



Sunflower meal as a nutritional and economically viable substitute for soybean meal in diets for free-range laying hens



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ARTICLE INFO

Article history:

Received 20 August 2015

Received in revised form 25 July 2016

Accepted 31 July 2016

Keywords:

Helianthus annuus L

Economic feasibility

Eggs

ABSTRACT

Alternative feedstock which may partially or fully replace conventional ingredients and consequently reduce the cost of egg production have been sought for a long time. In this context, the aim of this study was to evaluate the performance, egg quality and profitability of Naked Neck laying hens fed different levels of sunflower meal in place of soybean meal. A total of 128 hens were used, distributed in a completely randomized design, 16 boxes with eight hens each. The treatments consisted of one reference diet (RD) and three diets replacing the crude protein of soybean meal with sunflower meal at levels of 10%, 20% and 30% (R10, R20 and R30, respectively), properly supplemented with synthetic amino acids. All diets were based on the nutritional requirements of the semi-heavy laying hens. There was no significant difference of the different levels of substitution of soybean meal by sunflower meal on the laying rate ($P=0.14$), egg mass ($P=0.06$), feed conversion ($P=0.20$) and egg weight ($P=0.35$). However, for egg quality yolk color showed significant effects at different levels of substitution. The economic analysis of dietary treatments showed a reduction in the price per kilogram of soybean meal (0.59; 0.57; 0.55 and 0.53 dollars, respectively) replaced by sunflower meal at levels of 0%, 10%, 20% and 30% protein gross. Thus, the partial replacement of crude protein of soybean meal by sunflower meal in diets for hens is economically feasible, provided that the amino acid profile is corrected through supplementation, allowing the maintenance of the main quantitative and qualitative indices.

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1. Introduction

Semi-intensive rearing of poultry is characterized as a differentiated system which provides a larger area per animal and free access to grazing areas. This system aims to reduce the costs of production and increase marketing of products, catering for a demanding consumer as regards the nutritional and sensory quality of the meat. The use of corn and soybean meal based on the feed of these chickens has been responsible for much of the total production cost. In this context the strategy of formulating rations with alternative ingredients is a way out of the problem, especially when the soybean meal in certain geographical regions of Brazil is expensive because of the cost of growing, processing and transportation.

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Table 1
Nutritional composition of sunflower meal, soybean meal and elephant grass.

Nutrients (%)	Ingredients		
	Sunflower meal	Soybean meal [*]	Elephant grass
Dry matter	91.84	88.75	18.01
Crude protein	25.71	45.22	7.80
Ether extract	19.59	1.69	2.35
Neutral detergent fiber	49.96	13.79	68.03
Acid detergent fiber	37.70	8.07	40.63
Mineral matter	5.64	5.83	14.08

^{*} Rostagno (2011).

With rising feed prices, there is a general tendency to formulate diets that specifically meet the requirements of the chickens without offering excess nutrients (Mushtaq et al., 2009). Sunflower meal is obtained from the extraction of the vegetable oil and its use is becoming attractive in poultry feed to replace the most costly ingredient in this diet, soybean meal. Despite having a protein rich in sulfur amino acids, its use in poultry feed has some limitations, such as low levels of lysine and threonine and high fiber concentration (Junqueira et al., 2010). There are variations in the chemical composition of sunflower bran, attributable to different ways of processing the seeds (Pinheiro et al., 2002), which may be an obstacle to the use of sunflower meal in poultry diet.

The results found in the literature on the effect of sunflower meal on the performance of laying hens are contradictory. Shi et al. (2012) showed no negative influence of sunflower meal inclusion on egg production and quality of commercial hens. However, Junqueira et al. (2010) found that the inclusion of sunflower meal interferes with the egg quality of laying hens of the Isa Brown line.

The contradiction in the literature on the influence of sunflower meal on the productivity and profitability of Naked Neck laying hens makes its use dubious and more evidence is required. Consequently, the objective of this study was to evaluate the performance, egg quality and economic viability of Naked Neck laying hens fed with different levels of substitution of soybean meal protein with sunflower meal, supplemented with synthetic amino acids.

2. Materials and methods

The experimental procedure was approved by the Animal Ethics Committee of the Federal Rural University of the Semi-Arid (CEUA-UFERSA 65/2012/23091.001795/2012-49).

2.1. Experimental location

The experiment was conducted at Empresa de Pesquisa Agropecuária do Rio Grande do Norte (EMPARN), Parnamirim, Rio Grande do Norte State, Brazil (5°55' south, 35°11' west, 30 m altitude). During the study, the meteorological variables inside the shed were: average air temperature and relative humidity of 29.4 °C and 62.4%, respectively.

2.2. Animal model and treatments

A total of 128 Naked Neck laying hens (Label Rouge line) were housed from the 28th to 43rd weeks of age in 16 boxes according to a completely randomized design. The hens were housed standardizing laying rate between the experimental units. The experimental unit was a box with eight laying hens. Each box provided a covered (2 × 3 m) and an open area (2 × 10 m). Each box was fitted with a pendulous drinker, a tubular feeder and wooden nests. No artificial lighting program or climatization systems were used throughout the experimental period.

The diets were formulated according to Rostagno (2011) for the nutritional requirements of semi-heavy laying hens based on the medium production of egg mass. The treatments were a reference diet (RD) based on corn and soybean meal and three diets (R10, R20 and R30) with gradual replacement of 10%, 20% and 30% crude protein soybean meal with sunflower meal duly corrected by supplements of methionine and lysine (Table 2). Hens were fed twice daily (07h00 and 16h00). The open area of free-range system was devoid of pasture. Thus, was provided elephant grass in the amount of 100 g/hen/day in feeders type tray for all hens. Elephant grass was considered in the economic analysis.

Nutritional composition of sunflower meal, soybean meal and elephant grass are presented in Table 1. The chemical-bromatological analysis of sunflower meal and elephant grass was conducted at the Animal Nutrition Laboratory of Federal Rural University of the Semi-Arid. The chemical-bromatological composition of soybean meal was determined by Rostagno (2011).

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