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Assessment of Lablab (*Lablab Purpureus*) Leaf Meal as a Feed Ingredient and Yolk Colouring Agent in the Diet of Layers

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Abstract: A feeding experiment was conducted to determine the performance, nutrient digestibility and egg quality of layers fed 0,50, 100 or 150 g/kg leaf meal of *Lablab purpureus* (lablab) Chemical analysis of lablab gave (g/kg) crude protein 234.0, ether extract 19.0, crude fibre 83.4, ash 116.0 and nitrogen free extracts 467.0. Feeding lablab at 100 and 150 g/kg significantly reduced feed intake and egg production while egg weight, feed conversion efficiency and body weight changes were not affected ($p > 0.05$) by dietary treatments. Apparent nutrient digestibility of dry matter and crude protein decreased significantly ($p < 0.05$) with lablab while ether extract was not significantly influenced. Internal and external egg quality values were comparable amongst dietary groups except for yolk colour, which was significantly higher ($p < 0.05$) in layers fed lablab compared to those without. Diet and boiling had no significant effect ($p > 0.05$) on the proportion of egg components but boiling effected a percentage reduction of 62, 56 and 52 in the egg yolk colour of 50, 100 and 150 g/kg lablab fed layers respectively. The persistence of the colour change after withdrawal of lablab ranged from 5 days (50 g/kg) to 15 days (150 g/kg). Based on egg quality, lack of mortality and similar biological efficiency, it may be possible to include lablab in layer diets up to 100 and 150 g/kg in situations of acute scarcity and/or high cost of grain and concentrates.

Key words: Lablab leaf meal, layers, yolk colour, nutrient digestibility

Introduction

The rapid growth of human and livestock population, which is creating increased needs for food and feed in the less developed countries demand that alternative feed resources must be identified and evaluated. A minor grain legume that demands attention is *Lablab purpureus L*. Hendricksen and Minson (1985) reviewed and concluded that relatively little attention has been given to its grain or forage. This is in contrast to information on peanut, pigeon pea, cowpea and mung beans (Akinlade *et al*., 2002; Topps, 1992; Ologhobo, 1992; Udedibie and Igwe, 1989). *Lablab purpureus* is an annual or short-lived perennial dual-purpose legume grown in the tropics. The seed and immature pods can be used for human food (Purseglove, 1968) while the herbage is used as a feed supplement for ruminant grazing during the dry season (Schaaffhausen, 1963). Reports are however, limited on its use as a feed resource for monogastric animals.

This study was therefore carried out to expound on the suitability or otherwise of incorporating lablab leaf meal in layer diets. Performance, nutrient retention and egg quality of egg-type chickens were thus assessed.

Materials and Methods

The leaves of *Lablab purpureus* were harvested from plants on the University Teaching and Research farm plots. They were thinly spread on concrete slabs and sun-dried. The dry leaves were ground using a 2mm screen and stored in jute bags until needed.

Prior to the trial, 72 of 28-week-old Harco layers were fed with a standard white maize pre-trial diet for a 2-week period during which daily egg production and egg weight were recorded. At the beginning of the trial period, when the birds were 30 weeks old, they were divided into four dietary treatment groups of similar mean body weight and egg production level, comprising 18 birds each. Four experimental laying diets based on white maize were formulated such that they contained 0, 50,100 and 150 g lablab/kg diet respectively (Table 1). Each group was fed *ad libitum* with its own diet for a period of 8 weeks. The birds were housed in battery cages of two-tier wire blocks in a complete randomized design and each group was further subdivided into three replicates of six birds each. Performance was determined weekly by measuring feed intake, feed conversion efficiency (feed intake: egg weight) egg production (in number and weight) and body weight changes. Egg quality was estimated by measuring length, width, shape index (width/length), shell weight, shell thickness, albumen weight and yolk weight of eggs laid every two weeks. The weights of the egg components were adjusted and expressed in percentages. The shell surface area was calculated using the formula developed by Carter (1975) i.e $\text{Area} = 3.9782W^{0.7056,}$ where

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Table 1: Composition of experimental layer diets containing graded levels of lablab leaf meal

Ingredients	Lablab in diets (kg)			
	0	50	100	150
Maize	450	423	395	366
Soybean meal	200	177	155	134
[1]Lablab leaf meal	0	50	100	150
[2]Fixed	350	350	350	350
Total	1000	1000	1000	1000
Analysis (g/kg DM)				
Crude protein	172	171	172	171
Ether extract	32.5	35.4	34.8	32.6
Crude fibre	34.3	35.4	38.4	43.1
Ash	33.5	40.2	43.4	48.2
[3]ME (KJ/Kg)	10.64	10.2	9.44	8.94

[1]Composition of lablab (g/kg): 919.6 dry matter; 234.3 crude protein, 19.0 ether extract, 83.4 crude fibre, 116.0 ash and 466.9 nitrogen free extract [2]All diets contained wheat offal (192.5 g/kg) fish meal (30 g/kg), oyster shell (90 g/kg), bone meal (30 g/kg), methionine (2.5 g/kg), salt (2.5 g/kg) and vitamin-mineral premix (2.5 g/kg) providing the following per kg of diet: vitamin A, 10,000 i.u; D, 2000 i.u; E, 5 i.u; K, 2.24 mg; riboflavin, 5.5 mg; B_{12}, 0.01 mg; pantothenic acid, 10 mg; nicotinic acid, 25 mg; choline chloride, 350 mg; folic acid, 1 mg; Mn 56 mg; I, 1mg; Fe, 20 mg; Cu, 10 mg; Zn, 50 mg; Co, 1.25 mg. [3]Calculated metabolizable energy content short of whatever ME contributed by lablab leaf meal.

Table 2: Regression equations relating levels of inclusion of lablab to performance parameters and egg quality of layers

Parameters	Equation	R^2
Feed intake	111.33 - 0.499X	0.97**
Hen day production	93.62 -0.609X	0.80*
Feed/ egg weight	2.166 + 0.063X	0.45NS
Egg weight	54.91 - 0.019X	0.17NS
Haugh unit	82.19 + 0.1025X	0.53NS
Shell thickness	0.31 + 0.001X	0.89NS
Yolk index	0.44 - 0.002X	0.43NS
Yolk colour	1.815 + 0.471X	0.93**
Percent yolk	23.62 -0.027X	0.36NS
Percent shell	9.37 + 0.009X	0.70NS
Percent membrane	1.442 - 0.0004X	0.02NS

* $p < 0.05$, ** $p < 0.01$, NS = Not Significant

W = weight of fresh egg. The albumen and yolk heights were measured using a tripod micrometer. The yolk index was calculated as the proportion of yolk height to diameter. Haugh unit scores were calculated from egg weight and albumen height while the Roche colour fan was used to determine the pigmenting potency of diets on the egg yolk. Shell samples from top, middle and bottom of the eggs were measured for thickness using a micrometer and the mean was calculated before statistical analysis.

To assess the effect of boiling on egg component, six eggs from each replicate were immersed in boiling water for 8 minutes. The eggs were carefully broken out and the different egg components weighed and adjusted in percentages. A nutrient retention trial using the Total collection method was carried out at the last week of the experiment. Weighed quantities of feed were supplied and excreta collected over a 72-hour period. Samples of diets and excreta were dried in a forced drought oven at 60 ^{o}C for 48 hours and ground.

Dried samples of lablab, diets and excreta were analyzed for proximate contents (AOAC, 1990). Data collected were subjected to analysis of variance and treatment means compared using the Duncan's multiple range tests (Daniel, 1991). Regression analysis of performance and egg quality parameters on the level of leaf meal inclusion was also carried out.

Results and Discussion

The proximate analysis of lablab leaf meal on DM basis revealed: 234.0g crude protein, 19.0g ether extract, 83.4g crude fiber, 16.0g ash and 467.0g nitrogen free extract. The values obtained are generally similar to the contents for most leaf meals such as Cajanus cajans (Udedibie and Igwe, 1989), gliricidia (Odunsi *et al*., 2002) and cowpea (Akinlade *et al.*, 2002).

Regression equations describing the relationship between levels of inclusion of lablab to performance parameters and egg quality of layers are presented in Table 2. The regressions between level of lablab and feed intake, and hen day production showed a high and negative correlation ($p < 0.05$) while yolk colour ($p < 0.05$), Haugh unit and shell thickness ($p > 0.05$) revealed a high and positive correlation. Data presented in Table 3 indicated that feeding lablab at 100 and 150 g/kg diets caused a significant ($p < 0.05$) reduction in feed consumption and rate of egg production compared to those fed on 0 and 50 g/kg levels. Average body weight change, egg weight and feed conversion efficiency were not affected ($p > 0.05$) by dietary treatments. The slight negative body weight changes recorded across the dietary groups could be due to the high rate of egg production among the layers. No mortality was recorded during the trial. Dry matter and crude protein values decreased ($p < 0.05$) while ether extract was not significantly influenced ($p > 0.05$) with level of lablab. Hendricksen *et al*. (1981) obtained 55% digestibility of leaf fractions of lablab to cattle and 56% to sheep which, was similar to the mean of 54% found for a range of annual and perennial tropical legumes (Minson, 1977). The digestibility values of 66.2 and 48% were obtained for dry matter and crude protein respectively in layers fed 150 g/kg lablab.

Egg quality values (Table 4) indicated that the diets supported equal shell weight, shell surface area, shell thickness, Haugh unit, yolk index and egg shape index. The similar values for egg shell traits across diets,

Table 3: Effect of dietary lablab leaf meal on performance and nutrient digestibility of layers

	Lablab in diets (g/kg)				
Parameters	0	50	100	150	SEM
Feed intake (g/d)	111.1[a]	109.6[a]	105.7[b]	104.1[b]	0.77
Body weight change, g	-3.0	-3.1	-2.1	-3.2	-
Hen day egg production, %	91.9[a]	92.3[a]	89.3[b]	82.7[c]	1.95
Feed / kg egg (kg)	2.20	2.17	2.19	2.3	0.02
Dry matter, %	74.7[a]	68.9[b]	66.1[b]	64.8[c]	2.03
Crude protein, %	59.2[a]	51.5[b]	46.3[b]	45.0[c]	1.87
Ether extract, %	96.7	96.6	95.9	95.2	0.04

Means with different superscripts on the same row are significantly different ($p < 0.05$)

Table 4: Effect of lablab leaf meal on internal and external egg quality of layers

	Lablab in diets (g/kg)				
	0	50	100	150	SEM
Egg weight, g	54.9	55.0	54.4	54.8	0.46
Haugh unit, %	82.8	81.8	83.3	83.9	1.05
Yolk index	0.45	0.42	0.40	0.42	0.01
Yolk colour	1.0[d]	5.3[c]	6.8[b]	8.4[a]	0.71
Shell thickness, cm	0.31	0.32	0.32	0.33	0.003
Egg shell surface,g/cm^3	67.2	67.3	66.1	67.1	2.15
Egg shape index, %	77.2	76.4	74.1	75.2	2.23
Albumen: yolk index	2.68	2.73	2.78	2.73	0.41
Adjusted % albumen	70.1	70.8	70.6	70.8	1.64
Adjusted % yolk	26.2	25.9	25.4	26.0	0.96

Means with different superscripts on the same row are significantly different ($p < 0.05$)
Albumen weight = Initial whole weight - (yolk + dry shell weight)
Adjusted % albumen = (albumen weight/(initial whole egg weight - dry shell weight) x100
Adjusted % yolk = (yolk weight / (initial whole egg weight - dry shell weight) x 100

Table 5: Effect of dietary lablab leaf meal on raw and boiled egg components of layers

	Lablab in diets (g/kg)					
Components(%)	0	50	100	150	SEM	Average value
Yolk						
Raw	23.7	23.5	23.0	23.5	0.29	23.4
Boiled	24.3	23.4	22.8	23.9	0.38	23.6
Albumen						
Raw	63.5	64.1	63.9	64.0	0.48	63.9
Boiled	63.5	64.4	63.7	64.6	1.14	64.1
Shell						
Raw	9.40	9.38	9.43	9.53	0.12	9.44
Boiled	9.73	9.63	10.0	9.73	0.22	9.77
Membrane						
Raw	1.44	1.43	1.47	1.42	0.04	1.44
Boiled	0.67	0.82	1.35	0.75	0.12	0.9
Yolk colour						
Raw	1.0[d]	5.3[c]	6.8[b]	8.4[a]	0.71	5.4
Boiled	1.0[d]	2.0[c]	3.0[b]	4.0[a]	0.02	2.5

Means with different superscripts on the same row are significantly different ($p < 0.05$)

presumed that lablab based diets were capable of supporting eggshell deposition thus guaranteeing low percentage egg loss that can accrue from cracking and shellessness. Egg shape values were slightly lower than the value of 75% indicated as most satisfactory by Sainsbury (1992).

The effect of boiling on egg components of layers fed lablab is shown in Table 5. Average values for raw versus boiled eggs are 23.4 vs. 23.6; 63.9 vs. 64.1; 9.44 vs. 9.77 and 1.44 vs. 0.9 for yolk, albumen, shell and membrane respectively. Boiling resulted in a slightly heavier yolk, albumen and shell but lighter membrane compared to the raw eggs. There was no incidence of meat or blood spots but egg yolk colour was markedly affected. At 50, 100 and 150 g/kg lablab, boiling effected a percentage reduction of 62, 56 and 52% respectively in the yolk colour. The feasibility of lablab as a natural source of pigment for egg yolk is of scientific interest. With increase in lablab, egg yolk colour was significantly enhanced ($p < 0.05$) which, indicates the presence of carotene in available form. Comparatively, Odunsi *et al*. (2002) recorded egg yolk colour of 2.3 and 5.9 for layers fed gliricidia leaf meal at 50 and 150 g/kg levels, whereas, in the present study with similar levels of lablab, the values of 5.3 and 8.4 were recorded. Lablab could therefore, be used to produce yolk colour intensity acceptable for table eggs, bakery and other industries favoring deeper yellow yolks without seriously implicating overall performance of the birds. Observations also showed that it only took 2 days of introducing lablab in diets for the colour to start manifesting. At the withdrawal of lablab in diets, the persistence of egg yolk colour ranged from 5, 11 and 14 days for layers fed 50, 100 and 150 g/kg lablab respectively.

Conclusively, the inclusion of lablab at higher levels caused a reduction in egg number (even though > 75%), similar biological efficiency and egg quality while limiting dietary lablab to 50 g/kg ensures comparable performance response to the control diet in all ramifications. Since consumers prefer high quality eggs in terms of deep yolk colour, strong shells and high Haugh unit, then including lablab at levels up to 150 g/kg in layer diets where it is abundant and available as a feed resource is justified. This is particularly so in the tropics, where the search for alternative feed ingredients for farm animals is far from being over. It is noteworthy that there is little or no report of feeding lablab grain or forage in layer diets. This could be due to the performance of alternative crops such as cowpea, which produces several cuts and grains within the same year (Hendricksen and Minson, 1985). There was no incidence of anti-nutritional factor as compared with gliricidia (D'Mello, 1995). The major constraints of lablab for layers appears to be the relatively high fibrous nature and low energy while the hard nature of the seed during processing limits utilization in human diets.

References

Akinlade, J., G. O. Farinu, A. O. Awogbade and A. J. Gbadamosi, 2002. Screening five varieties of cowpea (Vigna unguiculata) for fodder yield and quality in crop-livestock farming system. Proc. 27th Annual Conf., NSAP, FUT, Akure, March 2002, pp: 221-222.

AOAC., 1990. Association of Official Analytical Chemists. Official methods of Analysis. 15th edition, Washington, DC.

Carter, T. C., 1975. The hens egg: Estimation of shell superficial area and egg volume using measurement of fresh egg weight and breadth alone or in combination. Br. Poult. Sci., 16: 541- 543.

Daniel, N. W., 1991. Biostatistics: A foundation for analysis in the health sciences. John Wiley and Sons, New York.

D'Mello, J. P. F., 1995. Leguminous leaf meals in non-ruminants nutrition. In: Tropical Legumes in Animal Nutrition. D'Mello, J.P.F and Devendra, C(eds) CAB International, UK, 247-283.

Hendricksen, R. E. and D. J. Minson, 1985. Lablab purpureus- A review. Herbage Abstracts, 55: 215-228.

Hendricksen, R. E. D., D. P. Poppi and D. J. Minson, 1981. The voluntary feed intake and retention time by cattle and sheep of stem and leaf fractions of a tropical legume, Lablab Purpureus. Aust. J. Agri. Res., 23: 389-398.

Minson, D. J., 1977. Chemical composition and nutritive value of tropical legumes. In: Tropical Forage Legumes. (PJ Skerman, Ed.) FAO Plant Production and Protection Service, 2: 569-582.

Odunsi, A. A., M. O. Ogunleke, O. S. Alagbe and T. O. Ajani, 2002. Effect of feeding Gliricidia sepium leaf meal on the performance and egg quality of layers. Int. J. Poult. Sci., 1: 26-28.

Ologhobo, A. D., 1992. Nutritive values of some tropical (West African) legumes for poultry. J. Appl. Anim. Res., 2: 93-104.

Purseglove, J. W., 1968.Tropical crops (Dicotyledons) Longmans, Green and Co. Ltd. London, UK. Vol., 1: 273-276.

Sainsbury, D., 1992. Poultry Nutrition. In: Poultry Health and Management,3rd edition. Blackwell Sci. Ltd., London.

Scaaffhausen, R. V., 1963. Economical methods for using the legume (Dolichos lablab) for soil improvement, food and feed. Turialba, 13: 172-178.

Topps, J. H., 1992. Potential composition and use of legume shrubs and trees as fodder for livestock in the tropics. J. Agri. Sci., (Cambridge) 118: 1-8.

Udedibie, A. B. I. and F. O. Igwe, 1989. Dry matter yield and chemical composition of pigeon pea (C. cajan) leaf meal and the nutritive value of pigeon pea leaf and grain meal for laying hens. Anim. Feed Sci. Tech., 24: 111-119.