Pharmacy Education (2022) 22(2) 50 - 54
https://doi.org/10.46542/pe.2022.222.5054

IAI SPECIAL EDITION

RESEARCH ARTICLE

Development of Sumbawa honey as tonic to stimulate stamina during the COVID-19 pandemic in West Nusa Tenggara

Baiq Leny Nopitasari, Shah Iqbal Ikraman Akbar, Alvi Kusuma Wardani
Faculty of Health Sciences, University of Muhammadiyah Mataram, West Nusa Tenggara, Indonesia

Keywords
COVID-19
Natatory exhaustion
Sumbawa honey
Tonic

Correspondence
Alvi Kusuma Wardani
Department of Phytochemical and Pharmacognosy
Faculty of Health Sciences
University of Muhammadiyah Mataram
West Nusa Tenggara
Indonesia
alvikusuma99@gmail.com

Abstract

Introduction: COVID-19 is a disease caused by infection with a recent type of coronavirus called SARS-CoV-2. The positive cases of COVID-19 have been increasing, particularly in the West Nusa Tenggara region, Indonesia. COVID-19 is a self-limiting disease and can be overcome by the innate immune system of an otherwise healthy patient. Stamina is related to strength, and so is linked in many traditions to the immune response; Therefore, a method to increase immunity can be linked-to maintaining stamina. Sumbawa honey is a type of honey that is tremendously popular both locally within the island of Sumbawa and internationally, for its use as a stamina enhancer. **Objective:** This study examined the potential of Sumbawa honey as a tonic for improving stamina. **Methods:** This research was an experimental model with the natatory exhaustion method. The parameter measured was the fatigue time of the test animals. The greater the difference in fatigue time, the higher the tonic effect produced. **Results:** The results of the one-way ANOVA test display significant differences in all groups ($p < 0.05$). Sumbawa honey at a dose of 75g/70kgBW with a positive control group provided a significant difference in value ($p = 0.017$). It is expected that Sumbawa honey can be an alternative treatment, a traditional therapy, to help maintain a healthy body, particularly during the COVID-19 pandemic. **Conclusion:** Sumbawa honey has significant activity as a tonicum and the optimal dose of Sumbawa honey possessing an effect as a tonic is 75g/kgBW applied once a day.

Introduction

Coronavirus Disease 2019 (COVID-19) is a new disease that had never been previously identified in humans. The virus causing COVID-19 is Sars-CoV-2. COVID-19 is a zoonotic disease (transmitted between animals and humans) (WHO, 2020a). Common symptoms of COVID-19 infection include acute respiratory distress such as fevers, coughs and shortness of breath (Huang, 2020; Wang, 2020). The average incubation period is between five to six days, with the longest known incubation period as 14 days (Centre of Disease Control and Prevention, 2020). In severe cases of COVID-19, it causes pneumonia, acute respiratory syndrome, kidney failure, and even death (Ministry of Health, 2020). Based on a report obtained from the West Nusa Tenggara (NTB) Provincial Health Office, as of 16 July 2020, the number of positive cases infected with COVID-19 globally was 13,745,330 cases, with the number of cases in Indonesia amounting to 81,668 cases, while the data in NTB was 1,669 cases (WHO, 2020b, 2020c). These numbers have continued to increase every day (Dinas Kesehatan, n.d.). This disease is also rapidly transmitted between people. COVID-19 can be overcome by a healthy immune system in patients with no co-morbidities; therefore, increasing the immune response using immunostimulants is an important step in preventing COVID infections (Ministry of Health, 2020).

Sumbawa honey is a type of honey that is tremendously popular both within the island of Sumbawa and internationally. Sumbawa forest bee honey is mostly produced by the *apisdorsata* bees (Hani, 2006). Sumbawa honey has been consumed and produced for generations by the local Island community. Sumbawa honey is extensively used as a treatment by the locals, particularly in the people of West Nusa Tenggara. Honey is a sweet viscous substance created by bees through the

fermentation of flower nectar in their digestive tract (Rahman, 2012). Generally, honey is efficacious for producing energy, increasing endurance, and increasing stamina. The magnesium mineral content in honey is the same as the magnesium content in blood serum, which is around 1.70-2.43mg/dL. Honey also contains food elements administered as a natural tonic (Baskhara, 2008). Furthermore, honey contains acetylcholine. Acetylcholine (ach) is one of the neurotransmitters which plays an essential role in the autonomic nervous system function (Sukohar, 2014). Honey possesses varied properties, including an antioxidant effect due to the flavonoids in contains (Adji, 2007; Baroni *et al.*, 2006). Honey at a concentration of 0.1% stimulates the activity of lymphocyte cells. The presence of lymphocyte activity indicates the body's immune response to infection, particularly in wounds (Antary *et al.*, 2013). Lymphocyte cells carry out the task of maintaining specific immune responses, including cellular (lymphocytic related to T cells) and humoral (related to antibodies in the blood or B cells) immune responses (Adji, 2008; Conti *et al.*, 2014).

Based on this background, the objective of this study was to identify the effect of Sumbawa honey in increasing stamina by employing the *in-vivo* natatory exhaustion method. This research aimed to contribute to the production of scientific evidence that Sumbawa honey, which is an original product from Sumbawa Island, could possess a tonic effect for the prevention of COVID-19. This research comes in the context of the recent use of Sumbawa honey as a stamina enhancer based on empirical experiences.

Materials and methods

This study employed an experimental design. The study was performed for a period of four months, from January to April 2021. This study had been approved by the ethics committee of the Faculty of Medicine Universitas Islam Al-Azhar, Mataram Indonesia, with number 28/EC-04/FK-06/UNIZAR/VIII/2021.

Preparation of tools and materials

The tools used in this study were scales, beaker glass, stirring rod, measuring cup, dropper, sonde, stop-watch, oral syringe, water tank, mercury thermometer, and artificial wave maker (Aquilla P1200). The materials used in this study were Swiss Webster strain male mice, Sumbawa honey, CMC Na, and royal jelly. The Sumbawa honey used comes from the forest of the Moyo sub-district, Sumbawa Besar district.

Preparation of animals

The animals administered in this study were white male mice, Swiss Webster strain, with a bodyweight ranging from 20 - 30g. The 15 mice used in the investigation were approximately three months old. The test was administered at the pharmacy biology laboratory and pharmacology laboratory of the Pharmacy Study Programme, Faculty of Health Sciences, University of Muhammadiyah Mataram, Indonesia.

Dosage calculations

Based on the dose conversion table, the bodyweight of an adult human was 70kg, and the dose conversion factor from a human to a mouse weighing 20g was 0.0026. The dose determination of honey as a tonic effect was based on research by Sambodo (2009); the dose of honey employed in humans is 100 - 200g/BW. The doses administered in this study were 25g/kg human body weight (kgBW), 50g/kgBW and 75g/kgBW.

Preparation of test solutions

Preparation of Sumbawa honey solution

Sumbawa honey solutions were created to a volume of 20ml for each group. Sumbawa honey was weighed as 2g, 3g and 4g and then dissolved into warm CMC-Na suspensions up to a volume of 20ml of solution. The dosage was then provided orally to the mice. The volume of dosage provided to mice was 0.5ml at dose concentrations of 25g/kgBW, 50g/kgBW and 75g/kgBW, respectively, per group.

Preparation of royal jelly solution (as a positive control)

The royal jelly was dissolved with CMC-Na up to 20ml, with a volume of 0.5ml administered to each mouse. The dose used was 0.78g/kgBW (Bramasta, 2013).

Treatment of animals

Adaptation and dividing animals into groups

Prior to dosing, the mice were fasted for 12 hours and were provided merely with aquadest (distilled water). The dosage was administered orally, i.e. through the esophagus employing a blunt needle. The mice were divided into five groups, consisting of three mice per group. The first group was provided with a solution of Sumbawa honey with a concentration of 25g/70kgBW, the second group was provided with a solution of Sumbawa honey with a concentration of 50g/70kgBW, while the third group was provided with a Sumbawa honey solution with a concentration of 75g/70kgBW, the fourth group was provided a solution of royal jelly as a positive control and the fifth group was provided only a solution of CMC-Na as a negative control.

Observation of fatigue time

All animals, before being provided treatment, were swimming in the reservoir. After the examined animal was tired (leaving its head under the water surface with the head and tail vertical position for more than seven seconds), it was lifted from the reservoir, and the time was recorded as the first fatigue time (T1). The mice were then rested for 40 minutes while drying. After the rest period was over, the mice were provided with a dose treatment and then rested again for 30 minutes for absorption time. Thirty minutes later, the mice were replaced in the reservoir to swim again until fatigue occurred, and the time was recorded as the second fatigue time (T2). The difference in fatigue time between before (T1) and after (T2) treatment was recorded as quantitative data to be analysed further (Mississauga, 2012).

Results

The research data in the form of fatigue time of the test animals in each group is presented below in Table I. From the table, it can be implied that Sumbawa honey has a very good tonic activity. From the three test groups, it is identified that Group III, with a treatment concentration of 75g/70kgBW, displayed the highest average fatigue time. All treatment groups displayed a higher average difference in fatigue time compared to the positive control group.

Table I: Data on fatigue time of test animals before and after treatment in each group (n = 3)

Groups	Mice	T1	T2	T2-T1	Average difference in Fatigue time ± IQR
Group I	1	28′	169′	141′	107 ± 51.5′
	2	91′	139′	48′	
	3	47′	180′	133′	
Group II	1	83′	221′	138′	152 ± 70.1′
	2	72′	300′	228′	
	3	67′	157′	90′	
Group III	1	86′	235′	149′	213 ± 57.3′
	2	48′	307′	259′	
	3	137′	369′	232′	
Positive control	1	78′	133′	55′	52 ± 8.8′
	2	90′	132′	42′	
	3	144′	203′	59′	
Negative control	1	123′	175′	52′	47 ± 6.1′
	2	114′	162′	48′	
	3	40′	80′	40′	

′: second

The results of the one-way ANOVA test in Table II present significant differences in all groups ($p < 0.05$) (Bramasta, 2013). The three differences include Sumbawa honey at a dose of 75g/70kgBW with a negative control group providing a significant difference in the value of p = 0.008, and Sumbawa honey at a dose of 75g/70kgBW with a positive control group which provides a significant difference in the value of p = 0.017. The results of this test can be implied that the preparation of Sumbawa honey at a dose of 75g/70 kg BW possesses an effect as an energy booster (tonic).

Table II: One way ANOVA analysis

Parameter	Groups	One-way ANOVA test (sig)
Difference in fatigue time	Group I Group II Group III Positive control Negative control	0.05[ŧ]

ŧ: The data is significantly different ($p \leq 0.05$)

Discussion

In this study, the animals employed were white male mice, Swiss strains, weighing between 20-30g. Before treatment, the mice were fasted for 12 hours or overnight and only provided aquadest to drink during this period. This method reduces the food influence consumed by the test animals. The positive control administered was royal jelly. The solvent employed in this study was CMC-Na, and negative control was performed using this solvent. CMC-Na was selected because it is a universal solvent, does not change the pH of the solution, is cheap, and is easy to obtain. The negative control was intended to see that the CMC-Na solvent employed was not efficacious as a tonic.

The magnitude of the tonic effect caused by Sumbawa honey was because of the presence of several compounds reported as triggers for the tonic effect. The compounds with the highest concentration in the honey are polysaccharides (Stockton, 2009) and amino acids (Szczesna, 2006). The polysaccharides and amino

acids contained in honey are considered to be responsible for the tonic effect of the mice (Amanto *et al.*, 2012).

Polysaccharides are an energy source and contain dietary fibre, which cannot be digested by the body but stimulates digestive enzymes (Pramono, 2010). Polysaccharides are comprised of long chains of monosaccharides. Monosaccharides are important sugar components, such as glucose, fructose and galactose. The dominant type of sugar in almost all honey is levulose, and merely a small portion of honey contains a higher portion of dextrose than levulose. Indigestion, glucose and dextrose are broken down into glucose and fructose. Fructose or levulose is present with glucose in fruit and vegetables, particularly in honey (Winarno, 2004 cited in Septorini, 2008). Therefore the fructose contained in honey can restore the stamina of the test animals.

Amino acids derived from food and the breakdown of body proteins were then carried by the blood and, ultimately employed to replace damaged tissues and, if necessary, they can be converted into energy sources (Wahyuni, 2008). Qamer and colleagues (2007) corroborated that samples of Pakistani honey from *Apis mellifera* bee species with 17 amino acids contained 83.2% proline in 35.6mg/100g, the most dominant form sunflower honey, followed by 26.4% aspartic acid in 8.7mg/100g and 17.1% glutamic acid in 5.8mg/100g of *phulai* honey.

It is expected that Sumbawa honey can be an alternative to traditional therapy in all circles of society to act as an immunostimulant to maintain population health during the COVID-19 pandemic.

Conclusion

Based on the research which has been performed, it can be concluded that Sumbawa Honey is proven to have an activity as a stamina enhancer (*tonicum*) which can be employed as an alternative to multivitamins for the prevention of COVID-19. The optimal dose of Sumbawa honey which has an effect as a tonic, is 75g/kgBW provided once a day.

Acknowledgements

This article was presented at the 2021 Annual Scientific Conference of the Indonesian Pharmacist Association. Also, the authors thank the Department of Clinical Pharmacy and Pharmacology for laboratory facilities to conduct this research.

Conflict of interest

The authors declare that there is no conflict of interest.

References

Amanto, S., Parnanto, N.R., Basito, B. (2012). Kajian Karakteristik Alat Pengurangan Kadar Air Madu Dengan Sistem Vakum Yang Berkondensor. *Jurnal Teknologi Hasil Pertanian*, **5**(2), 8-16.

Dinas Kesehatan, (n.d.). Data COVID-19 Dunia, Indonesia, dan NTB (online). Available from: https://corona.ntbprov.go.id/

Antary, S., Ratnayani, K., Laksmiwati, M.A.A.I.A. (2013). Nilai Daya Hantar Listrik, Kadar Abu, Natrium Dan Kaliuam Pada Madu Bermerek Di Pasaran Dibandingkan Dengan Madu Alami (Lokal). *Jurnal Kimia*. **7**(2), 172-180

Baroni, V., Nores, M.L., Díaz Mdel, P., Chiabrando, G.A., Fassano, J.P., Costa, C., Wunderlin, D.A. (2006). Determination of volatile organic compound patterns characteristic of five unifloral honey by solid-phase microextraction-gas chromatography-mass spectrometry coupled to chemometrics. *Food Chemistry Journal.* 7235-7241. https://doi.org/10.1021/jf061080e

Baskhara, A.W. (2008). Khasiat dan Keajaiban Madu Untuk Kesehatan Dan Kecantikan. Smile-Books. Yogyakarta

Bramasta, B.A. (2013). Uji Pengaruh Royal Jelly terhadap Efek Tonik Madu dari Spesies Lebah (Apis Mellifera) pada Mencit Putih Jantan Galur Swiss Webster. Skripsi. Fakultas Farmasi Universitas Muhammadiyah Surakarta. Surakarta

Centers for Disease Control and Prevention (2020). Human Coronavirus types (online). Available from: https://www.cdc.gov/coronavirus/types.html

Conti, Finoia, M.G, Fontana, L., Mele, G., Botrè, F., Iavicoli, I. (2014). Characterization Of Argentine Honeys On The Basis Of Their Mineral Content And Some Typical Quality Parameters. *Chemistry Central Journal*, **8**(44), 1-10

Hani, H. (2006). Management Personalia dan Sumber Daya ManusiaEdisi Kedua. Badan Penerbit Fakultas Ekonomi: Yogyakarta

Huang C, Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., Zhang, L., Fan, G., Xu, J., Gu, X., Cheng, Z., Yu, T., Xia, J., Wei, Y., Wu, W., Xie, X., Yin, W., Li, H., Liu, M., Xiao, Y., Gao, H., Guo, L., Xie, J., Wang, G., Jiang, R., Gao, Z., Jin, Q., Wang, J., Cao, B. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet.* **395**(10223), 497-506. https://doi.org/10.1016/S0140-6736(20)30183-5

Ihsan, A.A. (2011). Terapi Madu Hidup Sehat Ala Rasul. Javalitera. Yogyakarta

Mississauga. (2012). A Review Of Mechanisms, Outcomes, and Measurement Of Fatigue At Work. The Toronto Workshop. Ontario: CRE-MS

Pramono, S., (2010), Tingkat Manfaat dan Keamanan Tanaman Obat dan Obat Tradisional, Fak.Farmasi UGM, Yogyakarta

Qamer, S., Ehsan, M., Nadeem, S., & Shakoori, A.R. (2007) Free Amino Acids Content of Pakistani Unifloral Honey Produced by Apis mellifera. *Pakistan Journal of Zoology*, **39**(2), 99-102

Rahman, N. (2012). Uji Pengaruh Bee Pollen Terhadap Efek Tonik Madu Dari Spesies Lebah (Apis Mellifera) Pada Mencit Putih Jantan Galur Swiss Webster. Skripsi. Fakultas Farmasi Universitas Muhammadiyah Surakarta. Surakarta

Sambodo (2009). Uji Eefek Tonik Madu Rambutan Pada Mencit Putih Jantan Dengan Metode Natatory Exhaustion. Skripsi. Fakultas Farmasi. Universitas Muhammadiyah Surakarta. Surakarta

Septorini, R. (2008) Perbedaan Kadar Glukosa yang Dihidrolisis dengan Asam Klorida, Asam Sulfat, dan Asam Oksalat, Karya Tulis Ilmiah, Fakultas Ilmu Keperawatan dan kesehatan, Universitas Muhammadiyah Semarang, Semarang

Stockton (2009) Natural Medicine (online), Available from: http://www.naturaldatabase.com

Suranto, A. (2008). Khasiat dan Manfaat Madu Herbal. Jakarta: PT Agromedia Pustaka. Hal: 19-92

Sukohar, A. (2014) Neurofarmakologi-Asetilkolin dan Norefinefrin. Fakultas Kedokteran Universitas Lampung. Bandar Lampung

Szczesna, T. (2006) Protein content and amino acids compositon of bee-collected pollen originating from poland, south kore and china, Institute of pomology and floriculture, *Journal of Apicultural Science*, **50**(2), 91-99

Wahyuni, K. (2008) Efek Tonik Ekstrak Air Biji Cola (Cola Nitida Schott & Endl.) Pada Mencit Jantan. *Jurnal Penelitian Sains & Teknologi*, **9**(2), 137-14

WHO (World Health Organization) (2020a). Novel Coronavirus (2019-nCoV) Situation Report-1.

WHO (World Health Organization) (2020b). WHO Director-General's remarks at the media briefing on 2019-nCov on 11 February 2020 (online). Available from: https://www.who.int/dg/speeches/detail/who-director-generals-remarks-at-the-media-briefing-on-2019-ncov-on-11-february2020

WHO (World Health Organization). (2020c). Clinical management of severe acute respiratory infection when novel coronavirus (2019-nCoV) infection is suspected. interim guidance (online). Available from: https://www.who.int/publications-detail/clinical-management-ofsevere-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected