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HIGH QUALITY EGGS

Producer to Consumer

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USDA EGG GRADES of Quality

	AA	A	B
Shell	clean unbroken normal shape	clean unbroken normal shape	slight stain unbroken slight abnormal
White	clear firm	clear reasonably firm	clear slight weak
Yolk	stands high well centered slightly defined free of defects	fairly high fairly well centered fairly well defined slight defects	flattened off center plainly visible moderate defects

The higher quality eggs (AA or A) are ideal for all purposes but are especially good for frying and poaching where appearance is important.

USDA EGG GRADES by Size

Size	Ounces per dozen	Grams per egg	% Wt. of large egg
Extra large	27	64	112
Large	24	57	100
Medium	21	50	88
Small	18	43	75

All 3 consumer quality grades are available in all weight or size classifications. Price variations for various sizes depend upon available supply. Generally speaking, if there is less than 7¢ price spread between one size and the next smaller size, you will get more for your money by buying the larger size. Refrigerate eggs promptly at home to help maintain quality.

Maintaining Egg Quality

Poultrymen need to do everything possible to preserve the high quality of new laid eggs. Frequent gathering, immediate cooling and marketing within the shortest possible time are essential. Adequate facilities, equipment and handling methods are necessary.

Time, temperature and humidity determine whether eggs maintain their high quality or lose it quickly. These conditions are most important while you hold eggs on the farm and during the marketing process. High temperature causes rapid thinning of the egg albumen because of loss of carbon dioxide. Low humidity — especially with high temperatures — results in enlarged air cells because of evaporation. Both contribute greatly in downgrading eggs. Temperatures of 50 to 55° F and a relative humidity of 70 to 80% are the most desirable ranges for maintaining egg quality. Usually this requires an eggroom with mechanical refrigeration and humidifying equipment.

Eggs will "sweat" because of moisture condensation from the air when removed from cold storage into an area where the temperature is more than 10 degrees higher than in storage.

The Egg-Cooling Room

An egg-cooling room is essential in the modern egg-producing plant. The size of this room is determined by the size of flock, rate of egg production and frequency of marketing. When you plan an egg-cooling room, plan it large enough to permit future expansion. Table 1 shows the approximate size of the eggroom based on flock size, production rate and marketing frequency.

Locate the cooling room near the laying house to reduce labor costs and decrease egg breakage. Place the room next to cleaning and grading facilities if possible (Fig. 1). Building the cold storage part into an existing structure may be feasible and more economical.

Table 1. Approximate size of egg-cooling room required for various flock sizes, based on 70% production.

Size flock	Cooler capacity — number of 30-dozen cases for: 1 delivery per week	2 deliveries per week	3 deliveries per week	Min. inside diameter of cooling room (7′ height)	Cooling unit size (ton)
1,000	15	8	6	5 x 5 ft.	1/4
2,000	30	16	12	6 x 6 ft.	1/3
3,000	45	24	18	7 x 7 ft.	1/2
5,000	75	40	30	8 x 8 ft.	3/4
10,000	150	80	60	10 x 12 ft.	1

The size of refrigeration unit required will be determined primarily by flock size and size of the egg-cooling room. Refrigeration equipment is usually rated on the number of British thermal units (BTU) of heat it can remove in 1 hour. Some systems are rated in tons with a ton of refrigeration being equal to 12,000 BTU per hour. Many equipment manufacturers recommend installation of multiple units in the eggroom when more than 1 ton of refrigeration is required.

Humidity — You will usually need a supplemental source of moisture to provide adequate humidity. Small commercial humidifiers with automatic humidistat controls do an excellent job in the egg room. Evaporative coolers, if used without an outside air connection, will furnish adequate moisture and can also be controlled by a humidistat. Water in the drip pan of the refrigeration unit evaporator can sometimes be used to supply additional humidity, but the feasibility of this depends on the unit's design.

Arrange the cooling room according to the cooling unit location. The basic idea is to have an air circulation pattern so that air leaving the cooling unit passes over cased eggs first and then around the baskets of eggs before it returns to the cooling unit. Precooling eggs in baskets or flats before casing them is good, standard practice in keeping egg quality.

Construction may be conventional frame type with 3 to 4 inches of either bat or loose-fill insulation in the walls and 6 to 8 inches in the ceiling (Fig. 2).

Place vapor barriers of aluminum foil or plastic materials on both sides of the insulation. High humidity in the cooling room combined with seasonal temperature variation results in periodic higher temperatures inside the cooling room than outside. When this occurs, only a good vapor barrier prevents moisture from condensing inside the insulation. Once wet, insulation loses its insulating value.

Use waterproof material for interior walls. You can also use exterior plywood or other building materials that will stand up under high humidity. Seal and paint with an oderless paint to prevent moisture penetration.

Build concrete floors 4 inches thick over 4 or more inches of gravel fill. If floors are good, insulate them adequately. Floor drains are essential.

Use an insulated refrigerator door at least 3 feet wide. Seal it with weather stripping. Raised door sills are not recommended if eggs are handled on carts.

Arrange equipment to facilitate movement of eggs from processing to storage to market. A 1- to 2-day supply of empty cases and cartons should be stored in the cooler. This gives them time to cool and absorb moisture.

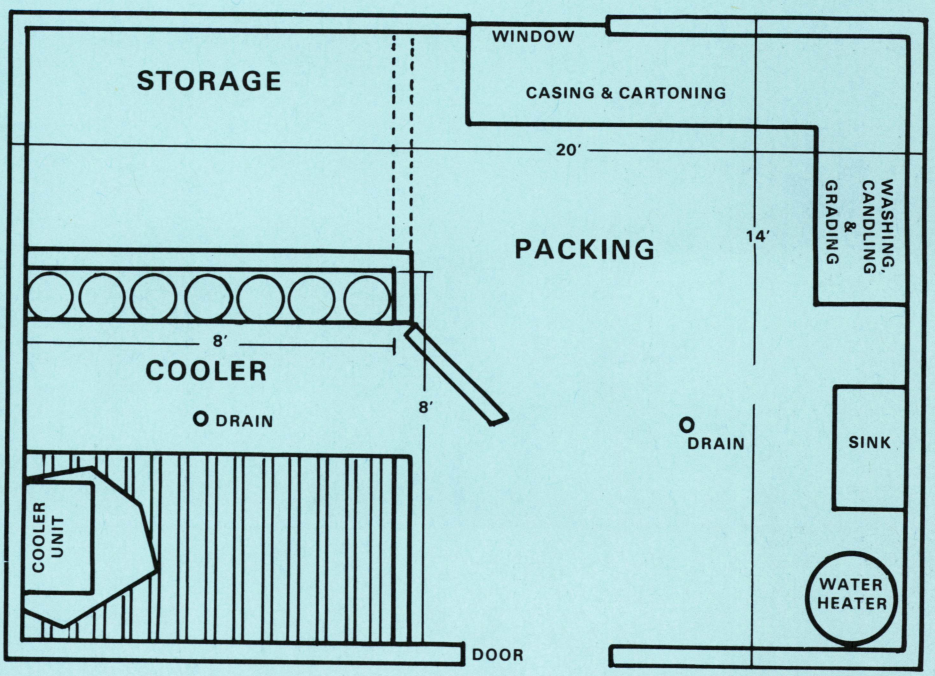

Fig. 1. Suggested floor plan for egg-cooling room with adjacent packing room.

Grading, Packing Room

Locate the grading and packing room adjacent to the egg-cooling room (Fig. 1). See that it is well lighted and contains an efficient egg cleaner and adequate egg-packing space. The ideal temperature is not more than 10 degrees above that in the cooling room. Candling and grading equipment are also needed if eggs are to be graded. The size of the grading and packing room will depend to some extent on the size of the laying flock. However, the room must be large enough for efficient and convenient location of cleaning, grading and packaging equipment.

Processing

Cleaning soiled eggs is not a substitute for good management to produce clean eggs. At best, cleaning is an expensive and time-consuming chore for most producers.

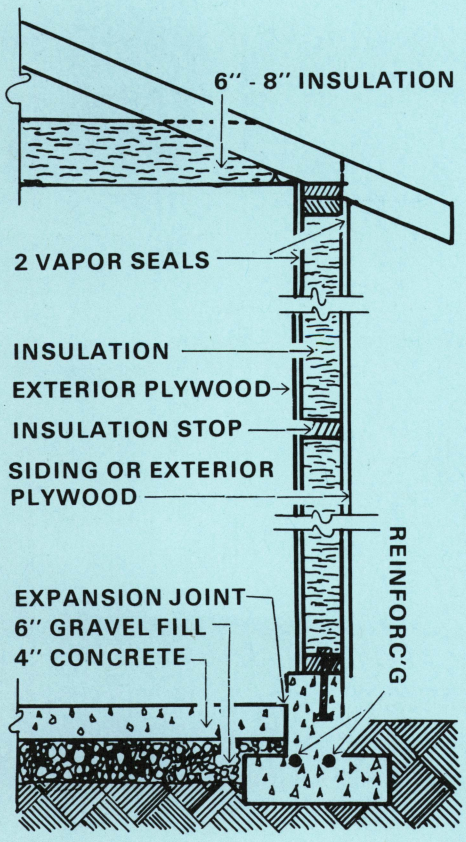

Fig. 2. Detailed cross section of egg-cooling room.

Dry cleaning with abrasives reduces spoilage hazards but is slow and tedious. The needed equipment is also expensive for the volume of eggs that can be cleaned.

Washing eggs reduces the labor requirement but can lead to serious spoilage problems unless it is properly done. Higher washing temperatures generally reduce the incidence of spoilage in washed eggs (Fig. 3). However, high washing temperatures result in excessive breakage in some egg washers. The use of washing temperatures up to 135° F requires careful control of both time and temperature. High temperature produces a rapid rise in the internal temperature of the egg and may result in coagulation of the albumen. Proper washing of eggs is not detrimental to the interior quality as measured either by candling or by Haugh units.

Egg spoilage associated with washing is caused by bacteria which penetrate the wet shell immediately after washing. Off flavors are often noticeable to consumers before spoilage can be detected by candling. This results in dissatisfied customers and reduced egg consumption.

If you wash eggs — follow these suggestions:

1. Wash soiled eggs only. This will minimize spoilage and breakage.

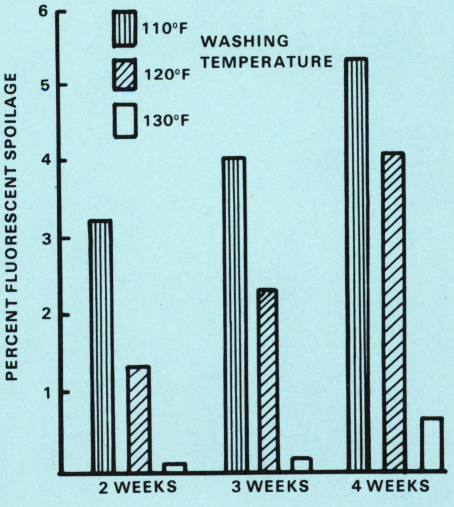

Fig. 3. The effect of washing temperature on the incidence of greenrot spoilage through 4 weeks of storage at 50° to 55°, 70 to 80% R.H.

2. To prevent bacterial build-up, change the wash water after each 5 baskets when using single-basket washing.
3. Use a sanitizer detergent.
4. Use a washing temperature of at least 120° F. Higher temperatures up to 135° F reduce spoilage, but the actual temperature used varies with the washing time and machine.
5. Do not hold washed eggs more than 5 to 10 days.
6. Clean and sanitize the egg washer daily.

Shell treatment seals the pores of egg shells with mineral oil or an oil emulsion to prevent loss of carbon dioxide and moisture. Apply the oil either by dipping or spraying eggs.

Oil dipping is an effective treatment but there are disadvantages. Oil dipping produces a shine on the shell and makes prevention of a bacterial build-up in the oil supply difficult.

Oil spraying applies a fine mist to the large end of the egg. An electric paint sprayer will do this effectively if you spray while the eggs are on flats. Spraying seals about three-fourths of the shell pores and is nearly as effective as dipping when eggs are marketed rapidly. Aerosol pressure cans are effective in spraying but are somewhat more expensive.

Frequent egg delivery is essential to high quality for the consumer. The sooner eggs reach the consumer, the higher their quality. Top-quality eggs reach the consumer no later than 1 week after they are produced.

Grading Eggs

USDA grades and standards have been developed for market eggs and are the basis on which quality eggs are sold.

Most commercial producers use automated equipment including mass light scanning to detect inferior egg quality. Small flock producers will need to use hand candling with a single light candler. The reasons for candling fresh eggs are to remove eggs that contain blood spots, have dark yolk shadows and are irregular shaped or have checks or cracks in the shell. Thinning of the white as evidenced by yolk shadow and movement and air cell size must also be considered if eggs are candled and graded after being held in storage for several days.

Producing High Quality Eggs

To produce and maintain high quality eggs, you must:

1. Use clean, dry litter in the laying house.
2. Use clean dry nesting material.
3. Provide at least 1 nest for every 4 layers.
4. Gather at least 3 times daily. In warm weather, 4 times daily is better.
5. Gather eggs on flats in wire baskets. Move them immediately to the cooler for rapid cooling.
6. Keep layers confined at all times.
7. Feed high quality feed.
8. Keep an all-pullet flock.

Feeding affects egg quality in yolk color, shell quality and flavor. Specific feed ingredients such as corn and alfalfa meal contain carotene and xanthophyll pigments. These affect yolk color and may indirectly affect grade. In turn, grade affects price and the producer's income.

Feeding can affect shell strength. Most commercial rations today have adequate nutrients to maintain high egg production. However, recent work of the Idaho Agricultural Experiment Station shows that for maximum shell strength, feed calcium level needs to be above the generally recommended 2.25%. The layer ration should contain a minimum of 3.5% calcium or free-choice oyster shell should be supplied.

The age of hens and the length of time they have been in production affect both shell and interior quality. Fig. 5 also shows the decline in shell quality as influenced by layer age. Fig. 6 shows a similar decrease in interior quality. Particularly notice in Fig. 6 that the grade of fresh eggs is at the lower limits for grade AA after the hens have been laying for 10 months.

Answers to Commonly Asked Questions About Eggs

What are the stringy white pieces in egg whites?

These are perfectly normal components of eggs — the chalazas. The chalaza is the thick, white, rope-like material which appears on opposite sides of the yolk during formation of the egg. They anchor the yolk in the thick white. Prominent chalazas indicate high quality eggs. As eggs become poorer in quality, the chalazas tend to disappear.

Why do some hard-cooked eggs have discolored yolks?

Sometimes there is a greenish coating around the yolks of hard-cooked eggs. Usually, they have cooked at too high a temperature or for too long a time or they have not cooled rapidly following cooking. The greenish color comes from sulfur and iron compounds in the egg. These compounds form at the surface of the yolk when eggs are over-cooked. Even though the greenish color appears, the eggs may be eaten. They are wholesome and nutritious, and the flavor is unaffected.

What are blood spots?

Blood spots are caused by the rupture of a blood vessel on the yolk surface during formation of the egg or by a similar accident in the wall of the oviduct. There are many factors which contribute to the incidence of the spots. These include breed, feed and condition of the hens.

About 1% of all eggs produced have blood spots in them. Most of these eggs are removed during the grading, but occasionally one is overlooked. These spots are more difficult to detect in freshly laid eggs than in stored eggs.

Why are some hard-cooked eggs difficult to peel?

Frequently shells do not peel easily from hard-cooked eggs. This condition is related to fresh eggs. As eggs are stored, they lose carbon dioxide and become easier to peel when hard-cooked. The consumer should understand that eggs which will not peel easily when hard-cooked are freshly laid and generally of high quality. Eggs that have been stored for several days will usually peel easily.

Why do some eggs have cloudy whites?

Cloudy or milky whites are noticeable in freshly laid eggs or eggs which have been oil-treated while fresh. The cloudiness indicates that the carbon dioxide naturally present in fresh eggs has not yet escaped as a gas through the shell. As this gas escapes, the white becomes clearer.

Are yolks lighter in color than they used to be?

Sometimes. Yolk color almost completely depends on the feed the hen eats. Birds that have access to grass and pasture or that have yellow corn or alfalfa in their diet tend to produce dark-colored yolks. Yolk color does not affect nutritive value or cooking characteristic.

Are eggs always wholesome?

Fresh eggs are perfectly wholesome foods, but if they are stored in a soiled condition, become cracked or are otherwise mishandled, they may become contaminated with bacteria. Even then, unless they are actually spoiled, adequate cooking makes them safe to eat.

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