



INCREASING IN PRODUCTIVITY OF LAYING HEN FED BY NATURAL GUARD ESSENTIAL OILS SUPPLEMENTATION

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ABSTRACT

A study was conducted to determine the efficacy of the developed product Natural Guard to improve the quality and quantity of egg production in laying hen. Natural Guard is a supplement consisting of natural essential oils like Pine, Eucalyptus and Lavender. Natural Guard was added to the feed with 0.2% concentration. Total egg per pan and HDA were significantly better in Natural Guard group FCR also was lower in Natural Guard hen, total Cholesterol was also significantly lower 9.53 compared with 12.1 in the control group. The trial results showed that the Natural Guard has a significant effect on egg production in both quality and quantity.

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INTRODUCTION

Animal livestock industry can't be separated from Antibiotic Growth Promoters (AGP) which increases productivity and prevent the disease caused by the environment of farms. However, AGP causes a negative impact of being a residue in the products that dangerous when consumed excessively. AGP cause pathogen microbial resistance.

Excessive utilization of Antibiotic and Growth Promotor (AGP) in animal farming stimulates bacterial resistance, and AGP residue in animal products (meat, milk, and egg) is harmful to human health. EU has banned the utilization of AGP in animal farming since 2006, and more consumers have aware of the issue of food quality and food safety. Research on the alternative use of AGP 'feed quality for food safety' has been growing much of interest. Alternative use of Growth Promotor: organic acids, immunomodulator, probiotic, prebiotic, enzyme, phytogetic, essential oils, etc.

In early 2018, the Indonesian government banned AGP in the livestock industry. The banning of AGP utilization becomes a dilemma because at the level of local farmers who do not have a good biosecurity system to prevent various diseases that are likely to occur. As a result, the production decreased that caused economic losses.

It is necessary to develop AGP substitute products to increase productivity and to prevent various types of diseases.

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The use of essential oils can be an alternative that safe and natural replacement of AGP. The use of essential oils can improve performance in poultry farms such as weight, feed consumption, feed ratio conversion, and egg production. Essential oils are generally recognized as safe for the uses recognized by the Food and Drug Administration (FDA). Essential oils can inhibit the growth of pathogen microbes in intestines and improve nutrient digestibility.

Natural Guard is a feed supplement product containing three essential oils consisting of Pine oil, Eucalyptus globules oil and Lavender oil. Essential oils are combined with minerals and vitamins to improve the productivity of poultry livestock. Natural Guard (NG) as a feed supplement product contains essential oils that will improve the production in quantity and quality.

MATERIALS AND METHODS

Experimental design and animals

A total of 30, 50-week-old, ISA laying hens were randomly allotted to two equal groups according to dietary treatments. Each group included five replicates with three laying hens. The hens were fed with a basal diet based on corn (47.7%), laying concentrate (40%), rice hulls (6%), mineral premix (0,3%), palm oil (2%), limestone (2%), and DCP (2%) which containing 17.10% crude protein, and corresponding to a metabolizable energy of 11.52 MJ/kg. Treatment group supplemented with Natural Guard 0.2% of kg feed.

Initial and final body weight (BW) of hens were recorded by weighing the hens using a 1.0 g precision scale. Hen Daily

Average (HDA) was recorded daily. Feed intake (FI) and egg weight (EW) were recorded daily. The feed conversion ratio (FCR) was calculated using the formula: $FCR = FI/EM$.

At d 31 to 37, 10 eggs each treatment were collected every day for analysis eggs exterior analysis (length, width, and weight). The interior egg quality characteristics (specific gravity, shell breaking strength, shell weight, and shell thickness) were evaluated using random samples of eggs. The eggs were broken to determine eggshell, albumen and yolk weights. The eggshells were rinsed in running water and dried in an oven at 60°C for 12 h. Eggshells were weighed using a 0.01 g precision scale. Eggshell percentage was calculated using the formula: $eggshell\ weight\ (\% \ EW) = [eggshell\ weight\ (g)/EW\ (g)]$. Eggshell thickness (including the membranes) was determined at three points on the eggs (one point on the air cell and two randomized points on the equator) using a micrometer (Mitutoyo Inc., Kawasaki, Japan).

Chemical composition of eggs was measured according to AOAC (2005) for lipid and protein of the yolk, Plumer (1997) cholesterol, Lowry (1989) for albumen protein and ANRC (1997) yolk xanthophyll.

Statistical analysis

Data were analyzed using SPSS software, version 16 (IBM, 2011). Data variables were determined using the *T-test*. All comparisons were done at 5% level of significance.

RESULT AND DISCUSSION

The laying performance of hens fed by Natural Guard supplementation is presented in Table 4. Compared with the control group, the addition of Natural Guard to the diets of hens significantly increased total egg per pan and HDA ($P < 0.05$). However, birds fed with the Natural Guard shown had no effect in their feed intake and FCR ($P > 0.05$).

Table 5 The effect of NG supplementation on laying hens performance

Parameters	Control	Natural Guard
Total egg per pan	2.94±0.02 ^a	2.99±0.02 ^b
Feed Intake (g)	119.92±0.19	118.80±0.69
HDA (%)	97.86±0.53 ^a	99.52±0.65 ^b
FCR	1.85±0.02	1.81±0.07

^{a,b} Means in the same row not sharing a common superscript differ significantly at $P < 0.05$.

The exterior and interior quality of laying hens egg fed by Natural Guard supplementation are shown in Table 5.

Table 6 Exterior and interior quality of egg fed by Natural Guard supplementation

Parameters	Control	Natural Guard
	(n: 15 Birds)	(n: 15 birds)
Egg mass (g)	63.980	63.810
Length (cm)	5.717	5.698
Wide (cm)	4.428	4.420
Albumen Height (cm)	0.755	0.771
Albumen wide (cm)	7.389	7.539
Yolk Height (cm)	1.633	1.671
Yolk wide (cm)	3.933	3.965
Yolk color (cm)	7.656 ^a	8.278 ^b
Thick shell (cm)	0.290	0.297
Shell mass (g)	6.533	6.500
Haugh Unit	85.496	86.079

^{a,b} Means in the same row not sharing a common superscript differ significantly at $P < 0.05$

Addition of Natural Guard in laying hen diets had no significant effect on neither exterior nor interior quality of the egg, except yolk color. Yolk color of laying hens that fed by Natural Guard supplementation higher ($P < 0.05$) than control.

The effect of Natural Guard supplementation on egg chemical composition of laying hens is shown in Table 7. The Natural Guard supplementation had no significant effect on albumen protein, yolk protein, and xanthophyll. However, cholesterol was reduced in Natural Guard supplemented laying hens ($P < 0.05$) compared with control.

Table 7 The effect of NG supplementation on egg chemical composition of laying hens

Parameters	Control	Natural Guard
Cholesterol	12.137±0.76 ^b	9.523±0.47 ^a
Albumen protein ^{ns}	11.300±0.42	11.563±0.17
Yolk protein ^{ns}	17.597±0.46	18.101±0.58
Xanthophyll ^s	0.947±0.05	1.109±0.15

^{a,b} Means in the same row not sharing a common superscript differ significantly at $P < 0.05$

In his study, dietary Natural Guard essential oils supplementation significantly increased total egg per pan and HDA compared with the control group. Similar to the results of this study, the addition of EO from *Ligustrum lucidum* (Li et al., 2017) and cinnamon (Torki et al., 2015) in the diet had a positive effect on increasing of egg production. The essential oils of the utilization of nutrients in the intestine and consequently increase egg production in laying hens (Cao et al., 2010; Amad et al., 2011).

Increasing in yolk color with Natural Guard supplementation can be influenced by the material content of essential oils. Plant materials containing carotenoids affect the egg yolk color when to egg-laying hens (Hammershoj, 2014). A study by Narahari et al. (2009), shows that two types of herbs belonging to the basil family (*Ocimum sanctum* and *Ocimum album*) Holy basil and White basil, respectively, have a significant effect on egg yolk color, when fed to egg-laying hens as inclusion in the feed at 3 g/kg. Botsoglou et al. (2005) reported that yolk color was significantly improved in the saffron supplementation (10 mg/kg diet). Improvement in yolk color indicated the passage of crocin, lycopene, and carotene, the coloring components of saffron, from hen diet into the egg yolk.

The decreasing in cholesterol level of the egg from laying hens fed by Natural Guard supplementation similar to Bölükbaşı et al. (2009), essential oil from *Nigella sativa* significantly reduced cholesterol content until 8,5% compared to control (El-Bagir et al., 2006). The action mode of essential oil to reduce cholesterol production by inhibiting the activity of HMG-CoA enzymes that affect cholesterol synthesis. This inhibition performed during the conversion process of lathosterol to cholesterol (Crowell, 1999).

CONCLUSIONS

The dietary supplement with Natural Guard significantly affected egg production, yolk color and decreasing cholesterol content. The Natural Guard has a positive effect on laying hen performance and egg quality.

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