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Application of SEAMON as Edible Bird's Nest cleanser in the Edible Bird's Nest Industry

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ABSTRACT

Background: In Surabaya, the edible bird's nest industry has witnessed significant growth in recent years, driven by increasing demand for this highly prized delicacy, known for its nutritional and medicinal benefits. As the industry expands, effective cleaning methods for edible bird's nests become paramount. Contaminants, impurities, and feathers can compromise the quality and purity of edible bird's nests, affecting their market value and consumer appeal.
Contribution: In response to this challenge, applying SEAMON as an edible bird's nest cleanser has emerged as a promising solution. SEAMON, a specific cleaning agent for edible birds' nests, offers the potential to revolutionize the cleaning process within the edible birds' nest industry. This innovative approach addresses the cleanliness and hygiene standards required for edible bird's nests, ensuring that consumers receive the highest quality product.
Method: The SEAMON application was carried out at the edible bird's nest industry in Surabaya, East Java, on July 2, 2023, with twelve samples of edible bird's nests with heavy feather characteristics. All samples were tested for nitrite analysis using a Genesys 30 visible spectrophotometer.
Results: Based on the results of its application, this innovation has the potential as an edible bird's nest cleaning agent to clean hydrogen peroxide residue and can reduce nitrite levels in the white edible bird's nest.
Conclusion: This washing liquid is the first cleanser specifically for white edible bird's nests, and another advantage is that it is food grade, so edible bird's nests cleaned with SEAMON is safe for human consumption.

INTRODUCTION

Indonesia is one of the world's foremost producers of edible bird nests [1], coveted for their exceptional market value, with prices soaring to an astonishing USD 3000 per kilogram. This remarkable demand is not merely a matter of commerce; it is deeply rooted in cultural beliefs, particularly within the Chinese community, where the nests of edible birds are reversed for their

reputed youthfulness-enhancing and immunity-boosting properties [2]. Amidst the global turmoil caused by the COVID-19 pandemic, the allure of edible bird nests as guardians against health threats has only grown stronger [3], [4].

However, the pristine reputation of these nests as a source of vitality comes with a critical caveat: the peril of nitrite contamination [5]. To safeguard consumer health, especially in export destinations like China, nitrite levels in the nests of edible birds must not exceed 30 parts per million (ppm) [6]. Nitrite, originating from both the swiftlet droppings [7] and the less-than-sterile environment of their dwellings, poses severe health risks. High nitrite consumption can lead to nausea [8], vomiting [9], and, in the long term, cancer [10]-[12].

To mitigate this risk, a rudimentary practice has been adopted: rinsing the nests of edible birds under running water for 30 seconds [2]. However, this method has limitations as it can reduce nitrite levels by only a maximum of 10%. This brings to light a pervasive issue within the industry: the prevalence of low-quality raw materials with alarmingly high nitrite content. To meet export quotas and maintain profit margins, unscrupulous actors often resort to fraudulent means, including the addition of hazardous substances such as hydrogen peroxide [13].

In response to this pressing concern, our community service initiative seeks to introduce a food-grade washing liquid for the nests of edible birds to ensure their safety for human consumption. This innovative solution, named SEAMON, harnesses the nitrite-reducing properties of lime juice (Citrus aurantifolia Swingle) during washing. Augmented by sea salt, SEAMON not only effectively cleans the nests of edible birds but also has a unique capability to address the cleaning needs of swallow nests [14]. Currently, the industry relies on reverse osmosis-filtered water for cleansing; however, this method fails to significantly reduce nitrite levels [15].

The research gap in the field of edible bird's nest (EBN) primarily lies in the challenge of nitrite contamination and the inadequacy of current cleaning methods. Despite the high cultural and economic value of EBN, particularly in Indonesia, a significant health risk is posed by the presence of nitrites. These nitrites, which can lead to serious health issues, are not sufficiently mitigated by the existing practice of rinsing with water. The prevalence of low-quality nests with high nitrite content and the use of harmful substances like hydrogen peroxide for cleaning exacerbate this problem.

The research contribution of the proposed solution, SEAMON, is substantial in addressing these gaps. SEAMON, a food-grade washing liquid combining lime juice and sea salt, aims to more effectively reduce nitrite levels in EBNs than current methods. Our community service aims to test SEAMON by applying it to pristine white edible bird nests. The primary goal is to reduce nitrite levels and eliminate any residual hydrogen peroxide, thereby ensuring the safety and quality of these cherished natural treasures. Through the introduction of SEAMON, we aim to usher in a new era of safety and trust in the edible bird nest industry, safeguarding both the health of consumers and the integrity of this esteemed tradition.

METHOD

All procedures are described in Figure 1. The total sample used in this community service activity was 12 white edible bird nests (refer to Figure 2) with heavy feather characteristics obtained from swiftlet houses on Java Island. In this community service activity, feathers from the nests of edible birds that were tested for nitrites were not removed. Meanwhile, as many as nine edible bird nests were contaminated by 1% hydrogen peroxide, which were divided into

three treatment groups, namely T1, T2, and T3. Treatments T1, T2, and T3 were edible bird nests contaminated with 1% hydrogen peroxide with contamination times of 5 s, 10 s, and 30 s, respectively.

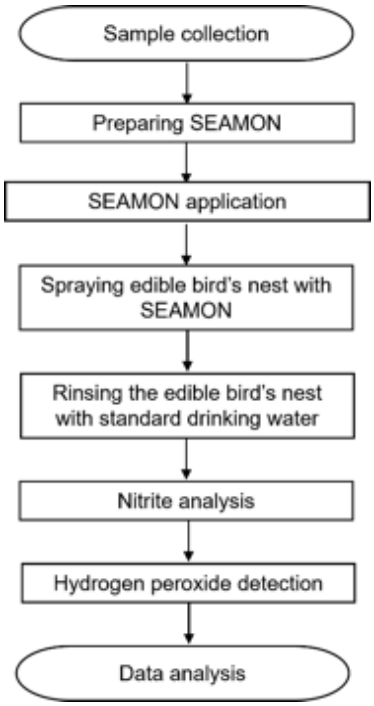

Figure 1. Flowchart of procedures

Figure 2. The representative of white edible bird's nest with heavy feathers

1. SEAMON Characteristic

SEAMON was produced in a previous study [14] using Patent IDS000005156. SEAMON contains 6% lime juice and 94% sea salt solution, which are food grade. This washing liquid does not leave a distinctive lime odor, change the original color, or leave a sour or salty taste in the nests of edible birds.

2. Application of SEAMON in the Edible Bird's Nest Industry

SEAMON application was carried out at the edible bird's nest industry located in Surabaya, East Java on July 2, 2023. Twelve samples of edible bird nests with heavy feather characteristics were cleaned using SEAMON according to the manufacturer's instructions. Three cleaning groups were trained using a previously described method [14] with modifications. The SEAMON was distributed to each group and practiced using it.

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3. Detection for Hydrogen Peroxide

The procedure for testing hydrogen peroxide levels has been described in a previous study [16]. Hydrogen peroxide in the sample was detected using a Quantofix® Peroxide 25 semi-quantitative test (Macherey-Nagel, Germany). One Quantofix ® Peroxide test strip was dipped into the sample solution for 1 s and then dried in air for 15 s. Results were read by comparing the color formed on the test paper with the indicator color (0-25 mg/L hydrogen peroxide).

4. Preparation of Standard Curve

A standard curve was prepared as described as previous study [17] by dissolving a standard nitrite solution (1 ppm) (Merck, Germany) with 0.6 mL saturated NaCl solution (Merck, Germany), 0.5 mL sulfanilamide solution (Merck, Germany), 0.5 mL naphthyl ethylene diamine solution (Merck, Germany) and distilled water down to 6 concentration levels (0 µg/L, 0.2 µg/L, 0.3 µg/L, 0.4 µg/L, 0.5 µg/L, and 0.6 µg/L). The standard solution was allowed to stand for 15 min and then placed into a cuvette. Nitrite levels were determined by absorbance using a Genesys 30 visible spectrophotometer (Thermo Scientific, USA) at 541 nm wavelength [18].

5. Extraction and Spectrophotometry

All the samples were examined for nitrite levels using a spectrophotometer. Approximately 1 g of each sample was crushed with a mortar until the sample size became fine [19]. Each sample (0.5 mg) was added to 3 mL of a saturated NaCl solution (Merck, Germany). Distilled water was then added to the solution to a volume of 50 mL. Previously prepared samples were sonicated using an Elmasonic S 30 H (Elma, Germany) at 40 °C for 30 min, while several were homogenized every 5 min [20]. The mixture was then replaced with a sonicator and placed at room temperature until it cooled. The solution was filtered using a Whatman No. filter paper 42 (GE Healthcare, Germany). One millilitre of each extracted sample was measured for nitrite content using a Genesys 30 visible spectrophotometer (Thermo Scientific, USA) at a wavelength of 541 nm [21].

6. Data Analysis

Examination of nitrite and hydrogen peroxide residues in the nests of edible birds is critical for ensuring the safety and quality of these highly valued products. The results of this examination were descriptively analyzed using graphical representations to provide a clear understanding of the findings.

RESULTS AND DISCUSSION

SEAMON was produced from previous research through the 2021 Scientific Research Program (Grant Number 161/E4.1/AK.04.RA/2021). Based on the results of this community service, SEAMON was successfully applied to the nest industry for edible birds in Surabaya. The results of washing the nests of edible birds showed a decrease in nitrite levels of up to 68.8% (Figure 3). This result is still lower than the washing result in a previous study [14], which was 86%. This could be due to the presence of heavy feathers still attached to nests that were washed in this community service. This indicates that the use of SEAMON can be optimally performed on the nests of edible bald birds. The results of washing the nests of edible birds in this community service, which showed a remarkable decrease in nitrite levels of up to 68.8%, were significantly correlated with the suitability of these products for export, particularly in China,

where stringent safety standards mandate that nitrite levels must not exceed 30 parts per million (ppm) [22]. This correlation underscores the critical importance of reducing the nitrite content to meet international safety and quality requirements. The primary reason for washing the nests of edible birds is to ensure that they meet the stringent safety standards set by importing countries. If present at elevated levels, nitrite poses health risks to consumers, including nausea, vomiting, and potential long-term health issues such as cancer [23], [24]. To facilitate international trade and ensure consumer safety, it is imperative that the nests of edible birds adhere to these nitrite limits [25]. Exporting edible bird nests is a lucrative endeavor, especially in markets like China, which have a high demand for these delicacies [26]. However, to access these markets and command competitive prices, it is essential that products conform to their regulatory standards. Therefore, nitrite reduction is a crucial step in preparing edible bird nests for export [27]. Thus, the substantial reduction in nitrite levels achieved through washing with SEAMON will enhance market access for edible bird nests. Products that meet or exceed these safety standards are not only more attractive to international buyers, but also safeguard the reputation of the edible bird's nest industry. Hence, importing countries, especially China, prioritize consumer safety and well-being. By ensuring that nitrite levels are well below the permissible limits, the edible bird's nest industry instills confidence in consumers, reinforcing the product's reputation as a premium, safe, and health-enhancing delicacy.

Hydrogen peroxide is a bleaching agent that is prohibited from being used in nests of edible birds [28]. However, hydrogen peroxide has been detected in the nests of commercial edible birds [29]. This indicates that hydrogen peroxide is often used in the nests of edible birds. In this community service, white edible bird nests were contaminated with 1% hydrogen peroxide at different times. Based on the results of washing the nests of edible birds using SEAMON in this community service, all samples showed negative results with the Quantofix® Peroxide 25 semi-quantitative test (Macherey-Nagel, Germany) (as showed in Table 1). This indicates that SEAMON succeeded in reducing hydrogen peroxide residue in the edible bird nest so that it was undetectable by the rapid test (as presented in Figure 4).

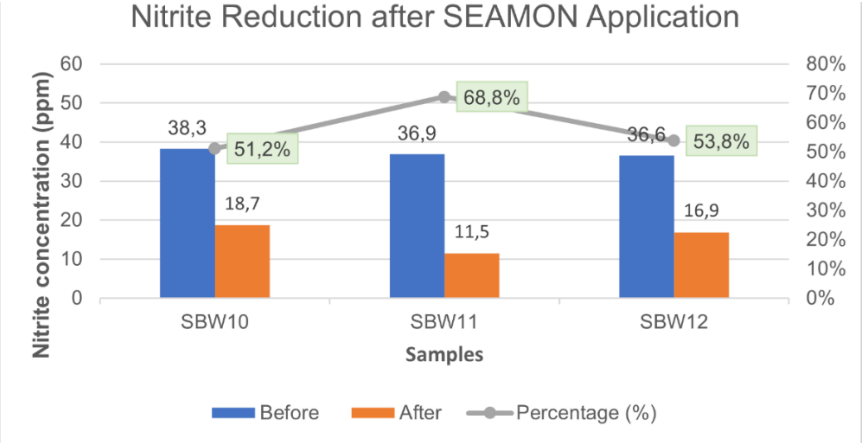

Figure 3. Nitrite reduction after SEAMON application on edible bird's nest

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Table 1. The results of hydrogen peroxide detection in edible bird's nest after cleansing with SEAMON

Sample ID	Dipping time with hydrogen peroxide (second)	Results
SBW1	5	Negative
SBW2	5	Negative
SBW3	5	Negative
SBW4	10	Negative
SBW5	10	Negative
SBW6	10	Negative
SBW7	30	Negative
SBW8	30	Negative
SBW9	30	Negative

Based on the results of the direct application of SEAMON in the field, this washing liquid was able to demonstrate its performance by reducing the levels of nitrite and residual hydrogen peroxide in white edible bird nests. The community, in this case the edible bird's nest industry, is the main user of this special washing liquid for the nests of edible birds. Concerns regarding the high levels of nitrite in raw materials can be overcome by using SEAMON in the nest industry of edible birds. This application is challenging in the edible bird nest industry because potable water is commonly used only for the cleaning process [27]. SEAMON meets food safety standards because this washing liquid is food grade, does not leave a distinctive lime odor, does not change the original color, and does not leave a sour or salty taste in the nests of edible birds. Therefore, SEAMON is suitable and safe for use in the edible bird's nest industry or households. Apart from having the potential to be used in swiftlet nests, SEAMON has the potential to be used as a cleansing agent for other animal-origin foods such as fish, meat, and shellfish, and is safe for washing vegetables and fruits. Thus, SEAMON users are not limited to the edible bird's nest industry, but can be used in other food industries and even at other user levels such as micro, small, and medium enterprises and households. SEAMON, as a cleansing agent for edible bird nests, has value and benefits for the wider community, especially for the edible bird nest industry, and is a solution to the current problems of the edible bird nest industry.

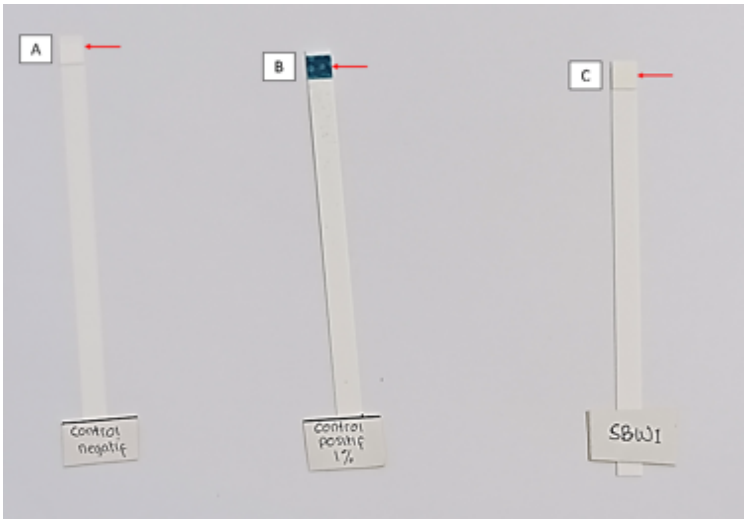

Figure 4. Hydrogen peroxide test after SEAMON application to edible bird nests (a) Negative Control (b) Positive Control (c) Sample of SBW1

SEAMON effectively addresses the industry's longstanding concern regarding high nitrite levels in the nest materials of raw edible birds. By incorporating SEAMON into their cleaning processes, the edible bird nest industry can confidently tackle this issue, ensuring the safety and quality of their products. The application of SEAMON presents a notable shift in the nest industry for edible birds, where conventional cleaning primarily relies on potable water. SEAMON's adherence to food safety standards, coupled with its neutral characteristics (no distinctive odor, color change, or taste alteration), makes it a suitable and safe alternative for industrial cleaning. SEAMON's utility extends beyond commercial enterprises, reaching micro, small, and medium enterprises as well as households. The potential to enhance food safety and quality makes it a valuable asset for a broad spectrum of users. SEAMON has emerged as a tangible solution to the pressing challenges faced by the edible bird nest industry. It not only elevates product safety and quality but also helps safeguard the industry's reputation.

CONCLUSION

SEAMON, a specialized washing liquid, is highly effective in reducing nitrite and residual hydrogen peroxide levels in white edible bird nests. The edible bird nest industry, which serves as the primary user of this innovative washing solution, can benefit significantly from SEAMON's performance. Our findings have several noteworthy implications.In summary, SEAMON's role as a cleansing agent for edible bird nests has significant benefits for the wider community, particularly within the edible bird's nest industry. Its versatility, adherence to food safety standards, and potential for broader applications make it an innovative solution to address existing industry challenges. SEAMON not only ensures the safety and quality of edible bird nests but also opens doors for diverse applications, making it a valuable asset in the realm of food safety and hygiene.

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References

[1] N. H. Jamalluddin, N. A. Tukiran, N. A. Fadzillah, and S. Fathi, “Overview of edible bird’s nests and their contemporary issues,” *Food Control*, vol. 104, pp. 247–255, 2019, https://doi.org/10.1016/j.foodcont.2019.04.042.

[2] H. Susilo, H. Latif, and Y. Ridwan, “Application of Washing Method under Running Water to Reduce Nitrit Level of Edible Bird’s Nest,” *Journal Kedokteran Hewan (Banda Aceh)*, vol. 10, no. 2, pp. 95–97, 2016, https://doi.org/10.21157/j.ked.hewan.v10i2.5021.

[3] K. H. Chua, I. N. Mohamed, M. H. M. Yunus, N. S. M. Nor, K. Kamil, A. Ugusman, and J. Kumar, “The Anti-Viral and Anti-Inflammatory Properties of Edible Bird’s Nest in Influenza and Coronavirus Infections: From Pre-Clinical to Potential Clinical Application,” *Frontiers in Pharmacology*, vol. 12, p. 1106, 2021, https://doi.org/10.3389/fphar.2021.633292.

[4] S. G. Ningrum, R. Sasmita, and V. D. Kharisma, “Edible Bird’s Nest as Potential Food with Anti-Viral and Anti-Inflammatory Properties Against Covid-19: an in Silico Study,” *Acta Veterinaria Indonesiana*, vol. 11, no. 1, pp. 43–50, 2023, https://doi.org/10.29244/avi.11.1.43-50.

[5] K. C. Chok, M. G. Ng, K. Y. Ng, R. Y. Koh, Y. L. Tiong, and S. M. Chye, “Edible Bird’s Nest: Recent Updates and Industry Insights Based on Laboratory Findings,” *Frontiers in Pharmacology*, vol. 12, p. 746656, 2021, https://doi.org/10.3389/fphar.2021.746656.

10.12198/spekta.v4i2.7997

[6] Badan Karantina Pertanian, "Pedoman Verifikasi Terhadap Pemanasan Sarang Walet Untuk Pengeluaran ke Negara Republik Rakyat Tiongkok," Indonesia: Kementerian Pertanian, pp. 1–33, 2018. Available: https://karantinaindonesia.go.id/pedoman-sekretariat-utama

[7] B. Yeo, T. Tang, S. Wong, C. Tan, Y. Wang, L. Cheong, and O. Lai, "Potential Residual Contaminants in Edible Bird's Nest," *Frontiers in Pharmacology*, vol. 12, p. 312, 2021, https://doi.org/10.3389/fphar.2021.631136.

[8] S. Kurian, N. Panigrahy, V. Jamalpuri, and D. Chirla, "Cow's milk protein allergy in a neonate presenting with methaemoglobinaemia," *BMJ Case Report*, vol. 15, no. 8, p. e246599, 2022, https://doi.org/10.1136/bcr-2021-246599.

[9] C. Sangsawang, N. Chuaydamrong, T. Luankaew, T. Thepparat, and N. Leesahud, "Investigation of a Methemoglobinemia Outbreak Caused by Eating Sausages with High Concentrations of Nitrates and Nitrites in Trang Province, Thailand, January 2022," *OSIR Journal*, vol. 15, no. 2, 2022, https://doi.org/10.59096/osir.v15i2.262422.

[10] S. Chamandoost, M. Fateh, and M. Hosseini, "A Review of Nitrate and Nitrite Toxicity in Foods," *Journal of Human, Environment and Health Promotion*, vol. 1, no. 2, pp. 80–86, 2016, https://doi.org/10.29252/jhehp.1.2.80.

[11] P. Taneja, P. Labhasetwar, P. Nagarnaik, and J. H. J. Ensink, "The risk of cancer as a result of elevated levels of nitrate in drinking water and vegetables in Central India," *Journal of Water and Health*, vol. 15, no. 4, pp. 602–614, 2017, https://doi.org/10.2166/wh.2017.283.

[12] P. Ziarati, M. T. Zahedi, F. Shirkhan, and M. Mostafidi, "Potential Health Risks and Concerns of High Levels of Nitrite and Nitrate in Food Sources," *SciFed Pharmaceutics Journal*, vol. 1, no. October, 2018, https://doi.org/10.3390/antiox9030241

[13] T. H. Lee, W. A. Wani, C. H. Lee, K. K. Cheng, S. Shreaz, S. Wong, N. Hamdan, and N. A. Azmi, "Edible Bird's Nest: The Functional Values of the Prized Animal-Based Bioproduct From Southeast Asia–A Review," *Frontiers in Pharmacology*, vol. 12, p. 626233, 2021, https://doi.org/10.3389/fphar.2021.626233.

[14] S. G. Ningrum, A. Y. R. Candra, and H. C. P. Wardhani, "The Potency of Citrus aurantiifolia Swingle and Sea Salt Solution as a Cleansing Agent for Edible Bird's Nests," *Makara Journal of Science*, vol. 27, no. 1, p. 4, 2023, https://doi.org/10.7454/mss.v27i1.1361.

[15] P. Widiyani, S. Mirnawati, L. Hadri, and W. L. Denny, "Detection of Nitrite in Cleaned Edible Bird Nest from Sumatra Island," in *International Seminar on Livestock Production and Veterinary Technology*, p. 29, 2021, http://103.169.28.92/index.php/proceedings/article/download/2791/2355.

[16] S. G. Ningrum, "Deteksi Kandungan Nitrit dan Hidrogen Peroksida dalam Produk Sarang Burung Walet Bersih Asal Indonesia," *Jurnal Ilmiah Kedokteran Wijaya Kusuma*, vol. 10, no. 1, pp. 20–26, 2021, http://dx.doi.org/10.30742/jikw.v10i1.1078.

[17] S. G. Ningrum, B. U. Palgunadi, and R. Sasmita, "Evaluation of Nitrite Concentration in Edible Bird's Nest (White, Yellow, Orange, and Red Blood)," *Makara Journal of Science*, vol. 26, no. 1, p. 7, 2022, https://doi.org/10.7454/mss.v26i1.1311.

[18] T. Hachiya and Y. Okamoto, "Simple spectroscopic determination of nitrate, nitrite, and ammonium in Arabidopsis thaliana," *Bio-protocol*, vol. 7, no. 10, pp. e2280–e2280, 2017, https://doi.org/10.21769/BioProtoc.2280.

[19] B. Yusuf, P. Farahmida, A. W. Jamaluddin, M. N. Amir, R. I. Maulany, and D. K. Sari, "Preliminary study of nitrite content in South Sulawesi uncleaned edible bird nest," *IOP Conference Series: Earth and Environmental Science*, vol. 486, no. 1, p. 012008, 2020, https://doi.org/10.1088/1755-1315/486/1/012008.

[20] M. Akyüz and Ş. Ata, "Determination of low level nitrite and nitrate in biological, food and environmental samples by gas chromatography–mass spectrometry and liquid chromatography with fluorescence detection," *Talanta*, vol. 79, no. 3, pp. 900–904, 2009, https://doi.org/10.1016/j.talanta.2009.05.016.

[21] Z. Ding *et al.*, "Evaluation of nitrate and nitrite contents in pickled fruit and vegetable products," *Food Control*, vol. 90, no. 1, pp. 304–311, 2018, https://doi.org/10.1016/j.foodcont.2018.03.005.

[22] Balai Karantina Pertanian (BKP), "Guidelines for Examination of Edible bird's nest Nitrite Content for Export to the People's Republic of China," Indonesia: Ministry of Agriculture Republic Indonesia, no. 416, 2014.

[23] M. R. Ghalhari, S. Kalteh, F. A. Tarazooj, A. Zeraatkar, and A. H. Mahvi, "Health risk assessment of nitrate and fluoride in bottled water: a case study of Iran," *Environmental Science and Pollution Research*, vol. 28, no. 35, pp. 48955–48966, 2021, https://doi.org/10.1007/s11356-021-14027-w.

[24] D. A. Ayejoto and J. C. Egbueri, "Human health risk assessment of nitrate and heavy metals in urban groundwater in Southeast Nigeria," *Acta Ecologica Sinica*, 2023, https://doi.org/10.1016/j.chnaes.2023.06.008.

[25] A. F. E. Sheikha, "Why the importance of geo-origin tracing of edible bird nests is arising?," *Food Research International*, vol. 150, p. 110806, 2021, https://doi.org/10.1016/j.foodres.2021.110806.

[26] K. I. Unal, L. Chang, W. A. W. Mustapha, N. S. M. Razali, A. S. Babji, and S. J. Lim, "Edible Bird's Nest, a Valuable Glycoprotein Source: Current Research Prospects and Challenges in Malaysia," *Sains Malaysiana*, vol. 51, no. 9, pp. 2829–2842, 2022, https://doi.org/10.17576/jsm-2022-5109-08.

[27] S. G. Ningrum, "Food Safety Management System in Edible Bird's Nest Industry: A Review," *Journal of Applied Veterinary Science & Technology*, vol. 4, no. 1, 2023, https://doi.org/10.20473/javest.V4.I1.2023.41-51.

[28] Badan Standardisasi Nasional, "Sarang burung walet bersih (Edible bird nest)", Indonesia. Available: http://sispk.bsn.go.id/sni/DetailSNI/13492, 2021.

[29] E. K. S. Shim, G. F. Chandra, and S. Lee, "Thermal analysis methods for the rapid identification and authentication of swiftlet (*Aerodramus fuciphagus*) edible bird's nest – A mucin glycoprotein," *Food Research International*, vol. 95, pp. 9–18, 2017, https://doi.org/10.1016/j.foodres.2017.02.018.

10.12198/spekta.v4i2.7997