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Popular Article

Nutritional Factors Effecting the Interior Quality of Egg

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Introduction

Egg is composed of shell (11%), albumen (58%) and yolk (31%). Internal quality of egg is based on relative viscosity of albumen, freedom from foreign matter in the albumen, shape and firmness of the yolk and also free from yolk defects.

1. Yolk quality is measured by

- A) yolk index: measured by spherometer and vernier calipers, Yolk index of chicken egg doesn't exceed 0.5.
- B) Yolk color: assessed by yolk color rotor or yolk color fan. Depends on hen's diet.
- C) Yolk firmness: The yolk of a freshly laid egg is round and firm. However, as the egg ages, degeneration of the vitelline membrane occurs and water from the albumen moves into the yolk and gives the yolk a flattened shape.

2. Albumen quality is measured by

- A) Albumen index: ratio of average height of the albumen to the average breadth and length. Albumen index in chicken egg doesn't exceed 0.1.
- B) Haugh unit score: Albumin quality is measured in terms of Haugh Units (HU) calculated from the height of the albumin and the weight of the egg.
Haugh Units = $100 \log (H - 1.7 W^{0.37} + 7.6)$, Where: H = albumen height (mm); W = egg weight (g)
Haugh Index: AA: 72 or more, A: 71 – 60, B: 59 – 31, C: 30 or less



C) pH of albumen: In Fresh egg the albumen pH is 7.8. Liquefaction leads to decreased albumen quality: pH 9.7

Defects in eggs which can deteriorate internal quality are presence of bloodspots, meat spots, watery whites, pale yolk, mottles and discolored yolk and whites.

Nutritional factors affecting egg white quality

The composition of egg white is strongly related to the diets fed. Vitamins concentration in feed, mainly water-soluble vitamins, has been shown to affect vitamin levels in egg white. Riboflavin, folic acids, niacin, thiamine, pyridoxine, pantothenic acid, biotin, vitamin B12 are well transferred into the egg white and their concentrations depend on feed concentration.

- Blood spots found in the egg weight could also have some nutritional links. Blood spots are affected by mycotoxins contamination like ochratoxin, vitamin A and vitamin K.
- Vanadium concentration can lead to watery egg whites.
- Greenish albumen in fresh eggs might be due to 1. Riboflavin (vitamin B2) in feed: this is natural and is not undesirable.
- Cloudy white condition might be due to 1. High CO₂ inside egg: may result from oiling egg too soon after lay, 2. Refrigeration of fresh eggs at low temperatures (32 to 39°F).
- Pink white condition due to Cottonseed oil (contains the fatty acids malvalic and sterculic acid)
- Blood spot: Deficiencies of vitamin K (probably rare) or vitamin A. Sulfaquinoxaline may increase the incidence if vitamin K is marginal.

Nutritional factors effecting yolk quality

- Crude cottonseed oil and velvet weed seed causes rubbery yolk.
- Yolk color depends on the yellow-orange pigments (xanthophylls) present in the plants which might get deposited in the yolk. Yellow corn and alfalfa meal causes yellow yolks. White corn, grain sorghum (milo), wheat or barley causes light-colored (platinum) yolks. Natural yellow-orange substances such as marigold petals may be added to light-colored feeds to enhance yolk color.
- Iron and sulfur cause greenish line around yolk.

Mottling in yolk

The degree of yolk mottling is related to the amount of degeneration of the vitelline membrane. The severity of mottling depends on the extent of damage occurred to the membrane.



Vitamin E has been shown to increase vitelline membrane strength.

Dietary factors causing mottling

1. Anticoccidial drugs
2. Cottonseed meal: more gossypol content leads to mottling. If gossypol is $<0.005\%$ then addition of iron sulphate to gossypol in 4:1 ratio will decrease mottling. But if gossypol is $> 0.005\%$ no effect of iron sulphate
3. Grain sorghums with 1 or 2% of tannins
4. Deficiency of calcium for 12 days

