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THE EFFECT OF USING KATUK LEAF MEAL (Sauropus androgynus L. Merr) IN THE DIET ON THE BLOOD CHARACTERISTICS OF GROWER LANDRACE CROSSBRED PIGS

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ABSTRACT

Katuk leaves (Sauropus androgynus L. Merr) are known to contain the active compounds, flavonoids, which can boost the immune system. This study aims to determine the effect of katuk leaves in the diet on the blood profile of growth Landrace pigs. Twelve castrated male pigs were used in this study, divided into 3 groups with 4 treatments. The treatment consisted of: T0 (control diet without katuk leaf meal); T1 (97% control diet + 3% katuk leaf meal); T2 (94% control diet + 6% katuk leaf meal); T3 (91% control diet + 9% katuk leaf meal). The variables measured were: cholesterol, TPP (Total Plasma Protein), Haemoglobin, Erythrocytes and leukocytes. Pigs were fed treated diets for duration of 8 weeks. Data were analyzed by using Completely Randomized Design. The results showed that katuk leaf meal increased TPP, hemoglobin, erythrocytes, leukocytes and not significantly lowered blood cholesterol (P>0.05). The conclusion of this study was that the inclusion of katuk leaves meal

in the diet had no significance effect on the blood characteristics of the growth Landrace crossbred pigs.

Keywords: Katuk Leaves, Blood, Hemoglobin, Cholesterol, Growing Pigs.

INTRODUCTION

Adequate nutrition and good physiological status are closely related to the health condition of pigs. Blood has a very important role for the functioning of the body as a whole properly, so that livestock productivity runs optimally.

The description of blood characteristics can be an indicator to see the physiological condition of a livestock related to its health status to increase productivity.

Katuk leaves are one of the herbal plants whose leaves can be used to be given to livestock. Katuk (Sauropus androgynus L. Merr) is a vegetable plant that is widely found in Southeast Asia, has high nutrition, as an antibacterial, and contains beta carotene as an active substance, phytochemical compounds, saponins, flavonoids, and tannins, isoflavonoids. Saponins have been shown to be efficacious as anti-cancer, anti-microbial, and enhance the immune system in the body (Santoso, 2009), contain high nutrients of 23.13% crude protein (Yuliani and Marwati, 1997), bioactive components include phenols, flavonoids, alkaloids, saponins, tannins, terpenoids, steroids (Mashayekhi, et al. 2018). Flavonoids can improve immunity and act as antioxidants in broiler chickens (Kamboh et al. 2016). Saponins can protect red blood cells from destruction by free radicals, and can stimulate increased production of red blood cells (Manjaniq et al. 2017).

Giving katuk leaf flour to rations can improve the performance of poultry (Santoso, 2000; Bidura et al. 2007; and Nasution et al. 2014), increase the efficiency of ration use and reduce fat accumulation in the abdomen, liver and carcasses (Santoso and Sartini, 2001), reduced Salmonella sp. and Escherichia coli in feces, but increases effective microbes such as Lactobacillus sp. and Bacillus subtilis (Santoso et al. 2001)

MATERIALS AND METHODS

Animals and Feed Materials

A total of 12 growth landrace pigs with age range of 3-4 months were used in the study. The pigs were cage individually with an enternit roof, and rough cement floors

and walls with 12 plots measuring 2 m x 1.8 m each with a floor slope of 2° and equipped with feed and drinking water containers.

The feed ingredients used was 37% yellow corn ground, 30% rice bran, 31% KGP-709 concentrate (made by PT. Sierad Product Tbk), 0.5 minerals, 1.5% coconut oil. The preparation of research diet was based on the need for growing pig contained protein 18-20% and energy of 3160-3400 Kcal/kg (NRC, 1988).

Research methods

This study was used an experimental method and Completely Randomized Design was used as experimental design. There were four treatments with 3 replications consisted of:

T0 : Diet without katuk leaf meal (control diet)

T1 : 97% control diet + 3% katuk leaf meal

T2 : 94% control diet + 6% katuk leaf meal

T3 : 91% control diet + 9% katuk leaf meal

Feed and water were given ad libitum to ensure the animal needs.

Parameters studied

The parameters studied and analyzed were:

a. Cholesterol (Mg/dl)

b. Total Plasma Protein/TPP (g/dl)

c. Haemoglobin (g/dl)

d. Erythrocyte

e. Leukocytes

Blood Collection

Blood sampling was carried out on the morning of the end of the study. The collection area was cleaned using 70% alcohol, then 3 ml of blood was taken through the yugoralis vein (vein in the neck) using a syringe, put into an EDTA tube and temporarily stored in a coolbox, then taken to the laboratory for analysis.

Data analysis

The data obtained were analysed by Anova with treatment as the sole source of variation in the model. The Anova was performed using the SPSS-23 statistics for windows program. Duncan multiple range test also used in the study if the level of significant at $P<0.05$.

RESULTS AND DISCUSSION

The results of the study on the effect of the treatment on the blood characteristics of the research pigs are shown in Table 2. The response of growing pigs to the administration of katuk leaf meal in the diet which containing the active substance were not significantly affect the blood characteristics of animal test.

Tabel 2. The blood characteristics of pig test.

Variables	Treatment Diets				SEM	P-value
	T0	T1	T2	T3		
Cholesterol (Mg/dl)	230.42	210.08	205.25	201.84	9.16	0.67
Total Plasma Protein (g/dl)	9.90	8.67	8.93	9.13	0.30	0.85
Hemoglobin (g/dl)	16.11	18.06	18.73	18.98	0.77	0.54
Erytrocytes (million mm^{-3})	7.19	7.52	7.24	7.42	0.17	0.88
Leucocytes (million mm^{-3})	11.91	12.08	12.15	12.29	0.22	0.93

No significant differences (P>0.05) found between the treatments

Inclusion katuk leaf meal in the diet up to 9% on growing pig slightly decreased blood cholesterol (P>0.05). The results of this study are in line with Santoso et al. (2013) reported that broiler meat cholesterol was the same as those given katuk leaf flour up to 4.5% without being given katuk leaf flour. In contrast to the results of the study by Santoso and Sartini (2001), giving katuk leaf powder at 3% in the diet can reduce abdominal fat. Whereas Nugraha (2008), reported that giving katuk leaf meal 0%, 5%, 10% and 15% slightly reduced egg cholesterol, but did not significantly (P> 0.05) affect egg cholesterol. Other investigation by Santoso and Fenita (2013) found that the use of katuk leaf meal was reduced chicken egg cholesterol (P<0.05), but the protein, fat, calcium, potassium and iron levels in the eggs did not change (P>0.05). Giving katuk leaf extract with ethanol 0.9-1.8 g/kg in the diet resulted in reducing abdominal fat, blood fat, blood cholesterol, egg cholesterol of laying hens (Santoso et al. 2005).

Fermentation katuk leaf meal prior to use in chickens diet has beneficial effect on growth and egg quality. Giving katuk leaf extract which is fermented with EM4 (efektiv microorganism-4) and saccaromyces resulted in reducing fat deposits (Kamalia et al. 2014), and also improving carcass quality without affecting the growth of broiler chickens (Santoso et al. 2015) and reduce broiler chicken fat (Syahruddin et al. 2013).

Hemoglobin is part of the erythrocyte which is bind oxygen in the form of a conjugated complex protein (Guyton, 1997), it is a solid substance in the blood that causes a red color and

protein molecules in red blood cells. Hemoglobin is an indication of the adequacy of oxygen transported (Kimball, 1988). Low oxygen content in the blood causes an increase in hemoglobin production and the number of erythrocytes (Swenson, 1984). Frandson (1993) reported the presence of hemoglobin in the blood indicates the ability of blood to transport oxygen and causes red blood. Hemoglobin also transported CO2 from tissues, take O2 from the lungs, maintain acid-base balance and is a source of bilirubin. The amount of hemoglobin in the blood is affected by age, sex, physical condition, weather, air pressure and disease. The amount of hemoglobin is directly proportional to the number of red blood cells. The higher the red blood cells, the higher the hemoglobin level in the red blood cells (Haryono, 1978). The blood hemoglobin level of the study pigs was within the normal range, namely 16 g/dl, average the hemoglobin level in pigs was 10-16 g/dl (NseAbasi N. Etim et al. 2014) and 9.3-13.8 g/dl (Jezek et al. 2018).

The part of the blood that functions to transport oxygen is the red blood cells (erythrocytes) in which there is hemoglobin (Frandson, 1993). Erythrocytes are the most dominant blood component, contain hemoglobin and function to carry oxygen needed by cells throughout the body. The main function of erythrocytes is to transport hemoglobin in which there is a lot of oxygen that comes from the lungs to the tissues. Papaperin in the blood can interact with erythrocytes, especially in the ability of hemoglobin to bind oxygen, but it can also decrease the affinity of oxygen and hemoglobin contained in erythrocytes (Budiono, 2008). The content of flavonoids which are active compounds can act as antioxidants which function to remove free radicals in the plasma membrane. Oxidative damage due to free radicals that accumulate in membrane components will affect the aging and destruction of erythrocytes, namely shortening of cell life span. Flavonoids affect the activity of enzymes attached to the plasma membrane, namely alkaline phosphatase, carbonic anhydrase and superoxidismutase. The formation of erythrocytes is influenced by protein, vitamins B2, B12 and folic acid (Piliang and Djojosoebagio, 2006).

The number of red blood cells can be used as a parameter to determine the health of te pigs. Red blood cells of pigs that were given katuk leaf meal up to 9% in the diet slightly increased red blood cells but not significant ($P>0.05$) between the diet. Unlike the results of Prakoso et al. (2018) who supplemented with 5% katuk leaf meal found significantly increased the red blood cells of broiler chickens. Increased red blood cells can increase metabolic processes in the animal body. The range of red blood cell levels in research pigs ranged from 7.19-7.52

mg/dl, and this finding was lower than that reported by Jezek et al (2018), which was 9.78-22.67 mg/dl.

Leukocytes are one of the active blood components and play a role in the body's defense and immune system. The function of leukocytes is to provide antibodies in the fast and strong defense system against infectious genes. The immune defense mechanism that is carried out is by destroying infectious agents through the process of phagocytosis or by forming antibodies and lymphocytes that are sensitive (Sukardi, 2005).

Factors that affect the number of blood leukocytes are physiological and pathological characteristics. Physiologically, an increase in the number of neutrophil cells and lymphocyte cells can increase the number of blood leukocytes, and increase the secretion of epinephrine and corticosteroids in the blood. Pathologically an increase in the total number of leukocytes in the blood circulation can be caused because leukocytes are active against pathogenic microorganisms that can cause disease. A decrease in the number of leukocytes also commonly occurs due to pathological disorders such as bone marrow hypoplasia, viral diseases and severe infections (Rukayah, 2008). Flavonoids in katuk leaves can protect cell structures, increase the effectiveness of vitamin C, anti-inflammatory, anti-bacterial, anti-viral and natural antibiotics. The ability of flavonoids to reduce the number of leukocytes due to foreign substances that enter the body are pathogenic and damaging. The ability of flavonoids as natural antibiotics causes a reaction if a virus enters the body by blocking damage to the outer membrane of the body of the virus so that it does not secrete proteins in cells to carry out DNA replication. This ability causes the existence of pathogens to not increase and the number of leukocytes to remain stable in the blood (Rukayah, 2008).

The white blood cell count of the study pigs ranged from 11.91-12.29 million mm-3, still within the normal range. NSeAbasi N Etim et al. (2014) reported WBC (white blood cells) of normal pigs ranging from 7-20 million mm-3. White blood cell levels of pigs that were given katuk leaf flour up to 9% in this study increased not significantly ($P>0.05$). These results are in line with Prakoso's research, et al. (2018) giving 5% did not significantly increase broiler white blood cells.

The number of erythrocytes is influenced by hemoglobin concentration, age, exercise, nutritional status, lactation, pregnancy, increased epinephrine, blood volume, maintenance, time, ambient temperature, altitude and climatic factors (Swenson, 1984). One of the functions of the erythrocytes is to bind oxygen by hemoglobin into the body's cells and remove carbon dioxide from the body's cells. The oxygen enrichment by hemoglobin is

closely related to the total red blood cells and is also related to the respiratory organs. The more total red blood cells, the better the respiratory rate because more oxygen is bound by hemoglobin to be circulated throughout the body. Age affects the number of erythrocytes in the blood. Weaning pigs (21 days) had an average of 6.0 (1012/L) erythrocytes, 11.2 (x109/L) leukocytes and 11.5 (g/dl) hemoglobin (Perri et al. 2017).

Protein is hydrolyzed by protease enzymes into amino acids and glycine amino acids which will later be used in the process of forming erythrocytes (Wardhana et al. 2001). Pig blood erythrocytes found in the study were not significantly different. Katuk leaf meal up to 3% can increase erythrocytes (6.17-6.25) 106/mm3, but leukocytes and platelets have no significance effect on rabbits (Pradikta et al. 2014).

CONCLUSION

Giving katuk leaf meal up to 9% in the diet reduced cholesterol from 230.42 to 201.84 Mg/dl but increased hemoglobin from 16.11 to 18.98 g/d, no significance effect (P>0.05) on cholesterol, total plasma protein, hemoglobin, erythrocytes and blood leukocytes of growing pigs.

RECOMMENDATION

As a recommendation that katuk leaf meal (Sauropus androgynus L. Merr) can be given as feeds at the level of 9% in diet without defeated blood characteristics of growing pigs.

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