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***"Animal Farming and Environment Interactions
in Mediterranean Regions"***



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Poster

BUCKWHEAT (*FAGOPYRUM ESCULENTUM*) AS PARTIAL REPLACEMENT OF CORN AND SOY IN THE LAYING HEN DIET**M.N. Benvenuti¹, V. Berrugi¹, C. Pasqua² and M. Bagliacca¹**¹ Faculty of Veterinary Medicine, Viale delle Piagge 2, IT-56124 Pisa² Gattinera Farm, IT-13885 Salussola (Biella).**ABSTRACT**

Buckwheat (*Fagopyrum esculentum* Moench) is mainly used as human food and its by-product could be fruitfully used in animal nutrition thanks to its chemical composition. For these reason the aim of this study was to evaluate the partial substitution of corn and soybean meal with buckwheat bran in the diet for low-producing hen. Experimental diet was prepared by incorporating buckwheat bran at a level of 30% in a corn-soy based laying-hen diet as partial substitution of corn (20%) and soybean (10%). Sixteen low-producing ISA-Brown hens, 74 weeks of age, were transferred in couple wire cages, 16L:8D and tested according to a Latin square design with 14 days adaptation and 14 days performance data collection. Egg production, egg mass and egg quality (shell: thickness and weight; albumen: Haugh units and weight; yolk: colour and weight) were daily measured; feed intake (g/hen d), feed conversion and body weight were recorded per period. Faecal and feed samples were also collected to evaluate digestibility by the natural-marker technique (acid-insoluble ashes). Results showed that, after the adapting phase, egg production rate increased in the group fed buckwheat (50.5% vs. 43.3%; $p < 0.05$). The feed intake also increased (78.3 ± 0.68 eggs/hen d vs. 87.8 ± 0.68 eggs/hen d; $p < 0.05$) but no significant difference was reached in the feed conversion efficiency between the two diets (control diet 3.0 ± 0.42 vs. experimental diet 3.4 ± 0.42 ; $P = 0.52$). Egg quality traits did not differ between thesis; improvement trend was observed for albumen Haugh units in the group fed buckwheat (89 ± 1.2 vs. 92 ± 1.1 ; $P = 0.12$). Nutrient balance confirmed that AMEn of diet was deeply lowered by the buckwheat bran use (6.5 MJ/kg vs. 10.1 MJ/kg), due to the high fibre content of buckwheat bran (263 g/kg). Buckwheat bran can be used as an ingredient feed for low-producing laying hen; it induces a feed-intake increase partially balanced by improved egg-production rates and a tendency to better albumen Haugh units.

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Buckwheat (*Fagopyrum esculentum*) as partial replacement of corn and soy in laying hen diet

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Introduction

The Buckwheat (*Fagopyrum esculentum* Moench) is mainly used as human food and its by-product could be fruitfully used in animal nutrition thanks to its chemical composition. For these reason the aim of this study was to evaluate the effects of the partial substitution of corn and soybean meal with buckwheat bran in the diet for low-producing hen.

Methods

Performance test

Diet - Buckwheat bran was incorporated at a level of 30% in a corn-soy based laying-hen diet as partial substitution of 20% of corn and 10% of soybean.

Dietary composition and calculated dietary nutrient content of diets

Ingredients (g kg ⁻¹)	Control	Buckwheat
Maize	595.2	395.2
Soybean meal de-hulled, solvent	246.8	146.8
Buckwheat bran	-	300.0
CaCO ₃ (38% Ca)		52.3
Wheat, shorts	30.1	
Oats	14.0	
Wheat germ meal	14.0	
Molasses beet	14.0	
CaHPO ₄ (24% Ca 17% P)	10.5	
Vegetable oil	9.8	
Alfalfa meal, dehy	7.0	
NaCl	2.1	
NaHCO ₃	0.6	
Premix ¹	3.6	

Animals - 16 low-producing ISA-Brown hens, 74 weeks of age, with free and continuous access to *ad libitum* food and water.

Experimental design - Latin square design with two 14 days

Adaptation (pre-experimental) and two 14 days performance data collection (experimental): 4 replicates (8 hens per treatment).

Relieves - Egg production (Hen-day), egg, shell, albumen and yolk weights, shell thickness, Haugh units and yolk colour were measured daily; Feed intake (g/hen d) was recorded weekly.

Animal weights, faecal and feed samples were collected at the end of each experimental period from every cage and pooled in two samples for each experimental period. Acid-insoluble ashes as the indigestible natural marker were used to calculate the Apparent Digestibility at excreta level.

Feed choice test

Comparative palatability of maize, soybean and buckwheat was also evaluated on 14 hens for 5 days: free and continuous access to single feed in different sub-space of the feeder (food position randomly changed every day; water and calcium *ad libitum* supplied).



Particle Size	Corn	Soybean	Buckwheat
Grain	whole	whole	whole
2mm<PS<4mm	whole	solv.extr.	bran
PS<1mm	whole	solv.extr.	bran

Results and discussion

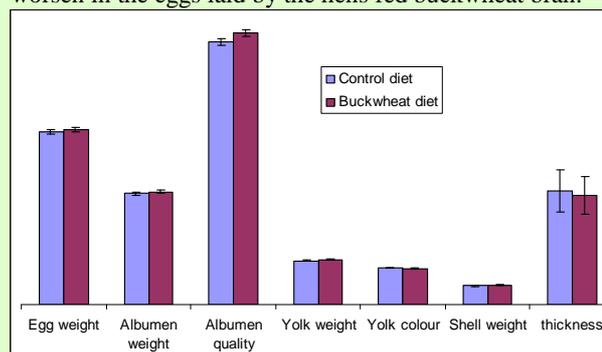
Performance test

The partial replacement of maize and soybean with buckwheat bran had a significant effect on the increase of feed intake, so that, in the actual study with low productive laying hens, either laying performance or body weight gain were positively influenced ($p < 0.05$). The egg mass production was not significantly improved since the average egg weight was slightly reduced (difference not statistically significant).

Effect of buckwheat on performance of laying hens from 54 to 62 wk of age.	Control Hens n.8		Buckwheat Hens n.8		
	Least Sq. Mean	Std Error	Least Sq. Mean	Std. Error	
Egg production rate	%	43.3	a	50.5	b
Egg mass	egg/hen d	58.4 ± 0.72	ns	58.8 ± 0.69	ns
Feed intake	g/hen d	78.3 ± 0.68	a	87.8 ± 0.68	b
Feed conversion	g feed/g egg	3.0 ± 0.42	ns	3.4 ± 0.42	ns
Body weight gain	g	-19 ± 22.5	a	+49 ± 20.5	b

Note: means with different letters differ per $P < 0.05$.

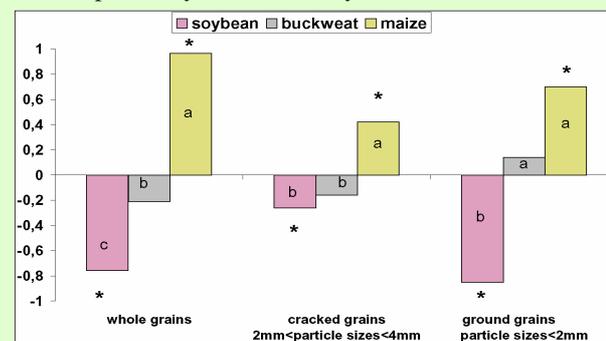
The quantitative and qualitative traits of the eggs did not worsen in the eggs laid by the hens fed buckwheat bran.



The introduction of buckwheat bran in the maize-soy based diet determined a reduction of the hen AME of -0.12 MJ for each kg of buckwheat bran inserted in the diet as substitute of 2/3 maize and 1/3 soy.

Feed choice test

Maize was always the most preferred food (as expected); buckwheat bran (test with particle sizes <2mm) was preferred more than expected and did not differ from maize consumption; soybean was always the less chosen feed.



Significant differences between component choices are shown by different letters; Significant differences between observed and expected feed consumption are shown by asterisks

Conclusions

The low-producing hens fed buckwheat bran, at least till to the level of 30%, perform equally or better to the hens fed the maize soy diet (control).