

Chemical Composition of Eggs

Egg consists of three main parts, the shell, the egg white and the egg yolk. The shell consists of calcite crystals embedded in a matrix of proteins and polysaccharide complex. Inside the shell the viscous colorless liquid called the egg white accounts for about 58 per cent of the total egg weight. The composition of egg white and yolk is given in the following table.

Percentage composition of egg white and yolk

Nutrients	Egg White	Egg yolk
Water	88.0	48.0
Protein	11.0	17.5
Fat	0.2	32.5
Minerals	0.8	2.0

Egg White

Egg white is composed of thin and thick portions. 20-25% of the total white of fresh eggs (1-5 days old) is thin white. The chief constituents of egg white besides water are proteins. Different types of proteins are present in egg white.

Ovalbumin This constitutes 55% of the proteins of egg white. This is a phosphor-glycoprotein and is composed of three components A1, A2, and A3, which differ only in phosphorus content.

Conalbumin This constitutes 13% protein of the egg albumin. It consists of two forms neither of which contains phosphorus nor sulphur.

Ovomuroid It is a glycoprotein. This constitutes about 10% of the egg white proteins.

Ovomucin This protein is responsible for the jelly like character of egg white and the thickness of the thick albumen. It contains 2% of the egg white. Its content in the thick layers of albumin is about 4 times more than in thin layers. It is insoluble in water but soluble in dilute salt solution.

Lysozyme Lysozyme content of egg is 3.5%. This is an enzyme capable of lysine or dissolving the cell wall of bacteria. It is composed of 3 components A, B and C. It binds biotin and makes the vitamin unavailable.

Avidin Avidin is 0.05% of the egg white protein. It is denatured by heat and cooked eggs and do not affect the availability of biotin.

Ovoglobulin It is a protein consisting of two components G1 and G2 and both are excellent foaming agents.

Ovoinhibitor % of egg protein is made up of ovoinhibitor. It is another protein capable of inhibiting trypsin and chymotrypsin.

Egg yolk

Solid content of yolk is about 50%.

Percentage composition of egg yolk on dry weight basis is given below

Nutrient	Granules	Plasma
Lipid	34	77-81
Protein	60	18
Ash	66	2

The major proteins in egg yolk are lipoproteins, which include lipovitellins and lipovitellinin. The lipoproteins are responsible for the excellent emulsifying properties of egg yolk.

Chemical composition of egg contents

1. The weight and composition of a table egg is dependent on heredity, age, season, diet, and other factors. A typical White Leghorn egg usually weighs from 53 to 63 g with an average of 55 g.
2. In addition to water (74%), the main chemical compositions of hen egg are 11.8% lipids, 12.8% proteins, and small amounts of carbohydrates and minerals.
3. Most of the proteins are present in the egg white and the egg yolk, amounting to 50% and 44%, respectively; the eggshell contains the rest of the proteins. The yolk accounts for slightly over one-third of the edible portion, but it yields three-fourths of the calories and provides all or most of the fat in whole eggs.
4. The yolk comprises 48% water, 16% protein, 32.6% fat, and some minerals and vitamins. The white consists of 88% water, 10% protein, and some minerals. The amount of lipid in the egg white is negligible (0.01%) compared with the amount present in the yolk.
5. The shell makes up 11% of the weight of an egg, and approximately 98% of the shell consists of calcium. Carbohydrates are a minor component of hen eggs. Their average content is about 0.5 g per egg, 40% of which is present in the yolk.
6. Carbohydrates are present as free and conjugated forms which are attached to proteins and lipids. Glucose accounts for about 98% of the total free carbohydrate in the white.
7. The content of carbohydrate in egg yolk is about 1.0%; 0.7% of it consists of oligosaccharides bound to protein, composed of mannose and glucosamine; the remaining 0.3% is free carbohydrate in the form of glucose.
8. About 94% of the minerals are in the eggshell fraction; the rest are distributed in egg white and egg yolk. Most of the minerals are in conjugated form, and only a small portion is present as inorganic compounds or ions.
9. Calcium represents over 98% of total mineral in the shell; other inorganic components include phosphorus, magnesium, and trace contents of iron and sulfur. Egg yolk contains 2% minerals, phosphorus being the most abundant.
10. More than 61% of the total phosphorus of egg yolk is contained in phospholipids. The major inorganic components of egg white are sulfur, potassium, sodium, and chlorine.

Gross Composition of the Egg

%	water	protein	fat	ash
Whole egg	74	13	11	1
White	88	11	0	0
Yolk	48	17	13	1