

## LAYING PERFORMANCE OF CHICKEN (*Gallus domesticus L.*) FED DIETS SUPPLEMENTED WITH *CAPSICUM FRUTESCENS*.

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**Abstract.** The study was conducted to evaluate the effect of diets supplemented with *C.frutescens* on chicken laying performance and egg quality. Specifically, it aimed to determine the biological performance, production efficiency and egg quality. A total of 320 heads -Lomman strain of 54-74 weeks old were used during the five (5) months feeding trial. They were randomly distributed in five (5) dietary treatments following the single factor experiment. Each treatment is replicated eight times with eight (8) heads for each replicate. Experimental diets were formulated to contain 17.7 percent crude protein and ME level of 2650 kcal/kg following the nutrient recommendation by (Philsan,2003).The experimental additive was incorporated in the ration following the inclusion rates of 0.5, 1.0, 1.5 and 2.0 percent. Layers were fed with treated and pre-weighed diets four days a week. Feed left was measured on weekly basis to determine the actual feed intake of layers. Results showed that feed consumption and feed efficiency of layers were significantly ( $P<0.05$ ) affected by addition of *C.frutescens* on the ration. However, hens egg production and monthly laying percentage from 54-74 weeks of age were comparable to those of control group ( $P>0.05$ ). Moreover, feed cost per kilogram of egg produced and income over feed cost were significantly affected ( $P<0.05$ ) by treated diets. Egg quality on the other hand were determined based on egg weight, yolk color intensity and shell thickness did not affect ( $P>0.05$ ) by treated diets. Among the parameters used in egg sensory evaluation, the general acceptability was found to be significant while comparable results were obtained from egg flavor, off-flavor and texture. Meanwhile, mortality rate was not significant indicating that *C.frutescens* can maintain overall health conditions of layers.

**Key words:** *C.frutescens*, performance enhancer, egg quality, disease prevention.

### 1. Introduction

The utilization of natural plant extracts nowadays become an important concern of the livestock and poultry sectors in order to meet consumer demands on organically produced meat and egg products. To establish potentials of herbal plants as alternative growth promoters for AGP's in poultry diets for meat and egg production an extensive trials and evaluation are to be conducted. As alternative in addressing the global concerns on organic production practices, the technology however is a economical measure against the costly synthetic supplements being used in conventional production system. Because of the capsaicin content of *Capsicum frutescens* it has been popularly used as food ingredient apart from its medicinal value against gastric ulcers, rheumatism, alopecia and toothache (Szallasi and Blumberg, 1999). The said medicinal value is due the seeds capsaicin content which through to have the antibiotic properties(Chiej 1984). Moreover, Capsicum products are used not only as flavoring agent, but used to stimulate gastric acid secretion acting as therapeutic agent, especially in the form of extractives containing high levels of capsaicin (Estrada *et al.*, 2002).

*Capsicum frutescens* is said to have a powerful antioxidant capacity in which the 100g of the pepper has an equivalent antioxidant activity of 826 mg of vitamin C from aqueous extracts of *Capsicum annum* (Sambo

et al., 2007). The fruits red color is partly due to its vit.A content that plays as catalyst for other herbs to stimulate circulation and flow of blood, making the plant as food for the circulatory system. The 0.1-1.5 percent capsaicin substance in fruit stimulates circulation and alters temperature regulation (Wee and Husuan 1990).

Despite of these promising medicinal and nutritive value of the plant, it's full economic potentials particularly in animal nutrition was not fully explored why until today it remained unpopular in the market due to lack of information and development for its value as animal feed supplement.

Therefore, this study was conducted to evaluate the practicality and economics of the plant as performance enhancer in the layer diets.

## 2. Objectives of the Study

The general objective of this study is essentially to evaluate the effect of *Capsicum frutescens* supplementation on layer performance and egg quality.

Specifically, it aimed to determine the effects of diets on average egg production percentage, monthly egg production, feed consumption, feed conversion ratio (FCR), egg weigh, shell thickness, sensory characteristics of egg, feed cost per kg of egg produced, income over feed cost, and mortality and morbidity rate.

## 3. Materials and Methods

**Experimental Design.** A total of 320-Lohmann hens of 54 weeks of age were used in the study. They were randomly distributed in five (5) dietary treatments with eight (8) replicates per treatment with eight (8) birds per replicate following the Completely Randomized Design (CRD). Data gathered were subjected to analysis of variance (ANOVA) of DMRT to determine comparison among treatment means. The treatments are as follows:

Treatments	Type of Diet
Treatment-1 (Control)	Inclusion of AGPs in the mixture
Treatment -2	Inclusion of 5g <i>C. frutescens</i> /10kg mixture
Treatment -3	Inclusion of 10g <i>C.frutescens</i> / 10kg mixture
Treatment-4	Inclusion of 15g <i>C.frutescens</i> / 10kg mixture
Treatment-5	Inclusion of 20g <i>C.frutescens</i> / 10kg mixtu

## 4. Data Gathered

**Feed consumption.** This was determined by subtracting the feed orts from the pre- weighed feeds.

**Feed conversion ratio.** This was taken by dividing the amount of feed consumed over the kg of egg produced.

**Egg production percentage.** This was taken by dividing the egg produced from the number of birds per replicate.

**Mortality.** This was taken based on the number of death during the duration of the study.

**Shell thickness.** Thickness measurements were obtained from shell fragments of five sections of the egg, namely; blunt pole, pointed pole, mid section, mid bottom and mid- top of egg using dial vernier caliper. Three readings were made for each section, and thickness profile was obtained for each size, grade and shape (Moog and Peralta, 2003).

**Yolk color intensity.** This was measured using Roche Egg Yolk Color Fan

**Sensory evaluation.** Measured based on the following parameters (Bueno and Espiritu,2005).

**Flavor:** 7= rich full flavor; 6= full flavor ; 5= slightly full flavor ; 4 =neither full or weak flavor; 3 = slightly weak flavor; 2= moderately weak flavor; 1= weak flavor

**Off-flavor:** 7= very strong off-flavor; 6=strong off-flavor; 5= slightly strong off-flavor; 4= highly perceptible; 3= moderately perceptible; 2= slightly perceptible; 1= none.

**Texture:** 7=very fine; 6= very fine; 5 fine; 4= moderately fine nor coarse; 3= moderately coarse; 2= slightly coarse; 1= coarse.

**General acceptability:** 7=very desirable; 6=desirable; 5= slightly desirable; 4= neither desirable nor undesirable; 3= slightly undesirable. 2= moderately undesirable, 1= very undesirable.

**Feed cost per kilogram of egg produced.** This was taken by multiplying the FCE over the cost of experimental diet.

**Income over feed cost.** This was taken by subtracting the cost of feeds from the sales of eggs from each replicate /bird.

## 5. Results and Discussion

**Feed Consumption.** Results indicate that feed consumption of layers were significantly ( $P<0.05$ ) influenced by the level of *C.frutescens* inclusion in the ration. The findings revealed that inclusion level of 1.5 and 2.0 percent of *C.frutescens powder* in the layer diets gave significant reduction of layers feed consumption as observed from T4 (115.72) and T5(116.40).

**Feed Efficiency.** Statistical analysis revealed that treated diets significantly influenced feed efficiency ( $P<0.05$ ) of layers compared with the control group having the least mean value of 2.04. Layers at treated groups had obtained a feed efficiency ranging from 1.87-1.97.

**Egg production.** Statistical analysis revealed that egg production of layers from 54- 70 weeks of age were similar ( $P>0.05$ ).The average egg production of both treated and control groups ranged from 25.04-26.11.

Table 2. Average cumulative feed consumption, feed conversion efficiency (FCE) and egg production of birds fed with *Capsicum frutescens* supplemented diets from 54- 74 weeks of age.

Treatments	Parameters		
	Feed Consumption, g	Feed efficiency	Monthly Egg Production/ Bird
T1	119.611a	2.04a	25.04
T2	117.87ab	1.97ab	25.19
T3	118.60a	1.88b	26.11
T4	115.72c	1.86b	25.83
T5	116.40b	1.87b	25.20
CV,%	1.51	4.04	4.65

Column means with different superscripts are significantly differ ( $P<0.05$ )

**Average monthly laying percentage of 54-58 weeks old layers.** Treated diets showed a relatively better laying performance over the control group with a mean difference ranged from 0.5- 4.12. Nevertheless, no significant difference ( $P>0.05$ ) was among treatments.

*Average monthly laying percentage of 59-62 weeks old layers.* With the numeric difference among mean values, significant effect ( $P>0.05$ ) of treated diets on laying percentage were not observed.

*Average monthly laying percentage of 63-66 weeks old layers.* As presented in Table 3, the average cumulative laying efficiency of layers from 63-66 weeks of age did not differ ( $P>0.05$ ) significantly from each group.

*Average monthly laying percentage of 71-74 weeks old layers.* The treated diets did not differ significantly from the control lot in-terms of rate of lay. Results show that T4 gave the highest mean value of 85.71 followed by T5 (84.45), T2 (84.39), T3 (84.37) and T1 that registered the lowest rate of lay of 83.00.

Table 3. Average monthly egg production percentage of birds fed with *C. frutescens* supplemented diets at 54, 59, 63,66 and 74 weeks of age

Treatments	Parameters				
	% of lay at 54-58 weeks of age	% of lay at 59-62 weeks of age	% of lay at 63-66 weeks of age	% of lay at 67-70 weeks of age	% of lay at 71-74 weeks of age
T1	79.63	84.75	85.12	86.88	83
T2	79.63	84.88	86.13	84.88	84.39
T3	83.75	89.5	91.75	88.38	84.37
T4	82.25	87.13	90.75	88.38	85.71
T5	80.13	86.63	87.25	84.75	84.45
CV,%	7.91	6.92	6.29	6.63	7.19

Column means are not significantly differ at ( $P>0.05$ ) by DMRT.

*Average egg weight.* The results show that egg weight of layers from 54-70 weeks of age were not affected ( $P>0.05$ ) by diets supplemented with *C.frutescens*. Comparable egg weight ranged from 63.38-64.60 were obtained from treated and control groups.

*Average yolk color intensity.* Average yolk color intensity was not affected by dietary treatments ( $P>0.05$ ) of mean values ranged from 7.5-7.75.

*Average shell thickness.* Similar mean values obtained from egg samples from replicates of dietary treatments were not statistically different ( $P>0.05$ ) from each other.

Table 4. Egg quality of birds fed with *C.frutesecens* supplemented diets from 54- 74 weeks of age

Treatment	Parameters		
	Egg weight, g	Yolk color intensity	Shell thickness, mm
T1	64.60	7.5	0.290
T2	65.00	7.5	0.289
T3	65.60	7.75	0.288
T4	65.21	7.75	0.292

T5	63.38	7.88	0.289
CV,%	3.39	8.20	11.58

Column means are not significantly different ( $P>0.05$ ).

*Mortality.* Analysis of variance revealed that recorded mortality during the period of the study was not differ significantly ( $P>0.05$ ).

*Feed cost per kg of egg produced.* Analysis of variance showed that *C.frutescens* supplemented diets significantly reduced the cost of egg production ( $P<0.05$ ).

*Income over feed cost.* The results disclosed that treated groups gave the highest income over the control group. Significant difference on the other hand among treatment means were obtained ( $P<0.05$ ).

Table 5. Mortality, feed cost per kg of egg produced and income over feed cost of birds fed with *C.frutescens* supplemented diets from 54-74 weeks of age.

Treatments	Parameters		
	Mortality	Feed cost per kg of egg produced, (□)	Income over feed cost,(□)
T1	0.00	43.10a	25.73b
T2	0.375	42.62a	31.23ab
T3	0.00	39.57b	37.25a
T4	0.50	37.72c	37.10a
T5	0.25	41.71ab	33.80a
CV,%	20.4	6.39	18.54

Column means with different superscripts are significantly differ ( $P<0.05$ ).

*Sensory evaluation.* The results disclosed that composition of *C. frutescens* could have influenced acceptability egg which could be attributed to it's capsicidins compound. Generally, the egg texture, flavor and off-flavor were not significantly ( $P>0.05$ ) affected by *C.frutescens* inclusion in the ration.

Table 6. Sensory evaluation of egg as affected by *Capsicum frutescens* in the diet

Treatments	Flavor	Off-flavor	General Acceptability	Texture
T1	6.25	1.75	6.63 <sup>a</sup>	5.88
T2	5.63	2.88	5.75 <sup>b</sup>	5.88
T3	5.75	1.63	6.25 <sup>a</sup>	5.88
T4	5.75	2.63	6.13 <sup>ab</sup>	6.00
T5	5.13	2.25	5.13 <sup>c</sup>	5.63

Column means with different superscripts are significantly differ ( $P < 0.05$ ).

## 6. Summary, Conclusion and Recommendation

Layers of 54-70 weeks of age fed diets supplemented with *C. frutescens* performed similarly with basal diets in-terms of monthly egg production, monthly egg laying percentage and egg quality as measured based on egg weight, yolk color intensity and shell thickness. Moreover, feed consumption and feed efficiency of layers were significantly affected by diets supplemented with ground chilies/ *C. frutescens*.

The production efficiency of layers on the other hand as determined by feed cost per kg of egg produced and income over feed cost were significantly affected by the experimental diets. Meanwhile, mortality rate was not affected an indication of less incidence of deaths among treatments during the period of the experiment.

Among the parameters used in evaluating the egg sensory characteristics, the general acceptability was found to be significant indicating that *C. frutescens* could have influenced acceptability score.

It is recommended that further studies be conducted relative to coefficient digestibility and a disease challenge should be conducted to determine inhibition efficiency of *C. frutescens* against bacterial and fungal organisms commonly striking the birds. Further studies on egg quality and sensory evaluation should be conducted to determine optimum values.

## 7. Reference Cited

- [1] CHIEJ. R. *Encyclopaedia of Medicinal Plants*. 1984. MacDonald. ISBN 0-356-10541-5
- [2] ESTRADA.2002. Capsaicinoids in vegetative organs of *Capsicum annum* L. in relation to fruiting. *J.Agric.Food Chem.* 50, 1188-1191pp.
- [3] LAVETIN AND MC MAHON.2003. *Plants and Society*.4<sup>th</sup> Edition. Mc Graw-Hill Companies, Inc. 1221 Avenue, New York, NY 10020.293-294 pp.
- [4] MOOG,DJP AND PERALTA,R.J. 2003. Mechanical properties of eggshell in relation to its handling and transport. *Philippine Journal of Veterinary and Animal Sciences*.29:71-81.
- [5] PERUCKA, I., OIESZEK, W. 2000.Extraction and determination of capsaicinoids in fruit of hot pepper *Capsicum annum* L. by spectrophotometry and high-performance liquid chromatography. *Food Chem.* 71, 287-291.
- [6] PHILSAN 2003. *Feed Reference Standards*. 3<sup>rd</sup> ed. Philippine Society of Animal Nutritionists.
- [7] N.SAMBO. 2007. The effects of *C.annum* and *C.frutescens*- induced Gastric acid secretion in rat is by H2 receptor stimulation. *Highland Medical Research Journal*. Vol.5 No.2 / *International Journal of Toxicology (Int J Toxicol)* Vol. 26. Suppl 1 pp.3.
- [8] ZIGGER D. 2007. *Feed Technology*. 11.5 <http://www.allaboutfeed.net>. Accessed 2. October 2007.
- [9] Kamon Chaiyasit. 2009. Pharmacokinetic and The Effect of Capsaicin in *Capsicum frutescens* on Decreasing Plasma Glucose Level. *J Med Assoc Thai*; 92 (1): 108-13(2)
- [10] T. STERGIPOULOU. 2008. In vitro activity of CAY-1 a saponin from *Capsicum frutescens* against *Microsporum* and *trichophyton* species/ *Medical Mycology*, Volume 46, Issue 8, pages 806-850.
- [11] The antimicrobial properties of chili peppers and their uses in Mayan medicine/
- [12] *Journal of Ethnopharmacology* Vol. 52, issue 2, June 19196, pp 61-70.  
CAPSICUM –Therapeutic Powerhouse and Herbal Catalyst
- [13] <http://www.mdidea.com/products/new/new005research.html>
- [14] <http://pdfcast.org/pdf/capsicum-ethanol-extracts-and-capsaicin-enhance-interleukin-2-and-interfe>