

INTRODUCTION TO EGGS

Learning Objectives

After reading this chapter, you should be able to:

- · identify various types of eggs and classify them
- · understand the structure of eggs
- · select eggs for various uses
- · recognize the importance of selection and storage of eggs
- · appreciate the usage of eggs in cooking to create various delicacies

INTRODUCTION

Science defines egg as a cell from which a living organism takes birth and grows. All animals (including birds) lay eggs, except mammals who give birth to babies. An egg laying animal lays eggs, no matter whether they are fertilized or not. In other words, it does not have to be mated to lay an egg. In order to develop into an embryo, an egg must be fertilized by sperm before it is laid. The fertilized eggs, under favourable conditions hatch into living organisms.

It becomes crucial for humans to select good quality eggs which should be freshly laid, as one does not want to see a structural form of living organism, when an egg is broken. The eggs that we usually get in the market are unfertilized eggs.

There are many varieties of eggs found around the world, but only a few are used for human consumption for various reasons. The eggs can be of fish, poultry, game birds, or even reptiles; but in cooking when we refer to eggs we are always talking about poultry

STRUCTURE OF AN EGG

Let us discuss the structure of an egg (refer to Fig 14.1) and then we shall discuss different types of eggs and their uses.

Shell

It is the outer covering of the egg and is composed of calcium carbonate. It may be white or brown depending upon the breed of the chicken. The colour of the shell does not affect cooking quality, character, or nutrition.

Yolk

This is the yellow portion of an egg. Colour of yolk varies with the feed of the hen, but does not indicate the nutritional content.

Vitelline

It is a clear seal that holds the egg yolk.

Chalazae

These are the twisted cordlike strands of the egg white. They anchor the yolk in the centre of the egg. Prominent chalazae indicate high quality.

Shell Membranes

Two shell membranes, inner and outer membrane, surrounds the albumen. They form a protective barrier against bacteria. Air cell forms between these membranes.

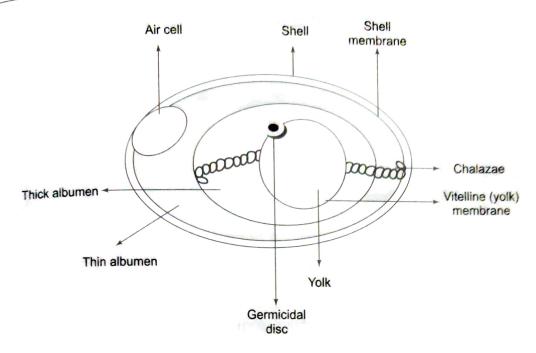


Fig. 14.1 Structure of an egg

Air Cell

It is the pocket of air formed at the large end of the egg. This is caused by the contraction of the contents on cooling after the egg is laid. The air cell increases with the age of the egg as there is considerable amount of moisture loss. The eggs are stored with the larger side facing up to keep the yolk in the centre.

Thin Albumen

It is nearest to the shell. When the egg is broken there will be a clear demarcation of the thin and thick albumen. As the egg gets older these two albumens tend to mix into one

another. This is again a test of good and fresh egg.

B

C

Large

Medium

CHEF'S TIP Thick Albumen Thin and thick whites become

It stands high and spreads less than the thin white in a high quality egg. It is an excellent source of riboflavin and protein.

CLASSIFICATION OF EGGS

Duck

Turkey

indistinguishable in an old egg

or eggs of low quality.

Eggs can be classified into different types as discussed in Table 14.1.

Free range

Organic

Basis of Grade Sizes Farm and Feed Source (Bird) classification US European Types AAJumbo Ostrich Battery farm Extra large A Goose Barn laid Extra large Large

Table 14.1 Classification and types of eggs

Medium

Small

Table 14.1 (Contd)

Basis of	Source (Bird) Farm a	Farm and Feed	and Feed Grade	Sizes	
classification				US	European
Types	Hen Bantam Pheasant Guinea fowl Quail	Vegetarian Omega-3 Vitamin enhanced		Small Peewee	

Source of Eggs

Eggs are named after the birds that laid the eggs. Eggs can be distinguished by size and colour of the shell. Various eggs are listed in descending order of their average weights in Table 14.2.

Table 14.2 Source of eggs and their characteristics

Name of Bird	Average Weight	Colour of Shell	Remarks	Taste*
Ostrich	450	Pale yellow	Best used in baked dishes	Stronger flavour
Goose	200	Chalky white	Best used in baked dishes	Stronger flavour
Duck	90	Vary from Pale blue to white	Higher fat content oilier texture, being rich produces good sponges.	
Turkey	75	Creamy white with light brown specks	Farmed for meat, therefore eggs are reserved for hatching.	Similar in taste
Hen	60	Vary from white to brown	Ideal for many uses, can also be served on its own, fried/boiled/scrambled, etc.	
Bantam	30	White	Can be used as hen's egg, but more numbers are needed as it is smaller in size.	Similar in taste
Pheasant	25	Buff to blue-green	Can be used in many ways, boiled, baked, etc.	Stronger flavour
Guinea fowl	25	Light brown	Ideal for garnishes, salads, even in baked dishes.	Delicate flavour
Quail	18	Pale yellow with dark specks	Light and creamy texture, ideal for garnishes (hard-boiled).	Delicate flavour

^{*} Comparisons made are judged with respect to hen's egg

Farm and Feed

Eggs are named after the farming method employed or the feed provided to the bird to enhance a particular nutrient in the egg. The various eggs falling under this classification are listed in Table 14.3.

Table 14.3 Eggs on the basis of farm and feed

Туре	Description	Remark
Battery farm*	These are the most regular commercially produced eggs. In this method, hens are kept in small cages (three to seven per cage) and are fed a high protein diet. This method enables keeping large number of hens in smaller shed, thus there is more yield of eggs at lesser cost.	Regular egg
Barn laid	indoors in straw covered barns, which are separated into pens and not congested cages. Nutrientwise it is much the regular egg	Regular egg
Free range	This method of farming involves keeping hens in barns and at the same time, allowing them access to open space with vegetation. The hens get a good amount of exercise, but as the eggs are laid all around the barn and open spaces, egg safety and collection is a challenge, thus increasing cost.	Regular egg
Organic	These are eggs produced from birds, which are fed an organic diet. An organic diet is one which is produced without use of chemicals such as pesticides and fertilizers. These hens are even not fed any hormones or chemicals otherwise used to enhance their growth.	Regular egg free from chemical traces
Vegetarian	These are eggs produced from birds that are fed a vegetarian diet. A vegetarian diet is free from any meat or fish products. Nutrientwise it is much the regular egg.	Regular egg
Omega-3	These are eggs from birds that are fed a diet of canola, linseed, and flaxseed, which are rich vegetarian sources of Omega-3 fatty acids. Omega-3 is beneficiary for the heart.	Regular egg with Omega-3
Vitamin enhanced	These are eggs from birds that are fed a diet rich in certain vitamins with an intention of enhancing the particular vitamins content in the laid egg. Usually birds are fed with a diet of vitamin E, B6, or B12, thus enhancing their content in the egg.	Regular egg with enhanced vitamin content

^{*} Battery farming is the most popular standard farming method employed over the world.

GRADE

Eggs are named after the quality grades awarded to them based upon set quality factors/parameters. The various eggs falling under this classification are listed in Table 14.4.

Table 14.4 Grading of eggs

Grades*	Quality factors			
A A	Shell	Egg white (on breaking)	Yolk (on breaking)	
AA	Clean, unbroken	Clear, without spots/clots; thin and thick albumin,	Well centred and	
A	Clean, unbroken	distinct, with a layer of thick albumin covering yolk	rounder in shape.	
-1		Clear, without spots/clots; thin and thick albu-	Fairly centred and	
		min distinct	rounder in shape.	

Table 14.4 (Contd)

Grades*	Quality factors			
	Shell	Egg white (on breaking)	Yolk (on breaking)	
С	Clean to slightly stained Slightly to mod- erately stained	Clear, without spots/clots; very less or no distinction between thick and thin albumin Spots or clots may be present; no distinction between thick and thin albumin, egg white is watery and spread out	May be off centre and flat in shape. Off centre and flat in shape. In some cases, yolk even breaks and does not hold shape on breaking shell.	

^{*} Food production outlets usually receive AA or A grade eggs for their use

Sizes

Eggs are named after their sizes, which are assigned to them based upon their weights. The sizing is based upon the weight per dozen of eggs, but is represented as weight of individual egg after taking out mean weight per egg for ease. There are different size nomenclature for classifying eggs on basis of size. Two of the most popular size classification—US and European—are as given in Tables 14.5 and 14.6. In India the European classification is usually followed.

Table 14.5 Classification of eggs by US standards

Egg size	Weight (g)
Jumbo	73
Extra large	63
Large*	53
Medium	45
Small	40
Peewee	35 and below

^{*}Large is the most common size.

Table 14.6 Classification of eggs by European standard

Egg size	Weight (g)
Extra large	73
Large	63
Medium	53
Small	45 and below

TYPES OF EGGS

We saw the various ways in which eggs are classified. We shall now discuss various types of eggs commonly used in kitchens all over the world. Table 14.7 shows various kinds of eggs.

Table 14.7 Types of eggs (see also Plate 9)

Type	Description	Photograph
Chicken eggs	These are the most commonly eaten eggs around the world. They are available in brown colour and white colour. The brown coloured ones are referred to as <i>desi eggs</i> in India.	180
Duck eggs	They are darker in colour than chicken eggs and are larger in size too. The duck eggs are stronger in flavour and are always eaten very fresh, as the flavour intensifies with age.	
Goose eggs	Similar in size and colour to duck eggs, goose eggs taste slightly oily as they have more fat content.	9
Guinea fowl eggs	They are flecked with brown colour and are boiled between $3-5$ minutes and served in salads.	
Gull eggs	Since sea gulls prey on sea food, their eggs are also fishy in flavour and hence are valued. These are usually boiled for 5 minutes and served cold with celery salt. They are smaller than chicken eggs.	
Ostrich eggs	These weigh around 500 g and are 10 times bigger than chicken egg. One egg can feed four people and is used in the same way as chicken egg.	
Partridge eggs	They are tiny in size and cooked medium boiled for 2 minutes.	
Pheasant eggs	These eggs have a natural pinkish hue and are around the size of a quail egg. They can also be used as chicken eggs.	A.C.
Quail eggs	They are speckled and slightly brown in colour. They are usually one-third the size of a chicken egg and are usually served cold or set in aspic jelly.	111
Plover eggs	They are very similar to quail eggs and are considered to be a delicacy. They are usually served soft boiled.	
Turkey eggs	These are creamy white in colour and speckled wit brown colour. At times a turkey egg can be twice the size of a chicken egg. The	
Thousand year old eggs	that are cured for around 100 days. These duck eggs are coated	
	with mixture of lime, salt, tea ashes, and charcoal and buried in the ground to mature. These are usually served shelled, sliced and are also served cold.	

SELECTION OF EGGS



CHEF'S TIP

If eggs of the best quality are desired, medium-sized ones that are uniform in size and colour should be selected. With regard to shape, they should have a comparatively long oval shell, one end of which is blunt and the other, a sharp curve.

Eggs available in the market are graded according to the freshness, cleanliness, size, cracks, and colour. With the exception of their freshness, these points can be readily told from the appearance of the eggs. But in order to determine whether an egg is fresh or not, it is put through a process known as 'candling', by which the interior condition of the egg can be ascertained. This method of determining the freshness of eggs consists of placing a piece of cardboard containing a hole, a little smaller than an egg between the eye and a light, which may be from a lamp or an electric light and holding the egg in front of the light. The rays of light passing

through the egg show the condition of the egg, the size of its air space, the growth of mould, or the spoiling of the egg by any ordinary means.

Another way of judging the quality of eggs consists in observing the condition of the surface of the shell. When eggs are freshly laid, the shell is covered with a substance called 'bloom' that gives it a feeling much like that of a thin lime coating deposited in a pan after water boils. This coating disappears gradually as the egg is exposed to air, but as long as it remains, the egg may be considered as fresh and germ-proof. While this $way\ of$ determining freshness is probably the quickest, it is possible that the quality of some eggs from which the bloom has recently disappeared has not been injured.

One can determine the freshness of an egg by shaking it. When the water inside the shell evaporates, the yolk and white shrink so much that they can be felt moving from side to side when the egg is shaken. More stale the egg, more pronounced the movement becomes. This method should be applied only immediately before the egg is to be used, as the thin membrane between the yolk and the white and the spiral cords that hold up the yolk are liable to be disturbed by the shaking. A test for freshness which consists in placing the eggs in glass containing water will be found effective. A perfectly fresh egg will sink when it is put into the water, but if the egg is three weeks old the broad end will rise slightly from the bottom of the glass. An egg that is three months old will sink into water until only a slight portion of the shell remains exposed; whereas, if the egg is older or stale, it will rise in the water until nearly half of it is exposed.

Check for cracks in the shell which could let bacteria in and contaminate the eggs. They should be less than 21 days old. The yolk should be plump and there should be two layers of white. If the egg is stale the yolk becomes flat ant the distinction between the two layers of white is lost. The final test will be the smell; bad eggs will have an unpleasant odour.

STORAGE OF EGGS

The storage of the eggs could mean two things. First, there is the storage in fridge for daily use and then there is industrial storage that is done at the warehouses for retail markets. The method of industrial storage does not concern chefs as much as the storage factors of the eggs once they are received into the hotels. In the warehouses eggs are kept little above freezing point and the humidity of air and the amount of carbon dioxide in the

air are controlled. They will keep about nine months under those conditions. The other methods of long storage of eggs can be achieved by:

Freezing The eggs are washed, sanitized, and then broken into sterilized containers. After combining yolks and whites, they are strained, pasteurized, packed, and quick frozen.

Drying Eggs are broken well mixed and then spray dried at a temperature of approximately 71°C (used by bakers and confectioners).

Let us now talk about the storage of eggs that are received in the hotels.

- . Eggs should be used within a month and stored unwashed, with the pointed end down, in the cold part of the refrigerator. Washing the egg makes the shell permeable to smells. So strong smelling foods, such as cheese, onion, and fish, should not be stored near the eggs because the egg shells are porous and the egg will absorb strong odours.
- · A hardboiled egg will keep for four days if unshelled and two days if shelled. Hard boiled eggs pickled in flavoured vinegar and sterilized will keep for months.
- Once broken, egg yolk will keep for 24 hours and egg white will keep for six to 12 hours in a refrigerator.
- A dessert containing raw eggs such as mousse should be eaten within 24 hours. Fresh eggs can be frozen if they are broken into a bowl, beaten and poured into suitable containers.
- These days egg pasteurizers are available in almost all the hotels and it has become a standard to pasteurize the eggs before they arrive in the hotel.
- One must also receive and store eggs in a plastic crate rather than a cardboard box as paper breeds germs and invites pests.

USES OF EGGS

Most of the eggs are enjoyed on their own, served boiled or fried. Eggs also help to make many dishes successful. They add colour and taste to several dishes. We can use eggs in many roles, but these are governed by the major cooking functions performed by eggs.

So, before discussing the uses, it is important to know the three major cooking functions performed by eggs. These are:

- Coagulation
- Leavening
- Emulsification

Coagulation

It is the firming up of the protein on application of heat. We can vary the coagulation to our taste, and have it as soft boiled, hard boiled, fried, or scrambled. When too intense a heat is used, the eggs become over-coagulated. Eggs coagulate at 65°C and continue to thicken till 70°C. This is below the boiling point of water, which is why the eggs should always be cooked over a low fire.

If other ingredients, such as milk, cream, etc., are added to the eggs, it may raise the coagulation point. This helps to get a softer scrambled egg as eggs never over coagulate to a hard texture.

Uses of eggs based upon coagulation are given below.

- The process of coagulation thickens custard and sauce.
- Coagulated egg protein helps support cream puffs, cakes, and breads. It binds together foods as in meat loaves and burgers. It also coats foods in form of egg.
- To clarify a consomme, a chef beats in egg whites into the soup. The white coagulates, trapping impurities within its strands. This is because, when the egg coagulates, the protein molecules that can be visualized as a network of strands, contracts. The network becomes denser because new protein bridges are formed that interlink the molecules tighter.

Leavening

The effectiveness of the leavening depends on the amount of air trapped within the egg. Yolks when beaten transform into thick light yellow foam. Egg yolks, however, hold less air between its molecules as compared to egg whites that have a power of trapping in air bubbles of large size; thus they can be whisked to a very large volume.

A little acid in the form of cream of tartar or a squeeze of lemon juice helps stabilize the foam. When heat is applied, the air in the cells trapped by egg whites expands, increasing the volume to form a light porous structure desirable in a leavened product. However, if over-beaten, the egg whites stretch to a thin film, on application of heat, more expansion breaks this thin film, which means the product rises gloriously at first, but falls back/collapses later.

It is also important to separate the whites and the yolks as even a small trace of yolks will prevent the whites from rising properly.

Use of eggs based upon leavening:

 Eggs are used for making baked goods such as sponges, cakes, etc. Leavening of eggs gives these products a lighter texture that is desirable.

Emulsification

Egg yolk acts as an emulsifying agent, because its protein can wrap itself around tiny globules of oil. Yolk also contains lecithin, which is an emulsifying agent.

Uses of eggs based upon emulsification:

- · Oil is added to the yolks to form a mayonnaise. The oil is beaten up into tiny droplets, then each drop is caught in an egg yolk protein film, so the droplets remain dispersed in a stable emulsion.
- The emulsifying power of egg yolks also contributes to the crumbly quality of a rich cake. Apart from these cooking functions, eggs are also used in varying proportions in batters and dough to add colour, flavour, and texture to the products.

COOKING OF EGGS FOR BREAKFAST

Eggs find a special place on the breakfast menu. It is eaten by almost 80 per cent people in the world for breakfast. The egg counters are the busiest in breakfast preparations. Eggs are prepared in various ways but the most common cooking methods used for breakfast are boiled, poached, pan-fried, and also deep-fried.

Boiled

Boiling of the egg can be quite tedious, especially when the guest asks for an egg boiled for a typical time. Some hotels have egg timers to monitor the same. But though they are call boiled, the water should be at a simmer and not at a rolling boil.

The eggs should preferably be at room temperature to prevent the shell from cracking.

Like most other egg preparations which have varying degrees of doneness, boiled eggs are cooked hard, soft, or medium.

Soft boiled—3 to 5 minutes

Medium boiled—7 to 8 minutes

Hard boiled—10 to 15 minutes

The boiling time referred to above are for eggs that are at room temperature and placed in water that is already simmering.

The time spans given are broad due to the different sizes of eggs. For smaller eggs lower the time, and for larger eggs higher the limit. Never overcook a hard-boiled egg as the white would get tough and the egg will darken around the yolk.

Fried Eggs

A fried egg has to be glossy, tender, and moist no matter what the degree of doneness is. Always break the eggs into a bowl, so if there are any blood spots or a broken yolk you can save the egg for some other preparation.

Use a well-seasoned pan, heat it over a low fire till warm, add butter but remember the temperature should be just warm, when you slide in the egg. Deep-fried eggs are traditionally fried in hot oil; but mostly when we refer to fried eggs on the buffet they are pan-fried.

Sunny Side Up Fried but not turned over or flipped over, the white should be cooked firm and the yolk should be cooked medium.

Over Easy It is best to make this by placing a sunny side up fried egg under a heat source. The thin film of albumen, which coats the yolk, will cook and form a white layer over the yolk.

Turned Over or Over Well This is a sunny side up fried egg that is flipped over. Both the yolk and white are to be firm.

Scrambled Eggs Whites and yellow are beaten together, then fried and broken up while cooking. Scrambled eggs are normally served soft. Some chefs add milk to the beaten egg.

Poached Eggs It is a simple process, but there are several factors that are critical in achieving a good looking poached egg—one that has a compact, glossy, obviously tender white surrounding an unbroken somewhat thickened yolk. Three major factors that influence the making of good poached egg are:

- The first is the quality and the freshness of the egg. The white will looked ragged and unattractive if the egg is old.
- The second factor is the poaching liquid. This is a liquid with water, salt, and vinegar. Normally a teaspoon of salt and 15 ml vinegar for about 500 ml water should be used. The acid in the liquid helps the protein to coagulate faster and hence retain the shape.
- The third factor is the temperature; it should not be too hot as to create agitation, but hot enough to start cooking the white as soon as the egg hits the water.

Make sure there is enough liquid so that the water temperature does not drop drastically when you introduce the egg. Break the eggs into a bowl and slip it into the side of the dish gently. When done, take them out with a skimmer or a perforated spoon and drain them well. Poached eggs can be served plain on buttered toast or English muffins.

Shirred Eggs

These are eggs which are cooked and served in the same dish, usually a shallow flat-bot-tomed earthenware dish. The dish is coated with butter and then the eggs are broken into it. Cook it over the fire for a while and then put it into an oven.

Omelettes

Cooking an omelette is difficult to master, as a lot of patience and practice is required. A perfect omelette is fluffy and moist, soft in the centre, yellow in colour with no brown at all. It should be cooked at 60–70°C. It should be oval in shape and one continuous piece. One can add fillings into the beaten mixture or can add it before making the first fold. Some chefs add a little water or milk.

Common pitfalls in making good omelettes are:

- Eggs brown and crisp—too much heat. Cook at 60-70°C.
- Egg white blistered—too much heat or too much fat.
- Odd shaped eggs—eggs not fresh
- Eggs sticking—too much heat, too little fat or porous cooking surface or pan not seasoned well

Seasoning a Fry Pan

A porous cooking surface is a nightmare for an egg cook, and a seasoned or primed surface is necessary. Water destroys a seasoned surface, and cooking a hamburger of anything else in an egg pan causes the same frustration. Egg pans should be used for eggs only. A seasoned surface is one that has been polished at high heat with salt and fat to overcome its porousness.

Following are the steps for seasoning a fry pan.

• Heat the pan on a hot fire.

100

- · Add a few drops of oil and a handful of salt.
- · Rub the salt and the oil with a cloth vigorously with pressure into the surface as though you are scouring it with a cleanser.
- · Discard the salt and oil mixture and wipe the pan clean with a cloth.
- Repeat until you can cook an egg without it sticking anywhere in the pan.

CONCLUSION

Eggs discussed in the chapter are edible eggs of poultry that include ducks, chicken, and few other farm-raised birds and game birds also used for consumption of meat. Eggs of other animals are known by specific names, for example, eggs of fish are termed as 'roe', etc. There are many factors that influence the egg laying capabilities of birds. One of them is sunlight, and another is climate. Hens lay the greatest quantity and best quality of eggs in April and May. In winter, considerable number of eggs is preserved when they are comparatively cheap and abundant. If stored for too long they are characterized by musty odour and flavour.

Many varieties of eggs are consumed by humans, ranging from hen, to duck, turkey, partridge, and quail. These eggs are different in sizes and colours and also vary in taste. Some taste oilier such as duck eggs. Whenever the quality of an egg is judged, it is always benchmarked against chicken egg as this is the most common egg consumed around the world. The size of an average egg depends upon the breed, age, and feed of the poultry. For this reason eggs are classified according to sizes such as A, AA, and so on. Eggs are also classified upon the basis of source of the bird such as turkey, goose, duck, etc. or sometimes upon the basis of feed and farm such as organic, vegetarian, Omega-3, etc. Eggs are classified differently by the USA and Europe. There is not much difference between the classifications in these categories. In India we usually follow the European classification.

Utmost care should be taken while selecting the eggs, as these are highly perishable if they are not stored properly. Since one can only come to know the real quality of eggs after they are broken, it becomes essential to device some methods where an egg is judged by conducting few tests such as candling, where an egg is viewed against a light. The rays of light passing through the egg, gives an idea about the quality of an egg. The other common test is to float the egg in a bowl of water. A fresh egg would sink to the bottom and the stale egg would float on top.

Eggs find many other uses in the kitchens apart from simply being cooked into a fluffy omelette. Eggs are used in leavening to produce cakes and soufflés and the emulsification properties of eggs find its usage in thickening sauces and dressings. Check the recipes of classical dishes of egg in the DVD provided.