

Food security

through designer egg production

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Chicken egg is considered as a 'complete food' which is naturally available to human beings, but still modifying the content of egg through various means will make the egg 'most complete food' to all strata of consumers including the sick persons. Designer egg is the outcome of the concept of functional food in which certain components of the chicken egg is modified in a way to provide additional benefit beyond its traditional nutritional value.

Key words: Designer eggs, Food security

DESIGNER eggs are specially produced eggs which are rich in additional nutrients and health promoting components. It is an important tool to contain diet related disease conditions and nutritional deficiencies among Indian population. Therefore, by maintaining more or less same production cost the output of the poultry farm can be increased as the price of the designer egg is high in market compared to the ordinary egg. The various methods of production and significance of designer egg in Indian context is explained step by step here.

How to produce designer egg?

Designer egg is produced by modifying/enhancing the constituents of a standard egg by feeding the layer with special diet containing certain ingredients. This modification in egg is done in such a way to produce health and nutritional benefits to the consumers. The constituents mostly modified are cholesterol, fat and fatty acid, vitamins, minerals and pigments.

Reduction of cholesterol

Chicken eggs are known to have significant amount of cholesterol. A normal egg contains 200-220 mg cholesterol; due to this consumers

are reluctant to add chicken eggs in their diets. The reason is obvious that cholesterol is the predisposing factor for cardio-vascular diseases in human beings. This peculiar behavior of consumer is known to be called as '*cholesterol phobia*'. But there is no scientific relationship established over the cholesterol content of the egg with cholesterol level in blood. However to get over from the fear of consumer, the cholesterol content of the egg needs to be reduced. It can be done either through nutritional or pharmacological intervention. Supplementations of various vitamins and minerals, viz. vitamin A, vitamin C, niacin, copper and chromium in layer feed are proven to reduce the cholesterol level of egg. Apart from these substances certain herbal products like garlic, basil leaves, tulsi, fenugreek and ginger show good results towards reducing the cholesterol level in eggs. When these herbal products are used in designer egg then the product is called as Herbal Enriched Designer Eggs (HEDE). Reduction of cholesterol in egg has more advantages including reduction in occurrence of cardio-vascular diseases in human. It also encourages the consumer to come out of *cholesterol phobia* and increases egg

consumption which in turn helps in the growth of poultry industry.

Fat and fatty acid enrichment

Apart from the total content the fatty acid composition of the food plays essential role in keeping the health of the consumers. Consumption of polyunsaturated fatty acids (PUFAs) especially omega 3 PUFAs has been reported to reduce the risk of atherosclerosis and stroke in human, for example linolenic acid. Also these fatty acids are shown to promote infant growth. These omega 3 PUFAs are dietary essential that is they cannot be synthesized by human body and need to be supplied through food. The ratio of omega-6 and omega-3 fatty acids in normal and designer egg is 10:1 and 1:1, respectively. The fatty acid profiles of egg yolk lipid can be easily changed by changing the type of fat used in the hen's diet. Different feed such as linseed, safflower oil, rape seed, bajra and marine algae are known to increase omega-3 and PUFAs. Canola oil is commonly used to alter the ratio of saturated to unsaturated fatty acids.

Vitamin enrichment

The role of vitamins in human health is a well established fact. Vitamin deficiencies are more



Table 1. Nutritive value of designer egg

Nutrient content	Quantity per 100 g of egg contents (2 eggs)*	
	Ordinary egg	Designer egg
Total saturated fatty acids	3.3 g	2.8 g
Total unsaturated fatty acids	6.4 g	6.9 g
Mono unsaturated fatty acids (MUFA)	4.4 g	4.4 g
Poly unsaturated fatty acids (PUFA)	2.0 g	2.5 g
Linoleic acid (w-6 fatty acids)	1.9 g	1.4 g
α -linolenic acid (w-3 fatty acids)	0.03 g	0.7 g
w-3 fatty acid (EPA+DHA)	0.08 g	0.4 g
n6/n3 ratio	17.3	1.27
Unsaturated/saturated fatty acids	1.94	2.46
Cholesterol	400 mg	320 mg
Carotenoids	1.5 mg	2.2 mg
Vitamin E	2 mg	15 mg
Selenium	Traces	1.8 μ g
Chromium	Traces	1 μ g

*Quantities depend upon their levels in the feed provided.

common in developing countries like our India. Other than known aspect of vitamin deficiencies another aspect which is not that much visible is hidden hunger. Here the diet taken by the marginalized sections of Indian society lacks critical vitamins which is apparently unnoticed, thus vitamin enrichment in egg is very much important as far as developing countries are concerned. Designer eggs contain higher concentrations of several vitamins, especially vitamins A and E. To some extent the vitamin content of the egg is also dependent on the concentration of any specific vitamin in hen's diet. Vitamin transfer efficiency and cost of the vitamin must be taken into consideration while determining the economic feasibility of marketing such eggs. Eggs higher in vitamin E are currently available in stores. As omega 3 PUFAs enriched eggs are more susceptible to lipid oxidation addition of vitamin E is recommended because of its anti-oxidant property.

Minerals enrichment

The hidden hunger concept is applicable to minerals. The best example of enriched food for alleviation of mineral deficiency is iodized salt. With regard to the mineral content of eggs, there is challenge to change the calcium and phosphorus content of the albumen and yolk. The calcium and phosphorus content of egg shell is approximately 2,200 mg and 20 mg. However, it is possible to increase the

content of selenium, iodine and chromium. Selenium is the necessary trace mineral for reducing oxidative damage complementary to vitamin E in its function. Sources used to increase selenium in egg include inorganic sources (selenate and selenite) and organic sources of selenium supplements (selenium yeast). Selenium has sparring effect on vitamin E as it will increase the vitamin E content of the egg when supplemented. But high level of selenium is toxic. Allowable level of selenium in commercial poultry feed is 0.3 ppm.

Pigments enrichment

Pigment enrichment of chicken egg has many benefits as it prevents macular (retinal) degeneration which is the major cause of blindness in elderly and the enrichment increases yolk color which has better preference among consumers. The yolk color is the direct reflection of pigment content in the yolk. The carotenoids present in the egg yolk are called as xanthophylls. The most common xanthophylls present in the egg yolk are lutein and zeaxanthin. The feed ingredients used to increase these pigments are 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 protein rich blue-green algae (spirulina) are also considered to be an efficient pigment source for poultry skin and egg yolk.

Ways to enhance farmers' income

Agriculture is complementary to farming system in India due low land holding of average Indian farmers. Among allied sectors poultry is very much important as chicken are reared under backyard system since long time. The designer eggs are produced economically from the cheaply available materials. Price of designer eggs in market is higher than ordinary eggs. This has been demonstrated by the farmers in wayanad region of Kerala where under support and training of National Bank for Agriculture and Rural Development (NABARD) farmers have produced Omega-3 enriched eggs. The designer eggs may increase the farmer's income by more than 40-50 percent in compared with selling of ordinary eggs in the markets. So the net income of farmers from eggs or its products may get increased which is mostly suited to landless farmers and agricultural laborers in our country. The nutritive value of ordinary versus designer egg has been presented in Table 1.

SUMMARY

Designer eggs are produced by modifying the contents of ordinary eggs through nutritional intervention. It provides numerous benefits to both consumer and farmers. The consumers can take desired nutrients without changing their food habit keeping in view their health issues. With the advent of vitamin and mineral enriched designer eggs micronutrient deficiency in human beings can be reduced. Designer eggs have the potential to reduce the burden of lifestyle diseases in India and may also help in achieving the ambitious vision of central government for doubling the farmer's income. The increased consumption will trigger the market need and consequently which will most likely boost the poultry industry and also increase the farmer's income.

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