LIFE AND NUTRITION OF COMMERCIAL EGG-TYPE CHICKENS

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ABSTRACT

As lucrative and enterprising as a poultry business can be, if adequate knowledge about the birds and proper managerial skills are lacking, it might end up as a disaster. Poultry production accounts for the major part of all meat produced in many developing countries and are of considerable significance to rural as well as national economies. Poultry birds have various nutrient requirement based on the objective for raising the birds, be it for egg production or meat production or both? This write up gives a brief history of egg type chickens, different breeds, their behavioral and production tendencies and an account of how they have become a source of financial income to the farmers who commercializes their production. The paper further explains the nutritional requirement of egg-type chickens and reasons for these requirements. Furthermore, the paper brings out the benefits of supplying the birds with their nutritional requirements as well as the danger in deficiencies of these requirements.

Keywords: Egg, chickens, nutrition, breed.

INTRODUCTION

The egg-type chicken, otherwise known as laying hens or simply put 'layers' are majorly the egg producers which probably originated as a jungle fowl in South Western Asia, some 3000 years ago. Out of about 17billion chicken in the world majority of the birds are in Asia while about 7% of the world's flocks are found in Africa (Dessie *et al*, 2012). Layer birds contribute 65-70% of the total poultry population which after completing their laying cycles renders tough meat (Manish et al., 1999).

As large scale poultry production expands in the tropics, due to surging demand for chicken meat and eggs, chicken farming is undergoing dramatic changes. Inadequate nutrition can cause hens to stop laying, some of these nutritional deficiencies, their resulting effect on the laying birds and solutions are mentioned in this paper. As part of efforts to keep the poultry industry growing especially egg production, this paper gives extensive information on the life and nutritional requirements of a commercial egg-type chicken.

Life of Egg-type chickens

The female chickens that are capable of laying eggs are referred to as egg-type chickens.

The laying cycle of a chicken flock usually covers a span of about 12months. Egg production begins when the birds reach about 18-22 weeks of age (some starts laying earlier) depending on the breed and season. Flock production rises sharply and reaches a peak of about 90%, 6-8 weeks later. Production then gradually declines to about 65% after 12 months of lay. A typical production curve for a laying flock, showing changes in the level of egg production and in the egg quality characteristics is formed. Hens of special laying breeds may produce as many as 300 eggs a year. After 12 months in laying, the hen's egg-laying ability starts to decline, and the commercial laying hens are then culled. The egg possesses excellent nutritive value and constitutes a food used in many basic and formulated preparations. Besides its important reserve of highly digestible proteins, lipids, vitamins and minerals, the egg contains molecules with numerous health promoting and biotechnological properties (Froning, 1991).

There are many factors that can adversely affect egg production. Unraveling the cause of delayed first egg laid and of sudden drop in egg production requires a thorough investigation into the history of the flock. Egg production can be affected by such factors as climatic condition, feed consumption (quality and quantity), water intake, intensity and duration of light received parasite infestation, disease and numerous management and environmental factors. Chickens can live for more than five years and continue to lay for many of these years.

However, after two or three years many hens significantly decline in productivity. This varies greatly from bird to bird; good layers is expected to lay about 400 eggs for 50-60 weeks and then have a rest period called a 'molt'. Poorer layers and old hens will molt more often and lay less consistently. Molting in avian species may be generally defined as the periodic shedding and replacement of feathers, for most wild species of birds, molting involves reproductive quiescence (Berryl, 2003).

Breeds

Prominent in Nigeria is the Rhode Island Red Chicken breed, common name for a hardy breed of domestic chicken. It was originally bred by a Rhode Island farmer from strains of red Malay and Shanghai chickens in the mid-1800s. Although used primarily for egg production, the Rhode Island Red chicken is known as a dual-purpose breed because it is also a valuable source of meat. These valuable qualities have led to its exportation to countries around the world especially West Africa. There are various indigenous breeds of egg-type chickens available locally as well. Other commercial breeds available in Nigeria are Black Harco and the White Leghorn.

Nutrition

Laying chickens require a completely balanced diet to sustain maximum egg production over time. Inadequate nutrition can cause hens to stop laying. Inadequate levels of energy, protein or calcium can cause drop in egg production, for instance, low protein diets can limit the increase in heat production of chickens (Waldroup *et al.*, 1976). This is why it is important to supply laying hens with a constant supply of nutritionally balanced layer feed. Feeding whole grains, scratch feeds and table scraps will cause the birds diet to become imbalanced and inadequate. Many times these imbalances can cause other problems like oviductal prolapse. Prolapse may occur when the bird is too fat and/or the egg is too large and the bird's reproductive tract is expelled with the egg. Prolapse usually causes permanent damage to the hen and is fatal in many cases. Animals have an innate desire to consume salt. Feeding a salt deficient diet will lead to increased feather pecking and a decline in egg production. Most animal feeds will contain added salt, usually in the form of sodium chloride. Iodine is rarely added as a separate ingredient; instead, iodized salt is routinely used. Cobalt iodized salt is often used in diets for swine and ruminants, and this can also be used without any problems for poultry. This type of salt is usually blue. Sodium is an essential nutrient, playing a major role in maintaining body fluid volume, blood pH and proper osmotic relationships.

A continuously low intake of salt can cause a loss of appetite. It was reported that increasing sodium chloride (NaCl) in the diet or adding it in the drinking water has also proved to be beneficial to hyperthermic birds. Sodium deficiencies adversely affect utilization of dietary protein and energy and interfere with reproductive performance. Chlorine is also an essential nutrient. Hydrogen chloride (HCl) released from the true stomach (proventiculus) is important in digestion. Chlorine also plays a role in maintaining osmotic balance in body fluids. Birds deficient in chlorine are more nervous, showing increased sensitivity to sudden noise. The egg shell is composed primarily of calcium carbonate. The pullet's requirement for calcium is relatively low during the growing period, but when the first eggs are produced, the need is increased at least four times, with practically all of the increase being used for the production of egg shells. Inadequate calcium consumption will result in decreased egg production and lower egg shell quality. Hens store calcium in medullary bone, a specialized bone capable of rapid calcium turnover (6). As calcium stores are depleted, bones become brittle. In severe cases, hens are unable to stand. The condition is known as caged-layer fatigue. Birds on the ground or on litter floors recycle calcium and phosphorus through consumption of feaces, and do not have caged-layer fatigue. Calcium can be supplied in the diet as either ground limestone or oyster shell. Particle size affects calcium availability. Usually the larger the particle size, the longer the particle will be retained in the upper digestive tract. This means that the larger particles of the calcium source are released more slowly and this may be important for the continuity of shell formation, especially in the dark period when birds do not ordinarily eat. Periodically, dolomitic limestone is offered to the feed industry. However, dolomitic limestone (which is used in the steel industry) should never be used in poultry diets. Dolomitic limestone

contains at least 10% magnesium and this competes with calcium for absorption sites in the intestines. The consequence of feeding dolomitic lime stone is induced calcium deficiency. Young birds should not be fed high calcium layer diet because the calcium/phosphorus ratio will be unbalanced, resulting in increased morbidity or mortality. Vitamin D is required for normal calcium absorption and utilization (NRC, 1998). If inadequate levels of vitamin D are fed, induced calcium deficiency quickly results and egg production decreases. Feed grade vitamin D comes in two forms, D2 and D3. in most animals both are equally potent. In birds, however, D3 is substantially more active than D2. In poultry diets, therefore, vitamin D must be supplied in the form D3. The active form of vitamin D3 is involved in the synthesis of calcium binding protein, essential for calcium and phosphorus homeostasis. (Rama Rao *et al.*, 2004), reported that heat stress is known to interfere with the conversion of vitamin D3 to its metabolically active form i.e. 1,25 (OH) 2D3, so higher dietary levels may be justified during periods of high temperature.

Dietary requirements for protein are actually requirements for the amino acids that constitute the protein (Lesson and Summers, 1998). There are 22 amino acids in body proteins and all are physiologically essential. Poultry cannot synthesize some of these or cannot synthesize them rapidly enough to meet the metabolic requirement (NRC,1998). Therefore, these amino acids must be supplied in the diet. Amino acid requirements vary considerably according to the productive state (i.e. growing, laying eggs), age, type, breed, and strain as well as weather condition. Methionine is the amino acid most often deficient in laying rations. When pullets begin laying there is an increase in protein, vitamins and minerals requirement per day due to deposition in egg. If dietary protein is too low or the amino acid requirements are not met, poor egg production and hatchability will occur.

Dietary fat is a source of energy and linoleic acid, an essential fatty acid. A deficiency of linoleic acid will adversely affect egg production. Dietary fats also serves as carriers of fat soluble vitamins and some fat is necessary for absorption of vitamins. Infact, impairment of the absorption of fat-soluble vitamins (A, D, E and K) is the most serious consequence of a dietary deficiency of fat. Although the salt requirement of birds is relatively low (NRC, 1998), adequate levels are essential and excessive amounts are highly toxic and can reduce egg production. Birds require a sensitive balance between toxic and necessary levels of salt. Excess dietary salt intake readily causes wet droppings and wet litter. Several feed ingredients such as fish meal, corn gluten meal, meat meal, whey and sun flower meal, contain high levels of sodium. When such ingredients are used, the level of supplemental salt (NaCl) in the diet must be reduced. The nutritional role of phosphorus is closely related to that of calcium. Both are constituents of bone. The ratio of dietary calcium to phosphorus affects the absorption of both these elements; an excess of either one impedes absorption and can reduce egg production, shell quality and/or hatchability.

Water requirement for poultry

Water is regarded as an essential nutrient. The amount needed depends on environmental temperature and relative humidity, the composition of the diet and the rate of growth or egg production. It has generally assumed that birds drink approximately twice as much as water as the amount of feed consumed on a weight basis, but water intake actually varies greatly.

At a week old, chicks require 2 litres per 100 chicks per day, increasing to 18 litres per 100 birds per day at 12weeks of age. (Lacy, 2002), reported that a 2.3kg broiler would have consumed 8.2kg of water during its lifetime, compared to approximately 5.6kg of feed. The water intake will increase by up to 50% in hot weather, when heat stress can be a serious problem. This occurs when the chick or mature bird cannot maintain the balance between heat production and heat loss. Signs of heat stress include a rapid panting which results in loss of water from the lungs. This needs to be replenished to avoid dehydration, preferably with cool water which helps to increase intake and has a cooling effect. If the chick or mature bird is breathing rapidly and the temperature is correct, this is usually a sign of disease (Lang, 1999). It is therefore important that plenty of clean water is available at all times. Young chicks will visit their drinker between 30 and 40 times per day so they need easy access, and enough of them, to avoid crowding especially at higher stocking

densities and when the birds get older. There are a number of different watering systems available, including nipple, cup or bell drinkers. Nipple systems are probably the most reliable in terms of supplying clean water without the risk of contamination. (Merit *et al.*, 2010).Water has many important functions in the life of the birds as it helps to move feed through the digestive system, helps to transport digested nutrients to different organs and the removal of waste and toxic products through the kidneys. It also helps in maintaining the body temperature. Drinking water is the largest consumed nutrient for poultry production. Water is always administered *ad-libitum* and it does not amount to any additional cost burden to the farmer. However, drinking water that enters the digestive system of the bird can play havoc if the quality is not controlled.

Water also serves as a major means of administering poultry drugs and vaccines such as Gumboro vaccine, Newcastle disease vaccine (lasota), powdery drugs like antibiotics, anti-stress, anti-coccidial, to mention a few.

Having a broad as well as detailed knowledge about the life and nutrition of egg-type chickens will definitely assist intending poultry farmer, existing poultry farmer and studies in animal science to improve the understanding and management of these birds.

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Table 1 Stages and Duration of Egg Formation

	Section of Oviduct	Time Spent	Function of Each Section
1	Infundibulum(funnel)	15 minutes	Receives yolk from ovary.
2	Magnum	3 hours	Inner and outer shell membranes are added as well as some water and mineral salts. Albumen is secreted and layered around the yolk.
3	Isthmus	1 hour	Initially some water is added making the outer white thinner. The calcium carbonate which is mainly the shell material is added. Pigments may also be added to make the shell brown.
4	Shell gland (Uterus)	21 hours	The egg passes through this section before lay. It has no other function in egg formation.
5	Vagina/Cloaca	Less than one minute	