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THE EFFECT OF FEEDING FERMENTED KOMBUCHA TEA ON HDL, LDL AND TOTAL CHOLESTEROL LEVELS IN THE DUCK BLOODS

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Abstract: Kombucha have high content of glucoronic acid, a substance that could neutralized cholesterol deposit, changed to another compound that more soluble in water. The experiment concerns the effects of supplementary fermented kombucha tea on HDL, LDL, and total cholesterol levels in the duck bloods. It was carried out at the Faculty of Animal Husbandry, Universitas Padjadjaran. The objective of this research was to determine the effect of giving different levels of fermented kombucha tea on High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL) and the total cholesterol levels of duck bloods. This research used an experimental methods with completely randomized design (CRD). There were five treatments (P0 = 0%, P1 = 10%, P2 = 15%, P3 = 20%, and P4 = 25%) and four replications. Results indicated that all treatment decreased significantly LDL and total cholesterol levels, and increased HDL. The conclusion is, the addition of fermented kombucha tea up to 25% will decrease LDL and total cholesterol, and increase HDL in the duct blood.

Key words: kombucha fermented tea, HDL, LDL, total cholesterol, duck blood

Introduction

Kombucha is fermented tea that is often drunk for medicinal purposes. There are scientific studies that support the health benefits of Kombucha that show it to be antimicrobial *(Sreeramulu et al., 2000; Cetojevic-Simin et al., 2008)*, have hepatoprotective qualities (Murugesan et al,2009) and to be antioxidative *(Sai Ram et al., 2000; Dipti et al., 2003)* among other benefits. Kombucha is available commercially or can be made at home by fermenting tea using a visible, solid mass of yeast and bacteria. Kombucha contains multiple species of yeast and bacteria, as well as the organic acids, active enzymes, amino acids, and polyphenols produced by those microbes. Many health benefits have been reported by users of Kombucha

Tea, benefits are derived at due to its cleansing properties by detoxifying and aiding the liver and kidneys to flush the toxins from the body. The health benefits of this living beverage are varied. Efforts to reduce Total Cholesterol, HDL, and LDL in the duck can be done with giving Kombucha Tea Fermentation (TFK) in duck drinking water. Fermented kombucha tea can be consumed as a food supplement that offers the required compounds in stabilizing the body's metabolism. According to *Williams (2001)*, yeast ferments contained in kombucha tea is *Candida albicans*, *Sacharomyces*, and *Pichia fermentans* while the bacterium *Acetobacter xylinium*, *Gluconicum bacteria*, *Acetobacter ketogenum*. The suspension is glucoronic acid, gluconic acid, lactic acid, oxalic acid, lactic acid, butyric acid and natural antibiotics material. In addition to producing some organic acids . Kombucha also produce some vitamins such trace element that give a benefit for health body. The vitamin B groups in kombucha have a function for regenerating energy and metabolizing lipid and protein. Besides that it is also important for the nerve system. Vitamin C in kombucha have a potency as detoxifier agent, and it also able to support immune system, and increase the vitality *(Anonymous, 2006)*. Glucuronic acid also present in kombucha tea, this acid is a metabolite that is produced by a healthy liver and aids in the detoxification of the body. By drinking kombucha tea daily will help prevent our body tissues from absorbing all the toxins found in our industrial environment that can lead to illness *(Naland, 2008)*. Kombucha tea contains most polyfenol, including flavonoids. One of the flavonoids is catechin, these compounds are antioxidants with the power 100 times higher than vitamin C and 25 times than vitamin E, which is also a powerful antioxidant. Changes in LDL (Low Density Protein) into a form that LDL oxidized by free radicals can cause damage artery walls and increases atherosclerosis violence. Prevention mechanisms contained in its ability to inhibit the absorption of cholesterol and inhibits platelet clumping cells thus preventing the blockage of blood vessels. Polyfenol tea is also a powerful antioxidant that can protect LDL oxidation by free radicals.

According to *Mohan (1996)* and *Santoso (2000)* the addition of products fermented can decrease cholesterol levels through the mechanism of inhibit HMG CoA reductase enzyme activity (3-hydroxy 3-metilglutaril CoA reduckase) as a producer or through the mechanism of increased cholesterol synthesis bile acids. Increased secretion of bile acids will increase the excretion of cholesterol so that cholesterol levels in the blood decreased *(de Roos and Katan 2000)*. Reducing cholesterol levels due to inhibit mechanism of synthesis of HMG CoA played by the components contained in Kombucha tea. As it is known that HMG CoA could form mevalonat acid compound which is a precursor of cholesterol *(Martin et al., 1981)*.

The Kombucha colonies used in this investigation had a tendency to produce about 3.3% total acid, 0.7% acetic acid, 4.8% glucose, and 0.6% ethanol after a nine-day fermentation. There was no lactic acid produced by these colonies

(verified with HPLC; 9). The average pH of the fermented samples tested was 2.5. The pH of the neutralized samples was 7.0. When the fermentation was allowed to continue beyond the desired endpoint, the acidity reached levels as high as 24 g/L (2.4%) acetic acid, with 14 g/L (1.4%) ethanol.

Materials and Methods

Kombucha that have high level of glucoronic acid, would be test to decline blood cholesterol. Twenty ducks, with average body weigh 1800 gram and coefficient variable 8,59%, age 1,5 years The duck kept in the cage, as much as 5 group, and each of it contain 4 duck.
The ration consist 16% protein and metabolist energy 2900 kcal/kg
The formula rations were **:**

R0 Control diets
R1 Diets contain 10% of kombucha
R2 Diets contain 15% of kombucha
R3 Diets contain 20% of kombucha
R4 Diets contain 25% of kombucha

The dosage of kombucha (10, 15, 20, 25%) from drinking water has been standardize according to water consumption in premilary experiment. The range of temperature was between 24 until 32^{O}C.

Sample preparation: Kombucha was prepared by adding 100 g/L (10%) weight/volume sucrose and tea leaves of desired dry weight to boiling water. The fermentation time averaged twelve days at 25° C *(Lovita et al., 2011).*

Results and Discussion

Table 1. Effect on Total Cholesterol, HDL and LDL (Mg/dl) of duck blood

Variables	P0	P1	P2	P3	P4
Total Cholesterol	213,23	194,10	183,67	172,60	164,78
LDL	54,53	40,23	31,92	24,14	19,43
HDL	61,99	80,19	85,17	93,15	123,85

Effect treatment on total cholesterol levels of duck blood. Based on Table 1, Blood cholesterol in tested animal decline during treatment with consuming kombucha.. Adding 25% kombucha tea of the total drinking water consumption could be reduced highest the total cholesterol level.

Decreasing total cholesterol in all treatment, because of the catechins contained in the fermented tea Kombucha. Catechins reduce the accumulation of cholesterol in the blood and accelerates the elimination of cholesterol through the feces, as well as free radicals *(Anonymous, 2001)*. It could lower the absorption of fat and cholesterol in the intestine so that it will stimulate the secretion of bile acids were digest more fats *(Purnawan, 2010)*. Soluble fiber component also plays a role in lowering total blood cholesterol, it contained in fermented Kombucha Tea role in reducing the absorption of fat and cholesterol in the intestine, thereby reducing the cholesterol content in blood *(Kusnandar, 2004)*. In addition, soluble fiber stimulates the liver to release more bile salts into the duodenum to the liver needs cholesterol to produce more bile salts by taking cholesterol in tissues *(Astuti, 2004)*. The mechanism of decreasing total blood cholesterol is also associated with niacin, it inhibit reform and reducing fat tissue retrieval of free fatty acids by the liver so that the synthesis of cholesterol in the liver is reduced, and circulating cholesterol into the body tissues will decrease *(Naland, 2008)*. This is supported by previous research that the administration of niacin in chickens up to 4% in the ration may lower cholesterol levels in chickens due to an increase in lipolysis process so that acetyl CoA is formed from the process of beta oxidation of fatty acids declined . Glukoronat acid contained in fermentation of Kombucha tea is also a role in lowering cholesterol, that bind toxins, heavy metals and excess fat and cholesterol are easily soluble in water and excreted by the body along with urine *(Greenwalt, 1999)*. This is consistent with *Rahayu (2005)* which consume fermented Kombucha tea can reduce cholesterol level.

Effect Treatment on HDL and LDL in duck blood. HDL and LDL in cholesterol are soluble in water and could not distributed in the body. Cholesterol is distributed in blood systems by lipoprotein-protein component soluble in water which able to bring cholesterol and triglyceride in it. Cholesterol brings into the pheripherial system by cilomicron lipoprotein, VLDL and LDL. The capability of the lipoprotein to bind blood cholesterol are very low. Therefore, this kind of lipoprotein called bad cholesterol. Besides that, HDL particle have higher capability to bind cholesterol and bring it to liver then excreted to urine *(Anonymous, 2008b)*, HDL cholesterol in blood plasma of tested animal showed significantly increase during kombucha consumption. HDL cholesterol for P0, P1, P2, P3 and P4 were 61.99, 80.19, 85.17, 93.15, and 123.85 mg/dl respectively. The LDL in all treatment is decline.. LDL cholesterol for all treatment (P0, P1, P2, P3, P4) were 54.53, 40.23, 31.92, 24.14, and 19.43 respectively.

Cholesterol levels decreased because of the active substances activity that contained in kombucha tea. The addition of fermentation products could decrease the cholesterol levels of blood through the mechanism of inhibition of an enzyme activities that involved in cholesterol biosynthesis (3-hydroxy 3 metilglutaril CoA reductase) or through the mechanism of increased bile acid synthesis. *Naland (2008)*, the content of niacin in kombucha tea can reduce the excess of cholesterol

in the blood. Vitamin B3 (niacin) has been used to reduce high LDL, cholesterol and triglycerides (fats) blood and increasing HDL effectively.

Conclusion

Kombucha tea fermented in drinking water could decline blood cholesterol level P1 = 9 %, P2 = 13,9 % P3=19,1 %, P4= 12,8 %, respectively. Futhermore for bad cholesterol / LDL decreased P1 = 17,3% P2 = 41,5 % P3 = 55,8 % P4 = 64,4%, and good cholesterol/HDL would rise P1 = 12,93% P2 = 13,73 % P3 = 15,02% P4 = 19,97 % , after consuming kombucha for four weeks.

Uticaj ishrane fermentisanim kombuha čajem na nivoe HDL, LDL i holesterola u krvi pataka

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Rezime

Kombuha sadrži visok nivo glukuronske kiseline, supstance koja vrši neutralizaciju holesterolskih depozita pretvarajući ih u jedinjenja rastvorljiva u vodi. Proučavani su efekti fermentisanog kombuha čaja, kao dodatka u ishrani, na HDL, LDL i ukupan nivo holesterola u krvi pataka. Ogled je obavljen na Fakultetu za stočarstvo-Univerziteta u Padjadjaran-u. Predmet istraživanja bilo je utvrđivanje uticaja različitih koncentracija fermentisanog kombuha čaja na nivoe liporoteina visoke gustine (HDL) i liporoteina niske gustine (LDL) kao i na nivo ukupnog holesterola u krvi pataka. U istraživanju je korišćen eksperimentalni metod sa kompletno slučajnim modelom (CRD). Ogled je obuhvatio pet tretmana (P0 = 0%, P1 = 10%, P2 = 15%, P3 = 20%, and P4 = 25%) i četiri ponavljanja. Rezultati su pokazali da je dopunska ishrana svim tretmanima značajno smanjila nivo LDL i ukupnog holesterola dok je nivo HDL povećan. Može se zaključiti da dodavanje fermentisanog kombuha čaja do 25% u ishrani snižava nivoe LDL i ukupnog holesterola uz povećanje nivoa HDL.

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