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## Designer Eggs: A New Frontier in Poultry Nutrition

**Dr. Manthan Bhagora**

*Riddhi Polytechnic & Animal Husbandry collage, Kamdhenu University, Himatnagar*

### Introduction

Eggs have always been considered a “superfood” due to their high-quality protein, essential vitamins, and easy digestibility. However, with growing awareness about lifestyle diseases and nutritional deficiencies, consumers today want foods that offer targeted and additional health benefits. This demand has led to the rise of designer eggs that look just like regular ones but carry a superior and customized nutrient profile. Produced through advanced feeding strategies and scientific nutrition, designer eggs are becoming a game-changer for the poultry industry and a health booster for consumers. Designer eggs are produced by feeding egg-laying hens with a special diet rich in certain vitamins and other nutrients. The special diet usually includes kelp, flax seeds, canola oil and marigold extract.

### What Are Designer Eggs?

Designer eggs are nutritionally improved eggs created through scientific feeding practices. No genetic modification is involved; instead, hens are given feed enriched with specific ingredients such as:

- Flaxseed or fish oil (for omega-3)
- Organic selenium (for selenium-enriched eggs)
- Vitamin E and A supplements
- Herbal additives and probiotics
- Pigments like lutein (for improved yolk colour and eye health)

As hens consume these enriched feeds, the nutrients get deposited in the egg. This makes designer eggs healthier and more functional than regular eggs.

### How Are Designer Eggs Produced?

Designer eggs are produced primarily by scientifically modifying the diet of laying hens so that specific nutrients are naturally deposited into the egg yolk and albumen. The process begins with nutritional supplementation, where the feed is enriched with targeted ingredients such as flaxseed, fish oil, algal meal, vitamin E, selenium yeast, iodine sources, probiotics, or

herbal additives depending on the type of designer egg desired. These nutrients are absorbed through the hen's digestive system and transferred into the developing egg without any artificial injection or genetic modification. Functional feeds containing antioxidants or organic minerals further improve nutrient deposition and egg quality. Although certain breeds may naturally transfer specific nutrients more efficiently, feed manipulation remains the most effective method. Proper management practices—including good housing, optimal lighting, stress reduction, and disease control—ensure better feed intake and metabolic efficiency, enhancing the quality of designer eggs. Before marketing, these eggs undergo laboratory testing to confirm nutrient levels, ensuring that the final product meets consumer health expectations.

### Why Are Designer Eggs Gaining Popularity?

- 1. Health-Conscious Consumers:** People today are more aware of the link between diet and health. Designer eggs provide a simple way to improve daily nutrient intake.
- 2. Rich in Essential Nutrients:** These eggs may contain higher levels of omega-3 fatty acids, which help reduce heart disease, strengthen the brain, and support immunity.
- 3. Functional Food Trend:** Designer eggs fit perfectly into the global movement toward “functional foods” foods that provide extra health benefits beyond basic nutrition.
- 4. Safe and Natural:** Since designer eggs are produced through diet modification and not through genetic engineering, they are considered safe and natural.

### Types of Designer Eggs

#### Omega-3 Enriched Eggs

Feed ingredients like flaxseed, fish oil, or algae are added to increase omega-3 fatty acids, which help improve heart health.

#### Vitamin-Enriched Eggs

Designer eggs have been produced that contain higher concentrations of several vitamins, especially vitamins, A and E. The vitamin content of the egg is dependent on the dietary concentration of any specific vitamin to some extent. The efficiency of transfer of different vitamins into the egg varies with different vitamins. Vitamin transfer efficiency and cost of the vitamin must be taken into consideration when determining the economic feasibility of marketing such eggs. Eggs higher in Vitamin E are currently available in stores.

#### Mineral-Enriched Eggs

The shell contains the majority of the minerals in an egg. There are approximately 2,200 mg of calcium and 20 mg of phosphorus in the shell. There has been very little success in changing the calcium and phosphorus content of the albumen and yolk. It is possible, however,

to increase the content of selenium, iodine and chromium. This has been done through dietary supplementation of the hen. These three minerals are important in human health. Therefore, there has been some interest in producing designer eggs rich in these minerals.

### **Herbal Eggs**

Hens are fed herbal additives such as tulsi, turmeric, garlic, spirulina, or moringa — producing eggs with antioxidant and immunity-enhancing properties.

### **Low Cholesterol Eggs**

Normally, a large egg contains approximately 200 to 220 mg of cholesterol. Lowering egg cholesterol in egg can be brought out by dietary manipulation or pharmacological intervention (drugs). Drugs have been successful in lowering egg cholesterol by as much as 50%. Drugs lower cholesterol in the egg by either inhibiting the synthesis of cholesterol in the hen or by inhibiting the transfer of cholesterol from the blood to the developing yolk on the ovary. At present, the drugs which have shown promise in lowering cholesterol are not yet approved by the FDA for commercial use. Chromium supplementation to laying hen diets at concentrations of less than 1 ppm have been shown to lower egg cholesterol and also improve egg interior quality. The most effective way to lower egg cholesterol content is to lower the energy consumption of the hen. Therefore, feeding hens with a special all-vegetarian diet that is higher in protein and fibre, and enriched in vitamin E can result in the production of low cholesterol eggs.

### **Pigment Enriched Eggs**

The colour of the yolk is a reflection of its pigment content. In addition, the type of pigment in the egg and its concentration are directly influenced by the dietary concentration of any particular pigment. Consumer preferences vary greatly on yolk colour, even in the same country. Colour is described on the basis of the Roche Colour Fan (RCF). Yolk colours from 6 to 15 can be achieved by using only natural pigment obtained from natural raw materials. Natural sources can be from plants such as marigold, chili, or corn. The high protein blue-green algae known as Spirulina has also been shown to be a very efficient pigment source for poultry skin and egg yolk. Pigment enriched eggs may be beneficial in preventing macular degeneration, a major cause of blindness in the elderly. Higher intake of carotenoids reduced the risk of age-related macular degeneration. The most effective carotenoids were lutein and zeaxanthin, which are commonly found in dark-green leafy vegetables, such as spinach and collard greens. Most of the carotenoids in egg yolk are hydroxy compounds called xanthophylls. Lutein and zeaxanthin are two of the most common xanthophylls found in egg yolk.

Lutein and zeaxanthin are high in pigmented feed ingredients such as yellow corn, alfalfa meal, corn gluten meal, dried algae meal and marigold-petal meal. Both lutein and zeaxanthin are efficiently transferred to the yolk when these various feed ingredients are fed to laying hens. The egg processing industry has routinely produced highly pigmented yolks for use in bakery products, pasta and mayonnaise. The dark yolk colour has better acceptance by Indian consumers. With a growing problem of macular degeneration in the elder people, there is a great market potential for these eggs.

### **Nutritional Advantages of Designer Eggs**

Designer eggs offer a variety of health benefits:

- Improved Heart Health
- Omega-3 enriched eggs lower harmful cholesterol and reduce risk of cardiovascular diseases.
- Stronger immunity
- Higher levels of vitamins, selenium, and antioxidants help build resistance against infections and improve overall health.
- Better Brain Development
- DHA-rich omega-3 eggs support memory, concentration, and brain growth in children.
- Healthy Vision
- Lutein- and carotenoid-enriched eggs protect eyes from age-related problems.
- Support for Metabolic Health
- Low-cholesterol eggs are suitable for diabetic and pre-diabetic individuals, providing protein without raising cholesterol levels.
- Natural Protein for All Ages
- Designer eggs serve as a nutrient-packed meal for children, elderly people, athletes, pregnant women, and those recovering from illness.

### **Why Designer Eggs Are Becoming the New Trend**

#### **1. Rising Health Awareness**

Modern consumers are more health-conscious than ever. From heart diseases to poor vision and weak immunity, many health issues can be addressed through nutrient-rich foods. Designer eggs directly target these problems by improving the nutrient value of a commonly consumed food.

#### **2. Natural and Safe Method**

There are no artificial chemicals, injections, or genetic changes in producing designer eggs. The entire process relies on natural feed-based enrichment, making it safe for all age groups from children to senior citizens.

### 3. Premium Market Value

Designer eggs sell at higher prices compared to regular eggs. This creates a profitable opportunity for farmers and small poultry entrepreneurs. Supermarkets, organic stores, and online marketplaces now prefer stocking these specialty eggs.

### 4. Growing Demand in Urban Areas

Cities and health-conscious households increasingly choose value-added products. Designer eggs fit perfectly into this trend due to their scientific advantage and premium appeal.

### 5. A Sustainable Strategy for Poultry Industry

Instead of investing heavily in new breeds or pharmaceutical enhancements, farmers can produce designer eggs simply by modifying the hen's diet making it a sustainable and cost-effective innovation.

### Future of Designer Eggs

The future prospects of designer eggs are highly promising as consumers increasingly seek functional foods that enhance health and prevent lifestyle diseases. With rising awareness about nutrition, there is strong potential for expanding designer eggs enriched with omega-3 fatty acids, antioxidants, vitamins, minerals, probiotics, and immune-boosting compounds. Advances in feed technology, biotechnology, and nano-nutrient delivery systems will allow more precise nutrient deposition in eggs, opening possibilities for personalized nutrition and disease-specific eggs such as anti-diabetic or heart-friendly eggs. The growing demand for organic, antibiotic-free, and nutrient-dense foods will further boost the market for designer eggs in both urban and rural sectors. Additionally, premium pricing, value addition, and export opportunities provide economic benefits to poultry farmers and entrepreneurs. With continued research, improved feed formulations, and consumer education, designer eggs are expected to play a significant role in the future of functional foods, public health nutrition, and sustainable poultry production. The concept of designer eggs represents the exciting future of poultry nutrition. As feed innovations grow, new types of eggs will emerge fortified with probiotics, anti-stress compounds, and novel antioxidants. India, with its expanding poultry sector, is in a strong position to become a global leader in this segment.

### Conclusion

Designer eggs represent a powerful combination of science, health, and smart poultry nutrition. They are easy to produce, beneficial for consumers, and profitable for farmers. With rising health awareness and demand for natural functional foods, designer eggs are truly

emerging as a new frontier in the poultry industry. In the coming years, they are expected to become a regular feature in households, clinics, and supermarkets — contributing to better health and boosting the income of poultry farmers across the country.