Effect of Addition Cinnamon Bark Extract (Cinnamomum burmannii) of Water Content, Total Lactic Acid Bacteria Colonies, Antioxidant Activity and Cholesterol Levels from Goat's Milk Yoghurt

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Abstract— This research aimed to determine the effect of the extract of cinnamon bark (Cinnamomumburmannii) in making goat milk yoghurt products on water content, total lactic acid bacterial colonies, and antioxidant activity. This research used an experimental method that is designed with Random Block Design (RBD) with 5 treatments and 4 replications. The treatment in this study was the addition of cinnamon bark extract A (0%), B (1%), C (2%), D (3%), E (4%). This study used goat's milk as much as 4200 ml Peranakan Etawa (PE), and cinnamon bark extract 80 ml. The average water content ranged from 81.26 - 85.56%. The average of total lactic acid bacteria colonies ranged from 3.87 x 108 - 7.95 x 108 CFU/ml. The average of the antioxidant activity ranged between 10.98% - 26.88%. The mean cholesterol levels between 17.5-14.0 mg/ dl. The results of this study showed that cinnamon bark extract significantly ($P < 0.05$) to water content, total lactic acid bacterial colonies, antioxidant activity, and cholesterol levels. From this study, we can conclude that the use of cinnamon bark extracts 4% the best in making goat 's milk yoghurt.

Keywords— Cinnamomumburmannii, water content, total lactic acid bacterial colonies, antioxidants, cholesterol.

I. INTRODUCTION

oat's milk protein content is relatively higher than cow milk. Goat milk proteins are known not to contain β-Glacto globulin that are allergens, so it can be consumed by people who are allergic to cow's milk. [1] Fluorine contained in goat milk ranges from 10 to 100 times greater than cow milk. Fluorine content is useful as an antibacterial and can help suppress the propagation of pathogenic bacteria in the body, can help digestion and neutralize stomach acid, cure allergicre action son the skin, respiratory and digestive systems. The problem face disto consume goat milk has not been too entrenched than cow's milk, especially among the people of Indonesia for goat milk also has a distinctive aroma that is not preferred by consumers to make goat milk less desirable. The distinctive aroma of goat in goat milk can bereduced by a fermentation process. Cinnamon is a kind of spice trees. This plant in Indonesia is found in areas of West Sumatra, North Sumatra, Jambi, and Bengkulu. Cinnamon bark has a spicy and sweet flavor, smells fragrant and warm nature. [2] States that cinnamon is a plant source of antioxidants. The main component in cinnamon is the largest component sinamaldehid range of 60-70% as the main antioxidant compound. [3] The addition of cinnamon in solution form into a functional beverage cup produces the best gift as much as 1.5%, most preferably panelists with assessment of color and flavor. The purposeof this study is to determine the effect of extracts of cinnamon bark on the value of water content, total bacterial colonies of lactic acid and antioxidant activity in the yoghurt of goat's milk, and to determine the best concentration of the addition of an extract of cinnamon bark for on water content, total colonies of lactic acid bacteria, and antioxidant goat's milk yoghurt.

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II. METHOD RESEARCH

A. Preparation of Goat Milk Yoghurt Starter

50 ml of goat's milk pasteurized at a temperature of 65ºC for 30 minutes and then cooled at room temperature so as to achieve a temperature of 43ºC. Furt her more, a single colony *Pediococcus pentosaceus* and *Streptococcus thermophilus* which have been cultured to MRS inserted into the cooled milk at a ratio of 1:1. The milk then incubated in the incubator into an anaerobic atmosphereat a temperature of 37ºC for 5 hours.

B. PreparationofCinnamon Bark Extract

Preparation of cinnamon bark extract can refer to the with modifications, cinnamon with 96% ethanol at a ratio of 1: 3 for 3 days. After the extraction process is complete, then is filtered using filter paper, the filtrate obtained extracts. After the filtrate extract, evaporated to remove the solvent. Evaporation used a rotary evaporator at 40 ° C evaporated 1-2 hours [4].

C. Goat Milk Yoghurt-making

1000 ml of goat's milk pasteurized at a temperature of 65ºC for 30 minutes and cooled at room temperature so as to achieve a temperature of 43ºC. Further more, milk was divided each 200 ml. Then, yoghurt starter of goat's milk added to goat's milk containing inoculation Pediococcus pentosaceus and Streptococcus thermophilus as much as 5% with a ratio of 1: 1. Incubated for 5 hours at a temperature of Added extract of cinnamon as much as A (0%), B (1%), C (2%), D (3%), E (4%) into the goat's milk yoghurt.[5]

D. Data Analysis

Data were statistically analyzed using Random Block Design (RBD) with 5 treatments and 4 replications. Such treatment is the extract of cinnamon bark as much as A (0%), B (1%), C (2%), D (3%), E (4%) into the goat's milk yoghurt. The treatment showed significantly different results (F count> F table 0.05). The results were further by using Duncan's Multiple RangeTest (DMRT). In this study, the measured variable is the water content, total lactic acid bacteria, antioxidant activity and cholesterol levels.

III. RESULTS AND DISCUSSION

A. Water content

The average water content of th eyoghurt goat's milk can be seen in Table1.

TABLE I
THE NUMBER OF WATER CONTENT OF YOGHURT GOAT'S MILK

Treatment	Water content (%)
A	85.56[a]
B	84.54[a]
C	83.20[b]
D	82.93[b]
E	81.26[c]

Description: Different Superscripts In The Same Column Showed A Significant (P<0.05)

In Table 1 it can be seen that the average of water content yoghurt goat's milk range between 81.26 - 85.56%. Where the highest water content contained in A as a control treatment without the addition of cinnamon bark extract 0% is (85.56%) and the lowest in treatment E with the addition of cinnamon bark extract 4% is (81.26%). Results of analysis showed that the addition of cinnamon bark extracts significantly different (P <0.05) to the water content of goat's milk yoghurt.

The reduced water content in goat's milk yoghurt with increasing concentrations cinnamon bark extract, due cinnamon bark extract solution through the extraction process resulting from the maceration in the form of a thick solution. The addition of cinnamon bark extract solution with the higher concentration of the goat's milk, yoghurt affect moisture reduction from goat's milk yoghurt. [6] This is in accordance with the opinion of that the maceration extraction solution cinnamon bark obtained yield a solution which is thick with moisture content 80-89%. [7] 24.4 g fiber composition and composition of the lower 9.5 g in 100 g of cinnamon bark. [8] Supported by the opinions cinnamon bark extract contains high fiber such as cellulose,

[9]According commercial yoghurt composition contains water content ranges from 75-80%. The results from this study water content of goat's milk yoghurt obtained ranging from 81.26-85.56%. This means that the water

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content of goat's milk, yoghurt addition of cinnamon bark extract is slightly higher than the composition of the water content of the yoghurt commercial. [10] The addition of yoghurt commercial use skim milk or skim powder, and delivery of this type of lactic acid bacteria are more than two types or more can affect the viscosity of the solution of yoghurt. There is also the addition of emulsifiers, Flavor, and preservatives.

The high water content of yoghurt in treatment due to treatment A was not added cinnamon bark extract. As a result, there is no influence of the acidity of cinnamon bark extract, lactic acid is formed is produced by lactic acid bacteria (Streptococcus thermophilus and Pediococcuspentosaceus) was only goat's milk yoghurt. Yoghurt water content produced higher 85.56%. [11] Acidity produced low yoghurt can be influenced from the low protein coagulation because of the cessation of activity of the lactic acid bacteria due to the acidity of the environment is no longer possible for the process of metabolism.

B. Total Lactic Acid Bacteria Colonies

The average total lactic acid colonies of the yoghurt goat's milk can be seen in Table 2.

TABLE II

THE NUMBER OF TOTAL LACTIC ACID BACTERIA COLONIES OF YOGHURT GOAT'S MILK

Treatment	Total Colonies of Lactic Acid Bacteria (× 10^8 CFU/ml)
A	3.87^{c}
B	4.94^{bc}
C	5.90^{b}
D	6.54^{ab}
E	7.95^{a}

Description: different superscripts in the same column showed a significant (P<0.05)

Table 2 showed that the average the number of total lactic acid bacteria colonies on goat's milk yoghurt range between 3.87x 108 CFU /ml to 7.95 x 108 CFU/ml. The highest is the treatment E addition of cinnamon bark extract 4%, (7.95 x 108 CFU / ml) and the lowest for the treatment A as a control without the addition of cinnamon bark extract is 0% (3.87x 108 CFU/ ml). Results of analysis showed that the addition of cinnamon bark extract provides a significantly different (P <0.05) to the total colony LAB goat's milk yoghurt.

The total value of colonies of bacteria Pediococcuspentosaceus(5.9 x 108 CFU / mL) and Streptococcus thermophilus (4.1 x 108 CFU / ml), National Standardization Agency (SNI) (2009) state the amount of starter bacteria that is at least 107 CFU/ml, after being processed into a goat's milk yoghurt cinnamon bark extract total value averaging the resulting colonies range between (3.87 x 108 CFU/ml) - (7.95 x 108 CFU/ml). This shows that the increasing concentration of cinnamon bark extract significantly increased the total colony LAB goat's milk yoghurt.

LAB increased total colony along with the addition of cinnamon bark extract caused cinnamon bark extract solution is acidic with a pH value of 4.80 that provides the acidic environment that is suitable for starter cultures of lactic acid bacteria produce lactic acid activity. The results of this study were the highest total colony BAL is up (7.95 x 108 CFU/ml). [2] cinnamon can improve the growth of non-pathogenic bacteria or beneficial bacteria. [12] That the value of the low level of acidity which can increase the number of microorganisms because of the nature of which is still tolerant bacteria with low acid conditions.

The results showed an increase in total BAL colony highest (7.95 x 108 CFU/ml). According to health organizations [13] probiotics as living organisms which when administered in adequate amounts which will give effect to the body healthy. The content of probiotics in food in the range of at least 106 CFU/g. [14] That the addition of probiotics must pay attention to the concentration of 107-1011 CFU / g for human and 107-109 CFU /g for the animals.

When connected to the water content and pH, total lactic acid bacterial colonies goat's milk yoghurt on the results of this study significantly affected by two variables. The reduced water content of goat milk yoghurt will increase the growth of lactic acid bacteria that produce the acid that can inhibit the growth of pathogenic bacteria. [15] This is in accordance with the opinion of some of the main factors that influence the growth of microorganisms include nutrition, time, milk, water, pH, and oxygen availability. Yoghurt during the incubation period experienced fermnetasi be lactose milk into lactic acid by lactic acid bacteria produce acid can support the growth of lactic acid bacteria and prevents the growth of pathogenic bacteria.

C. Antioxidantactivity

The average antioxidant activity of the yoghurt goat's milk can be seen in Table 3.

TABLE III

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THE NUMBER OF ANTIOXIDANT ACTIVITY OF YOGHURT GOAT'S MILK

Treatment	Antioxidant Activity (%)
A	10.98[d]
B	24.77[c]
C	24.89[a]
D	25.99[a]
E	26.88[a]

Description: different superscripts in the same column showed a significant (P<0.05)

Table 3. showed that the average the number of antioxidant activityon goat's milk yoghurt between range between 10.98%- 26.88%.The average of the highest antioxidant activity yoghurt contained in E treatment is (26.88%) and the average total colony lowest for the treatment A is (10.98%). Results of analysis showed that the addition of cinnamon bark extract provides a significantly different (P <0.05) to the antioxidant activity of goat's milk yoghurt.

Increased antioxidant activity of goat milk yoghurt due to the addition of cinnamon bark extract, because the cinnamon bark contains compounds sinamaldehid which is the largest component in cinnamon bark serves as an antioxidant. Thus increasing accretion cinnamon bark extract, the higher sinamaldehid in goat's milk yoghurt consequently also increases antioxidant activity. [2] Cinnamon is a plant source of antioxidants. Cinnamon contains essential oils, sinamaldehid, eugenol, cinnamic acid, catechin, epicatechin. This phytochemical compound makes cinnamon's potential as an antioxidant. The main component in cinnamon is sinamaldehid is the largest component ranges from 60-70% as the main antioxidant compound.

Sinamaldehid compounds in cinnamon act to prevent the occurrence of free radical oxidation, in this case the DPPH (Diphenylpicryl-hidrazil). [16] Sinamaldehid is the most dominant phytochemical compounds in cinnamon. Sinamaldehid inhibit aldose reductase, the enzyme that plays a role in the polyol pathway, resulting in the formation of oxidative inhibited. [17] Antioxidants are substances that can neutralize free radicals that can protect the body from the biological system adverse effects arising from the process or reaction that causes excessive oxidation. As evident from the results of the study, that the addition of cinnamon bark extract highest in treatment E (4%) produces the highest antioxidant activity that is 26.88%.

The high antioxidant activity in the treatment of E, addition of cinnamon bark extract high of 4%. Calculation of activity of antioxidant activity to see how powerful the antioxidants in the products can inhibit the oxidation reaction. The antioxidant activity of cinnamon bark extract can be said to be relatively high antioxidant content, because with the addition of the cinnamon bark extract and 4% have been able to achieve up to 26.88% antioxidant. Results of previous studies [3] the addition of cinnamon as much as 1.5% into the functional beverage cup produces antioxidants 28.43%. It shows the content of antioxidants in cinnamon is high.

D.Cholesterol

The average cholesterol of the yoghurt goat's milk can be seen in Table 4.

TABLE IV
THE NUMBER OF CHOLESTEROL OF YOGHURT GOAT'S MILK

Treatment	Cholesterol(Mg / dl)
A	17.5[a]
B	16.0[ab]
C	14.8[bc]
D	14.3[c]
E	14.0[c]

Description: different superscripts in the same column showed a significant (P<0.05)

Table 4 showed that the average number of antioxidant activityon goat's milk, yoghurt range between 14.0 mg/dl - 17.5 mg/dl. The highest cholesterol levels found in a treatment without the addition of cinnamon bark extract of 0%, is 17.5 mg / dl, and the lowest for the treatment E with the addition of cinnamon bark extract 4% is (14.0 mg/dl). Results showed that the treatment effect significantly different (P <0.05) on cholesterol levels goat's milk yoghurt.

Foods rich in antioxidants have lower cholesterol levels because the antioxidants can inhibit the oxidation process of processing of food products, especially cooking. Processing and storage of food affect the nutrients

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contained stability and performance of groceries. Foods containing oils and fats will decrease the quality and nutritional content when heating process is carried out and when stored for a long period.[18]

Sinamaldehid is the most dominant phytochemical compounds in cinnamon. Sinamaldehid acts as an antioxidant by inhibiting aldose reductase, the enzyme that plays a role in the polyol pathway, resulting in the formation of oxidative stress inhibited. The content of the antioxidants in cinnamon bark can be derived from Vitamin A and Vitamin C contained in it. [19] vitamin serves as an anti-free radicals, which vitamin C belonged antioxidant that is easy and cheap if taken from nature.

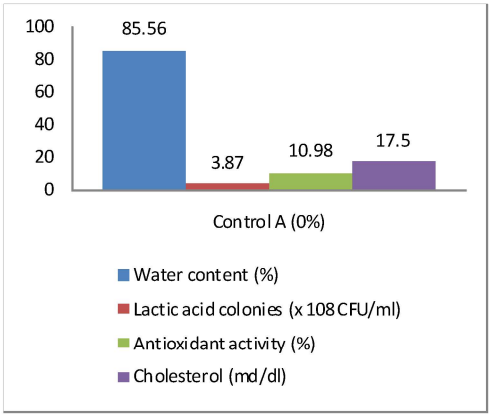

Fig.1:(A) treatment control 0% of cinnamon bark extract of yoghurt goat's milk

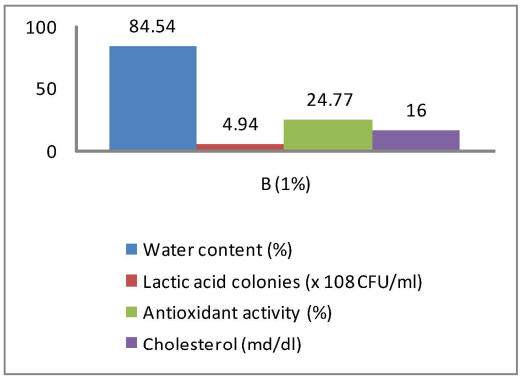

Fig. 2: (B) treatment 1% of cinnamon bark extract of yoghurt goat's milk

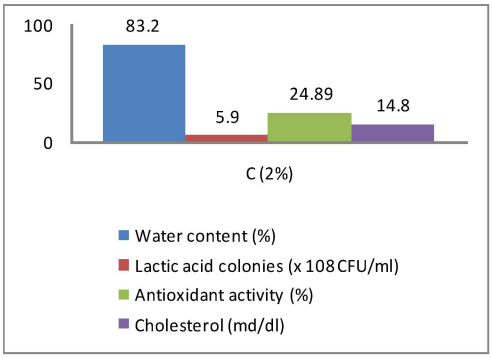

Fig. 3: (C) treatment 2% of cinnamon bark extract of yoghurt goat's milk

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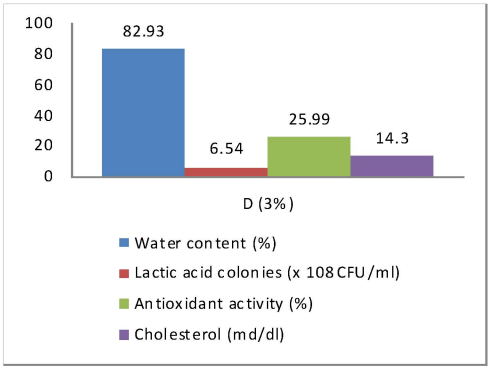

Fig. 4: (D) treatment 3% of cinnamon bark extract of yoghurt goat's milk

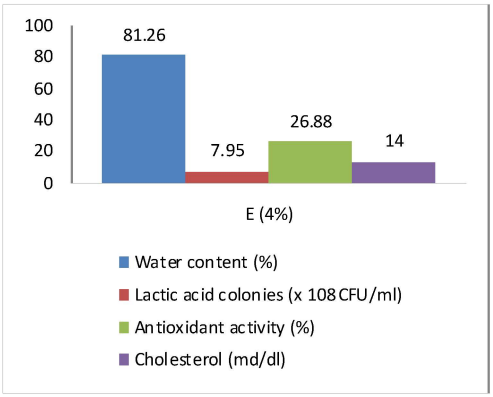

Fig. 5: (E) treatment 4% of cinnamon bark extract of yoghurt goat's milk

IV. Conclusion

Addition of an extract of cinnamon bark (Cinnamomumburmannii) on goat's milk yoghurt can lower water levels, cholesterol, increasing the total colonies of lactic acid bacteria, and antioxidant activity. Addition of an extract of cinnamon bark level of 4% to produce best yoghurt of goat's milk is with a water content of 81.26%, the total of colonies of lactic acid bacteria 7.95 x 108 CFU/ml, antioxidant activity of 26.88%, and cholesterol 14.8 mg/dl.

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