

Physical Properties of Milk Cincau Curd on Different Concentrations of Green Cincau Leaf (*Cyclea barbata L.Miers*)

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Abstract. The objective of this study was to determine the effect of cincau leaf (*Cyclea barbata L.Miers*) on the physical properties of milk cincau curd. The materials of this research were milk cow of Local Friesian Holstein and leaves of cincau. This research used one way randomized design. The treatment of this research was concentration ratio between cincau leaf and cow milk (w/v): A1 = 10%:90%; A2 = 20%:80%; A3 = 30%:70%. The data was analyzed using ANOVA, and differences between treatment means were further analysed using Duncan's New Multiple Range Test. Our study revealed that different concentrations of cincau leaf significantly affected cohesiveness, chewiness, hardness, gumminess, springiness, pH and syneresis ($p < 0.01$). However, it did not affect adhesiveness. In addition, the level of 30% of cincau leaf increased cohesiveness, and the level of 20% increased chewiness, hardness, gumminess, springiness, pH. On the other hand, syneresis decreased at the level of 20%. It can be concluded that the addition cincau leaf up to a level of 20% improved the physical properties of milk cincau curd.

1. Introduction

Green cincau leaf (*Cyclea barbata L.Miers*) is local name in Java Island. It is a vine growing in Asia, Africa and South America that can produce a gel-forming prepared by mixing the leaves with water [1]. Extracts of green cincau leaf contain pectin as a source of dietary fiber polysaccharides and the cause of the gel [2]. Chemical composition of the gel from green cincau leaf has been elucidated and classified as pectin consisting of the partly methylated and acetylated polygalacturonic acid backbone with neutral sugar side chains [3]. Pectin from green cincau leaf has unique characteristics because a gel occurs spontaneously in a short period of time at room temperature in the absence of neither sucrose nor calcium, and at the pectin concentration of as low as 0.5% w/v [4].

Application of pectin is not only in water but also in other solvents such as milk. Milk is a rich source of nutrients (fat, protein, carbohydrates, minerals and vitamins), protective compounds, enzymes, growth factors and components, making it very useful for humans [5]. Pectin has been used to produce sour milk (yogurt) in Iran with addition of salt and flavoring [6]. Pectin is used as a stabilizer in sour milk beverage by absorbing κ -casein from casein micelles [7]. Therefore, future application of green cincau leaf into milk can be furthered by investigating the physical quality of the milk curd.



2. Materials and Methods

The materials of this research were leaves of green cincau and milk cow of Local Friesian Holstein. Leaves of green cincau were collected in sub district of Imogiri, Yogyakarta Province, sub districts of Jepon and Mertoyudan, Central Java Province. Milk cow were obtained from small holder dairy farm in Karanganyar District, Central Java Province.

2.1. Sample preparation

The treatment of this research was concentration ratio between cincau leaf and cow milk (w/v): A1 = 10%:90%; A2 = 20%:80%; A3 = 30%:70%. Milk from local dairy farmer was pasteurized at 62-63°C for 30 minutes, and it was cooled to 20°C. Sample preparation of cincau refers to [8]. Green mature leaves were trimmed and washed in water, cut into small pieces, and mixed well together.

Sample of green cincau leaves was put in pasteurized milk and squeezed for 10 minutes. Thereafter, the mixture was incubated in room temperature for 30 minutes until forming a curd.

2.2. Measurement of pH value

Value of pH was measured in accordance with AOAC method [9]. As many as 5 g of sample were crushed and added 5 ml of distilled water and stirred until evenly. After that, the sample was measured by using instrument of pH meter.

2.3. Syneresis measurement

Syneresis measurement refers to [10]. Gel sample was inserted to plastic cup with the same weight for each treatment. Then, it was stored for a few days in a refrigeration temperature. After that, the level of syneresis gel was observed by taking water separated from the gel, and it was weighed and calculated by the formula:

$$\text{Syneresis level} = \frac{\text{initial weight} - \text{final weight}}{\text{initial weight}} \times 100\% \quad (1)$$

Where, initial weight is gel weight in plastic and final weight is gel weight in plastic after separating water from gel.

2.4. Measurement of adhesiveness, chewiness, hardness, gumminess and springiness

To measure the variables of adhesiveness, chewiness, hardness, gumminess, springiness by using texture analyzer by brand *LFRA texture Analyzer* and refers to [11]. In principle, the value obtained represents the measured variables. Preparation of sample based on height of curd of milk cincau approximately 3 – 5 cm as a requirement, and then the samples were analyzed by texture analyzer.

2.5. Data analysis

This research used one way randomized design. The data was analyzed using ANOVA, and differences between treatment means were further analysed using Duncan's New Multiple Range Test.

3. Result and Discussion

The treatment did not affect on adhesiveness, but significantly affected on chewiness, hardness, gumminess, springiness, pH and syneresis ($p < 0.01$). The addition concentration of green cincau leaf of 30% was able to increase the value of cohesiveness. In addition, the level of 20% could increase chewiness, hardness, gumminess, springiness, pH, but the level of 20% decreased syneresis (table 1).

The addition of 0.1% pectin can increase the value of adhesiveness and whey syneresis [12]. Samples of low fat cheese by adding pectin did not affect on hardness, gumminess, chewiness and adhesiveness [13]. This difference was influenced by the stability of the interaction between pectin and casein in milk caused by the difference in pH [14], sensitivity of Ca [15], water content of the milk and content of the buffer in the milk serum [16]. Increasing the value of chewiness, hardness, gumminess and springiness in this study were caused by pectin in leaves of green cincau. Pectin can separate the casein in milk, thus forming a gel [17]. According [4] pectin as a maker of gel contained in green cincau leaf (*Cyclea*

barbata L. Miers.). Separation of whey from the milk sour milk is influenced by the concentration of pectin [18] and the concentration of protein in milk [15]. Precipitation of gel formation is due to the hydrophobic molecular bonding with a methyl group on the side poligalaktoronik in pectin [4]. Proteins and polysaccharides covalently bonded or ionic in emulsion form [19]. Casein molecules will interact in the presence of Ca ions, resulting in sedimentation that facilitate the separation of the serum of milk [20]. Concentration of green cincau leaf of 20% was increase the amount of curd of milk cincau because hydrophobic group of casein has a maximum bonded to methyl group in poligalaktoronik of pectin.

Table 1. The concentration of green cincau leaf on physical quality of cincau milk curd

Parameters	A1 (10%:90%)	A2 (20%:80%)	A3 (30%:70%)	P
Chewiness (gmm)	80.511±10.808 ^x	143.128±10.850 ^y	157.553 ±3.227 ^y	0.001
Adhesiveness (gs)	67.684±0.040	86.780±101.936	8.027±2.619	0.277
Hardness (g)	99.167±8.845 ^x	146.667±7.576 ^y	133.111±5.445 ^y	0.007
Gumminess (g)	24.622±3.010 ^x	35.378±2.531 ^y	37.057±1.477 ^y	0.005
Springiness (mm)	3.364±0.178 ^x	3.510±0.086 ^y	4.198±0.149 ^y	0.001
pH	5.578±0.050 ^x	5.722±0.039 ^y	5.422±0.000 ^z	0.001
Syneresis (%)	44.324±1.204 ^y	39.318±1.871 ^x	35.389±2.194 ^x	0.004

^{x,y} Different superscript in the same line showed significantly different.

The value of pH was enhancement by addition of green cincau leaf at the level of 20%, but decreased at 30% (table 1). The addition of pectin concentration of pill *Citrus sinensis* on a yoghurt fermented for 2 and 4 hours can demote the pH [12]. Commercial skim milk added pectin of 0.2% did not change the pH [21]. The addition of green cincau leaf up to 20% increase pH on milk cincau curd [8]. Changes in pH was caused by complex formation of carbohydrate-protein influenced by changing in the isoelectric point of the protein (constituent amino acid groups) and the number of ions in the carboxyl group of carbohydrates [22].

Syneresis was decrease with increasing concentrations of green cincau leaf (table 1). The addition of carrageenan and carbohydrates can decrease syneresis [23]. The higher addition of green cincau leaf (*Cyclea barbata L. Miers.*) resulted in lower grades of syneresis [24]. Pectin added from *Citrus sinensis* pills of 0.6% can reduce syneresis of whey in yogurt [12]. Impairment syneresis of this study was caused by an increase in the amount of pectin. Pectin was able to bind water in the presence of carboxyl acid groups [25].

4. Conclusion

The concentration of 20% increased chewiness, hardness, gumminess, springiness and pH, but decreased syneresis. The concentration of green cincau leaf of 20% can raise the physical quality of cincau milk curd.

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