

Effect of Aloe Vera on Nutrient Digestibility, Organ Weights and Body Performance in Male Broilers

Prayogi Sunu^{1*}, Zakaria Husein Abdurrahman¹ and Sutardi²¹Lecturer at the Faculty of Animal Husbandry, Boyolali University, Boyolali, Indonesia²Student at the Faculty of Animal Husbandry, Boyolali University, Boyolali, Indonesia***Corresponding Author:** Prayogi Sunu, Lecturer at the Faculty of Animal Husbandry, Boyolali University, Boyolali, Indonesia.**Received:** February 23, 2020**Published:** March 12, 2020© All rights are reserved by **Prayogi Sunu, et al.****Abstract**

This study aims to determine the effect of the use of Aloe vera in the ration on nutrient digestibility in male broiler chickens. The research was conducted at the Poultry Cattle Maintenance Experiment Laboratory, Boyolali University, Faculty of Animal Husbandry, on 100 male DOCs kept in 20 cages consisting of 5 chickens per plot of cage.

The raw material used was a commercial ration commonly circulated in the market for formulation of starter feed and finisher feed. The design used was a completely randomized design (CRD) with 4 treatments and 5 replications. The data obtained were tested using analysis of variance. If there was an average difference between the treatment effects, then it was continued using Duncan's multiple range test. The treatment given during the study was as follows: T0 = Control ration. T1 = chicken given commercial ration and Aloe vera 0.75%. T2 = chicken given commercial ration and 1.5% Aloe vera. T3 = chicken given commercial ration and 2% Aloe vera. The parameters studied were included crude protein digestibility, crude fat digestibility, crude fiber digestibility, liver weight, and bursa of Fabricius weight.

Based on the results of the research, it was concluded that the nutrient digestibility of the crude protein value of aloe vera treatment was below the T0 control, while the digestibility value of T3 and T2 crude fiber was higher than T0 (control) but not T1, and the digestibility value of crude fat T0 was higher than T1, T3 and T2, respectively. The results of this study showed that administration of 0.75% aloe vera in feed affects the percentage of heart, spleen and long intestine compared to controls. Whereas, 2% aloe vera in food increase the percentage of bursa of Fabricius better than control.

Keywords: Aloe Vera; Crude Fat; Crude Fiber; Crude Protein; Immunity Broiler**Introduction**

The problem faced is the first low efficiency of broiler production, which is caused by the high price of broiler feed, so that efforts are often made to improve the efficiency of the use of feed by giving high fat feed and increasing feed conversion rate (FCR) by maximizing feed absorption by the digestive organs [1]. The second problem is the demand of consumers who want broiler meat that is low in fat such as cholesterol, but high in protein, and free of pathogenic microbes and free of antibiotics.

Feed additives are commonly used in the modern livestock industry. Agustina, *et al.* [2] explained that the function of herbal ingredients as feed additives to improve the performance, as well as to prevent the use of synthetic antibiotics in feed, so that it can be used by businessmen engaged in livestock business and live-

stock farmers. The provision of this supplement is intended to spur growth or increase livestock productivity and health and improve production efficiency. Feed additives that exist today generally consist of antibiotics, enzymes, probiotics, prebiotics, organic acids and bioactive plants.

In Indonesia, the use of nutritious plants mixed into traditional or herbal ingredients for prevention and treatment of diseases has traditionally been applied to humans for a long time. The use of herbs for livestock in Indonesia is still very limited. Some nutritious plants that have been studied for livestock use include Aloe vera, *Bancudus latifolia*, garlic, black cumin. Various types of nutritious plants that are widely used in humans, such as turmeric and ginger are very effective, and also used as a supplement to feed antibiotic substitutes in poultry.

One of the plants that contain bioactive and dubbed 'miracle plant' is Aloe vera. This plant has been widely used for human health. Giving dry gel in broiler ration can increase the efficiency of using dry matter rations up to 6.80% and giving fresh gel even increase efficiency up to 17.80% [3]. The results of research by Sinurat., *et al.* [4] also showed that administration of dried aloe vera gel of 1.00 g/kg ration could reduce feed conversion value in broilers from 1.90 to 1.74 or about 8.50% better than control. This efficiency increase is quite high compared to the increase in efficiency due to the provision of commonly reported feed additives.

This proves that the plant contains a 'bioactive' substance that can function for certain things. The bioactive substances generally consist of one or a mixture of compounds such as alkaloids, "bit-ters", flavonoids, glycosides, saponins and tannins. These bioactive compounds have also been reported to function as antibacterials [5].

Administration of antibiotics at subtherapeutic levels usually only increases feed efficiency in broilers by an average of around 2.90% [6]. The mechanism for improving the efficiency of ration due to the administration of aloe vera gel has not been fully understood. One possibility is the presence of anti-bacterial substances contained in these ingredients such as anthraquinones, a flavonoid that can dissolve in chloroform.

Materials and Methods

Research material

Broiler DOC was kept from 1 day to 35 days, with feed and *ad libitum* drinking water. Chicken up to 21 days were given a starter treatment ration with balanced protein and energy of 22% and 2,900 kkl/kg, respectively. From 22 to 35 days of age of chicken a finisher treatment ration with protein and energy balance of 19% and 3,000 kkl/kg, respectively was given. Aloe vera treatment was given from 7 to 35 days.

Research methods

The design used in this study was a Completely Randomized Design (CRD) with four treatments and five repetitions. Each unit of experiment consisted of 5 male chickens of one day (DOC) old with homogeneous body weight. This study was conducted using a completely randomized design (CRD), 4 treatments with 5 replications as follows: T0 = Control ration, T1 = chicken given commercial ration and 0.75% Aloe vera, T2 = chicken given commercial ration and 1.5% Aloe Vera, T3 = chicken is given commercial rations and 2% Aloe Vera

Results and Discussion

Nutrient digestibility

The results of the study of the effect of using aloe vera in the ration on nutrient digestibility (crude protein, crude fat, crude fiber) in broiler chickens aged 1 - 35 days are presented in table 1.

Treatment	Crude protein (%)	Crude fiber (%)	Crude fat (%)
T0	73,51 ^a	15,12 ^b	85,10 ^a
T1	70,51 ^b	12,01 ^b	83,37 ^a
T2	69,68 ^b	17,57 ^a	57,69 ^b
T3	71,05 ^a	21,58 ^a	65,14 ^b

Table 1: The digestibility of crude protein, crude fat and crude fiber (%) of broiler chickens aged 35 days after administration of bioactive aloe vera.

The treatment followed by the same letter means that it does not differ significantly according to DMRT 5%.

Values followed by different superscript letters in the same column show significant differences ($P < 0.05$).

Digestibility of crude protein

The results showed that the average crude protein digestibility of male broilers aged 35 days was 69.68 - 73.51% ($P < 0.05$). This showed that the results of high quality PK digestibility, according to Anggorodi [7] stated that the quality of digestibility based on digestibility was divided into 3 categories, namely: digestibility value in the range of 50 - 60% was low quality, 60 - 70% quality was medium and above 70% high quality.

Gross protein digestibility in male broilers fed rations with the addition of aloe vera had a significant effect. Factors that influence digestibility of crude protein are protein content in rations consumed by livestock. Rations with low protein content generally have low digestibility and vice versa. High and low protein digestibility is influenced by the protein content of rations and the amount of protein that enters the digestive tract [8]. The results of this study are not different compared to the results of the research by Iyayi., *et al.* [9] that the prececal protein digestibility in broiler chickens ranged between 61 - 78% if given rations containing 206 - 227 g protein per kg ration (20.6 - 22.7% crude protein).

Digestibility of crude fiber

The results of the statistical analysis of the digestibility of crude fiber of male broiler chickens aged 35 days, showed that the administration of aloe vera in rations with treatment significantly affected ($p < 0.05$) the digestibility of crude fiber ration. T3 treat-

ment of crude fiber digestibility value was 21.58% which was consistent with Suprijatna [10] which stated that the digestibility value of crude fiber in poultry generally ranges between 20 - 30%. The results of the digestibility of crude fiber of T3 and T2 treatment with the addition of aloe vera were 2% and 1.5%, respectively better than the control ration T0 and Aloe vera T1 0.75%. The opinion of Tillman, *et al.* [11] stated that the digestibility of crude fiber depend on the content of crude fiber in the ration and the amount of crude fiber consumed. Too high levels of crude fiber can interfere with the digestion of other substances. The digestibility of crude fiber is influenced by several factors including the level of fiber in the feed, the composition of the composition of crude fiber and the activity of microorganisms [12].

Digestibility of crude fat

The results of the statistical analysis of the digestibility of crude fat of male broiler chicken aged 35 days, showed that the administration of aloe vera in rations with treatment significantly affected ($p < 0.05$) the digestibility of crude fat ration. From Table 1 it can be seen that the addition of aloe vera in the diet reduced the digestibility of crude fat. The average digestibility of crude fat in the treatments T0, T1, T3 and T2 respectively were 85.10%, 83.37%, 65.14%, and 57.69%, respectively. Digestion of crude fat in the treatment of T1, T2 and T3 was lower than that of T0, this can be caused by the low consumption of crude fat of chicken ration which also decreases.

Sukaryana, *et al.* [13] stated that the determination of digestibility was done to determine the nutrients that can be absorbed for basic needs, growth and production. Digestion can be influenced by the level of feeding, animal species, food deficiency, processing of feed ingredients, the effect of combined feed ingredients and digestive tract disorders.

Low feed consumption in broilers causes lack of nutrients that do not meet the need for productivity. Bile salt is very necessary for poultry in digestion and absorption of fat. If the bile salts of are not sufficient to emulsify and absorb fat, it can reduce the digestibility value of crude fat [13].

Important organs

The results of the study of the effect of the use of aloe vera in the ration on percentage of heart, Spleen, and bursa of Fabricius weight and intestinal length in broiler chickens aged 1 - 35 days are presented in table 2.

Treatment	Heart	Spleen	Bursa of Fabricius	Intestine
T0	2,568 ^b	0,192 ^b	0,1256 ^b	216,4 ^b
T1	3,062 ^a	0,308 ^a	0,1067 ^b	222,6 ^a
T2	2,341 ^b	0,115 ^c	0,1008 ^b	218 ^b
T3	2,317 ^b	0,114 ^c	0,1351 ^a	219,6 ^b

Table 2: Percentage of heart bursa of Fabricius weight and intestinal length of broiler chicken aged 35 days after administration of bioactive aloe vera (% live weight).

The treatment followed by the same letter means that it does not differ significantly according to DMRT 5%.

Values followed by different letters in the same column show significant differences ($P < 0.05$).

Percentage of heart weight

The results of the analysis showed that the average percentage of 35-day-old male broilers given dry aloe vera was not significantly different from the increase in chicken heart weight compared to the control group. The highest percentage of chicken heart weight found in T1 treatment was higher than T0 treatment and the lowest in T3 treatment (Table 2). Sinurat, *et al.* [4] also reported that administration of aloe vera gel did not cause significant changes in heart weight. However, Bintang, *et al.* [3] reported that administration of dry aloe vera gel with high doses (1.00 - 4.00 g/kg ration) caused an increase in heart weight. However, the weight of the results of this study (T2 and T3) did not differ from the normal weight of chicken liver which was around 31 - 51 grams or 1.70 - 2.30 percent of the weight of life [3].

Percentage of spleen weight

The results showed that the highest percentage of Spleen weight in male broilers aged 35 days in T1 treatment was higher than treatment T0 ($P < 0.05$). According to Sinurat, *et al.* [4] normal size of broiler ranged from 1, 5 up to 4.5 g or 0.10 to 0.23% of body weight. This is different from T2 and T3 with results below T0. The data obtained in this study showed the weight of Spleen organs in the range of 0.114 - 0.308% (Table 2). The results of this study were not different compared to the results of Sinurat, *et al.* [14] study, which reported that the percentage of spleen weight was 0.18 - 0.37% ($P > 0.05$). Research conducted by Gill [15] showed that the weight of spleen broilers ranged from 0.10 to 0.18%.

Percentage of bursa of fabricius weight

The results showed that the average percentage of broiler bursa of Fabricius weight in male chickens aged 35 days ($P > 0.05$) ranged from 0.1008 - 0.1351% (Table 2). The highest chicken weight gain

in fabricius chicken study was found in T3 treatment, which was 0.1351% body weight higher than T0, which was 0.1256% of life weight. The lowest stock weight was recorded in T1 and T2 treatment, which was 0.1067 and 0.1008% body weight and the results were below the T0 bursa of Fabricius weight. Sinurat, *et al.* [4] concluded that the changes in the weight of the fabricated exchanges were caused by bioactive administration of aloe vera.

Intestinal length

The results showed that administration of Aloe vera in T1, T2 and T3 group birds cause increase intestinal length better than T0 ($P > 0.05$). Sinurat, *et al.* [4] concluded that changes in intestinal weight are caused by changes in intestinal length caused by bioactive administration of aloe vera. The addition of intestinal length can cause an increase in the number of cells and villi of the small intestine, thereby increasing nutrient absorption in feed and improving feed conversion.

Broiler chicken performance

The results of the study of the effect of the use of aloe vera in the ration on broiler chicken performance (body weight and feed conversion ratio) in broiler chickens aged 1 - 35 days are presented in table 3.

Treatment	Body weight (gms)	Feed conversion ratio
T0	1,168 ^c	1,56 ^a
T1	1,262 ^b	1,47 ^b
T2	1,241 ^b	1,50 ^a
T3	1,317 ^a	1,45 ^b

Table 3: Weight gain (gms) and feed conversion ratio (FCR) in broilers 35 days after the administration of bioactive aloe vera.

The treatment followed by the same letter means that it does not differ significantly according to DMRT 5%.

Values followed by different letters in the same column show significant differences ($P < 0.05$).

The results of the analysis showed that the average body weight gain of male broiler chickens aged 35 days by giving dry aloe vera had a significant effect ($P < 0.05$) in increasing chicken body weight at T3 compared to T0 treatment. The highest chicken body weight gain was found in the T3 treatment and the lowest was in the T0 treatment because it was less than optimal in stimulating metabolism.

Increased growth in body weight may be influenced by the saponin content in the aloe vera. Aloe vera can be used for animal feed, containing substances that can stimulate metabolism, such as anthraquinone groups, various minerals, vitamins, enzymes and

amino acids that can be used as natural feed additives. Saponin has the role of increasing the permeability of the intestinal cell wall so that absorption of food substances. This is in accordance with the opinion of Chaudhary, *et al.* [16] stated that saponins increase the permeability of intestinal mucosal cells and help the absorption of substances that are usually not absorbed optimally in the intestine. Another possible mechanism could be a decrease in the population of pathogenic microorganisms in the digestive tract due to the administration of bioactives contained in aloe vera namely anthraquinone [17].

The analysis shows that Aloe vera in 35-day-old male broilers had a significant effect ($P < 0.05$) on the FCR value. The T3 treatment (1.45) was non significantly different from T1 (1.47) but significantly different ($P < 0.05$) with respect to T0 (1.50) and T2 (1.57). Improvements to the efficiency of ration use with bioactive administration in aloe vera is possible caused by several mechanism. Aloe vera contains saponins which can increase absorption of nutrients in the intestine. At low concentrations, saponins can increase the permeability of intestinal mucosal cells, so that increase the absorption of nutrients in the intestine [18]. Besides that, improvement in efficiency might also be caused by a decrease population of pathogenic microorganisms in the channel digestion due to bioactive administration contained in LB (antrakinon). Observation at Balai Animal research showed that extracts LB chloroform can inhibit bacterial growth pathogens *E. coli* and *Salmonella hadar*, but not inhibits beneficial bacteria in the intestine like *Lactobacillus* sp. [19]. These three mechanisms (decreased ration consumption, increased absorption of nutrients in the intestine and decreased population of pathogenic microorganisms in the channel digestion) might be together led to increase efficiency in the use of feed in broilers. Bintang, *et al.* [3] reported that the administration of dry aloe vera gel 0.5 g/kg rations in chickens cause improve feed conversion (6.10%) compared to control. Thus also Sinurat, *et al.* [4] reported improvement in feed conversion by 8.40% with gel dried aloe vera as much as 1.0 g/kg of chicken ration broiler. In this study, improvement in feed conversion from the administration of 2% dry Aloe Vera showed better conversion value than with the treatment of dry aloe vera T2 as much as 1.5% and T0, although not significantly different with T1 treatment. The increase in the value of the FCR can be attributed to previous discussions which showed an increase in body weight and a decrease in ration consumption. In addition, aloe vera has anthraquinone and pyrocatechol content which has antimicrobial properties against pathogenic microbes in the broiler's intestines. This can cause the balance of the amount of microbes beneficial in the intestines, so it can decrease the pH in the intestine. This pH reduction increases the absorption of nutri-

ents in the intestine. This matter according to the study of Shokri, *et al.* [20] that aloe contains anthraquinone and pyrocatechol as antimicrobials pathogens in the intestinal broiler, so that absorption of nutrients can be more maximal, which can eventually correct the FCR value.

Conclusion

Based on the results of the present study, it was concluded that the addition of aloe vera in broiler chicken ration improve the digestibility of crude protein and crude fiber in aloe vera treatment group birds while the digestibility of crude fat in T0 and T1 group birds was higher than T2 and T3 group birds.

It was also concluded that administration of 0.75% aloe vera in feed affects the percentage of heart, spleen and long intestine compared to controls. Whereas, 2% of aloe vera in feed increased the percentage of bursa of Fabricius organs better than control.

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