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Sensory Quality Test of Liquid Eggs Preservation by Adding Forest Bee Honey and Cold Storage

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ABSTRACT

To extend their shelf life beyond the approximate 14 days they last at room temperature, fresh eggs are often processed into liquid eggs. Storage at 4°C with the addition of forest honey (*Apis dorsata*), which is rich in antibacterials, antioxidants, and sugars, has the potential to maintain quality and serve as a sugar substitute in food products. This study evaluated the sensory quality of liquid eggs with forest honey after cold storage. A total of 60 chicken eggs were stored at 4°C for 21 days. Sensory testing was conducted on 21-day-old liquid eggs that had been steamed for 30 minutes. Panelists assessed color, aroma, taste, and texture, and data were analyzed using ANOVA with a DMRT follow-up test at the 0.05 level. Results indicated that the addition of wild bee honey (*Apis dorsata*) to liquid eggs stored at 4°C significantly improved the sensory attributes of egg whites, including color, odor, texture, and taste, but showed no significant effect on the sensory properties of egg yolks. Overall, liquid eggs with forest honey were acceptable to panelists and have the potential to be developed as a value-added food ingredient.

Keywords: Preservation, Honey, Sensory test, Storage.

INTRODUCTION

According to the previous Indonesian National Standard (SNI 3926:2008), the shelf life of fresh chicken eggs is approximately 14 days when stored at room temperature ≤ 30 °C. However, the revised standard (SNI 3926:2023) emphasizes recommended storage conditions, including a maximum temperature of 30 °C and relative humidity of 90%, without specifying an exact storage duration. Delays in distribution often lead to reduced egg quality due to water evaporation, CO_2 release, and microbial contamination (Akpinar & Gunenc, 2019). Limited application of storage technology at the farm level further increases the risk of loss, necessitating preservation efforts to maintain quality and reduce overproduction. One possible solution is to process eggs into value-added products, such as liquid eggs, which are widely used in the food industry, including for making cakes, meringues, and soufflés (Singh et al., 2019). Furthermore, diversification of processed egg products is expected to support national food security by providing more durable, practical, and hygienic raw materials.

Eggs contain complete nutrition, particularly high levels of protein, and therefore have the potential to serve as a growth medium for pathogenic microorganisms, including coliforms, Escherichia coli, and Salmonella spp., which can cause disease in humans. Beck et al. (2025) reported that the main proteins in egg white are ovalbumin, ovotransferrin, ovomucoid, lysozyme, and ovomucin, which together constitute 80.5% (w/w) of the total protein. On the other hand, egg white has a natural defense system through antibacterial compounds, including lysozyme, ovotransferrin, proteinase inhibitors (ovomucoid, ovoinhibitor, ovostatin, cystatin), and avidin (Guyot et al., 2013). However, this defense system will degrade during storage. Therefore, exceptional handling and storage are required to extend their shelf life. Storing liquid eggs at 4°C can inhibit the growth of pathogenic microorganisms and extend shelf life up to 45 days (Necidova et al., 2019). Forest bee honey is generally multifloral because it comes from the nectar of various tree species and is widely found in Indonesia. Honey contains antibacterial compounds, including sugars, polyphenols, hydrogen peroxide, 1,2-dicarbonyl, and bee defensin-1 (Almasaudi, 2021), as well as antioxidant compounds such as flavonoids and phenolic acids (Zou et al., 2022). Research by Moniruzzaman et al. (2013) showed that *Apis dorsata* honey contains higher levels of sugars, phenols, and flavonoids than *Apis cerana* and *Apis mellifera* honey. Due to its higher antibacterial and antioxidant activity and its lower sugar content, Apis dorsata honey has the potential to be a more effective natural preservative. Therefore, honey can be used as a natural preservative in pasteurized liquid eggs (Yusrawati et al., 2019).

The cake and bakery industry generally uses sugar to provide sweetness, produce a soft texture, and develop chocolate color and aroma through the Maillard reaction and caramelization. Alternatively, honey can be used as a sugar substitute because it provides sweetness, a soft texture, and a distinctive color and aroma in bread and cake products. Liquid eggs combined with honey have the potential to be a suitable raw material for making cakes and sweet breads. The use of honey as a preservative in liquid eggs not only provides practical value but also adds a sweet flavor needed by the bakery and pastry industry. The addition of wild bee honey is known to help maintain the quality and extend the shelf life of egg whites during refrigerated storage. However, studies on the effect of honey on the quality of liquid eggs during refrigerated storage are still limited. Therefore, this study was conducted to assess the sensory quality of liquid eggs with the addition of honey during storage at 4°C.

MATERIALS AND METHODS

Tools and Materials

The tools used in this study included a refrigerator, plastic bottles, a stainless-steel basin, a chicken egg separator, a spatula, and writing utensils. The materials used in this study were 60 chicken eggs and forest bee honey.

Research Methods

This research used a Completely Randomized Design (CRD) with six treatments and four replications. The treatment factors consist of: P0: egg white without honey (control), P1: egg white with 5% honey, P2: egg white with 10% honey, K0: egg yolk without honey, K1: egg yolk with 5% honey, K2: egg yolk with 10% honey. The eggshells were washed with warm water, then rinsed and immediately dried. The eggs were cracked open, and the yolks were separated from the whites using a special separator. Afterward, forest bee honey was added to the liquid egg at concentrations of 0%, 5%, and 10%. Each sample was placed in a 200 mL plastic bottle. The egg white and yolk containers were then labeled with the corresponding treatment. All liquid egg samples, with and without added honey, were stored in a refrigerator at 4°C for 21 days.

Sensory Test

Eggs that had been preserved for 21 days were then subjected to sensory testing by 15 inexperienced panelists. The quality of chicken eggs was assessed by steaming them for 30 minutes, then presenting them to the panelists for evaluation of color, aroma, texture, and taste. According to Nur'aini et al. (2020), the panelists' assessment used a 5-point hedonic scale consisting of: (1) dislike very much, (2) dislike, (3) dislike somewhat, (4) like, and (5) like very much.

Data Analysis

Data analysis was conducted using ANOVA at the 95% confidence level. If the research results have a real effect, Duncan's Multiple Range Test (DMRT) will be conducted subsequently (Nur'aini et al., 2020).

RESULTS AND DISCUSSION

Sensory testing was conducted to assess panelists' acceptance and preference for the quality of broiler chicken eggs preserved with wild bee honey during refrigerated storage. The evaluation was conducted organoleptically, considering several attributes, including yolk color, egg white color, aroma, texture, and taste (Tables 1 & 2).

Table 1. Sensory quality test of egg white

Treatment	Color	Aroma	Texture	Taste
P0	$4{,}53 \pm 1{,}24^{a}$	$3{,}47 \pm 1{,}44^{ab}$	$4{,}13 \pm 1{,}61^{a}$	$4{,}40 \pm 1{,}22^{a}$
P1	$4{,}07 \pm 0{,}88^{b}$	$3{,}93 \pm 1{,}36^{a}$	$3{,}33 \pm 1{,}40^{ab}$	$3{,}87 \pm 1{,}77^{b}$
P2	$3{,}47 \pm 1{,}44^{c}$	$3{,}27 \pm 1{,}86^{b}$	$3{,}33 \pm 1{,}89^{b}$	$3{,}67 \pm 1{,}89^{b}$

^{ns}Non significant, ^{abc}Different superscripts in the same row indicate significant differences ($P<0.05$)

Table 2. Sensory quality test of egg yolk

Treatment	Color	Aroma	Texture	Taste
K0	$3{,}93 \pm 1{,}99^{ns}$	$3{,}53 \pm 1{,}91^{ns}$	$3{,}40 \pm 1{,}90^{ns}$	$3{,}73 \pm 1{,}71^{ns}$
K1	$4{,}20 \pm 1{,}81^{ns}$	$3{,}93 \pm 1{,}71^{ns}$	$3{,}67 \pm 1{,}89^{ns}$	$4{,}13 \pm 1{,}61^{ns}$
K2	$3{,}93 \pm 1{,}85^{ns}$	$3{,}73 \pm 1{,}54^{ns}$	$3{,}40 \pm 1{,}90^{ns}$	$3{,}80 \pm 1{,}82^{ns}$

^{ns}Non significant

Color

Colour is a primary sensory parameter that plays an important role in evaluating food quality, attractiveness, and consumer acceptance through the sense of sight (Ray, 2021). Colour is a primary sensory parameter that plays an important role in evaluating food quality, attractiveness, and consumer acceptance through the sense of sight.

Chicken eggs without treatment (control) and honey from forest bees still show the yellow colour that the panellist accepts. The addition of honey does not significantly affect the color of the egg yolk. (P<0,05). Eggs stored at room temperature for extended periods alter the structure of lysozyme, so the once-thick egg white becomes more liquid. By contrast, cool storage slows the movement of water from liquid egg whites to the yolk, keeping the yolk stable and less likely to break. This condition maintains the egg yolk color for up to 21 days of storage.

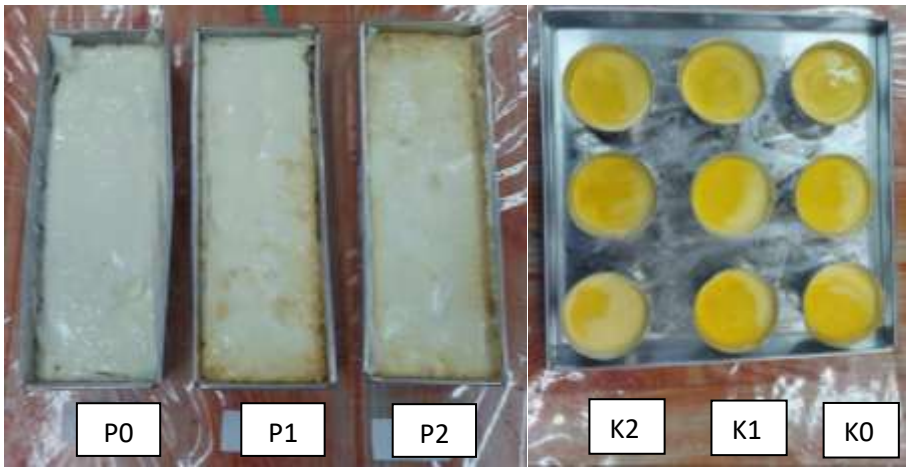

Figure 1. Steamed egg whites and egg yolks

The effects of adding forest bee honey to the runny white eggs color during cool storage are different from the egg yolk color. (Figure 1). The addition of honey has a significant effect on the color of egg whites (P < 0.05). The color of white eggs can be easily altered, producing a yellowish tint or turbidity. The color change in runny egg whites is attributable to interactions among bioactive compounds in honey, such as flavonoids and phenolics, as well as natural pigments that affect the product's visual appearance. (Almasaudi, 2021; Zou et al, 2022). Additionally, the sugar content in honey can promote mild chemical reactions, such as non-enzymatic browning (Maillard reactions). However, under cool storage conditions, the reaction rate is slower (Shahidi & Ambigaipalan, 2015). Another factor affecting color stability is honey's ability to inhibit microbial growth, thereby suppressing the damage to white egg proteins that usually causes color change (Moniruzzaman et al., 2013).

Meanwhile, the color of egg yolk tends to be stable during cool storage because it is determined by the relatively constant carotenoid pigment content in chicken feed. The color of egg yolk is affected by carotenoid pigments that the chickens' bodies cannot produce, so they must be obtained from the feed. One feed material rich in carotene, in the form of xanthophyll, is corn (Lestari et al., 2015). The higher the content of carotenoids in feeds, the deeper the color of egg yolk.

Aroma

The results of the sensory test show that the treatment of liquid eggs affects the aroma during cool storage. In control conditions, the eggs' distinctive aroma receives the lowest score compared with eggs treated with forest bee honey. The addition of honey significantly affects the aroma of egg whites (P < 0.05). Changes in aroma are caused by protein and fat degradation during storage, which produce volatile compounds that give rise to fishy or unpleasant odors (Scatolini-Silva et al., 2013). This condition indicates that, without additional treatment, the quality of egg aroma decreases with increasing storage time.

The addition of forest bee honey is proven capable of improving the quality of the aroma because the honey contains bioactive compounds such as flavonoids, phenolics, and natural sugar that not only act as an antibacterial but also

contribute to the appearance of sweet and distinctive aroma (Almasaudi, 2021; Zou et al., 2022). The compounds suppress the growth of spoilage microorganisms that produce off-flavour compounds, thereby allowing the aroma of liquid eggs to be accepted by the panels. Additionally, phenolic content in Apis dorsata honey is higher than that of other honey types, potentially providing better protection against aroma changes during cool storage (Moniruzzaman et al., 2013). Thus, forest bee honey has functions that are not only as natural preservatives but also improve sensory perception, particularly in aroma, during the storage of liquid eggs at low temperatures.

The addition of honey does not have a significant effect on the aroma of egg yolk (P<0,05). The aroma of egg yolk is determined by volatile compounds derived from the fat, phospholipid, and protein compundts in the yolk. The dense, fat-rich structure of egg yolk limits the interaction between honey compundts and internal volatile compounds, so honey is unable to alter the aroma profile significantly. Furthermore, aromatic compounds in honey have a relatively low intensity and easily evaporate during processing, so their contribution to the formation of egg yolk aroma is minimal. These results are in line with research by Zhou et al. (2024), which explains that the formation of egg aroma is mainly derived from lipid oxidation and protein degradation, and research by Tang et al. (2025), which shows that the addition of natural compounds such as polyphenols does not cause significant changes to the aroma profile of egg yolk.

Texture

The addition of honey has a significant effect on the texture of egg white but does not have a significant impact on the texture of egg yolk (P<0,05). In the sample, both egg whites and egg yolks show chewiness in egg whites and softness in egg yolks. Egg white is dominated by proteins such as ovalbumin, ovotransferrin, and ovomucin, which are easily denatured and coagulated due to interactions with the sugars and organic acids in honey. This interaction can increase the viscosity, elasticity, and stability of the egg white foam, resulting in a denser or more elastic texture. Ho et al. (2021) reported that egg white protein hydrolysate can improve texture characteristics, such as stability and foaming, but does not decrease fundamental textural attributes, such as chewiness or softness. Additionally, Li et al. (2022) report that the egg white protein structure makes the primary contribution to the texture, without modification during heating or by adding natural additives such as honey.

Meanwhile, the softness of egg yolk is affected by the balance between proteins and fat that forms a stable emulsion. Egg yolks have a high fat and phospholipid composition, so the addition of honey does not significantly affect the internal bonds between the compundts. The stable emulsion structure of egg yolks also makes it difficult for honey to interact with proteins or lipids that play a role in texture formation. Zhou et al. (2024) explained that the structure and texture of egg yolks are primarily influenced by the lipid and phospholipid compundts, not by the addition of external ingredients.

The addition of forest bee honey to liquid egg plays a significant role in chemical and microbiological aspects rather than in texture. Bioactive compounds in honey, such as flavonoids, phenolics, and reducing sugar, are known for suppressing the growth of spoilage microorganisms and decreasing fat oxidation reaction, but it is not enough to affect lipid protein interactions that determine the egg texture after heating (Almasaudi, 2021; Khalifa et al., 2021). It shows that honey can act as a natural preservative and a non-textural, organoleptic quality stabilizer, including aroma and color. In contrast, texture quality is still determined by the egg's original protein and fat composition and by heat treatment.

Taste

The addition of honey has a significant effect on the taste of egg white (P<0,05). The results of the sensory test show that both the controlled egg and the egg with the addition of forest bee honey are still acceptable to the panels, although differences occur in the levels of liking. The change in taste of a long-stored egg is caused by the degradation of chemical compounds, such as proteins and lipids, which produce volatile compounds that make the egg taste less fresh (Scatolini-Silva et al., 2013). However, the presence of honey makes a positive contribution through bioactive compounds, such as flavonoids, phenolics, and simple sugars, that inhibit lipid oxidation and the formation of off-flavor-causing compounds.

The addition of honey does not significantly affect the taste of egg yolk (P<0,05) because the main compundts that determine the taste of egg yolk come from fat and protein that undergo chemical reactions during heating, such as lipid oxidation and amino acid degradation

(Zhou et al., 2024; Tang et al., 2025). This reaction produces volatile and non-volatile compounds that impart a distinctive, slightly sulfuric, savory taste, so the sweetness of honey is not dominant. In addition, honey contains simple sugars and organic compounds that decompose readily at high temperatures, thereby limiting its contribution to the taste of high-fat products such as egg yolk.

Additionally, honey's natural sweetness adds flavor complexity that is appreciated by panels, thereby serving not only as a natural preservative but also as a sensory enhancer for liquid egg. The latest research also supports the claim that honey can improve the taste of stored food products by slowing oxidative reactions and microbial activity that affect flavor (Almasaudi, 2021; Khalifa et al., 2021; Silva et al., 2016). Thus, it can be concluded that forest bee honey has dual potential: it can maintain the freshness and enhance the taste of liquid egg during cool storage.

CONCLUSIONS

The addition of wild bee honey (*Apis dorsata*) to liquid eggs stored at 4°C significantly affected the sensory quality of egg whites, including color, odor, texture, and taste. However, it had no significant effect on the sensory quality of egg yolks. Overall, liquid egg with the addition of forest bee honey can be accepted by the panels, and it is potentially suitable for use as a high-value food product, particularly as a natural preservative.

REFERENCES

Akpinar, G.C. & A. Gunenc. 2019. Effects of transportation and storage duration of Japanese quail eggs on hatchability. South African Journal of Animal Science. 49: 253-261. http://dx.doi.org/10.4314/sajas.v49i2.6

Almasaudi, S. 2021. The antibacterial activities of honey. Saudi Journal of Biological Sciences. 28(4): 2188-2196. https://doi.org/10.1016/j.sjbs.2020.10.017

Badan Standardisasi Nasional. (2008). SNI 3926:2008 – Telur ayam konsumsi. Jakarta: Badan Standardisasi Nasional.

Badan Standardisasi Nasional. (2023). SNI 3926:2023 – Telur ayam konsumsi. Jakarta: Badan Standardisasi Nasional.

Beck, F., Noll, P., Schweiggert-Weisz, U., & Henkel, M. (2025). Scientific and technological challenges of recombinant egg protein production. BMC Biotechnol, 35,65, https://doi.org/10.1186/s12896-025-01002-3

Guyot, N., S. Jan, S. Rehalut-Godbert, Y. Nys, M. Gautier & F. Baron. 2013. Antibacterial activity of egg white: influence of Physico-chemical conditions. European Symposium on the Quality of Pultry Meat, Bergamo. [Italy].

Ho, H.-Y., Ciou, J.-Y., Qiu, Y.-T., Hsieh, S.-L., Shih, M.-K., Chen, M.-H., Tu, C.-W., Hsieh, C.-W., & Hou, C.-Y. (2021). Improvement of Foaming Characteristics and Stability of Sterilized Liquid Egg with Egg White Hydrolysate (EWH). Foods, 10(6), 1326. https://doi.org/10.3390/foods10061326

Khalifa, S. A. M., Elashal, M. H., Yosri, N., Du, M., Musharraf, S. G., Nahar, L., Sarker, S. D., Guo, Z., Cao, W., Zou, X., Abd El-Wahed, A. A., Xiao, J., Omar, H. A., Hegazy, M.-E. F., & El-Seedi, H. R. (2021). Bee Pollen: Current Status and Therapeutic Potential. Nutrients, 13(6), 1876. https://doi.org/10.3390/nu13061876

Lestari, D., Riyanti & Wanniatie, V. (2015). Pengaruh lama penyimpanan dan warna kerabang terhadap kualitas internal telur itik tegal. Jurnal Ilmiah Peternakan Terpadu, 3(1), 7-14.

Li, Z., Huang, X., Tang, Q., Ma, M., Jin, Y., & Sheng, L. (2022). Functional properties and extraction techniques of chicken egg white proteins. Foods, 11(16), 2434. https://doi.org/10.3390/foods11162434

Moniruzzaman, M. Md. I. khalil, S.A. Sulaiman & S.H. Gan. 2013. Physicochemical and antioxidant properties of Malaysian honeys produced by Apis cerana, Apis dorsata, and Apis mellifera. Complementary 7 Alternative Medicine. 13:1-12. https://doi.org/10.1186/1472-6882-13-43

Necidova, L., S. Bursova, F. Jezek, D. Harustiakova, L. Vorvola, & J. Golian. 2019. Effect of preservatives on the shelf-life and sensory characteristics of pasteurized liquid whole egg stored at 4°C.

Poultry Science. 98: 5940-5948. https://doi.org/10.3382/ps/pez378

Nur'aini, Suningsih, N., & Hakim, M. (2020). Organoleptic test of salted eggs with the addition of herbal plants. Indonesian Journal of Agricultural Research, 3(3), 171-178. https://doi.org/10.32734/injar.v3i3.4286

Ray, S. (2021). Sensory Properties of Foods and Their Measurement Method. 345-381. M. S. Khan, M. Shafiur Rahman (eds.), Techniques to Measure Food Safety and Quality, Springer, Switzerland. https://doi.org/10.1007/978-3-030-68636-9_15

Scatolini-Silva, A. M., Gloria, M. B. A., & Fernandes, E. A. (2013). Volatile compounds in eggs: Changes during storage and sensory evaluation. Poultry Science, 92(10), 2578–2587. https://doi.org/10.3382/ps.2013-03222

Shahidi, F., & Ambigaipalan, P. (2015). Phenolics and polyphenolics in foods, beverages, and spices: Antioxidant activity and health effects – A review. Journal of Functional Foods, 18, 820–897. https://doi.org/10.1016/j.jff.2015.06.018

Silva, P. M., Gauche, C., Gonzaga, L. V., Costa, A. C. O., & Fett, R. (2016). Honey: chemical composition, stability, and authenticity. Food Chemistry, 196, 309-323. https://doi.org/10.1016/j.foodchem.2015.09.051

Singh, A., D. J. Geveke, D. R. Jones, & E. D. Tilman. 2019. Can acceptable quality angel food cakes be made using pasteurized shell eggs? The effects of mixing factors on the functional properties of angel food cakes. Food Science and Nutrition. 7:987-996. https://doi.org/10.1002/fsn3.911

Tang, T., Zhang, R., Chang, C., Li, J., Gu, L., Yang, Y., & Su, Y. (2025). The effects of polyphenols on texture and flavor of egg yolk: A molecular docking study. Foods, 14 (2), 295. https://doi.org/10.3390/foods14020295

Yusrawati, Nahariah, F. N. Yuliati, & H. M. Ali. 2019. Effects honey on different levels of antioxidant activity and chemical of pasteurized eggs. 1st International Conference of Animal Science and Technology, Makasar. [Indonesia].

Zhou, Z., Cui, S., Che, J., Zhang, Y., Zhou, D., Huang, X., & Qin, L. (2024). Unraveling the formation mechanism of egg's unique flavor via flavoromics and lipidomics. Foods, 13 (2), 226. https://doi.org/10.3390/foods13020226

Zou, S., H. Tao, & Y. Chang. 2022. Characterization of antioxidant activity and analysis of phenolic acids and flavonoids in linden honey. Food Science and Technology. 42, e76621, 1-7. https://doi.org/10.1590/fst.76621