

## THE EFFECT OF DIETARY EARTHWORM *LUMBRICUS RUBELLUS* LEVELS ON PERFORMANCE OF BROILER CHICKEN

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### ABSTRACT

Two experiments were conducted to evaluate the effect of four dietary levels of raw earthworm and earthworm meal on performance of broiler chickens. These experiments were employed a Completely Randomized Design with four treatments and five replications. In the first experiment, it was applied four levels of raw earthworm (0, 5, 10 and 15 percent), while in the second experiment, four levels of earthworm meal (0, 5, 10 and 15 percent) was examined. Each experiment used eighty one day old unsexed broiler chicks kept in twenty cages. In both experiments, feed and water were served *ad libitum* for five weeks. Results showed that increasing dietary levels of raw earthworm had a highly significant ( $P < 0.01$ ) effect on body-weight gain, feed consumption and feed conversion. Dietary levels of earthworm meal had no significant ( $P > 0.05$ ) effect on body weight gain, feed consumption and feed conversion. It was concluded that earthworm can be used as source of protein up to 15 percent in broiler chicken diet.

Key words: Earthworm, Diet, Performance, Broiler Chicken.

### INTRODUCTION

Feed represents approximately 60-70 percent of the total cost in broiler production (Siregar *et al.*, 1982). Management practices such as feeding equipment and methods litter management and disease prevention as well as ventilation have an important role on optimizing feed conversion.

In feeding equipment and method, the quantity and quality of feed should be maintained and scheduled to prevent feed wastage. The problem in preparing feed among other things is high price of imported foodstuffs, such as soybean and fishmeal, which affect feed cost. One of the solutions is to maximize the utilization of potential local foodstuffs, which has superiority in technical and economical consideration.

The earthworm *Lumbricus rubellus* is one of the protein sources that have been known for centuries in Indonesia. Yuliprianto (1993) reported that there were 1800 species of earthworm in the world, but only lumbricidal family which has an important role on agricultural field. During recent years the beneficial effect of dietary earthworm have received much attention. It is also reported that *Lumbricus rubellus* has 64-72% crude protein (Palungkun, 1997), complete amino acids (Minnich, 1977), source of essential fatty acids such as linoleic acid and linolenic acid (Astuti, 2001). The nutritive value of earthworm meal depend on processing method, and protein content of earthworm 72.04 – 79.61% higher than earthworm meal 65.51 – 69.71% (Andayani, 1993). The price of earthworm meal relatively higher than raw earthworm because earthworm meal weights reduce by loosing moisture content and need additional processing cost.

The objective of this experiment is to study the response of broilers to various levels (0–15 percent) of raw earthworm and earthworm meal during the period of 1 day to 5 weeks.

## MATERIALS AND METHODS

Two experiments were conducted using one-day-old unsexed broilers. In Experiment 1, eighty broiler were reared in 20 colony cages, each of birds placed in cages measuring 30 x 60 x 35 cm. Treatments consisted of four levels of raw earthworm, is A (0%), B (5%), C (10%) and D (15%) and all diet containing 2800 kcal metabolizable energy (ME) per kg diet with difference of protein content. Before using in the diet, raw earthworm was blended, while earthworm meal was dried to 14 percent of moisture content.

In experiment 2, eighty broilers were allocated to 20 colony cages and each cage was placed four birds as the experiment units. The diets consisted of different levels of earthworm meal i.e. A (0%), B (5%), C (10%) and D (15%) and each diet contain 22 percent of crude protein and 2800 kcal/kg diet of metabolizable energy (ME). The foodstuffs and nutrient composition of experiment-1 and experiment-2 are described in Table 1.

In both experiments, feed and water were provided *ad libitum*. New Castle Disease vaccinations were administered to all birds at 4 day of age revaccination at 4 week of age by eye drops.

Feed consumption, body-weight gain and feed conversion were determined during the test period five weeks. Data were analyzed as Completely Randomized Design. The significant differences among treatments, tested by Duncan Test (Snedecor and Cochran, 1980)

## RESULTS AND DISCUSSION

### Experiment 1.

During the 5 weeks experiment, the average weekly body-weight, body-weight gain, feed consumption, feed conversion and mortality rate are shown in Table 2. Dietary raw earthworm levels had a highly significant ( $P < 0.01$ ) affect on body weight and body-weight gain. The average body weight and body-weight gain decreased with increasing dietary raw earthworm levels from 5 to 15 percent. The highest body-weight gain average was found in treatment B (1425.30 g), followed by treatment A (1423.25 g), C (1235.00 g and D (782.16 g). Decreasing response was probably due to less protein could be used and deposited in body tissue. This phenomenon is closely related to difference of protein metabolizable energy ratio in the dietary treatments. The protein content of raw earthworm is lower than fishmeal that affected the nutrient composition of the diet. Body weight and body-weight gain of broiler was extremely low in this experiment because the utilization of raw earthworm levels in the diet is based on fresh weight. Therefore, it is suggested that in order to get a better estimated of the nutrient content of protein and energy in the diet, calculation should be based on dry matter of earthworm. This figure is in compliance with Anggorodi (1985) and Olomu and Offiong (1980) whom reported that the protein and metabolizable energy ratio in the diet affect



the average of body weight and body-weight gain. The lack of nutrient composition in the diet tends to decrease digestibility and performance of broilers (Siregar *et al.*, 1982 and Resnawati, 2001).

The ratio of protein and metabolizable energy of treatment D (143.31) was higher than C (141.36), B (140.19) and A (124.00). While, NRC (1984) recommended that the ratio of protein and metabolizable energy for broiler starter and finisher was 130.13 and 160.00, respectively. The average feed consumption for each treatment was A (2184.16 g), B (2220.05 g), C (2165.41 g) and D (2071.60 g). There was possibly due to all treatments had the same dietary energy levels. These results agree with Wahju (1991) that as dietary energy was increased, feed consumption decrease in linear fashion.

The dietary raw earthworm levels had a highly significant ( $P < 0.01$ ) effect on feed conversion. The average of feed conversion of treatment D (2.65) was higher than treatment C (1.75), B (1.56) and A (1.53). Increasing in feed conversion followed the increasing of earthworm levels. In general, the results of this experiment are agree with the findings of Mudiwati (1991) whom reported that feeding the low protein diet from 0 to 4 weeks of age resulted in increasing feed conversion. Blakeley and Bade (1992) report this experiment also showed a higher feed conversion than which did. They reported that satisfactory level of feed conversion of broilers was 2.00.

During the experiment, the mortality of treatment D was 2.5 percent, but no mortality recorded in the other treatments diets. Low levels raw earthworm in the diet might cause the low mortality observed in this study. Poeloengan *et al.* (2001) reported that earthworm *Lumbricus rubellus* had the ability to produce anti bacteria and to inhibit the development of gram positive and negative bacteria. Consequently, low levels of raw earthworm in the diets might cause the low mortality observed in treatment A, B and C.

## Experiment 2.

The performance of the birds fed the dietary treatments of earthworm meal levels was described in Table 3. The average body weight were A (1400.87 g), B (1412.63 g), C (1330.00 g) and D (1363.23 g). There were no significant differences among the treatments. The results of this experiment agree with Aryadi (1992), whom found that the utilization of earthworm meal until 13 percent in the ration did not have significant effect on body weight and body-weight gain of broiler. Santoso (1989) found that the broilers fed ration containing dietary fish meal that was substituted with earthworm meal did not affect body weight and body-weight gain. These means that the fishmeal content of the control diet can be substituted gradually by earthworm meal up to 15 percent.

Feed consumption of treatments B, C, A and D were 2239.08 g, 2212.09 g, 2199.39 g, and 2176.75 g, respectively. Total feed consumption of treatment B and C was slightly higher than treatment A and C. However, there were no significant differences in feed consumption. Similar results have been reported by Catalan (1981) who found that protein and amino acid content of earthworm meal was higher than fish meal, so it did not have any differences on feed consumption in broiler ration. Several factors affected feed consumption were breed, quantity and quality of the ration and temperature of environment (Say, 1987).

The average feed conversion of the birds in the treatments A, B, D and C were 1.57, 1.58, 1.60 and 1.67, respectively. There were no significant differences ( $P>0.05$ ) of feed conversion between the treatments. The results of this experiment disagree with which is suggested by Catalan (1984) that the increasing of earthworm meal in the broiler ration can lead to decreasing of feed conversion. Aryadi (1992) reported that there were no significant effects of earthworm meal levels up to 13% in the broiler diets on body-weight gain, feed consumption and feed conversion. There was not mortality recorded during the experiment for all treatments.

According to this experiment, the substitution of fishmeal by earthworm meal as much as 15 percent in the ration, did not give negative effect on performance of broiler.

## CONCLUSION

Dietary raw earthworm levels from 5 to 15 percent in the ration lead to decrease body-weight gain and increase feed conversion. However, it did not have effect on feed consumption. Graded levels of earthworm meal to substitute fishmeal from 5 to 15 percent in the ration could be used in ration without any negative effect on broiler performance. There were no significant indications that dietary raw earthworm or earthworm meal levels in the diets influenced mortality rate.

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