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Research Articles

Impact of incorporating golden shower supplements into the laying hen diet on egg productive performance

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Abstract

The aim of this research was to examine the impact of supplementing the diet with golden shower on egg productive performance. Sixty Hybrid breed laying hens, aged 40 weeks, were allocated to 4 treatments, each comprising 3 replicates of 5 laying hens. Each group was assigned a randomly selected experimental diet supplemented with golden shower at levels of 0, 5, 10, and 15 g/kg, respectively, for a duration of 8 weeks. Egg-productive performance, encompassing factors such as body weight, feed intake, feed conversion ratio, and hen-day production were monitored throughout the experimental period. Results showed that all productive parameters were not significantly different (P>0.05). However, introducing golden shower into laying hen diets did not adversely affect the health and survival rate of the hens.

Keywords; golden shower, egg, egg productive performance

1. Introduction

Eggs are widely acknowledged for their considerable nutritional value, serving as a low-calorie yet nutrient-dense food choice, rich in selenium and vitamin D (Réhault-Godbert et al., 2019; Zhang et al., 2000). They provide an excellent source of high-quality protein, essential fatty acids, phospholipids, sphingomyelin, lutein, zeaxanthin, various bioactive components, antioxidants, and choline (Zdrojewicz et al., 2016; Sanlier et al., 2021) Additionally, eggs are cost-effective and versatile, suitable for preparation in a variety of foods, desserts, and beverages (Fredriksson et al., 2006). Due to these attributes, consumers show a preference for egg consumption, leading to a rapid expansion in egg production. Consequently, commercial egg production continually evolves to enhance production efficiency and quality to meet consumer preferences for freshness, cleanliness, size, and nutritional

content. Various factors influence efficient commercial egg production, with laying hen diet representing a significant factor impacting productivity in chicken egg production. Presently, the egg production sector plays a crucial role in formulating diets for laying hens. Many feed formulas include synthetic additives to stimulate growth, increase food intake, and improve productivity. Nevertheless, the incorporation of these synthetic components may have repercussions on the health of laying hens and could result in the presence of harmful residues for consumers. Hence, opting for supplements in laying hen diet derived from natural sources can be a viable alternative, avoiding potential adverse effects (El-Sabrout et al., 2022; Ratananikom et al., 2019).

Cassia fistula L., a member of the Fabaceae family, is commonly found in tropical regions, and in Thailand, it is known as the golden shower. This medium-sized perennial tree typically blossoms from February to May, displaying hanging clusters of numerous yellow-petaled flowers. Besides its ornamental significance, it is cultivated for its nutritional and biological attributes. According to the study from Ratananikom et al. (2021), the golden shower boasts a high carotenoid content, with β-carotene as a prominent carotenoid pigment. The study also highlighted its robust antioxidant properties against 2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) radicals, indicating potential inhibition of oxidative mechanisms (Ratananikom rt al., 2021). In Thailand, during the Songkran festival, substantial amounts of blossoming golden shower are intentionally employed in ceremonies and subsequently disposed of as waste. The repurposing of this waste as a source of feed additives for laying hen diets aims to enhance egg productivity while aligning with sustainable living practices is challenging. Consequently, this study seeks to evaluate how supplementing laying hen diets with golden shower impacts egg productivity.

2. Material and Methods

2.1 Sample collection

Petals of the golden shower were gathered at Kalasin University in the Mueang District of Kalasin Province, Thailand. Subsequently, they underwent drying in a hot air oven at 60°C for a duration of 24 hours before being finely ground into powder. The resulting dried golden shower powder was then securely stored in an airtight bag for subsequent analysis (Ratananikom et al., 2023).

2.2 Anumal study

Approval for all animal-related experiments was obtained from the Institutional Laboratory Animal Care and Use Committee of Kalasin University (Ethics Approval Number: KSU-AE-004/2566). Sixty Hybrid breed laying hens, 40 weeks old, were allocated into 4 treatments, with each treatment consisting of 3 replicates, each containing 5

laying hens. Each group was assigned a random experimental diet supplemented with golden shower for an 8-week duration.

Treatment 1: Control diet

Treatment 2: Control diet with golden shower supplementation at 5 g/kg

Treatment 3: Control diet with golden shower supplementation at 10 g/kg

Treatment 4: Control diet with golden shower supplementation at 15 g/kg

In the process of dietary formulation, the control group adhered to a maize-soybean diet outlined in Table 1, following the guidelines presented by Skřivan et al. (2015).

Table 1 Ingredient composition of the basal diet[1]

Ingredients	Amount (g/100 g diet)
Fish meal	10
Corn	35
Soybean meal	15
Broken rice	15
Rice bran	15
Limestone	2
Shells	7
Premix[2]	0.5
Salt	0.5

[1] The ingredient composition of the basal diet was was obtained and presented in the study from Ratananikom et al. (2023).

[2] Concentrate mixture including (per kg of diet): vitamin A 32000 IU; vitamin D3 6400 mg; vitamin E 8 mg; vitamin K3 3 mg; vitamin B1 4 mg; vitamin B2 8 mg; vitamin B6 4 mg; vitamin B12 0.02 mg; nicotinamide 16 mg; pantothenic acid 4 mg; choline 400 mg; folic acid 0.4 mg; manganese 68.8 mg; iron 140 mg; cobalt 0.4 mg; copper 4 mg; zing 40 mg; methionine 80 mg

Table 2 displays the proximate analysis of both the control diet and the experimental diets utilized in this study. The findings indicate that incorporating golden shower supplements into the experimental diets at levels of 5, 10, and 15 g/kg did not result in differences in the percentages of dry matter, ash, crude fiber, crude lipid, crude protein, and nitrogen-free extract ($P>0.05$).

All laying hen treatments were housed in cages in open-housing system and were fed twice a day at 110 g And fully provided clean water as well as 16-hours constant light were maintained, according to method described by Lokaewmanee et al. (2009) [11]. Various productive performance parameters, including body weight, feed intake, feed conversion ratio (FCR), hen-day production, and livability, were monitored throughout the experimental period.

2.3 Statistical analysis

The experimental design was completely randomized design (CRD). Data with a normal distribution were analyzed using one-way analysis of variance (ANOVA), followed by least significant difference (LSD) with a significance level of α = 0.05

Table 2 Nutrition values of experimental diet[1]

Nutrition values (%)	Level of golden shower supplementation in diets (g/kg)			
	0	5	10	15
Dry matter	90.27±0.60	90.13±0.72	90.36±0.32	90.17±0.66
Ash	9.72±0.04	9.08±0.08	9.59±0.61	9.84±0.53
Crude fiber	3.11±0.11	4.38±0.09	4.41±0.25	3.62±0.36
Crude fat	2.04±0.20	2.54±0.06	2.35±0.02	2.45±0.07
Crude protein	17.15±0.58	17.18±0.01	17.18±0.01	17.17±0.01
Nitrogen free extract[2]	58.24±0.20	56.94±0.09	57.83±0.08	57.09±0.02

[1] The nutrition values of experimental diet was obtained and presented in the study from Ratananikom et al. (2023).

[2] Nitrogen free extract (% = 100 – (% Moisture + % ash + % crude fiber + % crude fat + % protein)

3. Results and Discussion

3.1 Effect of golden shower supplementation on productive performances

Table 3 illustrates the impact of golden shower supplementation on productive outcomes. It distinctly indicates that feed intake, hen-day production, FCR, and egg mass did not exhibit significant differences among the treatments (P>0.05). Furthermore, the inclusion of golden shower in laying hen diets did not yield any adverse effects, as 100% livability was observed across all treatments.

Table 3 Effect of golden shower supplementation on productive performances

Productive performances	Level of golden shower supplementation in diets (g/kg)			
	0	5	10	15
Feed intake (g/chicken/day)	90.91±0.50	90.97±0.81	90.88±0.34	90.89±0.27
Hen-day production (%)	90.85±0.21	90.39±0.34	90.52±0.18	90.12±0.35
FCR (g/kg of egg)	1.89±0.02	1.76±0.07	1.91±0.05	1.81±0.04
Egg mass (g)	52.68±0.30	53.19±0.42	52.89±0.32	52.91±0.27
Livability (%)	100	100	100	100

Proximate compositions of control diet and the experimental diets with golden shower supplementation at 5, 10 and 15 g/kg were not different. These diet formulas shared common conventional structure as approximately 17.5 % crude protein, which commonly used by feed producers and enough for growth (Skřivan et al., 2015; Lokaewmanee et al., 2009). In addition, other nutritive values such as crude fiber, crude fat, ash, nitrogen free extract, and dry matter were not significantly different among the experimental groups. As a result, there was no difference ($P>0.05$) in feed intake, hen-day production, FCR, egg mass, and livability. In other word, golden shower supplementation had no influence on egg production and did not interfere the mortality rate among the experimental groups ($P<0.05$). This outcome aligns with numerous prior studies indicating that pigment supplementation is not linked to alterations in the productive performance of laying hens, as demonstrated by Lokaewmanee et al. (2011). Their study found that adding marigold extract in laying hen diet at 10, 20, 30 and 40 mg/kg had no significant effects on feed consumption, body weight, hen-day production, and egg mass. Skřivan et al. (2015) also found that using marigold flower extract in laying hen diets at 150, 250, and 350 mg/kg did not influence on feed intake and FCR. Similar conclusion was also found by Lu et al. (2013), indicating that combining marigold petals into laying hen diet at 40 g/kg did not change any egg-productive performance.

Nonetheless, the study from Ratananikom et al. (2023) showed that introducing golden shower into laying hen diets, particularly through supplementation at 15 g/kg of feed, could significantly intensify the color of the yolk. The redness score (a*) of the yolk in the experimental group fed with golden shower at 15 g/kg was notably higher than that of the control group (10.05±0.44 compared to 6.79±0.94, respectively) ($P<0.01$), leading to an increased accumulation of carotenoids in the yolk (31.86±2.19 µg/g of yolk dry weight). Furthermore, the enhancement in yolk color intensity due to golden shower supplementation positively influences consumer acceptance scores for yolk color, particularly at the 15 g/kg supplementation level. Hence, golden shower petals can serve as a valuable natural colorant for laying hen diet (Ratananikom et al., 2023).

4. Conclusion

In conclusion, the inclusion of golden shower petals in laying hen diets does not influence alterations in egg productive performance, encompassing factors such as body weight, feed intake, feed conversion ratio, and hen-day production. Moreover, introducing golden shower into laying hen diets does not adversely affect the health and survival rate of the hens.

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