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The effect of safflower oil (*Carthamus Tinctorius L.*) and inositol supplementation on egg production

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Abstract. The study aimed to examine the effect of safflower oil and inositol supplementation in a feed on egg production performance and feed conversion ratio of Sentul chickens. The research was conducted using experimental methods based on a completely randomized design (CRD). The materials used were 81 female Sentul chickens aged 16 weeks, which were divided into 9 groups of feed treatment, namely R0: control feed; R1: feed containing 0.5% safflower oil; R2: feed containing 1% safflower oil; R3: feed containing 0.5% inositol; R4: feed containing 1% inositol; R5: feed containing 0.5% safflower oil and 0.5% inositol; R6: feed containing 0.5% safflower oil and 1% inositol; R7: feed containing 1% safflower oil and 0.5% inositol; R8: feed containing 1% safflower oil and 1% inositol. The variables measured consisted of egg production, egg weight, egg mass and feed conversion ratio (FCR). Data were analyzed by analysis of variance. The results showed that the treatment had no significant effect ($P < 0.05$) on all measured variables. The average number of eggs, egg weight, egg mass and FCR for 8 weeks of observation were: 66 ± 9 eggs; 37.31 ± 2.19 g; 16.44 ± 3.31 and 2.26 ± 0.37 . The conclusion of this study was the supplementation of safflower oil and inositol with a concentration of 0.5% -1% in feed has not been able to improve the performance of egg production, and the feed efficiency of Sentul chickens.

1. Introduction

Sentul chicken is a native chicken from Ciamis district, including the dual-purpose type, so that it can be used as a meat and egg production [1]. Sentul chicken has the characteristics of fast body weight gain, disease resistance and relatively higher egg production compared to other local chickens. Sentul chickens in one laying period produce eggs as many as 10-18 eggs [2] or about 150 eggs / year [3]. Efforts to improve egg production performance and feed efficiency can be made by improving feed quality. Feed quality improvement can be done by providing feed additives. One function of the feed additive as an immunomodulator to enhance the performance of health in order to increase production. Supplementation of safflower oil and inositol into feed is one of the feed additives that can be added to feed. Feeding efficiency can be measured based on feed conversion.

Safflower oil contains fat-soluble, vitamin retinol, calciferol, tocopherol and phyloquinone as well as unsaturated linoleic fatty acids [4]. The main unsaturated fatty acids in Safflower oil are oleic and linoleic acid. This content accounts for about 90% of total fatty acids and the remaining 10% is saturated fatty acids, namely palmitic and stearic acid [5]. Linoleic fatty acids can control the proteins and lipids needed for follicular development which directly control the production of eggs.

Inositol is a natural nutrient composed of sugar alcohol isomers with a C6 chain and belongs to the B-complex group of vitamins. Inositol is a type of vitamin that the body needs for growth, maintenance and reproduction. Previous studies reported, arginine silicate inositol complex supplementation



increased egg production, egg weight, shell weight and shell thickness during the laying period [6]. Based on this background, this study aims to determine the effect of safflower oil (*Carthamus inctorius* L) and inositol supplementation on egg production performance and feed conversion ratio of Sentul Chicken.

2. Materials and Methods

The research material used 81 female Sentul chickens; 16 weeks old. Chicken rearing was carried out for 12 weeks, and observation of egg production performance and feed conversion was carried out for 8 weeks. The feed additives used as treatment were safflower oil and inositol. Feed ingredients and feed nutrient content are presented in table 1. The research equipment consists of battery cages, feed and drinking water containers and digital scales.

Table 1. Composition of feed ingredients and nutrient content of the feed treatment

Feed ingredients	R ₀	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈
	%								
Milled corn	52	52	52	52	52	52	52	52	52
Rice bran	22	22	22	22	22	22	22	22	22
Soybean meal	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Fish meal	10	10	10	10	10	10	10	10	10
Palm oil	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
CaCO ₃	2	2	2	2	2	2	2	2	2
Topmix	1	1	1	1	1	1	1	1	1
Lysine	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Methionine	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Safflower oil	0	0.5	1	0	0	0.5	0.5	1	1
Inositol	0	0	0	0.5	1	0.5	1	0.5	1
Total	100	100.5	101	100.5	101	101	101.5	101.5	102
The content of nutrients									
CP (%)	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34	19.34
CL (%)	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99	11.99
CF (%)	10.18	10.18	10.18	10.18	10.18	10.18	10.18	10.18	10.18
ME (kcal/kg)	2853.60	2860.40	2867.21	2853.60	2853.60	2860.40	2860.40	2867.21	2867.21
Ca (%)	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44
P (%)	0.34	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
Lysine (%)	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
Methionine (%)	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68

The study was conducted using an in vivo experimental method, with an experimental design, namely a completely randomized design (CRD) consisting of 9 treatments and 3 replications, with each replication consisting of 3 chickens. The treatments given in this study were, R₀ = basal feed (0% safflower oil and 0% inositol); R₁ = basal feed + 0.5% safflower oil; R₂ = basal feed + 1.0% safflower oil; R₃ = basal feed + 0.5% inositol; R₄ = basal feed + 1.0% inositol; R₅ = basal feed + 0.5% safflower oil and 0.5% inositol; R₆ = basal feed + 0.5% safflower oil and 1.0% inositol; R₇ = basal feed + 1.0% safflower oil and 0.5% inositol and R₈ = basal feed + 1.0% safflower oil and 1.0% inositol. The research variables observed were the number of eggs (eggs / head / 8 weeks), egg weight (g), egg mass and FCR.

Measurement of feed consumption is carried out every day. The feed conversion ratio is calculated using the formula: feed consumption (g) / total egg weight (g). The measurement of egg mass is obtained by dividing the total egg weight (g) produced by the chicken population (birds). The data obtained were then entered into data tabulations and analyzed using analysis of variance.

3. Result and Discussion

The results of the research on the effect of safflower oil and inositol supplementation with a level of 0.5-1% are presented in Table 1. Analysis of variance showed that the treatment had no significant effect ($P < 0.5$) on all measured variables.

Table 2. Mean and standard deviation of egg number, egg weight, consumption and feed conversion ratio of Sentul chickens with safflower oil and inositol supplementation in the feed

Treatments	Egg production ^{ns}	Egg weights ^{ns}	Egg mass ^{ns}	Feed consumption ^{ns}	FCR ^{ns}
R0	58.33±10.02	36.00±2.75	16.28±4.93	4234.37±279.11	2.42±0.14
R1	73.00±9.00	37.43±0.23	19.68±4.23	4315.93±331.69	2.33±0.29
R2	71.00±12.17	39.18±3.36	19.99±3.48	4086.50±213.23	2.19±0.31
R3	65.67±7.77	38.52±4.20	15.85±4.09	3989.58±337.32	2.30±0.24
R4	63.33±10.07	37.68±0.09	16.55±2.73	3971.90±324.19	2.37±0.19
R5	60.67±7.23	36.67±1.04	16.35±3.09	4246.95±363.97	2.27±0.18
R6	68.33±5.51	35.54±2.14	13.03±2.57	3898.29±245.54	2.02±0.21
R7	73.00±6.93	37.66±1.01	16.92±2.31	4221.79±193.73	2.18±0.17
R8	72.33±3.06	37.33±1.84	17.53±1.34	3837.20±207.74	2.29±0.09

Note: R0: feed control; R1: feed containing 0.5% safflower oil; R2: feed containing 1% safflower oil; R3: feed containing 0.5% inositol; R4: feed containing 1% inositol; R5: feed containing 0.5% safflower oil and 0.5% inositol; R6: feed containing 0.5% safflower oil and 1% inositol; R7: feed containing 1% safflower oil and 0.5% inositol; R8: feed containing 1% safflower oil and 1% inositol; ns: non-significant ($P < 0.05$).

Supplementation of safflower oil and inositol in feed by 0.5-1%, has not been effective in increasing egg production and feed efficiency. Safflower oil is an unsaturated fatty acid that controls protein for follicle development and egg weight. Safflower oil supplementation with a percentage of 0.5% and 1% is assumed to not be able to control protein and lipids in the vitellogenin process. This result is consistent with research [7] which reported that chicken feed containing 0-10% safflower seed had no significant effect on egg production, egg mass and feed intake. Layer chicken feed supplemented with two levels (1.5 and 3%) of different oils, namely sunflower, rapeseed, linseed for 12 weeks resulted in relatively equal egg production, egg weight, feed intake, FCR and live weight of the chickens.

However, chickens whose feed had sunflower oil had a lighter yolk color [8]. Inositol supplementation also has not played an effective role in increasing the digestibility of feed protein derived from grains, because it is bound by phytate. Most of the phosphorus in feedstuffs from plants (about 60 to 70%) is in the form of phytate (IP6), which makes it less available to monogastric animals. Phytates are also able to bind nutrients (such as Ca, Zn, Fe, Mg, Cu, starch, lipids, and certain amino acids) so that these nutrients are less available to poultry [9].

The results of the study in Table 2 indicate that there is a tendency to increase the performance of egg production (number of eggs, egg weight, egg mass) and feed efficiency (decrease in the value of the feed conversion ratio) by supplementing with safflower oil and inositol. The use of safflower oil as a source of omega-3 and omega-6 in the ration of laying hens has a good effect on egg production as well as inositol. During the production period chickens need 1-2.5% linoleic acid. Linoleic acid consumed can affect the performance of egg production. If the intake of linoleic acid decreases, it can reduce the performance of egg production [10]. The availability of adequate fat and protein in the ration results in an increase in the maturation rate of follicles, so that the maturation phase can increase the number of follicles [11].

Inositol is one of the vitamins needed for normal body growth, maintenance and reproduction. Inositol can function to break the bonds between phytic acid and proteins, lipids and minerals. Although inositol supplementation has not significantly increased egg production, the results showed that there was an increase in egg production and feed efficiency. Inositol plays a role in the physiology of reproductive hormones and also increases the digestibility of certain feed ingredients from whole grains.

Inositol contained in a feed can reduce levels of anti-nutritional phytic acid found in grains and can break the bonds between phytic acid and protein, lipid and mineral complexes [12]. Inositol with sufficient doses has a positive impact on digestive enzymes, so that the digestibility of feed nutrients increases. High digestibility and absorption of feed nutrients can be used to increase egg production, so that the feed conversion ratio decreases.

4. Conclusion

Safflower oil and inositol supplementation with a level of 0.5-1%, either singly or in combination, has not been able to improve egg production performance and feed efficiency of Sentul chickens.

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References

- [1] Ermansyah G, W Tanwiriah dan YA Indrawati. 2015. Pengaruh Pemberian Tepung Ampas Tahu didalam Ransum Terhadap Bobot Potong, Bobot Karkas dan Income Over Feed Cost Ayam Sentul. *Students e-Journal* Fakultas Peternakan Universitas Padjadjaran **4**(4):1-6.
- [2] Widjastuti T. 2009. Pemanfaatan Tepung Daun Pepaya (*Carica Papaya*.L L Ess) Dalam Upaya Peningkatan Produksi dan Kualitas Telur Ayam Sentul. *J. Agroland* **16**(3):268-273.
- [3] Baktiningsih S, S Mugiyono. dan DM Saleh. 2013. Produksi Telur Berbagai Jenis Ayam Sentul di Gabungan Kelompok Tani Ternak Ciung Wanara Kecamatan Ciamis Kabupaten Ciamis. *Jurnal Ilmiah Peternakan* **1**(3):993-1000.
- [4] Katkade, Syed Andhalen, Dan Sontakke. 2018. Fatty Acid Profile And Quality Assessment Of Safflower (*Carthamus tinctorius*) Oil. *Journal Of Pharmacognosy And Phytochemistry*. **7**(2):3581-3585.
- [5] Khalid N, RS Khan., MI Husaain, M Farooq, A Ahmad, I Ahmed. 2017. A Comprehensive Characterisation Of Safflower Oil For Its Potential Applications As A Bioactive Food Ingredient. *Trend in food science and technology*. **66**(17):176-186.
- [6] Sahin K, C Orhan, M Tuzu, JR Komorowski and N Sahin. 2018. Effects of dietary supplementation of arginine-silicate-inositol complex on absorption and metabolism of calcium of laying hens. *PLoS ONE* **13**(1):e0189329. <https://doi.org/10.1371/journal.pone.0189329>.
- [7] Vashan, SJH. N Afzali, M. Mallekaneh, MA Nasser and A. Allahresani. 2008. The Effect of Different Concentrations of Safflower Seed on Laying Hen's Performance, Yolk and Blood Cholesterol and Immune System. *International Journal of Poultry Science*. **7**(5): 470-473.
- [8] Alagawany M, SS. Elnesr, MR. Farag, ME Abd El-Hack, AF. Khafaga, AE Taha, R. Tiwari, MI. Yattoo, P Bhatt, SK. Khurana, and K. Dhama. 2019. Omega-3 and Omega-6 Fatty Acids in Poultry Nutrition: Effect on Production Performance and Health. *Animals*, **9**(573):1-19. doi:10.3390/ani9080573.
- [9] Farhadi D, A Karimi, Gh Sadeghi, J Rostamzadeh and MR Bedford. 2017. Effects of a high dose of microbial phytase and myo-inositol supplementation on growth performance, tibia mineralization, nutrient digestibility, litter moisture content, and foot problems in broiler chickens fed phosphorus-deficient diets. *Poultry Science*. **96**:3664–3675 <http://dx.doi.org/10.3382/ps/pex186>.
- [10] Mampioper A, S D Rumetor dan F Pattiselanno. 2008. Kualitas Telur Ayam Petelur yang Mendapat Ransum Perlakuan Substitusi Jagung dengan Tepung Singkong. *Jurnal Ternak Tropika*. **2**(9):42-51.
- [11] Suprijatna EU. 2002. Manifestasi Taraf Protein Ransum Periode Pertumbuhan Terhadap Pertumbuhan Organ Reproduksi dan Dampaknya Pada Performan Produksi Ayam Petelur Tipe Medium. *Disertasi*. Program Pascasarjana Universitas Padjadjaran Bandung.
- [12] Żyła K, M Mika, R. Duliński, S. Świątkiewicz, J Koreleski, H Pustkowiak, and J Piironen. 2012. Effects of inositol, inositol-generating phytase B applied alone, and in combination with 6-phytase A to phosphorus-deficient diets on laying performance, eggshell quality, yolk cholesterol, and fatty acid deposition in laying hens. *Poultry Science*. **91**:1915–1927. <http://dx.doi.org/10.3382/ps.2012-02198>.