The Effect of Natural Aromatase Blocker on the Growth Comb and Body Weight of Layer Chicken

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Abstract. The aim of this research is to evaluate the effect of *Anadara granosa* shell powder as a natural aromatase blocker (NAB) and zinc sulfate ($ZnSO_4$) on the growth of the length comb, width comb, and body weight (BW) of layer chicken. This study used 45 DOC of layer's chickens with 3 treatments and 15 replications, those are; control (T0), clamshell powder *Anadara granosa* as NAB 0.036 mg/40 g BW (T1), and $ZnSO_4$ 0.018 mg / 40 g BW (T2). This treatment was given for 35 days. The data on the growth of length comb, width comb, and BW are measured weekly. The data collected was analyzed using one-way ANOVA at the 95% confidence level with the assistance of SPSS. The results of statistical analysis of the length and width of the comb in the same column showed that T0 was not significantly different ($p>0.05$) from other treatments. The statistical analysis shows that the length and width of the layer's chicken comb in the same row at T0, T1 and T2 were significantly different ($p<0.05$). The results of statistical analysis of the BW in the same column showed that T1 was significantly different ($p<0.05$) from other treatments. It can be concluded that additional NAB 0.036 mg/40 g BW can increase the body weight of male layer chicken after treatment of 35 days. The administration of NAB and $ZnSO_4$ could not increase the growth of the length and width of layer chicken combs. The growth in length and width of layer chicken combs is very fast in the starter phase.

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Table 1. Comb length (mm) of male layer chickens after being treated with NAB and ZnSO.

Treatment	Mean±SD Comb length (mm), Days				
	7	14	21	28	35
T0	10.56±0.51^{a,k}	14.23±0.92^{a,j}	16.00±1.00^{a,i}	21.26±0.73^{a,h}	24.50±0.50^{a,g}
T1	10.73±0.64^{a,j}	15.30±2.33^{a,i}	17.00±1.00^{a,i}	22.16±0.76^{a,h}	25.66±2.02^{a,g}
T2	10.66±0.30^{a,j}	14.33±2.51^{a,i}	16.16±0.76^{a,i}	21.40±0.52^{a,h}	24.83±0.76^{a,g}

$^{a-c}$ Different superscripts in the same column showed significant differences ($p<0.05$).
$^{g-k}$ Different superscripts in the same row showed significant differences ($p<0.05$).

1 Introduction

One of the performances of roosters can be seen from a good comb and body weight [1]. Rooster's performance is controlled by the male hormone, namely testosterone [2,3,4,5]. Many research found that good comb growth-promoting by increasing testosterone [2]. To keep testosterone stay high it can be controlled by aromatase blockers [6,7]. Aromatase blockers are drugs that can block the action of aromatase enzymes, thereby minimizing the conversion of testosterone to estrogen [8]. Shellfish shell squander isn't utilized by marine item makers, which causes environmental problems [9]. Shellfish shells can be innovated into NAB by converting them into powder [7]. The shell that is popular in the community is clamshell *Anadara granosa*, this shell is broadly expended and as it were the meat is utilized, whereas the shells are tossed absent [9].

According to Astuti *et al*. [10] NAB 0.3 mg/30 g BW can increase the sound quality and the frequency of male canaries. Reinforced by the results of research Yuneldi *et al*. [2] that administration of NAB 0.036 mg/40 g BW can increase the testosterone levels compared to controls. Giving NAB to rats at a dose of 0.18 mg/200 g BW can increase testosterone levels [7]. The provision of NAB is expected to improve the performance of layer chicken. The purpose of this study was to evaluate the effect of giving shell powder *Anadara granosa* and $ZnSO_4$ on the length comb, width comb, and body weight of the layer chicken.

2 Material and methods

The research design used a completely randomized design (CDR). The animals used in this study were 45 male layer day-old chicks (DOC) divided randomly into 3 treatment groups. Each treatment group consisted of 15 replications. The treatments given were control (T0), *Anadara granosa* shell powder as NAB 0.036 mg/40 g BW (T1), and $ZnSO_4$ 0.018 mg/40 g BW (T2) [2]. This treatment was given for 35 days. The data on the growth of the length comb, width comb, and BW are measured weekly [2].

The variable-length comb, width comb, and body weight were statistically analyzed using one-way ANOVA at a 95% confidence level ($\alpha = 0.05$). If there is a significant difference, it is followed by Duncan's test. SPSS software version 15 was used for data analysis [11,12].

3 Result and discussion

The comb, one of the chicken's secondary sex glands, grows under the influenced testosterone [2]. The results of the statistical analysis of comb length in the same column show that T0 is not significantly different from other treatments ($p>0.05$) (Table 1). Following Yuneldi *et al.* [2] that NAB and $ZnSO_4$ cannot increase comb length, while testosterone treatment can increase the length and width of the comb but causes downregulation, as well as a decrease in testicular weight in layer DOC chickens.

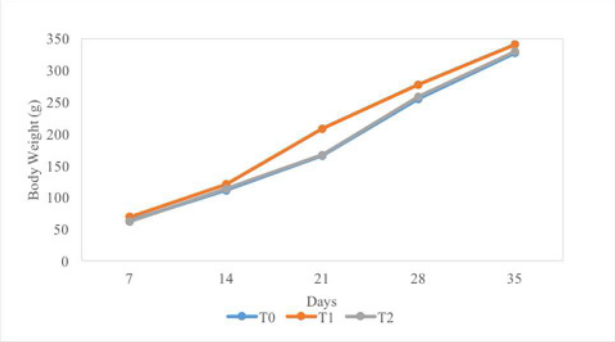

Figure 1. Body weight of male layer chickens after treatment 35 days. T0: control, T1: *Anadara granosa* shell powder as NAB 0.036 mg/40 g BW, and T2: $ZnSO_4$ 0.018 mg/40 g BW. T: treatment

Table 2. Width of the comb (mm) of rooster layer after being given NAB and ZnSO.

Treatment	Mean±SD Comb width (mm), Days				
	7	14	21	28	35
T0	1.66±0.30$^{a.k}$	2.36±0.55^{a,j}	5.46±0.32^{a,i}	7.13±0.35^{a,h}	9.33±0.15^{a,g}
T1	1.71±0.20^{a,j}	2.43±0.51^{a,j}	5.86±0.35^{a,i}	7.70±0.45^{a,h}	10.76±1.36^{a,g}
T2	1.70±0.26^{a,j}	2.08±0.38^{a,j}	5.56±0.83^{a,i}	7.33±0.41^{a,h}	9.93±0.20^{a,g}

$^{a-c}$ Different superscripts in the same column showed significant differences ($p<0.05$).
$^{g-k}$ Different superscripts in the same row showed significant differences ($p<0.05$).

Table 3. Body weight (g) of male layer chickens after being given NAB and $ZnSO_4$

Treatment	Mean±SD Body weight (g), Days				
	7	14	21	28	35
T0	63.43±4.72[a]	111.03±1.55[b]	166.16±1.64[b]	255.33±3.51[b]	327.16±2.87[b]
T1	69.40±2.76[a]	120.66±0.76[a]	208.60±4.70[a]	277.66±4.50[a]	340.56±3.93[a]
T2	62.13±1.97[a]	113.28±2.13[b]	166.93±2.63[b]	258.63±2.47[b]	329.50±1.32[b]

[a - c] Different superscripts in the same column showed significant differences ($p<0.05$).

The mechanism of action of NAB on comb growth begins with zinc which can stimulate Leydig cells in the testis to secrete the testosterone hormone, so that it will be transported to the comb and comb length growth occurs. Following the opinion of Otoo *et al*. [13] that the development of the comb in chickens is exceedingly subordinate to the testosterone hormone delivered by the Leydig cells within the testis. The testosterone produced will be secreted and transported to the comb, where it will experience comb growth. The size of the comb is emphatically connected with testosterone levels [14].

The results of the statistical analysis of the comb width in the same column showed that T0 was not significantly different from the other treatments ($p>0.05$) (Table 2). These results are following Yuneldi *et al*. [2] that clamshell powder *Anadara granosa* as NAB and $ZnSO_4$ cannot increase the height of the DOC layer chicken comb. It was confirmed by Astuti *et al*. [15] that *Anadara nodifera* shell powder as NAB and $ZnSO_4$ could not increase the comb size of Bangkok chickens.

Results of statistical analysis of length and width of the layer comb in the same column showed T0 was significantly different from day 7 to day 35 ($p<0.05$). The results of statistical analysis on the variable length of combs T1 and T2 on the 14th and 21st days were significantly different from those on the 7th, 28th, and 35th days, while on the variable of comb width T1 and T2 on the 7th and 14th days, significantly different from the 21st, 28th and 35th days. This was because the DOC chickens were in the starter phase. In this phase, chickens grow very fast, so that on the 7th to 35th day the results were significantly different ($p<0.05$). Following Yuneldi *et al.* [2] and Yuneldi *et al*. [3] that in the early growth phase or starter phase, comb length and height in all treatments experienced significant differences from 1st week to 5th week.

The results of statistical analysis of the body weight (BW) in the same column on days 14, 21, 28, and 35 showed that T1 was significantly different from the other treatments ($p<0.05$) (Table 3 and Figure 1). The results showed that *Anadara granosa* shell powder as NAB can increase BW. According to Yuneldi *et al*. [5] that the *Anadara granosa* shell powder as a NAB, one of which contains Zn at a dose of 0.9 mg/kg BW can increase BW in pelung chickens. It was confirmed by Hussan *et al*. [16] that increased BW in broilers was due to the positive effect of nano ZnO on digestion and absorption of nutrients in the digestive tract. Administration of nano-ZnO at doses of 20 mg/kg BW and 60 mg/kg BW can also increase the weight of broiler chickens [17]. According to Ibrahim *et al*. [18] that the administration of 50 mg/kg nano-ZnO and the combination of 25 mg/kg BW organic Zn + 25 mg/kg BW nano-ZnO can significantly increase BW in broiler chickens. The results obtained may be because *Anadara granosa* shell powder contains minerals one of which is Zn which can have a positive effect on digestion and absorption of nutrients in the digestive tract of the rooster layer.

The results of statistical analysis between columns on days 7, 14, 21, 28, and 35 on BW showed that T2 was not significantly different from T0 (Table 3 and Figure 1). Following Yogesh *et al*. [19] and Vieira *et al*. [20] that the addition of Zn inorganic had no significant effect on BW in broiler chicken. It was confirmed by the results of research from Stenclová *et al*. [21] that inorganic Zn supplements at doses of 120 mg/kg BW, 40 mg/kg BW, and 20 mg/kg BW had no significant effect on BW in broiler chicken. According to Jain *et al*. [22] that inorganic minerals (Zn, Cr, and Se) contain complex phytic acid and can reduce their absorption rate in the digestive tract, which can affect mineral absorption into tissues.

4 Conclusions

The addition of NAB 0.036 mg/40 g BW can increase the body weight of male layer chickens after treatment of 35 days. The administration of NAB 0.036 mg/40 g BW and $ZnSO_4$ 0.018 mg/40 g BW could not increase the length and width of layer chicken combs. The growth in length and width of layer chicken combs is very fast in the starter phase.

Ethical clearance statement

This research protocol got ethical clearance approved by Integrated Testing and Research, Universitas Gadjah Mada (UGM), (00059/04/LPPT /XI /2019).

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