

EFFECT OF SUPPLEMENTATION OF DIET WITH MUCUNA (*Mucuna cochinchinensis*), CASSAVA (*Manihot esculenta*) AND NEEM (*Azadirachta indica*) LEAF MEALS ON SHELF LIFE OF CHICKEN EGGS

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ABSTRACT

A 72 – day feeding trial was conducted using 240, 35week-old Lohmann[®] brown layer chickens, to study the effect of supplementing diet with three types of leaf meal on the shelf life of chicken eggs. The birds were grouped into 16 replicates of similar live body weight, and 4 replicates were randomly allocated to each of four treatments using the Completely Randomized Design. Treatment 1 served as control, with no leaf meal added to the diet. Treatments 2, 3 and 4 were, respectively, supplemented with 5% of leaf meal mucuna (*Mucuna cochinchinensis*), Cassava (*Manihot esculenta*) or Neem (*Azadirachta indica*). Eggs from all treatments were gathered on the same day and kept in plastic egg crates place on a wooden table in the same room at room temperature. The eggs were sampled on the same day and weekly for six weeks and analysed for yolk colour, yolk index and Haugh unit score. There was Significant difference ($P<0.05$) for yolk colour, yolk index and haugh unit for eggs from birds fed leaf meals, with cassava leaf meal giving the best results for up to six weeks of the experimental period.

Key words: Egg-quality, Feed-additive, Leaf -Meal, Egg-shelf-life.

INTRODUCTION

Majority of people, in the world, generally like to eat eggs and foods that contains eggs, because they are not only tasty and nutritious, they are also quick and easy to boiled or cooked. Eggs contain all the essential nutrients, like protein, mineral and vitamins, in the best proportions to promote growth and good health in humans (FAO, 2011).

Efforts to boost animal protein intake in human diets must involve increased production and productivity of animals, improvements in quality of animal products and better processing and preservation techniques. This will lower animal product prices and enhance affordability and, therefore, consumption.

All foods have limited shelf life, which varies depending on the type of food and storage conditions. The egg is a very perishable food product which loses quality rapidly during the period between being laid and consumption. Egg quality is negatively affected by length of storage, and the rate of deterioration depends on environmental conditions such as ambient temperature and humidity. Storage modifies some characteristics of the egg including water content and pH of the albumen (Decuyper *et al.*, 2001). Shelf life of egg in the shell is 3 to 4 weeks at a temperature of 28-31°C, and that of egg white is 3 to 4 days and egg yolk is 2 to 4 days.

A wide range of supplements are added to the feeds of commercial egg production flocks. According to Slattery *et al* (2000), these materials are included to promote properties such as appearance, flavour, shelf life and to suppress the population of harmful microorganisms. Consumers, however, are becoming increasingly cautious about foods which contain artificial additives. As a result, there is an increasing interest in additives of natural origin (Balyavin and Marangos, 1988). Ingredients and additives that would be good replacements for artificial ones must not be a staple item of human food, should be readily available and inexpensive to procure.

The aim of this study is to assess the effect of mucuna (*Mucuna cochinchinensis*), cassava (*Manihot esculenta*) and Neems(*Azadirachta indica*) leaf meals, when used as feed supplements, on the shelf life of chicken eggs.

MATERIALS AND METHODS

The leaves were harvested and dried in the shade, in order to avoid bleaching of the green colour, until they became crisp. The dried leaves were milled to produce leaf meals which were mixed with other feed ingredients to produce the experimental diets (Table 1).

Table1: Ingredient and calculated nutrient composition of experimental diets (%)

	Control	MLM	CLM	NLM
Ingredient				
Maize	39.77	36.29	37.88	34.97
Maize offal	10.00	10.00	10.00	10.00
Full fat Soya bean	15.62	17.55	15.16	19.76
Brewers Dried Grains	23.70	19.18	19.98	17.82
Leaf meal	-	5.00	5.00	5.00
Bone Ash	4.95	5.05	5.11	5.01
Limestone	4.96	5.93	5.81	6.47
Premix*	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30
Methionine	0.35	0.36	0.37	0.36
Lysine	0.10	0.09	0.14	0.06
Total	100.00	100.00	100.00	100.00
Calculated Nutrient Composition (%)				
Crude Protein	17.00	17.00	17.00	17.00
Crude fibre	5.80	7.50	7.50	7.50
Ether Extract	6.40	6.45	6.22	6.40
Calcium	3.82	3.65	4.01	4.21
Phosphorus	1.00	1.00	1.00	1.00
Methionine + cysteine	0.60	0.60	0.60	0.60
Lysine	0.80	0.80	0.80	0.80
ME (kcal/kg)	2600	2600	2600	2600

Two hundred and forty (240) 35-weeks old Lohman® brown chicken hens were used for the experiment. They were kept on deep litter in a tropical type poultry house with dwarf walls and open sides which was covered with wire mesh. The house was orientated in the east-west direction. The birds were grouped into 16 replicates of similar mean live body weight, and 4 replicates were randomly allocated to each of four treatments using the Completely Randomized Design. Treatment 1 served as control, with no leaf meal added to the diet, while the diet of birds in Treatments 2, 3 and 4 were, respectively, supplemented with 5% of the leaf meal of mucuna (*Mucuna cochinchinensis*), Cassava (*Manihot esculenta*) or Neem (*Azadirachta indica*).

Eggs for shelf life assessment were collected from all replicates on the same day and stored in plastic egg crates placed on a wooden table under room temperature (28-31°C) in the same room. Samples were taken on the same day and weekly for six weeks and analysed for yolk colour, yolk index and Haugh unit score.

Data for yolk colour, yolk index and haugh unit were subjected to analysis of variance (ANOVA) using Minitab statistical software (2006). Sets of means that were significantly different from each other were separated using Duncan's Multiply Range test.

RESULTS AND DISCUSSION

The result of estimates of internal egg quality are presented in Tables 2, 3 and 4. Internal egg quality deteriorated each week over the six weeks storage period and this was especially pronounced during the first week.

Yolk index was unaffected by treatment during all stages of storage with the exception of 2 week old eggs where it appeared that the feeding of mucuna and neem leafmeals accelerated the deterioration of yolk index.

The beneficial effects of feeding leafmeals on yolk colour and Haugh unit score were significantly ($p < 0.05$) apparent at all storage stages, and cassava leafmeal always gave the best results. For yolk colour, mucuna and neem leafmeals followed in that order, with the control treatment always bringing up the rear. For Haugh unit score, for 2 weeks the leafmeals conferred better scores, with cassava leafmeal being best, mucuna and neem leafmeals tied for second place and the control bringing up the rear. From the third week to the end of the study in the sixth week the pattern was simply that of eggs from hens fed cassava leafmeal having a superior score above the others.

Table 2: Effect of Duration of Storage on Egg Yolk Colour

Duration (Week)	T ₁	T ₂	T ₃	T ₄	P	SEM
Week 0	2.30 ^d	5.05 ^b	5.90 ^a	4.50 ^c	0.00	0.17*
Week 1	3.00 ^c	5.00 ^b	5.88 ^a	5.00 ^b	0.00	0.13*
Week 2	2.13 ^c	4.63 ^{ab}	5.75 ^a	4.38 ^b	0.00	0.03*
Week 3	1.75 ^c	4.38 ^b	5.50 ^a	4.00 ^c	0.00	0.39*
Week 4	1.50 ^c	4.13 ^b	5.25 ^a	4.18 ^b	0.00	0.35*
Week 5	1.38 ^c	4.05 ^b	5.13 ^a	4.05 ^b	0.00	0.30*
Week 6	1.13 ^c	3.75 ^b	5.13 ^a	4.00 ^b	0.00	0.30*

^{a,b,c} means in the same row bearing different superscripts are significantly different ($P < 0.05$)

Table 3: Effect of Duration of Storage on Egg Yolk Index

Duration (Week)	T ₁	T ₂	T ₃	T ₄	P	SEM
Week 0	0.39	0.39	0.40	0.40	0.69	0.02 ^{ns}
Week 1	0.39	0.39	0.40	0.40	0.68	0.02 ^{ns}
Week 2	0.33 ^a	0.30 ^{ab}	0.34 ^a	0.26 ^b	0.00	0.03*
Week 3	0.28	0.25	0.28	0.24	0.20	0.03 ^{ns}
Week 4	0.25	0.22	0.25	0.22	0.29	0.03 ^{ns}
Week 5	0.21	0.20	0.22	0.18	0.31	0.03 ^{ns}
Week 6	0.18	0.17	0.20	0.16	0.26	0.03 ^{ns}

^{a,b,c} means in the same row bearing different superscripts are significantly different ($P < 0.05$)

The higher yolk colour score for eggs from birds fed leaf meals is an indication of absorption and utilization of the pigmenting xanthophylls present in the leaf meal. This is similar to what was reported by Austic and Neisheim (1990), when they supplemented layers feed with sunflower leaf meal. McDowell *et al* (1990) and Bailey *et al* (1989) also found that adding aquatic plants to the diets increase yolk pigmentation. A detailed chemical analysis of the leafmeals will be necessary before the reasons for the superiority of cassava over the other leaf meals could be speculated upon.

CONCLUSION AND APPLICATION

The inclusion of leaf meals, especially cassava leaf meal, improved the quality and shelf life of eggs. It is recommended that egg producers should include 5% of either cassava, mucuna, or neem leaf meal, in that order of preference, as cost and availability dictates, in the diet of their laying hens. The improvement in shelf life conferred will enable them to keep their eggs longer during periods of glut or enable them transport their eggs further afield in search of better markets.

Table 4: Effect of Duration of storage on Egg Haugh Unit (HU)

Duration (Week)	T ₁	T ₂	T ₃	T ₄	P	SEM
Week 0	93.44	96.57	93.08	95.51	0.11	2.14 ^{ns}
Week 1	62.07 ^b	70.62 ^a	70.62 ^a	69.23 ^a	0.00	2.75*
Week 2	60.10 ^c	66.00 ^b	69.23 ^a	67.67 ^{ab}	0.00	1.34*
Week 3	58.93 ^b	62.21 ^{ab}	64.41 ^a	59.40 ^b	0.00	1.60*
Week 4	57.28 ^b	58.04 ^b	62.59 ^a	58.19 ^b	0.00	1.52*
Week 5	50.71 ^b	50.88 ^b	55.89 ^a	51.33 ^b	0.00	1.07*
Week 6	47.50 ^b	49.06 ^{ab}	51.16 ^a	48.10 ^{ab}	0.03	1.57*

^{a,b,c} means in the same row bearing different superscripts are significantly different (P<0.05)

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