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Evaluation of *Microdesmis puberula* Leaf Meal as Feed Ingredient in Laying Hen Diets

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Abstract: A fifty-day feeding trial was conducted to evaluate the leaf meal of *Microdesmis puberula* as feed ingredient in laying hen diets. *Microdesmis puberula* is a preferred tropical browse plant. Seven experimental layers diets were formulated incorporating the leaf meal of *Microdesmis puberula* at 0.0, 2.5, 5.0, 7.5, 10.0, 12.5 and 15.0% dietary levels. One hundred and five (105), Shikka brown layers already 10 months in lay were divided into 7 groups of 15 birds each and randomly assigned to the 7 treatment diets in a completely randomized design (CRD). There were no significant differences ($p<0.05$) in body weight, Haugh unit, Shell thickness, Yolk index and Albumin index among the groups. However, there were significant ($p<0.05$) differences among the groups in hen-day egg production, egg weight, feed intake, egg size and dressed carcass weight. The intensity of the egg yolk colouration increased with increasing levels of the leaf meal in the diets. The results of this study suggest that 15% dietary inclusion of *Microdesmis puberula* leaf meal could be used in layers diets without any deleterious effects on performance.

Key words: *Microdesmis puberula* leaf meal, layers, laying hen diets

Introduction

In Nigeria in recent years, the once prosperous poultry industry has virtually collapsed due to shortage and high cost of feed ingredients. The escalating cost of these ingredients has been the prime stimulant for the search for alternative feedstuff especially for monogastric animals (Joseph *et al*., 2002; Esonu *et al*., 2001; Emenalom and Udedibie, 1998). The option has been to source locally available plant materials, which are not directly consumed by humans for monogastric animal production. Attention is now directed to indigenous plant species (herbs and shrubs), which serve as browse plants for ruminants.

Browse plants not only supply essential nutrients but also contain oxycarotenoid, which positively affects the yolk and carcass colour of layers and broilers (Esonu *et al*., 2002; Opara, 1996; Udedibie, 1987; D'Mello *et al*., 1987). *Microdesmis puberula* is one of these indigenous preferred browse plant for ruminants especially goats. In Igboland of Southern Nigeria, it is called "Mkpiri or Mgbugbo" and in Yoruba also in Southern Nigeria it is called "Idi apata". The plant grows up to a giant shrub if not harvested or cut in thick rainforest. It is palatable and can withstand heavy grazing by up to four beast (Cattle, Sheep, Goat and Horse) per hectare after establishment. *Microdesmis puberula* contain 87.73% DM, 17.32% Crude protein, 9.6% Ash, 15.05% Crude fibre, 3.35% Ether extract and 24.05% NFE (Esonu *et al*., 2001).

The study herein reported was designed to evaluate *Microdesmis puberula* leaf meal as feed ingredient in laying hen diets.

Table 1: Composition of *Microdesmis puberula* leaf meal

Nutrients	% DM
Dry matter (in air dry meal)	84.90
Crude protein	17.30
Crude fat	6.52
Ash	12.20
Crude fibre	24.80
Nitrogen free extract	24.00
Gross energy (MJ/kg)	18.70
Minerals calcium	1.61
Magnesium	1.66
Sodium	2.00
Potassium	0.39
Phosphorus	0.24
Iron	1.90

Materials and Methods

The leaves of *Microdesmis puberula* were harvested from the bush around the Federal University of Technology, Owerri, Nigeria. The leaves were chopped for faster and effective drying. The chopped leaves were sun-dried for three days until they became crispy while still retaining the greenish colouration. The dried leaves were then milled using a hammer mill to produce a leaf meal. A sample of the leaf meal was then subjected to proximate analysis according to AOAC (1995). Mineral analysis was carried out by the method of Grueling (1966) while gross energy was determined with a Gallenkamp adiabatic oxygen bomb calorimeter (Table 1).

Seven experimental layers diets were formulated such

Table 2: Composition of treatment diets

Ingredients	Dietary levels of *Microdesmis puberula* leaf meal (%)						
	0.00	2.50	5.00	7.50	10.00	12.50	15.00
Yellow maize	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Leaf meal	0.00	2.50	5.00	7.50	10.00	12.50	15.00
Soybean meal	20.00	20.00	20.00	20.00	20.00	20.00	19.00
Palm kernel meal	8.00	5.00	5.00	5.00	5.00	1.50	1.50
Wheat offal	7.00	12.50	10.50	7.50	5.00	1.00	0.50
Fish meal	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Oyster shell	5.50	5.50	5.50	5.50	5.50	5.50	5.50
Bone meal	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Vit/TM premix*	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Calculated chemical composition (%in DM)							
Crude protein	18.80	17.07	19.80	19.76	19.80	19.09	18.63
Crude fibre	4.70	5.34	5.73	6.01	6.37	5.79	6.10
Ether extract	4.93	5.08	4.66	5.15	5.19	4.81	4.79
Total ash	4.05	4.09	4.13	4.17	4.20	4. 23	4.26
Potassium	0.46	0.48	0.43	0.48	0.52	0.52	1.57
ME (kcal/kg)	2586.2	2579.0	25550.0	2519.0	2489.0	2453.6	2401.0

* To provide the following per kg of feed: Vitamin A, 10000 iu; vitamin D_3, 2000iu; Vitamin B_1, 0.75mg; Nicotinic acid, 2.5mg; Calcium pantothenate, 12.50mg; Vitamin B_{12}, 2.5mg; vitamin K_3, 2.3mg; Vitamin E, 2.5mg; Cobalt, 0.40mg; Biotin, 0.50mg; Folic acid, 1.00mg; Choline chloride, 25mg; Copper, 8.00mg; Manganese, 64mg; Iron, 32mg; Zinc, 40mg; iodine, 0.8mg; Flavomycin, 100mg; Spiromycin, 5mg; DL-Methionine, 50mg; Selenium, 0.16mg and L-Lysine, 120mg.

that they contained *Microdesmis puberula* leaf meal at 0.0, 2.5, 5.0, 7.5, 10.0, 12.5 and 15.0% dietary levels respectively (Table 2). One hundred and five (105), Shikka brown layers already 10 months in lay were divided into 7 groups and randomly assigned to the seven treatment diets in a completely randomized design (CRD). Each treatment was further divided into three replicates of five birds. Feed and water was provided *ad libitum*. The birds were weighed at the beginning and end of the trial. Feed intake was recorded daily and eggs collected twice daily, morning (9.00 a.m) and afternoon (3.00 p.m). Total number of eggs laid per treatment was recorded. Five (5) eggs daily from each treatment were used in the determination of Haugh unit, Yolk index, Albumin index, Shell thickness and Yolk colour. The egg size (oblong and horizontal circumference of each egg were measured using a thin thread and thereafter measuring such length along a graduated ruler in centimeters), shell thickness was measured using a micrometer screw gauge (the membrane from each egg shell was removed and measurements taken from three points on each shell, the thickness value of each egg was the average value for the three measurements). Venier callipers was used to measure albumen and yolk heights and width respectively. Yolk colour was scaled on a Roche colour fan or chart (Vuilleumier, 1969) and the scores recorded. The yolk and albumin indices and Haugh units were subsequently computed and recorded. The experiment lasted for 50 days.

At the end of the 50th day, 5 birds were randomly selected from each of the treatment groups, deprived of feed but not water for 24 hours, slaughtered and eviscerated for dressed carcass weight determination. Data collected were subjected to analysis of variance (Snedecor and Cochran, 1978). Where analysis of variance indicated significant treatment effect, means were compared using Duncan's New Multiple Range Test (DNMRT) as outlined by Obi (1990).

Results

The chemical composition of *Microdesmis puberula* leaf meal is shown in Table 1, while the nutrient composition of the experimental diets is shown in Table 2. Data on the performance, egg quality and dressed carcass weights of laying hen on the various dietary levels of the leaf meal are presented in Table 3. There were no significant differences ($p<0.05$) in body weight, feed conversion ratio and egg quality characteristics (Haugh unit, Yolk and Albumin indices and Shell thickness) among the groups. However, there were significant differences ($p<0.05$) among the groups in hen-day egg production, egg weight, feed intake, dressed carcass weight and egg size (horizontal and oblong circumferences). The intensity of the egg yolk colouration increased with increasing levels of the leaf meal in the diets.

Table 3: Effect of different dietary levels of *Microdesmis puberula* leaf meal on the performance of lying hens

	Dietary levels of leaf meal (%)							
	0.00	2.50	5.00	7.50	10.00	12.50	15.00	SEM
Initial body weight (g)	1800.00	1800.00	1813.00	1810.00	1830.00	1830.00	1820.00	0.85
Final body weight (g)	1810.00	1810.00	1815.00	1811.00	1830.00	1835.00	1821.00	0.35
Egg weight (g)	66.69^{a}	63.83^{b}	68.09^{a}	64.18^{b}	62.39^{b}	69.64^{a}	64.53^{b}	2.45
Hen day egg production (%)	57.50^{a}	55.00^{a}	57.00^{a}	61.90^{b}	60.70^{b}	64.30^{b}	65.07^{b}	5.56
Feed intake (g/day)	142.00^{a}	140.00^{a}	144.00^{a}	152.00^{ab}	160.00^{b}	165.00^{b}	169.01^{b}	5.49
Feed conversion ratio	2.13	2.19	2.11	2.37	2.24	2.23	2.51	0.18
Haugh unit (HU)	70.40	71.34	72.21	70.03	71.17	70.03	70.03	0.86
Shell thickness (mm)	0.38	0.35	0.37	0.37	0.36	0.34	0.36	0.01
Yolk index	0.38	0.41	0.39	0.41	0.43	0.41	0.40	0.04
Albumin index	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.01
Horizontal circumference (cm)	13.77^{a}	14.25^{a}	14.19^{a}	13.77^{a}	13.76^{a}	16.27^{b}	13.75^{a}	0.18
Oblong circumference (mm)	16.39	16.42	16.35	16.37	16.09	16.60	16.24	0.41
Egg yolk colour score	4.00	5.00	7.00	7.00	8.00	10.00	12.00	1.15
Dressed carcass weight (%)	51.56^{a}	62.50^{b}	59.72^{b}	54.41^{a}	60.51^{b}	60.51^{b}	60.50^{b}	5.88

^{ab} Means within a row with different superscripts are significantly ($p<0.05$) different

Discussion

Birds on the leaf meal diets performed generally better than the group fed the control (0.0%) diet. The higher feed intake recorded by birds on diets containing *Microdesmis puberula* leaf meal was however understandable. The diets had low energy values due to high fibre content which had an energy dilution effect on these diets and a consequential increase in feed intake. This is in line with the report of D'Mello *et al.* (1987). However, this result from layers trial is contrary to earlier reports from Ash *et al.* (1992) and Esonu *et al.* (2002) with broilers. From the nutrient composition, it appears that *Microdesmis puberula* leaf meal could supply adequate amounts of minerals including Ca, P, Mg and Fe required for proper growth and development, shell and bone formation as well as egg production (Ademosun and Kalango, 1973; Fox and Feltwell, 1980; Fanimo *et al.*, 1999). The control group scored 4 on the Hoffman La Roche colour fan throughout the trial period. The yolk colour score on the scale increased as dietary levels of the leaf meal increased in the diets. This is an indication of efficient absorption and utilization of the pigmenting xanthophylls present in the leaf meal. It would appear from this study that the leaf meal could be used to reduce the cost of egg production and improve yolk colouration in humid tropical countries, without adverse effects on the performance of laying hens. Not much is known about the feeding value of *Microdesmis puberula* leaf meal on birds. Recent studies carried out at this station (Esonu *et al.*, 2002) showed that broiler finisher birds could tolerate this leaf meal at 10% dietary level with improved performance.

From the results of this study, it would appear that a 15% inclusion level of *Microdesmis puberula* leaf meal could be used in laying hen diets without any deleterious effects on performance. Further research is necessary to determine the phytochemical constituents of the leaf meal so as to improve its nutritive value for monogastric animals in view of its relative availability and cheapness.

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