



PROCEEDING INTERNATIONAL SEMINAR

IMPROVING TROPICAL ANIMAL PRODUCTION FOR FOOD SECURITY

3-5 November 2015

Eddy Agus Mokodompit Auditorium



Organized by

**Faculty of Animal Science Universitas Halu Oleo
Kendari - Southeast Sulawesi
Indonesia**



Unhalu Press
Kendari, 2015



**Proceeding
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Desain Cover dan Tata Letak: Unhalu Press

Diterbitkan pertama kali oleh Unhalu Press
Kampus Hijau Bumi Tridharma
Jalan H.E.A. Mokodompit, Kendari 93231
Email: unhalupress@uho.ac.id, press@uho.ac.id

Proceeding International Seminar “Improving Tropical Animal Production for Food Security”

Zainal Jaelan, Patricio S., J. Murali Dharan, W. Dollemore, Nasrullah, B. Purwantara, C. Sumantri dan Herry Sonjaya
xi + 257 hlm, 21,0 x 29,5 cm

ISBN : 978-602-8161-91-6

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Improving The Quality of The Yoghurt With The Addition of Honey

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ABSTRACT

Yoghurt is one of the functional food products with the potential to be developed and needed by the community. This research aimed to improve the quality of the yoghurt with the addition of honey. The study employed Completely Randomized Design with four treatments: 2, 4, 6, 8, and 10% honey levels. The data were analyzed by anova followed by Duncan's Multiple Range Test if there were significant effects. The results showed that the different honey levels gave significant difference effect ($P < 0.01$) on the crude protein content, but not significant ($P > 0.05$) on PH. The highest adding (10%) of honey in yoghurt gave the best result with the crude protein of 4.34% and PH at 4.0. The sensory evaluation result showed significant differences ($P < 0.05$) on texture and aroma, but not significant ($P > 0.05$) on color and taste. Level of 10% of honey inclusion had the highest overall acceptability score.

Key Words: Yoghurt, Honey, Crude Protein, PH, Organoleptic Analyses

INTRODUCTION

Milk as food with high nutritional content is the optimum medium for the growth of microorganisms and is therefore susceptible to damage. One of the preservation technologies that have been used is through the fermentation process (Ebringer *et al.* 2008). Fermentation is a change in the basic materials into the desired product by utilizing a microorganism activity, with the hope of foodstuffs can be more durable, have palatability and digestibility is high. One of the original fermented dairy products has sufficient potential to be developed and be required by the public is yoghurt (Mohamed *et al.* 2014).

Yoghurt is made with starter inoculation using a mixture of *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. Both types of lactic acid bacteria (LAB) work in synergy when fermenting milk (Lamoureux *et al.* 2002; Ramasubramanian *et al.* 2008). Improving the quality of yoghurt can be done with the addition of natural ingredients that works to increase the durability and value of the nutrients in yoghurt (Agarwal and Prasad, 2013). One alternative natural ingredient that is very effective in preventing damage and inhibits the growth of milk bacteria is honey.

Honey is a fluid-like syrup, viscous and sweet taste, produced by bees and insects other than nectar flowers. The sweet taste of honey is caused by the element *monosaccharide fructose* and *glucose* and has a sweet taste similar to sugar. Physical properties of honey are the type monoflora moisture content from 8.95 to 26.52%, the red color from 2.23 to 4.13, yellow 10.00 - 40.33, and a viscosity of 3.99 to 18.24 Poise. Chemical properties of honey monoflora is pH 3.87 to 4.48, total phenolic components from 371.4 to 1188.3 mg / 100 ml, maltose content of 6.71 to 28.82 mg / 100 ml, glucose 14.63 - 18.82 mg / 100 ml, and fructose from 28.82 to 41.30 mg / 100 ml (Chayati, 2008).

According to Taormina *et al.* (2001), honey can inhibit the growth of pathogenic bacteria such as *Escherichia coli*, *Salmonella typhimurium*, *Listeria monocytogenes*, *Bacillus cereus* and *Staphylococcus aureus*. This can be seen from the zone of inhibition produced by honey given to media who have planted these bacteria. In addition, honey can also inhibit damage boxed turkey meat that has been done by Antony *et al.* (2002). By adding honey in a certain concentration, pieces

of turkey meat containers have a shelf life longer than the pieces of turkey meat without adding honey containers.

The addition of honey to 10% in maize yoghurt provide the best quality improvement with the results of the analysis: 3.15% protein content, fat content 2.73%, 20.54% total solids, pH 3.8, 0.85% total lactic acid levels 0.32% ash, 4.49% fiber content, viscosity 4.66 dPa.s, total lactic acid bacteria 5.3×10^8 CFU / ml and total plate of 6.6×10^8 CFU/ml. Corn yoghurt products most preferred of organoleptic test results are corn yoghurt with honey addition of 8% with a score of 3.7 appearance, flavor 3.6, 3.9 consistency, color and aroma 3.7 3.6 (Nofrianti, Azima, and Eliyasmi, 2013).

MATERIALS AND METHODS

The study was conducted at the Laboratory of the Faculty Animal Husbandry, Kanjuruhan University, Malang. The materials used in the study were fresh cow's milk, honey, milk powder, and plain yoghurt as a starter. Starter cultures used consisted of *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. The used honey was pure honey (products royal jelly).

Methods

The study was conducted using design completely randomized (CRD) with five treatments and 3 replications for each. The treatment were:

P0 = Yoghurt + honey 0%

P1 = Yoghurt + honey 2%

P2 = Yoghurt + honey 4%

P3 = Yoghurt + honey 6%

P4 = Yoghurt + honey 8%

P5 = Yoghurt + honey 10%

Measured Parameter

The variables measured were: pH, concentration of protein and organoleptic evaluation including color, texture, taste and flavor.

Research procedure

The making procedure of yoghurt in this study was describe as follow:

1. Milk pasteurisation.
2. After pasteurised, the milk was keep until the temperature decrease to 40°C.
3. The addition of honey for each treatment (v/v). P0 was added 0% honey, P1 was added 2% of honey, P2 was added 4% of honey, P3, P4 and P5 was added 6, 8, and 10% of honey.
4. Inoculation of plain yoghurt starter in each treatment. The plain yoghurt starter was added as much as 100 ml in each treatment.
5. The yoghurt was fermented during 24 hours at room temperature.
6. After fermentation, the yoghurts were evaluated their pH, protein concentration, color, texture, taste and flavour.

Data analysis

Data were analyzed using analysis of variance (ANOVA) for each treatment and organoleptic evaluation data were analyzed according to the instructions of Susiwi (2009). If there is a significant difference among the treatment, the analysis will be continued using Duncan Multiple Range Test.

RESULTS AND DISCUSSION

General characteristics Fresh Milk Cow

Data observation of fresh cow's milk in terms of physical and pH were shown in Table 1.

Table 1. Quality of Fresh Milk Materials Research

Parameter	Result
pH	6,7
Color	White
Flavor	Typical milk
Texture	Liquid
Taste	Normal

The average pH value of milk in this study by 6, 7 observations physically has a white color, typical flavor of milk, a liquid without lumps and having taste of normal milk. The pH value of 6.7 due to the milk is still in a fresh state and has not experienced contamination by microorganisms or other materials that can damage the quality of the milk. Requirement quality of fresh cow's milk has a pH of 6.3-6.8. However characteristic of color, aroma, flavor and consistency does not changes. Fresh milk pH ranging from 6.6 to 6.7, and if there is a fair amount of acidification by bacterial activity, these numbers will decrease significantly.

Yoghurt Product Quality

pH Yoghurt

Streptococcus thermophilus in yoghurt served to break down into glucose lactose milk galactose (monosaccharide), while *Lactobacillus bulgaricus* metabolize the majority of monosaccharide into lactic acid. The average results of testing acidity yoghurt with honey and plain yoghurt as a starter at different level presented in Table 2.

Table 2. The average value of pH yoghurt

Level Honey	pH
P 0 (0%)	4.08
P1 (2%)	4.06
P 2 (4%)	4.06
P 3 (6%)	4.06
P 4 (8%)	4.00
P 5 (10%)	4.00

The average of each treatment showed that the usage level of the addition of honey gives no real effect on the pH of yoghurt ($P > 0.05$). The average pH for all treatments is 4.00. Based on research results, it can be seen that the addition of honey at various levels did not affect the pH. Sourness comes from *Lactobacillus bulgaricus* as lactic acid bacteria are able to convert lactose into lactic acid. Sour taste caused by pro donor to n, the intensity of sour taste pitch depends on H^+ ions are produced by acid hydrolysis of equal treatment for all. pH is the acidity of the actual value and the determination of the pH value is a better way than using acidity tertitiasi to determine the acidity of milk and dairy products. According to Hashim *et al.* (2009) pH yoghurt is determined by the type of milk used and the addition of stabilizers gelatin, alginate, and Ca has no impact on the change in pH and titration acidity of the yoghurt. Measurement of the degree of acidity (PH) is one

way to determine the characteristics and the quality of the newly formed yoghurt products. PH measurement in the food products in general are also used to determine the resilience of the food products against microbial contamination. Yoghurt is known as sour milk food products are classified in acidic medium with a pH of 4.0 to 4.5. Yoghurt product pH decrease during incubation occurs due to the accumulation of lactic acid produced by the activity BAL (Alakali, Okonkwo, and lordye, 2008).

Levels of Protein Yoghurt

Results of analysis of variance showed that the addition of honey a different treatment of men wave difference protein content of yoghurt. The average value of the protein content of yoghurt served at Table 3.

Table 3. The average value of the protein content of yoghurt

Level Honey	Protein (%)
P0 (0%)	3.15 ^a
P1 (2%)	3.37 ^a
P2 (4%)	3.40 ^a
P3 (6%)	3.67 ^b
P4 (8%)	4.19 ^c
P5 (10%)	4.34 ^c

Description ^{a-c} Notation different in the same column shows the significant difference (P < 0.01)

Based on data analysis, it can be seen that the addition of honey at various levels provide a very real effect (P < 0.01) on the protein content of yoghurt. The average results of testing for protein content by adding honey highest level of 10% in treatment P5 was 4, 34%. This is due crude protein contained in yoghurt influenced by the initial content of the raw material is fresh milk with 2.8% crude protein. The higher the concentration of honey used the higher the protein content of yoghurt, it can be caused by component constituent substance interacts with components of honey yoghurt like a combination of *Lactobacillus bulgaricus* and *Streptococcus thermopiles* by fermentation of milk into yoghurt happen synthesis of vitamin B complex, especially thiamin (vitamin B1) as well as some of the amino acids making up the protein which is useful for health (Zhang, Liu, Su, Li, Sun, Liang and Jiaping, 2011)

Yoghurt Organoleptic Test

Organoleptic test of a food will affect the food accepted or rejected by consumers before assessing the nutrient content of foodstuffs. Organoleptic quality testing is done by using the sense of taste, smell and touches the consumed foodstuffs. Interaction with the research results of the sensory apparatus used to measure the quality of foodstuffs in the context of quality control and product development (Idris, 2004). Methods of testing the organoleptic quality of foodstuffs used to distinguish the quality of foodstuffs in taste, flavor and texture directly.

Color

Results of analysis of variance showed that the addition of honey treatment the difference was not significant (P > 0.05) against the favorite color of yoghurt. The average value of yoghurt color level is presented in Table 4.

On average liking the color of the lowest yoghurt in treatment without the addition of honey (0%). Assessment highest at 10% addition of honey treatment. Using some addition level of honey in the yoghurt manufacture did not give any effect on color preferences of yoghurt. This is due to honey comes from bees. Bees change sacharides is honey with chewing process several times until half-digested. This process is not done all at once. Once chewed, saccharides are still in liquid form and still contains of water, the next process is the evaporation as much as possible the water and the transformation of the enzyme. Together so that the colors are produced equally. Color yoghurt

derived from the milk is influenced by the pigment carotenoid. Natural carotenoid pigment plant as a precursor form of vitamin found in milk fat and gives a yellowish color.

Table 4. The average value of color preference level yoghurt

Level Honey	Color
P0 (0%)	2.70
P1 (2%)	2.62
P2 (4%)	2.75
P3 (6%)	2.75
P4 (8%)	2.87
P5 (10%)	3.25

Texture of Yoghurt

Results of analysis of variance showed that the addition of honey treatment very real difference to the texture of yoghurt ($P < 0.01$). The average value of yoghurt served at Table 5.

Table 5. The average value of the level of preference texture of yoghurt

Level Honey	texture
P0 (0%)	2.70 ^a
P1 (2%)	2.75 ^a
P2 (4%)	2.64 ^a
P3 (6%)	2.70 ^a
P4 (8%)	3.46 ^b
P5 (10%)	3.62 ^b

Description ^{a-b}Notation different in the same column show a highly significant difference ($P < 0.01$)

The average preference for the texture of yoghurt was lowest in treatment 0%. The Rate was highest at 10% treatment. Usage levels significantly affected the addition of honey a yoghurt texture. Yoghurt gel structure as compactness yoghurt which is the interaction of milk protein, casein and *whey* formed during the process fermentation. Density gel set by the balance calcium in dairy produce hydrophobic interactions between the proteins in milk (Ramasubrahmanian, Restuccia and Deeth, 2008). The addition content of total solid such as honey, skim milk, sodium caseinat, *whey protein concentrate* on low-fat yoghurt aims texture to prevent damage due to low gel formation and separation of *whey* on the surface of yoghurt. Texture is a very important characteristic that determines the quality (appearance, taste, and overall acceptance) in the manufacture of camel milk yoghurt containing antimicrobial agents (Hashim *et al.*, 2009).

Aroma of Yoghurt

Aroma or flavor is a factor (*hedonic test*) of panelists who are affected by compounds produced during fermentation. Results of analysis of variance showed that the addition of honey showed significant differences ($P < 0.05$) to a yoghurt aroma. The average value of the level of preference aroma of yoghurt is presented in Table 6.

Preferences of panelists are real different of each treatment, but the high pitch panelists assessment contained in the addition of honey treatment 10%. Assessment was lowest for the treatment of 0%. According to Idris (2003), the aroma of yoghurt is not only influenced by the culture of the good and the ratio between *Streptococcus thermophilus* and *Lactobacillus bulgaricus* right. Both bacteria ratio should range between 1: 1 to 3: 2. The smell of the yoghurt comes from asetaldehi compound produced by *Lactobacillus bulgaricus* and *streptococcus thermophilus* from threonine.

Table 6. The average value of the level of preference aroma of yoghurt

Level Honey	Aroma
P0 (0%)	2.97 ^a
P1 (2%)	3.12 ^a
P2 (4%)	3.12 ^a
P3 (6%)	3.37 ^b
P4 (8%)	3.48 ^b
P5 (10%)	3.50 ^b

Description^{a-b} Notation different in the same column show significant differences (P <0.05)

Yoghurt taste

Results of research on the taste of yoghurt with honey in different level presented in Table 7.

Table 7. The average value of level a yoghurt taste

Level Honey	taste
P0 (0%)	2.62
P1 (2%)	2.75
P2 (4%)	2.87
P3 (6%)	2.87
P4 (8%)	3:00
P5 (10%)	3:12

Preference for taste test was conducted by the tongue senses. Analysis of variance showed that the addition of honey treatment showed no significant difference (P <0.05) A race against a yoghurt. Assessment by the highest number of panelis are in treatment 10% of 3.1 2% and the lowest at 0% for 2.62. In general, an increase in the level of preference to the use of sequential addition of honey level. Content lactic acid gives a characteristic taste to the yoghurt. pH is an indication of the main determinants of the taste of the yoghurt in addition to the presence of volatile, sweet taste (*sweet flavor*) yoghurt will look at a pH between 4.6 to 5.0 but undetectable at a pH of 4.0 to 4.4. A distinctive flavor in yoghurt posed by the presence of lactic acid and small amounts of other compounds, among others *Acetaldehyde*, diacetyl and acetic acid. Components produced by the symbiotic relationship mutualism between *S. Thermophilus* and *Lactobacillus* (Ott, Hugl, Baumgartner and Chaintreau, 2000).

CONCLUSION

The conclusion of this study is the effect of honey on various levels of the protein content and organoleptic quality that is based on the texture and aroma but there is no effect of adding honey at various levels on the pH (acidity) and organoleptic test based on color and the taste of yoghurt products. The level of honey at 10% gives protein content and preference level highes yoghurt products .

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