



# THE EFFECT OF USING EXOSKELETON OF BLUE CRAB (*Callinectes sapidus*) AS A DIETARY CALCIUM SOURCE ON THE EGG CHARACTERISTICS OF LAYER HENS (*Gallus gallus domesticus*)

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## ABSTRACT

The study focuses on the ability to use the exoskeletons of blue crab as an alternative calcium and carotenoid supplement for layer hens and its effects on the shell thickness and weight, and on the egg yolk color which were assessed through feeding of hens from the same batch, and collection of eggs. Three (3) groups of eighty (80) layer hens each were fed a base feed formulation following the University of the Philippines Los Baños' feed formulations. The feeds were base feed as negative control, a base feed formulation with natural egg yolk colorants capsorubin and lutein as positive control and a base feed formulation with 1% weight ground blue crab exoskeletons, as experimental. The feeding lasted for four (4) weeks before egg collection. Statistical treatment was done through the Kruskal Wallis test using SPSS software. According to the characteristic tests, the eggs of the experimental group had significantly heavier shells compared to the control groups at a mean of  $5.93 \pm 0.11$ g, compared to  $5.83 \pm 0.08$ g of the negative control and  $5.55 \pm 0.08$ g of the positive control. Egg shell thickness was not significantly different among the three groups, all groups are nearly 0.31mm. Egg yolk color was significantly different in the positive control group compared to the negative control and experimental groups with a DSM gradient value of  $11.96 \pm 0.11$ , compared to  $5.92 \pm 0.14$  of the negative control and  $6.48 \pm 0.20$  of the experimental. From the results, it could be said that ground blue crab exoskeleton as a calcium supplement may increase the weight of the egg shells, but may not intensify the egg yolk color as much as pre-existing natural egg yolk colorants.

## OBJECTIVES

- Assess if there's a significant difference between the egg characteristics of each treatment in terms of:
- 1.1 Egg weight;
  - 1.2 Albumen weight;
  - 1.3 Yolk weight;
  - 1.4 Shell weight;
  - 1.5 Average shell thickness;
- Assess if there's a significant difference between the egg's yolk color of each treatment in terms of:
- 2.1 Chromameter values;
  - 2.2 DSM Yolk Fan gradient; and
- Assess if there's a significant difference on egg characteristics on 2 different treatment:
- 3.1 Experimental group vs negative control group;
  - 3.2 Experimental group vs positive control group;
  - 3.3 Negative control group vs positive control group.

## METHODOLOGY



Acquisition Materials and Hens



Formulation and Preparation Feeds



Hen Feeding and Egg Collection



Proximate Analysis on Crab Meal



Egg Collection After 4 Weeks of Feeding



Conducting of Tests on Eggs and Data Analysis and Interpretation

Table 1: Means of the egg characteristics

Treatment	Weight				(Shell thickness)
	Egg	Albumen	Yolk	(Shell)	
Negative	63.26±0.83	36.04±0.69	17.59±0.25	5.83±0.08	0.32±0.01b
Experimental	63.15±0.91	35.51±0.72	17.57±0.22	5.93±0.11a	0.31±0.01a
Positive	61.90±0.77	34.84±0.57	17.47±0.23	5.55±0.08a	0.29±0.01ab

Table 2: Means of the yolk color

Treatment	Chromameter			(DSM Yolk Fan)
	(L*)	(a*)	(b*)	
Negative	82.69±0.15b	10.09±0.21b	56.23±0.80b	5.92±0.14b
Experimental	82.40±0.17a	10.85±0.30a	55.95±0.59a	6.48±0.20a
Positive	74.61±0.24ab	23.72±0.28ab	51.19±0.64ab	11.96±0.11ab

Table 3: Proximate analysis results

	Standard Tests (%)						
	Moisture	Protein	Fat	Fiber	Ash	Calcium	Phosphorus
Base Feed	12	17.5	5	5	-	4.2	0.7
Crab Exoskeleton Meal	5.59	8.66	0.58	11.57	72.19	23.59	1.95

## RESULTS & DISCUSSION

The mean egg shell weight of the experimental group was significantly heavier compared to the control groups. Shell weight may be increased by calcium (Ribeiro, et al. 2016).

The shell thickness of the experimental group which has a calcium supplement had no significant difference with the negative control group. Feeding hens more calcium may yield to higher shell weight (Tunç and Cufadar 2014).

In terms of color, the positive control group displayed the brightest and most significantly different in terms of all measurement aspects. Adding red and/or yellow dyes in layer hen diets may affect the egg yolk color (Grashorn, 2016)

It can be seen in the results of the proximate analysis that the crab shell meal has 23.59% calcium by weight, thus adding to the content of the base feed.

The increased shell weight mean of the experimental group is in line with the added calcium from the crab meal consequently increasing the amount of calcium of the eggs. However, the egg shell thickness results may imply that the shells' mean weight in this case do not directly relate to the shell thickness

## CONCLUSION

There is a significant difference between all the groups in terms of its shell weight, egg shell thickness, and yolk color.

The crab exoskeleton meal in the experimental feed could be used as a calcium supplement for layer hen feed due to its effects on the egg shells and its proximate analysis values, but it may not serve as an effective egg yolk colorant.

The crab exoskeleton meal has a lower calcium content than the commonly-used limestone grits, which may lessen its viability. Still, it finds a feasible alternative use for the otherwise disposed-of crab exoskeletons.

We recommend using the crab exoskeleton meal in conjunction with other egg yolk colorant supplements, such as capsorubin and lutein. Other supplements may likewise be added with the crab meal to enhance the nutritional value added to the base meal.