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Effect of feeding graded levels of *Moringa stenopetala* leaf meal on growth performance, carcass traits and some serum biochemical parameters of Koekoek chickens

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ABSTRACT

The aim of the present study was to evaluate *Moringa stenopetala* leaf meal (MLM) as alternative cheap source of protein in the diets of grower Koekoek chicken breeds. Two hundred 15-day old chicks were randomly assigned to five dietary treatments consisting of a control diet (T1) and those containing MLM at the levels of 50 g/kg (T2), 80 g/kg (T3), 110 g/kg (T4) and 140 g/kg (T5) replacing the roasted soybean of the control diet. The experimental period lasted for 14 weeks inclusive of 2 weeks of diet adaptation. The results indicated that chickens reared on diets containing MLM consumed more ($p < 0.01$) feed than those of the control diet. There were no significant differences in feed conversion ratio among treatment diets except in those fed T5 which had the lowest value. Chickens fed on T2, T3 and T4 had higher ($p < 0.01$) weight gain and final body weight values than those fed T1 and T5 diets. Chickens fed T3, T4 and T5 diets had higher ($p < 0.01$) weights of dressed carcass, thighs, drumsticks and wings than those of the control diet (T1). Significantly ($p < 0.01$) higher slaughter weight was obtained from chickens fed T3 and T4 diets than those of T1. Chickens fed T4 and T5 diets had the highest dressing and breast yields which differed ($p < 0.01$) from the other treatment diets. Serum total protein levels increased ($p < 0.05$) in chickens fed MLM. The values of serum alanine transaminase and of serum urea were reduced ($p < 0.05$) in chickens fed T3 and T4 diets. It can be concluded that *Moringa stenopetala* leaf meal could be used as alternative cheap source of protein for the emerging poultry industry of tropical regions.

1. Introduction

Livestock production in general and chicken production in particular plays important socio-economic roles in developing countries (Kondombo, 2005). Chickens are important source of animal protein, and can be raised in situations with limited feed resources (Olwande et al., 2010). They are the most important avian species reared for generating income by the resource challenged families of the developing world. Most of the developing countries are situated in the tropics where the infrastructure is not well developed to import the vital ingredients for human and livestock feeding. Feedstuffs used for poultry feeding are particularly expensive, thereby limiting the growth of poultry industry in the tropics (Nuhu, 2010). Hence it becomes imperative to identify cheap, locally available and less competitive substitutes to some ingredients of much needed for poultry feeds and in particular, sources of protein.

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Since protein from plants is the most naturally abundant and cheapest source, there has been growing awareness in the use of plant leaf meals (Esonu et al., 2006; Gadzirayi et al., 2012; Iheukwumere et al., 2008). The use of leaf meals of plants as feed ingredients as alternative to conventional feed resources is increasingly becoming a novel area of research in animal nutrition. One such possible source are the leaf meals obtained from some tropically adapted legume browse plants and in recent times, it has stimulated interests in the utilization of leaves from Moringa trees as an alternative affordable sources of protein in poultry nutrition (Abou-Elezz et al., 2011; Olugbemi et al., 2010).

Leaves of Moringa are promising as a food source in the tropics because the tree is covered with green leaves during the dry season when other foods are scarce (Melesse et al., 2009). *Moringa setenopetela* is one of the 14 species of Moringaceae family, indigenous to Eastern Africa and cultivated for its multipurpose usages (Melesse et al., 2012). Recent studies conducted by Melesse et al. (2012) reported that leaves of *Moringa stenopetala* are not only rich in protein but also contain substantial amounts of essential amino acids which are comparable to that of the conventional soybean meal. The current study was thus designed to evaluate *Moringa stenopetala* leaf meal (MLM) as a possible feed ingredient in the diets of poultry and its effect on feed intake, growth performance and carcass characteristics of Koekoek chicken breeds by replacing roasted soybean.

2. Materials and methods

2.1. Research site

The experiment lasted for 12 weeks, which were preceded by 2 weeks of diet adaptation. It was carried out using the poultry facility of the School of Animal and Range Sciences, Hawassa University (Ethiopia), which lies geographically between 7° 5′ N latitude and 38° 29′ E longitude at an altitude of 1700 m above the mean sea level. The average rainfall of the area ranges from 800 mm to 1100 mm. The mean minimum and maximum temperatures in the study area are 13.5 °C and 27.6 °C, respectively (NMA, 2012).

2.2. Feed material preparations

The leaves were collected from 7 to 8 years old *Moringa stenopetala* tree. Branches and twigs were carefully removed manually and leaves were dried under the shade. The dried leaves were then processed into *Moringa stenopetala* leaf meal (MLM) using a hammer mill with a sieve size of 4 mm. The leaf meal was packed in bags of 100 kg and stored until used. Proximate analysis was carried out to assess the composition of the dietary ingredients including MLM.

2.3. Chemical analysis

The determination of dry matter (DM), ash, ether extract (EE) and crude fiber (CF) was performed according to AOAC (1995). Total nitrogen content of the feed was determined using micro-Kjeldahl method and the crude protein (CP) was then calculated as nitrogen (N) × 6.25. Calcium was determined by atomic absorption spectrophotometer and phosphorus by colorimetrically methods as described by AOAC (1995). The metabolizable energy (ME) of diets was estimated according to the equation proposed by Wiseman (1987). Nitrogen free extract (NFE) was computed by difference of organic matter and the sum of CF, EE and CP. All the samples were analyzed in duplicates at Animal Nutrition Laboratory of Hawassa University.

2.4. Experimental chickens and design of the treatment diets

Day old Koekoek chicks were procured from Debre Zeit Agricultural Research Institute (Ethiopia). The Koekoek is a South African breed of chicken developed in the 1950s at the Potchefstroom Agricultural College in the city of Potchefstroom by cross breeding of Black Australorp, White Leghorn, and Barred Plymouth Rock (Fourie and Grobbelaar, 2003). This chicken breed is also known by a common name of Potchefstroom Koekoek. The name Koekoek refers to the barred color pattern of the birds. This breed is very popular among rural farmers in South Africa and neighboring countries for egg and meat production (Grobbelaar et al., 2010).

Three hundred fifty day old chicks were initially raised together for two weeks. The starter rations for the first and second weeks of adaptation period were prepared containing 20 g/kg and 30 g/kg MLM, respectively to accustom chicks to the experimental diets.

On day 15, two hundred chicks were selected at random, leg-tagged and randomly allotted to each of the four replicates of the five dietary treatments in a completely randomized design. As presented in Table 1, the diets were composed of white maize, roasted soybean, wheat bran, noug cake (*Guizotia abyssinica*), MLM, limestone, salt and vitamin/mineral premixes. Five experimental dietary formulations which were both iso-nitrogenous and isocaloric were developed using the above mentioned ingredients which were ground separately before mixing. The dietary treatments were the control diet (T1) and diets containing MLM at the levels of 50 g/kg (T2), 80 g/kg (T3), 110 g/kg (T4) and 140 g/kg (T5) partially replacing the protein of the roasted soybean in the control diet.

2.5. Management of chickens

All chickens were vaccinated against Marek's disease, Newcastle disease, infectious bursal disease (Gumboro), fowl typhoid and fowl pox as per the recommended vaccination schedules of the manufacturers. Chicks were kept in a deep litter housing system with concrete floors covered with wood shavings at a depth of 5 cm. The pens, watering and feeding troughs were cleaned and disinfected using appropriate detergents and insecticides. Each pen was electrically pre-warmed using 100 W bulb lamp before the transfer of the chicks to the experimental regime. Clean water was provided *ad libitum* throughout the experimental period.