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Research

Optimization of Kelulut Honey Addition on Organoleptic Quality of Pasteurized Goat Milk

Andi Nurmasytha[1*], Ari Wibowo[1], Anastasya Dian Sulistyowati[2], Fauziyyah Divayanti[3], Amalina Nurwahyuningtyas[1], Kirana Dara Dinanti Adiputra[1]

[1]Department of Animal Science, Faculty of Agriculture, Mulawarman University, Samarinda-Indonesia
[2]Student of Department of Animal Science Program Study, Faculty of Agriculture, Mulawarman University, Samarinda-Indonesia
[3]Postgraduate Student of Animal Science Program Study, Faculty of Animal Science, Hasanuddin University, Makassar-Indonesia
*Corresponding author: nurmasytha@faperta.unmul.ac.id

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Abstract

Background: Increased public awareness of the importance of healthy living is one of the things that encourage increased consumption of goat milk because it contains antioxidants, more fatty acids, proteins, and minerals when compared to cow's milk and is easily digested for those who are intolerant to lactose, has a perishable nature so it needs to go through a heating process with pasteurization before consumption. **Objective:** This study aims to measure the optimization of kelulut honey addition on the organoleptic quality of pasteurized goat milk. **Methods:** Goat milk was heated, and when it reached 75°C, the product was constantly stirred and pasteurized for 15 seconds. Then, kelulut honey was added according to the treatment. The research parameters in sensory testing used 36 semi-trained panelists. Panelists assessed the characteristics of pasteurized goat milk drink products by adding different levels of honey using the scale method (rating scale 1-5). This study used a completely randomized design with five treatments (addition of 0%, 5%, 10%, 15%, and 20% honey levels) with three replications. If the results obtained show a significant difference, the Duncan test is continued. **Results:** The values of color, honey aroma, milk aroma, product viscosity, taste, and panelists' liking had a significant effect ($P<0.01$) on pasteurized goat milk with the addition of different levels of honey. **Conclusion:** The addition of honey improved the quality of organoleptic values of color, honey aroma, and viscosity of the product. The aroma of milk, flavor, and liking decreased as the addition of honey level increased. Based on the overall organoleptic assessment of panelists, pasteurized goat milk with the addition of 5%-10% honey level is a product that is accepted by the public.

Keywords: organoleptic quality; kelulut honey; pasteurization; honey addition; goat milk

INTRODUCTION

Increased public awareness of the importance of healthy living is one of the things that drives the increase in goat milk consumption. Goat milk contains more fatty acids, protein, minerals (Ca, Mg, Fe, Cu, Zn, Se), and vitamins (A, D3, B12), as well as higher

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antioxidant levels when compared to cow's milk (Chen et al., 2023; AlKaisy et al., 2023). Goat's milk has a smaller amount of B12 than cow's milk but the difference between goat's milk and cow's milk is in the composition of fat globules which is about 2.22 µm, with a range of 0.34 to 6.99 µm (Costa et al., 2021), specifically, about 35% of these globules are smaller than 2 µm, while 50% are in the range of 2-5 µm but the ratio of cow's milk globules is larger which is about 4.5 µm (Krismaningrum & Rahmadhia, 2023).

The smaller fat globules in goat milk allow the fat to be dispersed better and more uniformly. This allows lipase enzymes to work more easily and quickly, which results in greater digestibility of goat milk. In addition, goat milk does not contain beta-lactoglobulin, which can cause various allergic reactions as well as indigestion (Muñoz-Salinas et al., 2022). Therefore, the high content of small fat globules makes goat milk easily digestible for those who are lactose intolerant (Facioni et al., 2020). Milk is a product of animal origin that is perishable and susceptible to contamination. Therefore, it is necessary to carry out a processing process before consumption to kill pathogenic microorganisms, reduce destructive microorganisms, and extend the shelf life of milk through the heating process with pasteurization (Rahman et al., 2022).

Milk pasteurization is a method of preserving milk by heating it at a specific temperature below the boiling point of milk. In this way, the resulting processed product retains the shape and flavor of fresh milk. The purpose of pasteurization is to kill pathogenic and non-pathogenic bacteria, including spoilage and spoilage bacteria, while improving the quality of the milk itself. The pasteurization process using moderate heating can be effective in reducing the number of bacteria contained in milk (Divayanti & Latif, 2021).

Common methods in the milk pasteurization process include LTLT (Low Temperature Long Time). This method involves heating the milk at 63°C - 65°C and maintaining it for 30 minutes. HTST (High Temperature Short Time). This method involves heating milk at a high temperature of 73°C - 75°C or above, but only for a short period, about 15-16 seconds. Both methods effectively maintain milk quality and extend its shelf life (Darmawan et al., 2019). To increase the acceptance of dairy products, various studies have added sweeteners that can improve organoleptic quality, such as sucrose (Taufik and Fatma, 2020) in fermented whey; matoa (Triana et al., 2023) in pasteurized milk; honey (Anwar et al., 2021) in kefir; and randu flower type honey (Hardiansyah et al., 2022) in goat milk kefir.

Kelulut honey, also known as trigona (Heterotrigona itama), is one of the non-timber forest products found in South Kalimantan and is in great demand by the local community. Studies have shown that honey produced by stingless bees has higher antioxidant activity than honey from stinging bees of the Apis sp. species (Ávila et al., 2018; Nweze et al., 2017). This gives kelulut honey hepatoprotective and cardioprotective effects (Rao et al., 2016). In addition, trigona bee honey is also reported to contain high levels of antioxidants thanks to its high total phenolic content (Hakim et al., 2019). The antioxidant activity in kelulut honey was 42.673 ± 1.028%, which was analyzed using the hydroxyl radical capture, ferric iron chelating, and hydrogen peroxide capture activities (Satriadi et al., 2023).

Kelulut honey has a unique flavor that is dominated by a distinctive sourness; in addition, its liquid (watery) texture contributes to its acidity (Karnia et al., 2019). Public acceptance determines the quality of the product produced. Therefore, an in-depth study is needed regarding the acceptance of pasteurized goat milk products with the

addition of different levels of honey with an organoleptic test approach involving panelists to determine the organoleptic quality of the product.

MATERIALS AND METHODS

Research Materials

The main ingredients used in this study were fresh goat milk and kelulut honey. The 5 L of goat milk used was obtained from a goat milk seller in Jalan Merdeka, Lempake, North Samarinda. Kelulut honey was obtained from a farmer in Bangun Rejo Village. The tools used are a pasteurization pan, thermometer, pH meter, and sterile container for pasteurized milk.

Preparation of Pasteurized Goat Milk

Goat milk was heated, and when it reached 75^0C, the product was constantly stirred and pasteurized for 15 seconds. Then, kelulut honey was added according to the treatment. The pasteurized product was then tested (Patela et al., 2020; Witawan et al., 2021).

Organoleptic Testing

Sensory testing used 36 semi-trained panelists. Panelists assessed the characteristics of pasteurized goat milk beverage products adding different levels of honey with the scale method (rating scale 1-5), namely: Color (1=white - 5=very brown); Milk aroma (1=very unscented milk - 5=very scented milk); Honey aroma (1=very unscented honey - 5=very scented honey); viscosity (1=very unthick - 5=very thick); taste (1=very sour - 5=very sweet); and liking (1=low favorability - 5=high favorability) (Taufik and Maruddin, 2020).

Design

This study used an experimental design consisting of 5 treatments and 4 replicates, namely: P0 = Pasteurized goat milk + 0% Kelulut Honey (Control); P1 = Pasteurized goat milk + 5% Kelulut Honey; P2 = Pasteurized goat milk + 10% Kelulut Honey; P3 = Pasteurized goat milk + 15% Kelulut Honey; and P4 = Pasteurized goat milk + 20% Kelulut Honey (Hardiansyah and Kusuma, 2022; Rahman et al., 2023).

Data Analysis

This study used a completely randomized design with five treatments and 3 replications. If the results obtained show a significant difference, it is continued with the Duncan test (Harsojuwono et al., 2020). The data obtained were processed using *SPSS IBM 22 software.*

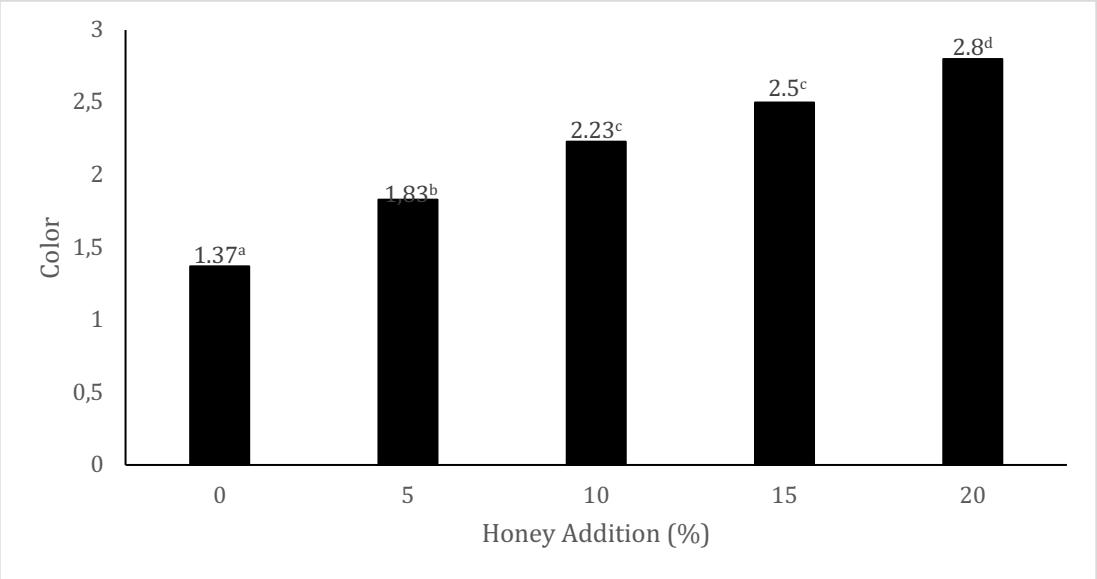
RESULTS AND DISCUSSION

Organoleptic quality can be reviewed from sensory evaluation, which consists of a series of techniques for accurate measurement of human responses to food and

minimizing the effects of distortion or bias that may arise from brand identity and other information influences on consumer perceptions (Gunawan et al., 2024).

Color of Pasteurized Goat Milk added with Honey Levels

Panelists' assessment of the color of pasteurized goat milk added with different levels of honey is presented in Figure 1.



Notes: Different superscripts indicate highly significant differences (P<0.01)

Figure. 1. Color of Pasteurized Milk adding Different Honey Levels

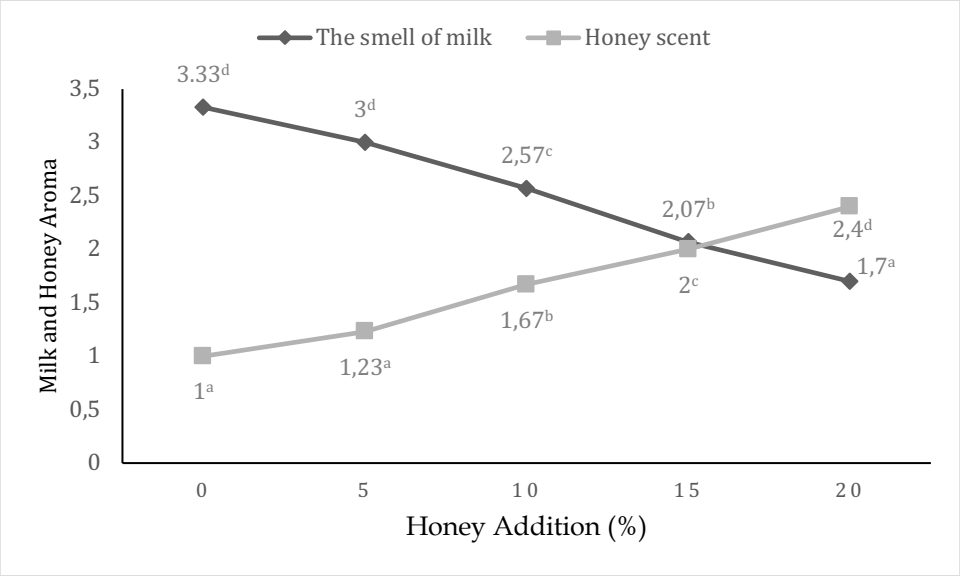
The results showed that pasteurized goat's milk with different levels of honey had a very significant effect (P<0.01) on the panelists' assessment of the color indicator. The average organoleptic assessment of panelists on pasteurized goat milk color indicators ranged from 1.37-2.8 (White-bright brown). The results of Duncan's Further Test showed that the panelists' assessment of the color value of pasteurized goat milk increased as the level of honey given increased. The color of honey detected by the panelists was due to the high content of nectar and polyphenols in honey, in addition, various components of color substances make up honey, including xanthophyll and carotene in honey, causing the honey to be yellowish brown, brown or concentrated. This is by Piotraszewska-Pająk & Gliszczyńska-Świgło, (2015) stating that the type of nectar influences the color of honey and is closely related to the content of compounds in the feed plant. In addition, honey color is also related to the content of minerals, pollen, and phenolic components, as well as the characteristics of the nectar source flower. Honey-forming dyes include xanthophylls and carotenes. In addition, several other factors affect the color of honey, such as the source of the nectar, the age of the honey, and the way it is stored.

According to Jaya et al. (2017), honey contains polyphenols that give it a brownish color. The higher the amount of these compounds, the more intense the color of the honey. Honey also contains Maillard substances and peptides that affect the color of milk; therefore, adding honey in large quantities will increase the color value of the milk produced. This is as research by Razak et al. (2021) explained that the addition of honey to milk contains fructose, glucose, and sucrose, which are easily soluble in water

during pasteurization. Honey contains Maillard and peptides, which are honey dyes that can affect milk's color. Also explained by Triwanto et al. (2021), honey has thick characteristics and is yellow to brownish according to the source of nectar taken by bees.

Milk Aroma and Honey Aroma of Pasteurized Goat Milk added with Honey Levels

Panelists' assessment of the milk aroma and honey aroma of pasteurized goat milk with different honey levels is presented in Figure 2.



Notes: Different superscripts indicate highly significant differences (P<0.01)

Figure 2. Milk aroma and Honey aroma of Pasteurized Goat Milk with Different Honey Level Additions

Analysis of variance showed that pasteurized goat milk with the addition of different levels of honey had a very significant effect (P<0.01) on panelists' assessment of the indicators of milk aroma and honey aroma of pasteurized goat milk. The average organoleptic assessment of pasteurized goat milk aroma indicators was 1.7-3.33 (moderately milky-scented); honey aroma ranged from 1-2.4 (No honey aroma-slightly honey aroma). Duncan's Further Test results showed that panelists' assessment of milk aroma decreased as the honey level increased, but the product's aroma was more dominated by milk aroma, while honey aroma increased as the honey level increased.

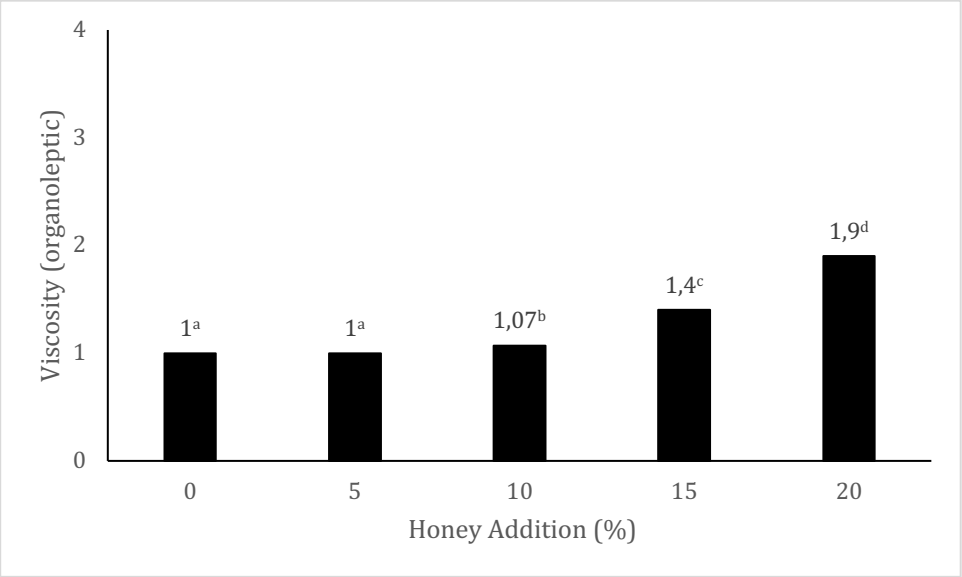
The aroma of milk in the resulting product is more dominant than the aroma of honey because the composition of the ingredients (milk) used is higher than that of other ingredients. The honey used only ranges from 0%-20% the rest is goat milk ranging from (80%-100%). Milk contains high levels of lactose and chloride that affect panelists' assessment of milk aroma. This is by the opinion of Triana et al. (2023) in their research on the sensory characteristics of pasteurized milk with the addition of natural additives of matoa leaf extract suggested that the aroma of milk in pasteurized milk is caused by milk containing lactose and chloride. This is also supported by Kuspradini (2016) in her research, explaining that aroma-determining compounds (coumarins) in the use of matoa leaf extract do not change the aroma of milk because

the content of lactose and chloride in milk is more dominant than aroma-forming compounds in matoa leaf extract.

The aroma of honey can be detected by panelists even though the aroma of milk dominates because honey has its distinctive aroma. Panelists' assessment of the value of honey aroma is highest in 20% addition, this is because the amount added is more than the other treatments, so the aroma of honey is more pronounced. This is in accordance with the opinion of Kusumastuti (2022) that aromatic substances in honey vary greatly, honey has a distinctive aroma obtained from the content of volatile organic substances.

The viscosity of Pasteurized Goat Milk added with Honey Levels

Panelists' assessment of the viscosity of pasteurized goat milk added with kelulut honey at different percentages is presented in Figure 3.



Notes: Different superscripts indicate highly significant differences (P<0.01)

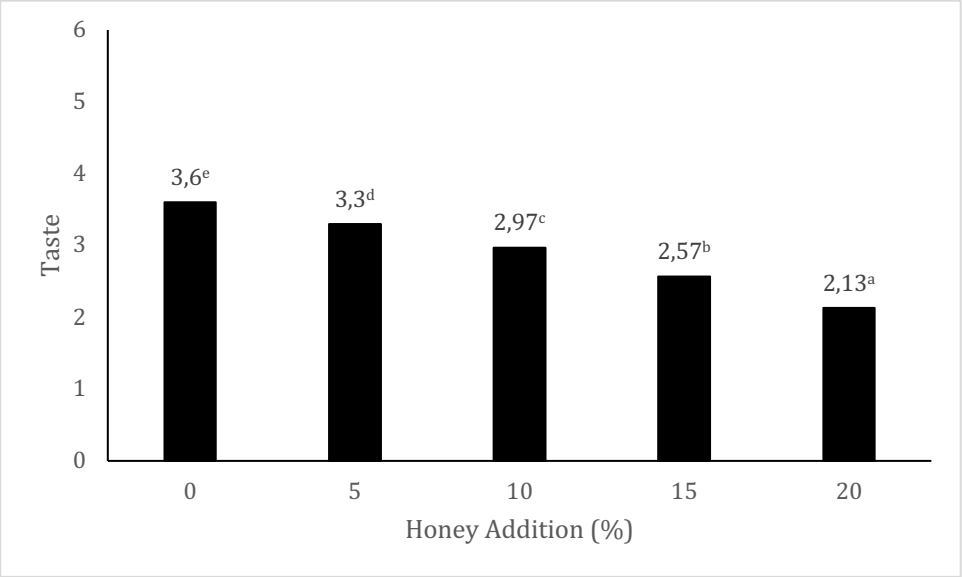
Figure 3. Pasteurized Goat Milk viscosity with Different Honey Level Additions

The results showed that pasteurized goat milk with different levels of honey had a very significant effect (P<0.01) on panelists' assessment of the product viscosity value indicator. The average organoleptic assessment of panelists on the indicator of pasteurized goat milk viscosity ranged from 1-1.9 (Not viscous-slightly viscous). The results of Duncan's Further Test showed that the panelists' assessment of the color value of goat milk for the addition of 0%-5% was not significantly different but different for all other treatments. Changes in viscosity value based on panelist assessment increased after adding honey above 10%. Although the viscosity value increased, the panelists' assessment of the viscosity of pasteurized goat milk was highest with the addition of 20% honey (1.9), indicating that the resulting product was not very thick (more towards a watery product). This is because the honey added is kelulut honey, which basically has a watery natural texture. This type of honey has a high water content. This is in accordance with the opinion of Karnia et al. (2019) in their research on the effect of the shelf life of kelulut honey (*trigona sp*) on reducing sugar content and acidity showed that kelulut honey itself has a watery texture which indicates that the water content in honey is relatively high.

The more volume of honey added, the panelists' assessment of the viscosity of pasteurized goat milk products will increase, this is because the more volume added, the total solids in a food ingredient will increase. This is as research by Anwar et al. (2021) stated in their research on the addition of honey to kefir products, stated that honey contains high carbohydrates, especially glucose and fructose, which have hygroscopic properties so that they can absorb and bind more water, increasing the viscosity of kefir. This study is also supported by previous research which states that honey not only functions as a natural sweetener but also as a source of solids that can increase the viscosity of a product.

The Taste of Pasteurized Goat Milk Adding Honey Levels

Panelists' assessment of the taste of pasteurized goat milk added with kelulut honey at different percentages is presented in Figure 4.



Notes: Different superscripts indicate highly significant differences (P<0.01)

Figure 4. Viscosity of Pasteurized Goat Milk with Addition of Different Honey Levels

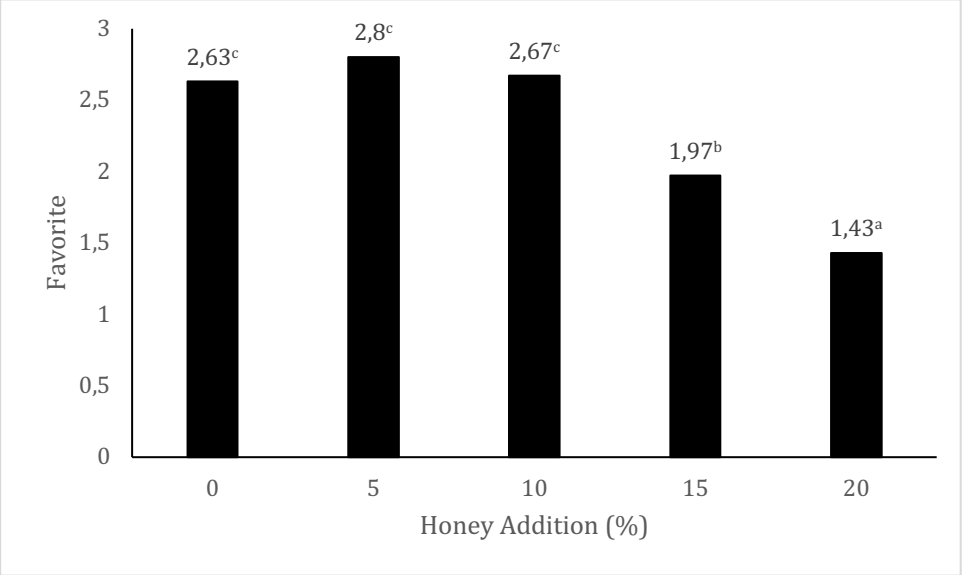
The results showed that pasteurized goat's milk with different levels of honey had a very significant effect (P<0.01) on panelists' assessment of product taste value indicators. The average organoleptic assessment of panelists on the taste indicators of pasteurized goat milk ranged from 2.13-3.6 (slightly sweet-sweet enough sour). The results of Duncan's Further Test showed that the panelists' assessment of the taste value of pasteurized goat milk decreased as the level of honey given increased; the taste of pasteurized milk produced was pasteurized milk with a dominant sour taste and slightly sweet. Panelists are thought to be able to detect a sour taste in pasteurized goat milk due to the sweetener used, kelulut honey which has natural characteristics in the form of a moderately sour taste and watery texture. Budiman & Mulyadi (2019), in their research, explained that the acidity of kelulut honey by titration testing is quite high, reaching 3.05 to 4.55. Of course, this will affect the taste of the product itself. This is by the opinion of Karnia et al. (2019), who explained that kelulut honey has a distinctive flavor with prominent acidic nuances. The liquid texture of this honey also affects its acidity. The liquidity of kelulut honey indicates a high water content, which

allows the fermentation process to take place more easily and contributes to the level of acidity present in the honey.

The results of the panelists' assessment of pasteurized goat milk products were dominated by a slightly sweet and sour taste. The decrease in taste value from sweet to slightly sweet-sour taste is thought to be due to the more honey added; the water content will increase due to the OH ⁻ group, which is a reactive sugar-saturated solution and triggers the creation of acidic conditions in honey. This is the opinion of Savitri et al. (2017) in their research, explained that honey has hygroscopic properties that facilitate the absorption of water. Hence, its water content tends to increase. In addition, honey is also a saturated solution of sugar containing free OH- reactive groups. Under conditions of high moisture content, honey is susceptible to fermentation, which can lead to an acidic atmosphere.

Panelists' Favorite of Pasteurized Goat Milk added with Levels of Honey

Panelists' assessment of pasteurized goat milk products added with kelulut honey at different percentages is presented in Figure 5.



Notes: Different superscripts indicate highly significant differences (P<0.01)

Figure 5. Panelists' favorite of Pasteurized Goat Milk with Different Honey Level Additions

The results showed that pasteurized goat's milk with the addition of different levels of honey had a very significant effect (P<0.01) on the panelists' assessment of the overall panelist's favorite value indicators of the product. The average favorability score of panelists ranged from 1.43-2.8 (low favorability - moderate favorability). The results of Duncan's Further Test showed that the panelists' favorite value of pasteurized goat milk increased at the addition of 5% honey level and decreased the favorite value above 10% honey. This is because the addition of honey above 10% creates acidic conditions in milk, which decreases public interest. This is as research by Lestraningsih et al. (2022) explained that several factors make children dislike kelulut honey. One of them is the taste of kelulut honey, which has unique characteristics, in the form of a combination of sweetness and sourness. This

combination of flavors can reduce public interest, especially in children, in the acceptance of kelulut honey.

Generally, honey is added to increase panelist acceptance in addition to its function as a sweetener. It is also used as an alternative for health improvement because of the components in it that contain bioactive compounds such as high antioxidant content. Still, in this case, the subjective assessment comes from the panelist's assessment. Zuhairiah et al. (2019) explained that honey functions as a natural sweetener commonly consumed by humans as a substitute for sugar, which is closely related to the acceptance of a food by covering up bad flavors. Honey strengthens the product because it can balance bitter, sour, and salty tastes and is claimed to have content of other nutrients that are useful for health, so that it becomes the ingredient of favorite food for many people (Anwar et al., 2022).

CONCLUSIONS

Based on the research conducted, it can be concluded that adding honey has an effect on improving the quality of organoleptic values on the value of color, honey aroma, and product viscosity. The aroma of milk, flavor, and liking decreased as the addition of honey level increased. Based on the overall assessment of panelists, pasteurized goat milk with the addition of 5%-10% honey level is a product accepted by the public.

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AUTHOR'S CONTRIBUTION

Conceptualize and design research: AN, AW. Data acquisition: AN, ADS. Conducting data analysis and interpretation: AN, FD, and drafting the manuscript: FD, AN, ADS, ANW, and KDDA.

CONFLICT OF INTEREST

The authors declare that this research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

ETHICAL APPROVAL

Ethical approval does not exist

REFERENCES

ALKaisy, Q. H., Al-Saadi, J. S., AL-Rikabi, A. K. J., Altemimi, A. B., Hesarinejad, M. A.,

& Abedelmaksoud, T. G. (2023). Exploring the health benefits and functional properties of goat milk proteins. *Food Science & Nutrition*, 11, 5641-1. https://doi.org/10.1002/fsn3.3531

Anwar, A. P.M., Maruddin, F., Yuliati, F. N., Wangdi, J. T. , and Dagong. M. I. A. (2021). The physiochemical properties of kefir using honey concentrations. Canrea Journal: Food Technology, Nutritions, and Culinary, 4(1): 8-16. https://doi.org/10.20956/canrea.v4i1.376

Ávila, S., Beux, M. R., Ribani, R. H., & Zambiazi, R. C. (2018). Stingless bee honey: Quality parameters, bioactive compounds, health-promotion properties and modification detection strategies. *Trends in Food Science and Technology*, *81*, 37-50. https://doi.org/10.1016/J.TIFS.2018.09.002.

Budiman, I., & Mulyadi. (2019). Improving the Quality of Kelulut Honey (Trigona Sp.) Using Venturi Machine and Dehumidifier to Improve Community Economy in Madurejo Village, Pengaron District, Banjar Regency. Pro Sejahtera, 1(1), 61-66.

Chen, L., Bagnicka, E., Chen, H., & Shu, G. (2023). Health potential of fermented goat dairy products: composition comparison with fermented cow milk, probiotics selection, health benefits and mechanisms. *Food & function*, *14*(8), 3423-3436. https://doi.org/10.1039/d3fo00413a.

Costa, R. G.; Azevedo, D. K. R.; Ribeiro, N. L.; Amorim, M. L. C. M.; Guerra, R. R.; Sant'Ana, A. M. S.; Altomonte, I. and Martini, M. (2021). Diet energy levels and temperature affect the size of the fat milk globule in dairy goats. Revista Brasileira de Zootecnia 50:e20200145. https://doi.org/10.37496/rbz5020200145

Divayanti, F., & Latif, B. (2021). Building a People's Economy on Livestock Management through Pancasila-based Communal Cooperation. *Journal of Social and Science*, *1*(10), 1305-1314. https://doi.org/10.59188/jurnalsosains.v1i10.164

Facioni, M. S., Raspini, B., Pivari, F., Dogliotti, E., & Cena, H. (2020). Nutritional management of lactose intolerance: the importance of diet and food labeling. *Journal of translational medicine*, *18*(1): 260. https://doi.org/10.1186/s12967-020-02429-2.

Gunawan, M. I. F., Riandani, A. P., Saleh, E. R. M., Rodianawati, I., Budaraga, I. K., Surani, S., Nurbaya, S. R., Astuti, S. D., Hurhayati, N., & Fayyadh, Z. N. (2024). *Teknik evaluasi sensori pangan*. CV Hei Publishing Indonesia.

Hakim, D. A., Tjahjaningsih, W., and Sudarno. (2019). Antibacterial activity of honey in preserving high-pressure cooked milkfish stored at room temperature. In The 1st International Conference on Fisheries and Marine Science IOP Conf. Series: Earth and Environmental Science 236. https://doi:10.1088/1755-1315/236/1/012079.

Hardiansyah, A., & Kusuma, H. H. (2022). Optimization of organoleptic quality and antioxidant activity of goat milk kefir with the addition of local randu flower honey. Journal of Nutrition College, 11(4): 278-284. https://doi.org/10.14710/jnc.v11i4.34506

Harsojuwono, B. A., Arnata, I. W., & Puspawati, G. A. K. D. P. (2020). Experimental Design Theory, Spss and Excel Applications. Malang: Lintas Kata Publishing Library.

Jaya, F., Purwadi, and Widodo.W. N. (2017). Honey Addition in Kefir Whey Drink in Term of Organoleptic Quality, Color, and Turbidity. *Journal of Animal Products Science and Technology*, 12(1): 16-21.

Karnia, I., Hamidah,S., and Thamrin, G. A. R. (2019). The Effect Of Storage Time Of Kelulut Honey (Trigona Sp) To Reducing Sugar and Acidity.Jurnal Sylva Scienteae. 2(6): 1094-1099.

Krismaningrum, A and Rahmadhia, S. N. . (2023). Quality analysis of the final product in the processing of powdered peranakan etawa goat milk at CV PQR D. I. Yogyakarta. *Agrocomplex*, 23(1): 70-77. doi: https://doi.org/10.51978/japp.v23i1.389.

Kuspradini, H., Pasedan, W. F., & Kusuma, I. W. (2016). Aktivitas antioksidan dan antibakteri ekstrak daun *Pometia pinnata*. *Jurnal Jamu Indonesia, 1*(1), 26–34.

Kusumastuti, I., Kusumah, S.H., and Tatang. (2022). Panelists' acceptance of the sensory properties of tomato velva with the addition of pure honey at various concentrations. Journal of Engineering Science.3(2):42-49.

Lestariningsih, N., Wahyuni, A. T., Fitriani, D., Puspita, D., Indriani, F., Firmansyah, G., Rahmadha, I. R., Nurmayada, N., Susilawati, S., Safrudin, S., & Wijaya, T. (2022). Candy Innovation from Kelulut Honey as an Attraction for Children's Interest in Kelulut Honey in Henda Village, Jabiren Raya District. Sasambo: Journal of Community Service, 4(4), 587-595. https://doi.org/10.36312/sasambo.v4i4.888

Muñoz-Salinas, F., Andrade-Montemayor, H. M., De la Torre-Carbot, K., Duarte-Vázquez, M. Á., & Silva-Jarquin, J. C. (2022). Comparative Analysis of the Protein Composition of Goat Milk from French Alpine, Nubian, and Creole Breeds and Holstein Friesian Cow Milk: Implications for Early Infant Nutrition. *Animals*, *12*(17), 2236. https://doi.org/10.3390/ani12172236

Nweze, J. A., Okafor, J. I., Nweze, E. I., & Nweze, J. E. (2017). Evaluation of physicochemical and antioxidant properties of two stingless bee honeys: A comparison with Apis mellifera honey from Nsukka, Nigeria. BMC Research Notes, 10(1), 1-6. doi: https://doi.org/10.1186/s13104-017-2884-2.

Patela, A. S., Bariyaa, A. R., Ghodasara, S. N., Chavda, J. A., & Patil, S. S. (2020). Total carotene content and quality characteristics of pumpkin flavored buffalo milk. *Heliyon, 6*, e04509. https://doi.org/10.1016/j.heliyon.2020.e04509

Piotraszewska-Pająk, A., & Gliszczyńska-Świgło, A. (2015). Directions of color changes of nectar honeys depending on honey type and storage conditions. Journal of Apicultural Science, 59(2), 51-61. doi: https:

Rahman, A. N., Maruddin, F., Said, I., Taufik, M., & Taggo, S. (2023). Antioxidant activity and physical characteristics of pasteurized goat milk with the addition of lontar fruit (Borassus flabellifer L.). *Journal of Agricultural Industrial Technology*, *33*(3), 317-323. https://doi.org/10.24961/j.tek.ind.pert.2023.33.3.317.

Rao, P. V., Krishhnan, K. T., Salleh, N., & Gan, S. H. (2016). Biological and therapeutic effects of honey produced by honey bees and stingless bees: a comparative review. Revista Brasileira de Farmacognosia, 26(5), 657-664. doi: https://doi.org/10.1016/j.bjp.2016.01.012 .

Razak, Q. A., Faridah, R., & Syamsuryadi, B. (2021). Penambahan madu sebagai pemanis alami untuk meningkatkan nilai organoleptik, overrun, dan daya leleh pada es krim. *Tarjih Tropical Livestock Journal, 1*(1), 8–14.

Satriadi, T., Aryadi, M., Susilawati, S., Fitriani, A., & Badaruddin, B. (2023). Proximate Analysis and Antioxidant Activity of Kelulut (Heterotrigona itama) Honey from

Peat Land Forest, South Kalimantan: http://www.doi.org/10.26538/tjnpr/v7i7.16. *Tropical Journal of Natural Product Research (TJNPR)*, *7*(7), 3388-3391. https://tjnpr.org/index.php/home/article/view/2228

Savitri, P. T., Hastuti, E. D., & Suedy, S. W. A. (2017). The local honey quality of some areas in Temanggung Regency. *Bulletin of Anatomy and Physiology, 2*(1), 1–9.

Taufik, M and Maruddin, F. (2020). Sensory characteristics of fermented whey beverage products with the use of sucrose percentage. Journal of Agricultural Industry Technology 30(1): 36-4. https://doi.org/10.24961/j.tek.ind.pert.2020.30.1.36

Triana, A., Adiputra, R., and Taufik, M. 2023. Sensory characteristics of pasteurized milk with the addition of natural additivesmatoa leaf extract. Journal of Agricultural Sciences. 5(2): 98-104. DOI: https:/doi.org/10.37577/composite.v5i2.581

Triwanto, J., Herlinda, K., and Muttaqin. T. (2021). Physicochemical quality of honey from nectar of randu (Ceiba pentandra) and calliandra (Calliandra callothyrsus) flowers. Journal of Forest Science Avicennia. 4(2) : 102-113.

Witawan, S. W., Lindawati, S. A., & Miwada, I. N. S. (2021). Panelist response of pasteurized fresh milk fortified with yellow sweet potato extract. *Scientific Magazine of Animal Husbandry, 24*(3), 122–126. https://doi.org/10.24843/MIP.2021.v24.i03.p04

Zuhairiah, N.Z.T., Ginting, E., Romatua, D.G., and Fahdi, F. (2019). Identification of glucose and sucrose levels in forest honey. *Journal of Pharmaceutical and Herbal Research*, 1(2): 5 - 10. https://doi.org/10.36656/jpfh.v1i2.62