results in weight loss during long-term storage.

Long-term storage causes changes in the physical state of the egg contents.

They include egg white thinning and yolk membrane rupture.

As the yolk membrane weakens and breaks, the yolk settles and becomes homogeneously mixed with the egg white.



Egg Spoilage and Contamination



Microbial spoilage of egg

Microorganisms must contaminate the shell of an egg, penetrate through the pores in the shell and inner membrane, reach the egg white and yolk, and grow there.

Some microorganisms can't grow in egg white but develop in yolk.

Changes in storage temperature allow organisms to pass through the shell and thus facilitate microbial spoilage.



Egg Spoilage and Contamination



Bacterial spoilage of egg

Bacteria are a more common spoilage organism than mold.

Bacteria cause rot in eggs. When bacteria grow within an egg, they decompose the contents and produce

byproducts.

Black rot

It is caused by Proteus and, on occasion, Pseudomonas and Aeromonas. Yolks blacken and then break down, giving the whole egg content a muddy brown color.



Egg Spoilage and Contamination



Green rot

It's caused by *Pseudomonas fluorescens*. When exposed to ultraviolet light, green egg white fluoresces. In the later stages of spoilage, yolk disintegrates, masking the green color of the egg white. The odor is either lacking, fruity, or sweetish.

Red rot

It is caused by *Serratia marcescens*. These eggs are distinguished by a rod dissociation of the egg white and the surface of the yolk in ammoniacal, or putrefied odor.

Colorless rot

It may have been caused by *Pseudomonas*, *Acetobacter*, *Acinetobacter*, or coliform.

In the later stages of spoilage, the yolk disintegrates or has incrustations.

Pink rot

It is usually caused by *Pseudomonas* during the late stages of green rot. They are like colorless rot, with the exception that the yolk and white are pink.



FACTORS INFLUENCING A QUALITY EGG



Breeding: High egg quality starts with good breeding. Important egg quality factors such as egg weight, shell texture, shell thickness. Shell color and albumen height may be inherited.

Rearing: Any hen that is expected to lay high quality eggs over an extended period of time must have been properly grown as a pullet. Only strong, healthy pullets can be expected to give maximum results in the laying house. Confinement rearing of pullets may be practiced where adequate housing is available. Eggs of the highest interior quality are usually laid by pullets. Confinement rearing results in clean egg as birds are reared in clean environment.



FACTORS INFLUENCING A QUALITY EGG



Nutrition: A balanced diet is essential for high production of eggs of good quality. Special attention must be given to supply adequate amounts of vitamins A and D, and calcium, if good shell quality is to be maintained. The misuse of Certain feed additives may adversely affect egg quality. Layers must be confined at all times if eggs of uniform yolk color are to be produced. Xanthophyll, Nicarbazine (drug), Gossypol, (of the cotton seedcake) in the feed produce olive yolk and pink albumen. A deficiency of Vitamin K may cause an increase in the number of bloodspots. Flocks of good breeding on a good ration should not have a blood spot incidence much over 1 percent.

Disease: Most outbreaks of disease or major flock disturbance will influence egg quality. The most common diseases severely affecting egg quality are Newcastle disease and bronchitis. These diseases are minimized by proper vaccination of the pullets.



FACTORS INFLUENCING A QUALITY EGG



Laying stock: Eggs from birds of different laying stock vary in the incidence of bloodspot, meatspot, shell quality, egg size and albumen quality. Age of bird also influences the quality of the egg. Initial egg quality declines with increase in age of birds. The higher number (Haughunit), the better the quality of the egg (fresher, higher Quality eggs have thicker whites).

Age of bird	Haugh unit	Egg quality
26 weeks	87.8	good
39 weeks	75.2	decline
76 weeks	73.0	further decline



FACTORS INFLUENCING A QUALITY EGG



Management Litter: Dry litter (bedding material) is essential. The use of built-up litter and adequate ventilation help to keep litter dry.

Nests: Clean eggs can be produced only when nests are filled with clean nesting material and are adequate as to number and size. Hens prefer darkened nests. All nests should have a minimum of light and equal light if hens use them uniformly.

Waterers: Automatic waterers with a wire platform underneath are recommended. An abundant supply of water is essential for high egg production. There should be approximately one pound of water for each dozen of eggs.

Collection of eggs: Eggs should be gathered at least three times per day. The exact time will vary according to the rate of lay and season of the year. A suggested schedule for gathering is 9:30a.m., noon and 4:30p.m. Heat is the worse enemy of quality. Always eggs should be gathered in a wire basket.



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FACTORS INFLUENCING A QUALITY EGG



Cleaning of eggs: Dirty eggs should not be a serious problem if proper housing and management practices are followed. However, dirty eggs and those with heavy stains cannot go into Grades A or B. Therefore, dry cleaning or Mechanical washing of dirty eggs is recommended. In an immersion type washer, the water should be thermostatically held at 120°F and eggs should not be Washed longer than 3 to 5 minutes. The detergent should contain a sanitizer to Reduce microbial growth. Certain egg laying farms are installing in-plant egg Washers to eliminate the need of washing on the farm.

Shell Treatment: The purpose of shell treatment is to partially seal the pores of the shell thus reducing the escape of H₂O and CO₂ from the egg. Farm shell Treatment normally consists of spraying a light weight mineral oil on the upper portion of the eggs as they are being cased after being cooled.



FACTORS INFLUENCING A QUALITY EGG

Problem	Cause	Remedy
Large air cells	<ol style="list-style-type: none"> 1. Holding too long. 2. Too high temperature and low humidity in holding room. 	<ol style="list-style-type: none"> 1. Market more frequently. 2. Provide 50-60°F temperature and 70-80% humidity in egg room. 3. Supply adequate oyster shell and grit to hen.
Blood or meat spots or bloody eggs production	<ol style="list-style-type: none"> 1. Ruptures of blood vessels during egg formation. 	<ol style="list-style-type: none"> 1. Avoid excitement or injury of birds. 2. Good diet
Blood rings	<ol style="list-style-type: none"> 1. Partial germ development in fertile eggs. 	<ol style="list-style-type: none"> 1. Remove males from flock. 2. Cool eggs to below 60°F promptly
Heavy yolk shadows (when Candling)	<ol style="list-style-type: none"> 1. Weak, watery whites. 2. Holding too long. 	<ol style="list-style-type: none"> 1. Keep eggs at 50-60°C. 2. Market 2-3 times a week.
Dark Yolks	<ol style="list-style-type: none"> 1. Feeding pigmented feeds or too much green. 	<ol style="list-style-type: none"> 1. Confine birds to house, reduce pigmented. 2. Keep eggs at 50-60°F.
Weak, watery whites	<ol style="list-style-type: none"> 1. Too high temperatures for holding eggs. 2. Holding too long. 3. Disease, especially Newcastle. 4. Breeding characteristic of birds. 	<ol style="list-style-type: none"> 1. Keep eggs 50-60°F and 70-80% °F humidity. 2. Market more frequently 3. Prevent respiratory disease. 4. Change strain of birds if other measure do not give results.
Heat spots	<ol style="list-style-type: none"> 1. High holding temperature. 2. Time held. 3. pH of egg. 	<ol style="list-style-type: none"> 1. Hold eggs at 50-60°F.



PRESERVATION OF EGG



Following methods employed to maintain the quality of egg:

Washing of eggs

- i Only dirty eggs are washed with water.
- ii. Sanitizer is used as recommended by manufacturer.
- iii. Water temperature should be 110°to 120°F for3 minutes.
- iv. Water should be changed after each batch washing.
- v. Eggs are collected from different sources to one plant which takes care of Bulk washing of eggs.
- vi. Ultrasonic are also used for egg as cleaning agents



PRESERVATION OF EGG



Thermo-stabilization : This involves immersing the eggs in hot water. Different time-temperature combinations can be used . Three such combinations are given below:

Temperature	Time
130°F	15minutes
142°F	2 minutes
212°F	5 seconds



PRESERVATION OF EGG



Immersing the eggs in hot water(212°F or 100°C) for 5 seconds is known as flash heat treatment. Thermo-stabilization helps in stabilizing the albumen quality. Albumen immediately next to the shell gets coagulated by heat treatment and forms a fine peripheral film of albumen. This treatment also destroys the viable germ of fertile eggs and there by defertilizes eggs. Thermo-stabilized eggs can be stored at room temperature for 3-4 weeks. But this method is time consuming ,expensive and requires instrument to control heat. If temperature is not controlled properly it may result in cooked eggs. This method is not in practice.



PRESERVATION OF EGG



Cold Storage: For short term storage (upto 2-3 weeks), eggs are stored at 4°C with relative humidity of 60-70%. Even the eggs can be stored at 15°C and relative humidity of 70-80% for short term storage. Dirty, cracked or low quality eggs should not be kept in the cold-storage. To facilitate heat loss from the eggs proper air circulation is important in the storage room. The storage room should be attached with an ante room to a void entry of air. For long term storage, a temperature of -1.1°C with relative humidity of 85-90% is sufficient but eggs in shell should not be kept in the freezer.

Product	Refrigerator (4°C)	Freezer (-18°C)
Raw eggs in shell	3 to 5 weeks	Do not freeze
Raw egg whites	2 to 4 days	12 months
Raw egg yolks	2 to 4 days	Yolks do not freeze well
Hard-cooked eggs	1 week	Do not freeze



PRESERVATION OF EGG



Lime water: Slaked lime is mixed with cold water to make saturated lime water solution. Eggs are submerged in this solution for 14-16 hours. Lime water treated eggs can be stored for 3-4 weeks at room temperature.

Oil coating: It involves use of oil which seals the pores of the shell and thus prevents escape of moisture and CO₂ from egg content. Generally, lightweight colourless, odourless mineral oil is used for this purpose. Eggs are either dipped or sprayed. Oil temperature should be 15-300 C. Oil should be food grade and egg surface should be dried completely before oiling. Oil treated eggs can be stored upto 3 weeks at room temperature. But this treatment may result in oil shine of the egg and cloudy albumen as CO₂ cannot escape from the egg.



PRESERVATION OF EGG



Water glass treatment: Water glass refers to a solution of 10% sodium silicate. It seals the shell pores of the eggs without hampering egg quality. Cold solution is used for dipping the eggs. Water glass treated eggs can be stored at room temperature.

Pasteurization of eggs: Generally pasteurization is done for preservation of yolk or whole egg content. Shell eggs are also pasteurized by immersing in hot water for a specific time (62°C for 3 minutes or 64°C for 2 minutes). Main objective of this treatment is to destroy the egg-spoiling microorganisms. Temperature and time should be maintained very carefully; otherwise it may result in cloudy albumen.



THANK YOU