Jurnal Biosains Pascasarjana Vol. 27 (2025) 1-4
© (2025) Sekolah Pascasarjana Universitas Airlangga, Indonesia

DETERMINATION OF DIASTASE ENZYME ACTIVITY AND WATER CONTENT OF HONEY FOREST OF SULA ISLAND, NORTH MALUKU

Fazrul M. Yasin[1], Denni Afriadi[2], Iqbal Abdul Qutni[3], Ezi Fedila Algeri[4], Maria Alexandra Karepoan[5]

[1] Chemistry Departemen of Nahdlatul Ulama University, North Maluku
[2-4] Forensic Laboratory Center of the Indonesian National Police Criminal Investigation Department
[5]Academy of Analytical Chemistry, Bogor
*E-mail: fazrulmyasin80@gmail.com

Abstract

The experiment that has been carried out aims to determine the quality of forest honey originating from the Sula Islands, North Maluku based on the parameters set by the Indonesian National Standards Agency (SNI) 8864:2018, which includes organoleptic parameters (odour and taste), water content and Diastase Number. These parameters can indicate the originality of a forest honey product. The research was conducted at the Forensic Laboratory Center of the Criminal Investigation Department of the Republic of Indonesia Police, using the laboratory experiment method, using the UV-Vis Spectrophotometry instrument, forest honey originating from the Sula Islands district, North Maluku Province was used as material in this experiment. Organoleptic tests including odour and taste were carried out using the sense of smell and taste, water content testing using an oven drying technique, and DN value determination using the UV-Vis Spectrophotometry instrument. The experiment results showed that some parameters met the requirements and did not meet the criteria. Tests on Sula Islands forest honey's taste and water content parameters did not meet the criteria, but the odour and DN parameters met the requirements.

Keywords: Forest honey, honey quality, UV-Vis spectrophotometry

Abstrak

Eksperimen yang telah dilaksanakan ini mempunyai tujuan untuk mengetahui kualitas madu hutan yang berasal dari Kepulauan Sula Maluku Utara berlandaskan pada parameter yang ditetapkan oleh Badan Standar Nasional Indonesia (SNI) 8864:2018, yang mencakup parameter organoliptik (bau dan rasa), kadar air serta Diastase Number. Parameter tersebut dapat menunjukkan orisinalitas sebuah produk madu hutan. Penelitian dilaksanakan di Pusat Laboratorium Forensik Bareskrim Mabes Polri, menggunakan laboratory experiment method, menggunakan instrument Spektrofotometri UV-Vis, madu hutan yang berasal dari kabupaten Kepulauan Sula, Propinsi Maluku Utara digunakan sebagai bahan pada eksperimen ini. Uji organoliptik yang meliputi bau dan rasa dilakukan menggunakan indera penciuman dan pengecap, pengujian kadar air dilakukan menggunakan teknik pengeringan pada oven, dan penentuan nilai DN menggunakan instrument Spektrofotometri UV-Vis. Hasil eksperimen menunjukkan bahwa terdapat parameter yang memenuhi syarat dan tidak memenuhi syarat. Uji pada parameter rasa dan kadar air pada madu hutan kepulauan sula, tidak memenuhi syarat namun pada parameter bau dan DN memenuhi syarat.

***Kata Kunci**:Madu hutan, kualitas madu, spektrofotometri UV-Vis*

1. PENDAHULUAN

Indonesia is a country with abundant natural resources, and forests are one of the ecosystems that contribute natural resources for survival (Rifkah Ansyarif and Nurhasanah Sari, 2023), one of the areas that has a pristine forest is the Sula Islands Regency, which is one of the regencies in the administrative area of the North Maluku provincial government, and one of the regencies whose people utilize natural resources from the forest well. One form of natural resource that is currently enjoyed is the result of forests that are rich in benefits, namely forest honey.

Honey is a liquid produced by bees, which is taken by bees from flower nectar (floral nectar) or other parts of plants that are extracted (extract floral nectar) (Adityarini, Suedy, and Darmanti, 2020).

Honey generally has a sweet taste, and is a product that is very useful for health (Rahayu et al., 2021). This is because honey contains chemical compounds such as carbohydrates with a percentage of 80-85%, 15-17% water, 0.3% protein, and 0.2% consisting of ash, amino acids,

and vitamins (Adityarini, Suedy, and Darmanti, 2020).

Honey has properties as a natural antioxidant needed by the body, which is what makes the demand for honey increase day by day because the majority of Indonesian people use honey as an additional ingredient in traditional herbal medicine to increase the efficacy of herbal medicine in healing disease. Honey is also beneficial in terms of tissue regeneration (Wulandari, 2018).

The benefits of honey can be seen in the high demand during the Covid-19 pandemic in 2022. Given how important honey is for health, it is considered necessary to know the quality of the honey that will be consumed. The quality of honey can be determined based on the parameters recommended by the Indonesian National Standards Agency (SNI) 8864:2018, which states that the determination of the quality of a product is seen from parameters that include the content of hydroxymethylfurfural (HMF), reducing sugar, sucrose, diastase enzyme activity and H2O in honey (Syamsu et al., 2023).

After explaining the importance of paying attention to the quality of honey and the parameters used to see the quality of a honey product produced by forest bees. So in this study, enzyme activity tests and determination of water content were carried out on forest honey from the Kepulauan Sula Regency, North Maluku.

2. 2. TOOLS AND MATERIALS

2.1 Tools

The tools needed during testing include Erlenmeyer flasks, measuring cups, volumetric pipettes, measuring flasks, burettes, glass funnels, dropper pipettes, porcelain cups, test tubes, beakers, analytical scales, ovens, pH meters, water baths, UV-Vis spectrophotometry.

2.2 Materials

The materials needed during testing include forest honey, 0.0007N iodine solution, 0.5M NaCl solution, starch solution, Carrez I solution, Carrez II solution, 0.20% sodium bisulfite solution, 0.05M NaOH solution, 0.05M HCl solution.

3. METHOD

Organoleptic Test

Organoleptic testing is carried out directly with the sense of smell (nose), taste (tongue), and sight (eyes). Testing is carried out by at least 3 trained panellists or 1 expert. Experts are those who have expertise related to honey analysis (honey traders, breeders, or researchers). The results are given a normal value if they are found to have the criteria for honey's smell, race, and colour.

The water content of the honey test

The sample was weighed as much as 2 grams and placed in a porcelain cup of known weight. The sample was placed in an oven at a temperature of 105-110°C for 2 hours. After that, the sample was cooled in a desiccator for 10 minutes, then weighed and put back in the oven for 1 hour. The sample was cooled in a desiccator for 10 minutes and then weighed again. Repeated heating in the oven and weighing until constant weight (difference in consecutive weighings ≤ 0.2 mg) then the water content of the sample was calculated.

Diastase enzyme activity test

A total of 5 grams of honey was weighed, then 10-15 ml of distilled water and 2.5 ml of acetate buffer solution pH 5.3 (1.59 M) were added. In a cold state, the solution was stirred until the honey sample was completely dissolved. The solution was then added with 1.5 ml of 0.5 M NaCl solution and set to the calibration mark with distilled water. A total of 10 ml of this solution was then added with 5 ml of starch solution through the inner wall of the tube and then placed in a water bath (40±0.2°C) for 15 minutes. At every 5-minute interval, 1 ml of the mixture was added to 10 ml of 0.0007 N iodine solution. The absorbance value was measured at a wavelength of 660 nm. The time from mixing the starch with honey to adding the liquid to the iodine was recorded as the reaction time. The solution was taken continuously at certain intervals until an A< value of 0.235 was obtained. The absorbance value is then plotted against time (minutes) from the top of the millimetre paper. From the graph, the time required to reach the absorbance value (A) = 0.235 is determined. The value of 300 divided by the time required to reach the absorbance value (A) indicates the activity of the diastase enzyme (DN).

4. Result and Discussion

The results of the organoleptic test of honey (smell and taste) showed a distinctive smell in forest honey that smells sharp like sugar. Organoleptic tests were carried out using the sense of smell and taste, showing that the results for the honey still have a distinctive honey smell

© (2025) Sekolah Pascasarjana Universitas Airlangga, Indonesia

and meet the requirements, while for the taste it does not meet the requirements. The forest honey used in this study can be seen in Figure 1 and the results of organolipic tests on forest honey can be seen in Table 1.

Figure 1. Frest honey originating from theSula Islands district

Honey is a fluid that is semi-liquid and usually in Indonesia honey itself has a variety of smells and tastes. This is caused by disparities such as distance of area, season, type and way of life of bees, type of plant (nectar source), and how to harvest and handle after the harvest period. (Rahayu *et al.*, 2021).

A water content test was conducted on forest honey samples. Water content is one of the most important parameters to note because the high or low water content in honey can inhibit microbial activity and the fermentation rate of a honey product. (A. Apriantini, Y. C. Endrawati and Z. Astarini, 2022).

hygroscopic in nature, making it very easy for honey to absorb water at a higher percentage than that stipulated by SNI. (Rahayu *et al.*, 2021). The water content in honey also affects the quality of the diastase enzyme activity of forest honey. (Silvester Maximus Tulandi, 2019).

The diastase enzyme is a biomolecular compound that has a chemical composition in the form of protein that comes from bees and is distributed when the honey harvest reaches old age.(Akuba and Pakaya, 2020).

The diastase enzyme is also a reference in determining the level of original quality of a forest honey product, and the activity of an enzyme in an original honey product from bees is determined using the Diastase Number abbreviated as DN. (Ichsan *et al.*, 2022). DN is defined as the amount of enzyme that will convert 0.01 g of starch to a specified endpoint in 1 h at 40°C under the test conditions. (Huang *et al.*, 2019).

The results of the DN value test on Sula Islands forest honey, North Maluku, obtained a diastase value of 20 DN. This value indicates that the diastase enzyme in the parameter meets the requirements set by SNI, where the lower limit of the DN value for honey is 1 DN (Dinengsih and Yustiana, 2021).

Honey that has DN value above 3 DAN has benefits as an immunomodulator (Akuba and Pakaya, 2020). An immunomodulator is a chemical component that has pharmacological

Tabel.1 Forest honey test results based on SNI 886 parameters

No	Parameter	Unit	SNI 886:2018 Requirements	Test Determination	Resul
1	Bau	-	Khas madu	Khas madu	Ms
4	Rasa	-	Khas madu	Tidak khas	Tms
3	Kadar Air	%b/b	Maks.22%	23.38%	Tms
4	Aktivitas enzim diastase	DN	Min. 1	20	Ms

Ket: - MS : Memenuhi syarat
- TMS : Tidak memenuhi syarat

The water content test of forest honey in this study obtained a value of 23.38%. This value indicates that the forest honey used in this study slightly exceeds the standard set by SNI, but the Sula Islands forest honey used in this study still has a fairly good water content. The water content of a product in the form of an extract is said to be quite good if it has a water content of no more than 30% (Yasin, Zam Zam and Rakhman, 2022). Usually, the high water content of honey is influenced by various factors including the humid conditions of the production and storage areas and because honey is

properties that modulate the function and structure of immune activity. (Wahyuni *et al.*, 2019).

Based on the Sula Islands forest honey, North Maluku has a DN value of 20, which also shows that this honey also has benefits as an immunomodulator that functions to increase the body's immunity to avoid attacks from things that can interfere with human health.

5. CONCLUSIONS AND SUGGESTIONS

Based on the results of the research that has been conducted, the researcher concluded that the water content and taste of the Sula Islands forest honey, North Maluku did not meet the requirements, while the fruit and Diastase Number (DN) met the SNI requirements. The water content and taste of the honey did not meet the requirements due to the influence of temperature and storage of Sula Islands forest honey, North Maluku, so further research is needed regarding this to obtain maximum results.

BIBLIOGRAPHY

A. Apriantini, Y. C. Endrawati and Z. Astarini (2022). Pengaruh Lama Waktu Penurunan Kadar Air terhadap Kualitas Fisikokimia Madu Kapuk dan Madu Rambutan. *Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan*, 10(2), pp. 98–104. https://doi.org/10.29244/jipthp.10.2.98-104.

Adityarini, D., Suedy, S.W.A. and Darmanti, S. (2020). Adityarini et al., 2020. *Buletin Anatomi dan Fisiologi*, 5(1), pp. 18–24.

Akuba, J. and Pakaya, M.S. (2020) 'Uji Aktivitas Enzim Diastase Madu Hutan Mentah Gorontalo Sebagai Imunomodulator', *Pharmaceutical Journal of Islamic Pharmacy*, 4(2), p. 30. https://doi.org/10.21111/pharmasipha.v4i2.4852.

Huang, Z. *et al.* (2019). Nondestructive determination of diastase activity of honey based on visible and near-infrared spectroscopy. *Molecules*, 24(7). https://doi.org/10.3390/molecules24071244.

Ichsan, D.S. *et al.* (2022) Deteksi Madu Palsu Dan Kualitas Madu Dengan Enzim Diastase, *Poltekita : Jurnal Ilmu Kesehatan*, 16(3), pp. 278–283. https://doi.org/10.33860/jik.v16i3.1685.

Rahayu, I.E. *et al.* (2021). Pengujian mutu madu kawasan Tahura Lati Petangis sebagai upaya peningkatan nilai pasar. *Community Empowerment*, 6(9), pp. 1701–1708.

Rifkah Ansyarif, A. and Nurhasanah Sari, D. (2023). Uji Sifat Fisika dan Kimia Madu Hutan (Apis dorsata). *Cokroaminoto Journal of Chemical Science*, 5(2), pp. 47–50.

Silvester Maximus Tulandi (2019). Pengaruh Efek dan Suhu Penyimpanan dengan Kualitas Madu. *Jurnal Teknologi dan Seni Kesehatan*, 10(1), pp. 59–71.

Syamsu, D.A. *et al.* (2023). Profil Aktivitas Enzim Diastase pada Madu Produksi UMKM Lokal Berdasarkan Hasil Uji BPOM di Jambi. *Eruditio : Indonesia Journal of Food and Drug Safety*, 3(1), pp. 1–8. https://doi.org/10.54384/eruditio.v3i1.108.

Wahyuni, W. *et al.* (2019). Efek Imunomodulator Ekstrak Etanol Spons Melophlus sarasinorum Terhadap Aktivitas Fagositosis Sel Makrofag Pada Mencit Jantan Balb/C. *Jurnal Farmasi Galenika (Galenika Journal of Pharmacy) (e-Journal)*, 5(2), pp. 147–157. https://doi.org/10.22487/j24428744.2019.v5.i2.13611.

Wulandari, D.D. (2018). Kualitas madu (keasaman, kadar air, dan kadar gula pereduksi) berdasarkan perbedaan suhu penyimpanan. *Jurnal Kimia Riset*, 2(1), pp. 16–22. Available at: https://doi.org/10.31938/jsn.v6i2.160.

Yasin, F.M., Zam Zam, Z. and Rakhman, K.A. (2022). Analysis Of Antioxidant Content Of Anthocyanin In The Lobi-Lobi Fruit (Flacourtian Inermis) And Jamblang Fruit (Syzygium cumini L Skeel) Using The Dpph Method With Spectrophotometry. *Jurnal Biosains Pascasarjana*, 24(1), pp. 8–14. https://doi.org/10.20473/jbp.v24i1.2022.8-14.