

# Egg Grading

## **How the egg is made:**

The reproductive system of the hen is divided into two main parts, the ovary and the oviduct:

### The ovary

When the pullet chick is first hatched it contains up to 4000 tiny yolks. Each of these yolks is within a sac or follicle. Each yolk is separate from the others. All of these little sacs, each containing the yolk, form a cluster (like grapes). This cluster is attached to the middle part of the back about midway between the neck and tail. When the hen is grown, if she is healthy and well fed, the yolks start developing. The yolks go through several stages of development and there are yolks of various sizes within the cluster.

### The oviduct

Normally one yolk matures at a time and when it is mature it is released by a rupture in the sac. The yolk then falls into the body and is picked up by the funnel of the oviduct. The oviduct is a long tube about two and one-half feet long, containing glands which give out fluid that helps complete the making of the eggs. As the yolk passes through the oviduct the white and shell is added. Fertilization would take place, if it occurred, in the oviduct. When the egg is first laid, it is at its best as far as quality is concerned. With the possible exception of cleaning the shell, man can do nothing to improve the quality of the egg but he can do a lot to retain this quality as long as possible. It is important that everyone handling the egg, from the "hen to the pan" do his job to retain this quality. This includes flock owners, truckers, candlers, merchants and cooks.

There are four parts of an egg:

1. The yolk which has four parts and constitutes approximately 31% of the total weight of the egg.
2. The white or albumen which consists of four distinct layers and constitutes about 58% of the weight of the egg. Water is its major component. The layers are the chalaziferous layer which is continuous with the chalazae which hold the yolk in place, the inner thin layer, the firm or thick layer and the outer thin layer.
3. Shell membranes which are tough and fibrous and are composed chiefly of a protein similar to that which is in hair and feathers. There is an outer shell membrane and an inner shell membrane. They are only about 24 ten-thousandths of an inch thick. These separate to form the air cell.
4. The shell which has three layers and is approximately 11% of the egg.

### **Care of Eggs:**

Immediately after the egg is laid it begins to lose quality, even if it is removed from the nest, cooled, packed and marketed promptly. When processing and grading eggs certain steps are necessary to maintain eggs at the highest level of quality, some of the steps to be taken include:

1. Gathering eggs frequently (at least 3 times a day).
2. Handling eggs carefully to prevent breakage.
3. Cooling the eggs promptly and storing them under optimum conditions of temperature and humidity.
4. Packing the eggs in clean cool packing materials.
5. Packing clean eggs separately from dirty eggs.

Eggs are not required to be washed if they are clean. However, even with good farm management, a certain percentage of dirty eggs will be produced. Producers must bear in mind that a dirty egg, covered with bacteria, may become contaminated from the bacteria if it is mishandled. This is possible because the egg shell has 6000 to 8000 pores in it. A washing solution that is colder than the egg causes the egg content to contract and allows bacteria to be drawn through the shell. Washing should be done in a manner that will minimize the possibility of bacteria entering the shell.

Keeping temperature and humidity at optimum levels retard loss in quality. The processed eggs must be held at 45 degrees or below. Precautions should be taken to prevent eggs from sweating (condensation or moisture forming on the shell) as this can allow bacteria to grow.

### **The quality in the egg:**

The United States Department of Agriculture (USDA) and Georgia Department of Agriculture (GDA) recognizes three grades of eggs: AA, A, and B. Eggs that do not meet these grades are considered a loss. The grade of an egg is based on the condition and quality of the shell and contents of the egg. The color of the shell has no effect on the quality of the egg and is not a factor in grades or standards. However, brown eggs are more difficult to classify as to interior quality than white eggs. The best way to determine the quality or grade of an egg is to break it open and look into it. This is not practical so we use the next best method and that is to place the egg in a strong beam of light and study the inside appearance of the egg to determine the quality. This is called candling.

#### *Descriptive Terms used in Egg Grading*

##### Shell

- Practically Normal – This shell is of usual shape of an egg, of good even texture and free from rough areas or thin spots. Some slight ridges and rough areas or thin spots that do not affect shell strength and texture are permitted.

- Slightly Abnormal – This shell may be slightly unnatural in shape and slightly faulty in texture or strength. It may show ridges but not thin spots.
- Abnormal – this shell may be misshapen or faulty in texture and strength, may show pronounced ridges, thin spots or rough areas.
- Checked or Cracked – An individual egg with a broken or cracked shell but the shell membrane is not broken, therefore the contents of the egg are not leaking out
- Leaker – Shell and membrane are broken and contents can leak out or are leaking out.

#### Air Cell

- Regular – This cell maintains a fixed position in the egg and shows a fairly even outline.
- Free Air Cell – Moves freely to uppermost point in the egg as it is rotated slowly.
- Bubbly Air Cell – The air cell has been ruptured and results in one or more separate air bubbles.

#### Yolk

- Well Centered – This yolk occupies center of egg and moves only slightly as the egg is turned
- Fairly Well Centered – This yolk is not more than  $\frac{1}{4}$  of the distance from its normal central position towards the ends of the egg and swings not more than  $\frac{1}{2}$  of the distance towards the sides as the egg is turned.
- Off Center – this yolk is distinctly above or below center and swings close to the sides of the egg as it is turned.

#### What determines the grade

There are four main points or factors that are studied in determining the grade of the egg. These are shell, air cell, yolk and white (or albumen). All of these factors are important and all must be considered in determining the grade. One thing to remember in grading an egg is no matter how high the grade is on three of these factors, if it falls down in the fourth factor, the egg must be put in the grade it falls to on the fourth factor.

#### The shell

Shell shape, texture and cleanliness should be judged in bright ambient light prior to candling. Checks may also be observed at this time. However, blind checks must be observed under a candling light. Frequently a bubbly air cell in a fresh egg will indicate a blind check. In grades AA and A the shell must be clean and unstained. In grade B the shell must be clean but may be stained up to  $\frac{1}{32}$  of the area of the shell if localized or  $\frac{1}{16}$  if scattered. In grades AA and A the shell must be practically normal in shape and texture. In grade B the shell may be abnormal. All three grades must have unbroken or unchecked shells.

#### The air cell

The air cell is formed when the outer shell membrane separates from the inner shell membrane. When an egg is first laid it has little or no air cell but as it cools

the shell membranes separate and the air cell is formed. As the egg breaks down in quality, the air cell grows in size. In other words the higher the quality of the egg the smaller is the air cell. You usually find the air cell at the large end of the egg when it is candled. It should be regular in its outline and remain stationary. Sometimes the shell membranes are damaged and the air cell floats around as the egg is turned in front of the light. This does not lower the grade. The air cell in a grade AA may not exceed 1/8 of an inch in depth, unlimited movement, and free or bubbly. The air cell in a grade A may not exceed 3/16 of an inch in depth, unlimited movement, and free or bubbly. The air cell in a grade B may be over 3/16 of an inch in depth, unlimited movement, and free or bubbly.

### The yolk

The yolk should be in the center of the egg. The white and two small white cords called chalaza, help to keep it in the center. As the egg loses quality, the white and chalaza loses its ability to keep the egg well centered. As the egg loses quality, the yolk also absorbs water from the white, causing the yolk to enlarge and flatten out. When the egg is held to the candling light, the higher the grade of the egg, the harder it is to see the outline of the yolk. As the yolk enlarges and moves more freely, the easier it is to see. In grade AA the yolk is only slightly defined and practically free from defects. In grade A the yolk is fairly well defined and practically free from defects. In grade B the yolk is plainly visible, enlarged and flattened, may have clearly visible germ development but no blood development. The yolk may show other serious defects that do not render the egg inedible such as a small blood or meat spot or double yolk.

Germ development may show up as dark spot on the yolk, a circular dark area near the center of the yolk shadow or as a ring of blood on the yolk. Once it shows blood development the egg is a loss.

### The white or albumen

The white is made up mostly of water. When we candle an egg, we can't see the white but by studying the position and movement of the yolk we determine the condition of the white. In a grade AA the white is clear and firm. In a grade A the white is clear and reasonably firm. In grade B the white is weak and watery and small meat or blood spots may be present. These blood or meat spot must not be more than 1/8 of an inch in size in aggregate and must not be due to germ development. Blood or meat spots are made when a portion of the reproductive organs sloughs off during the production of the egg or the egg is fertilized and the germ cell begins development.

### Candling Procedures

When hand candling, the grader should always have clean dry hands to avoid staining the egg. In order to obtain a proper view of the egg while candling it is necessary to have the contents of the egg spinning within the shell at the time of viewing. The content of the egg can be set in motion by a movement of hand and wrist in an arc of about 180 degrees. Stopping the hand motion at the end of

the arc without moving the hand or body permits the contents of the egg to spin freely. The long axis of the egg should be held at about a 45 degree angle to the aperture of the candling light. The thumb and index finger should be on opposite sides of the shell without obstructing the view of the grader. Consider each factor of the egg separately. These factors are shell, air cell, yolk position and condition of the white. A grader must learn to develop speed and skill in handling the egg through practice. You must develop speed without sacrificing accuracy. The first view the candler gets as he or she turns the egg is usually the view that most accurately tells the true quality. Chances are if the candler makes a decision on a slow or longer view the egg will be put in a lower grade than it belongs. When eggs are returned to the carton they should be placed carefully not dropped and always packed with the small end down.

### **Weight Classes for Shell Eggs:**

<u>Size or weight class</u>	<u>Minimum net weight Per dozen</u>	<u>Min Net Wt. for Indv. Eggs at rate per doz</u>	<u>Min. net Wt. for case per 30 dozen</u>
<i>Jumbo</i>	<i>30 ounces</i>	<i>29 ounces</i>	<i>56 pounds</i>
<i>Extra Large</i>	<i>27 ounces</i>	<i>26 ounces</i>	<i>50 1/2 pounds</i>
<i>Large</i>	<i>24 ounces</i>	<i>23 ounces</i>	<i>45 pounds</i>
<i>Medium</i>	<i>21 ounces</i>	<i>20 ounces</i>	<i>39 1/2 pounds</i>
<i>Small</i>	<i>18 ounces</i>	<i>17 ounces</i>	<i>34 pounds</i>

### **Package Labeling**

The label should be affixed at the time of candling and packaging. The label must be at least 2" x 4" on a case and both case and carton should have letters not less than 1/4 of an inch.

When eggs are sold in cartons, the cartons must show the date packed or an expiration date, which shall not exceed 45 days from the date packed and the grade and size, together with the name and address of the packer and safe handling instructions. The state of origin may also be given.

### **Dates for Egg Cases/Cartons**

Under Georgia regulations, **40-3-1.01 Open Dating on Egg Cases and Egg Cartons**, all eggs that are sold, offered for sale or stored for sale at retail or wholesale shall use an Open Date to express the packing date or expiration date.

(a) Definitions.

1. Open Date: Means the use of letters (for the month) together with number(s) (for the day of the month).
2. Pack Date: Means the date the eggs were washed, candled, and packed.
3. Expiration Date: Means the last date the eggs shall be sold at retail or wholesale.

(b) Manner of Expressing the Open Date: Open dating shall consist of a

combination of three letters (for the month abbreviation) and number(s) for the day of the month. Example: JUN 10

(c) Manner of Expressing the Pack Date: A pack date shall be the use of an Open Date (as defined in 40-3-1-.01(b) of these Regulations) with no words, numbers, or letters preceding or following the Open Date. Example: JUN 10

(d) Manner of Expressing the Expiration Date: An Expiration Date shall be the use of an Open Date (as defined in 40-3-1-.01(b) of these Regulations) preceded by the abbreviation "EXP" (Example: EXP JUN 10) or the use of an Open Date (as defined in 40-3-1-.01(b) of these Regulations) preceded by the term "Sell By," (Example: Sell By JUN 10). The Expiration Date shall not exceed forty-five (45) days from the date the eggs were washed, candled, and packed.

(e) Prohibited Act: The following act and the causing thereof are hereby prohibited.

1. Eggs are not to be sold or offered for sale at retail or wholesale after the expiration date.

### **Transportation and marketing of eggs**

Eggs must be transported, stored and displayed at an ambient temperature of 45 degrees Fahrenheit or below. The temperature must be maintained by mechanically refrigerated equipment.