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Glucose levels and Stress Index of Common Palm Civet (*Paradoxurus hermaphroditus*) Coffee Eaters and not Coffee Eaters

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Abstract

Common palm civet is a mamalia which often used to produce luwak coffee. Therefore health status of common palm civet is very important to be considered because force feeding of coffee can turn to stress condition. Glucose level, leukocyte profile and ratio N/L were often used as stress indicator. This study was aimed to determine glucose levels from blood of common palm civet, determine leukocyte profile and its deffirentiation also to calculate neutrophyl/limpocyte ratio from six common palm civet there were two group of observation, there were common palm civet coffe eaters and not coffe eaters. Blood samples were taken intracardially for further analyzed using manual blood method. Glucose levels of coffee eaters common palm civet was higher than common palm civet that was not coffee eaters. Stress index of coffee eaters common palm civet (0,516) was higher than not coffee eaters (0,463), but it was still in the normal range. Common palm civet that eat coffee continuosly can lead to oxidative stress condition.
Keywords: *Common Palm Civet, Blood Glucose level, Leukocyte Profile.*

Introduction

Common palm civet (*Paradoxurus hermaphroditus)* is mamals inclued in vevirridae family and nocturnal animal. Common palm civet has activitiies in trees (arboreal). Base on taxonomy, common palm civet categorized in carnivore animat, it eats small vetebrata such as reptile, aves and insect (Abebe 2003). But somehow, comon palm civet likes to eat mature fruits such as banana, papaya, mango and coffee. Common palm civet swallow fruit wich has small grain intact. Common palm civet has not digestive organs that do not support grain digestive, thus grains will be secreted with fesses (Joshi *et al.* 1995).

Common palm civet is known as animal can product coffee with its ability choose mature coffee fruit, than the fruit is eaten by common palm civet and than secreted with feces (Mudappa *et al.* 2010). The utilization of common palm civet for producing coffee beans need to be considered from animal welfare aspect (Permentan No 37 on 2015). Coffee delivery continuously to common palm civet wihtout accompanying any other supplemented feeding allegedly can affect the morphology of internal organs and physiology of common palm civet (Cheyne *et al.* 2010).

International Union for Conservation of Nature (IUCN) categorizes common palm civet on *least concern* condition. It means common palm civet population hasn't been feared to

extinct. Although common palm civet is classified on *least concern*, but animal population should be considered to maintain because they have potency to be utilized by human for many purposes. For this reason many common palm civets are potentially being captured. (Duckworth *et al.* 2008).

Previous research about common palm civet had been published, such as anatomy of reproduction male organs (Novelina *et al* 2014), and leukocytes profile, differentiation and stress index common palm civet, number of erythrocytes, hemoglobin levels and hematocrit value of domestic common palm civet (Satyaningtijas *et al.* 2013; 2014). This study were talking about stress parameter indicator of common palm civet given coffee continously. The data of pararmeter stress indicator would be useful for health status of common palm civet coffee eaters.

Stress condition can observe by increased of gucose level and stress index (N/L). Blood glucose is a sugar monomer found in blood derived from carbohydrates in food and serves as a source of energy. Glucose is usually stored in the form of glycogen in the liver and skeletal muscles. Some of the glucose in the blood is the result of intestinal absorption and breakdown of energy stores in the tissues. The body will increase glucose levels for activity during stress. Increased blood glucose can negatively affect the survival of badger weasels. Increased blood glucose levels can be triggered by hormonal activity.

Materials and Methods

Animal used were six common palm civet male and adult, devided by two groups, they were three coffee eaters and three not coffee eaters. Coffee were given for 8 mounth. Common palm civet were from Malabar coffee farmer, Pengalengan, Bandung, West Java. Animals were acclimatized for 24 hours and kept on individual cages (80x60x60 cm) after 8 mounths given coffee. After 24 hours acclimatization animal were prepare for sampling.

Common palm civet anasthesid using by combination of xylazine dose of 2 mg/kg body weight and cetamine dose 10 mg/kg body weight applied intramuscularly (IM) under veterinary supervision (Sohayati *et al.* 2008). After anasthetized animals, common palm civet were dissected on ventromedian body from perineum area until chest area, after that 3 ml blood were taken through intracardial. The blood sample were kept on EDTA tubes.

Blood was smeared on object glass for differentiation of leukocytes. The blood smeared were fixation with methanol for 5 minute. After fixation, blood smear were put into giemsa for 30 minutes then wash with running water. Blood smeared were observed under microscope at 100x objective lens and 10x oculer lens, to count leukocytes and precentage of differensiation leukocytes cell (Eggen *et al.* 2001). Calculation of absolute value each leukocytes is obtained from precentage multiplication each kind of leukocytes with number of leukocytes. Stress index were measured by calculating ratio of neutrophils to lymphocytes.

Glucose level was determined by used glucose kit (Gluco Dr). Glucose strip entered into Kit Glucose, than ± 0.2 ml blood dropped on strip. Aftrer a few minutes, there was number to showed glucose level. The data obtained were treated with Anova Two Way With Replication and if different were followed by T-Test

Results and Discussions

Calculation of Common palm civet glucose levels that eat coffee and not coffee eater can be seen in Table 1. Blood glucose level common palm civet coffe eaters (B) is higher than blood

glucose level of common palm civet not coffee eaters (A). Pervious researc repoth that glucose level of male common palm civet is 68.00 mg/dl (Gasandari, 2014). Base on pervious research and data that we got on common palm civet coffee eaters experiencing stress. Blood glucose levels are influenced by the secretion of the hormone cortisol.

Table 1. Average of blood glucose (mg/dL) common palm civet coffe eaters and not coffee eaters.

No.	Sample	Average of glucose level (mg/dL)
1	A	93±0,577[a]
2	B	115±1,154[b]

Ket : A = Common palm civet not coffee eaters, B = Common palm civet coffee eaters. Value are mean ± S.D.

The secretion of the hormone cortisol is regulated by the adrenal cortex by order of the hypothalamus and anterior pituitary, *adrenocorticotropic hormone* (ACTH) from anterior pituitary stimulates the adrenal cortex to secrete cortisol. Cortisol may affect glucose levels. According to Kadir and Salamanja (2015), Stress is an important factor affecting the production of cortisol hormones that can lead to increased blood sugar levels. According to Robertson *et al.* (2003), corelation betwen stress and blood glucose enhance is there is physiology reaction to stress who can affects the hypothalamic axis which further controls the two neuroendocrine systems (sympathetic system and the adrenal cortex system) sympathetic nervous system also signals the adrenal medulla to release epinephrine and norepinephrine into the bloodstream. Adrenal cortex system is activated if hypothalamus secretes CRF (*corticotropin releasing factor*) a chemical acting on the pituitary gland located just below the hypothalamus. pituitary gland further secretes the hormone ACTH (*adrenocorticotropic hormone*), which is carried through the bloodstream to the adrenal cortex and will stimulate the release of hormones including glucagon that stimulates the liver, muscle, fat tissue to release the energy stored (Dalami and Ermawati, 2010).

In addition to stimulating glucagon secretion, epineprin has an antagonistic effect on insulin function and inhibits insulin-induced glucose transport in peripheral tissues. These hormonal changes trigger maximum gluconeogenesis and increase glucose in the periphery, leading to severe hyperglycemia (Isselbacher *et al.* 2012).

Leukocytes Profil And Stress Index

Stress index can be calculated through the ratio of Neutrophile to Lymphocytes. In order to get the ratio , we need to calculate leukocytes and , differentioation leukocytes value (Neutrophils, Lymphocytess, monocytes, eusinophil, basophile), and stress index (N/L) of common palm civet. Average of Leukocytes, differentition value (neutrophyle, limphosite, monocyites, eosinophil, basophile), and stress index (N/L) of common palm civet coffe eaters and not coffee eaters were presen ted on Table 2.

Table 2. Average of Leukocytes (10^6/mm^3), differentiation value (neutrophyle, limphosite, monocyites, eosinophil, basophile), and stress index (N/L) common palm civet coffe eaters and not coffee eaters.

No.	Sample	Leukocytes	Kind of Leukocytes					Stress Index
			Limfosit	Neutrofil	Monosit	Eosinofil	Basofil	
1	A	10,275 ± 0,0091	62,82± 0,721	29,67± 0,480	2,06± 0,084	5,33± 0,014	-	0,463± 0,170
2	B	12,235 ± 0,388	60,83± 0,707	31,55± 0,855	1,16± 0,233	6,205± 1,124	-	0,516± 0,104

Ket : A = Common palm civet not coffee eaters, B = Common palm civet coffee eaters. Value are mean ± S.D.

Leukocytes is one of blood cells realated in body's immune mechanism (Edward *et al*. 2009). Types of leukocytes are Neutrophils, Lymphocytess, monocytes, eusinophil,and basophile, could change their level on certain conditions. Stress condition can increase one type of leukocytes and generally will increase total number of leukocytes in common palm civet body.

Number of leukocytes on common palm civet coffee eaters was higher than leukocytes of not coffee eater. Increasing of one type of leucocytes can increase total n umber of leukocytess. Number of neutrophils common palm civet coffee eaters was higher than number of neutrophils not coffe eaters. According to Davis *et al*. 2008, stress condition can trigger cortisol secretion which can increase number of neutrophils. Jenkin and Tortora (2013) report that cortisol will suppress number of limphocytes and increase number of neutrophils. Cortisol can suppress limphocyte circulation by carrying out limphocyte to limphatic tissue (Gardner *et al*. 2011). In turn limphocyte will redistribute into bone marrow and another place (Chastain and Ganjam 1986). Cortisol will also inhibit interleukin I and II secretion that use for limphocyte proliferation (Kantasa *et al*. 2016). This research showed limphocyte of common palm civet coffee eaters was lower than lymphocytes common palm civet not coffee eaters

Basophil only found very little in peripheral blood circulation (Ennis 2010; Ohnmacht and Voehringer 2009). According to Jones and Allison (2007), number of monocyte on common palm civet coffee eaters is lower than monocyte on common palm civet coffee not coffee eaters. Monocyte is immature leukocytes that will circulate into tissue mature leukocyte and become macrophage, its existancy in tissue is not long. Monocyte have function to mantain body immunity with phagocytosis mechanism (Davis *et al*. 2008). Eosinophil is leukocytes that increase when there is parasitic infection. Normally, eosinophil is found about 3% in leukocytes circulation (Rapaport 1987).

Stress index common palm civet were counted by the ratio of neutrophil to lymphocytes. According to Kannan *et al.* (2000), animal stress has N/L ratio above 1,5. Stress index of common palm civet coffee eaters was 0,516, which is higher than stress index of common palm civet not coffee eaters (0,463). Based on that result stress index of common palm civet coffee eaters and not coffee eaters still below the limit.

Conclusion

Based on the results of study, Blood glucose level common palm civet coffe eaters is higher than blood glucose level of common palm civet not coffee eaters.

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