ANTIOXIDANT ACTIVITIES OF EDIBLE BIRD'S NEST (EBN)

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Abstract: Edible bird's nest (EBN) is well-known as an expensive animal product. This product is the saliva of swiftlets that has been proven to give many health benefits. Existing studies showed that saliva contains high antioxidant properties which contributed to the benefits. However, the antioxidant properties of EBN have not been reviewed. This paper aims to review the antioxidant properties of EBN through existing pieces of literature. With that, an in-depth search on Web of Science (WoS)b was carried out using the keywords "antioxidant", "edible bird's nest", "enzymatic hydrolysis" and "sialic acid". It was found that the most common method for antioxidant quantification of EBN was DPPH assay. DPPH assay antioxidant activity of the EBN treated by enzymatic hydrolysis is significantly higher than other sample preparation methods. The overall findings suggest that EBN antioxidant studies open up opportunities for research and development of EBN as a health food which is gaining attention from the community.

Keywords: Antioxidant, edible bird's nest, enzymatic hydrolysis, sialic acid

1. Introduction

Edible bird's nest (EBN) is the saliva of special swiftlets only found in Southeast Asia. It is solidified in the air to form their nests. The EBN is claimed to be beneficial as it improves β-cell function and insulin signalling for type II diabetes (Choy et al., 2021), improves neurological function for Parkinson's disease (Yew et al., 2018), anti-oxidative and anti-inflammatory (Zhang et al., 2015). Since EBN is high in antioxidants, many recent research works have started to focus on the antioxidant properties of EBN. Several sample preparation methods were used in preparing the EBN for antioxidant analysis such as salt extraction, alkaline extraction, heat treatment (Zamri, Mahadi, Abdullah, Syafiuddin, & Hadibarata, 2020) and enzymatic hydrolysis (Babji et al., 2018; Nurfatin et al., 2016).

Even though many research studies have reported the antioxidant activities of EBN, however, an overview of EBN antioxidant activities was not available. Therefore, this paper aims to examine the reported antioxidant properties of EBN.

2. Discussion

Generally, EBN in its existing form contains a complex protein structure. It needs to be degraded to enhance the antioxidant activity. This is because the total surface area increases after degradation hence will increase the exposure of bioactive compounds for antioxidant activities. The literature search shows four sample preparation methods were used for EBN antioxidant

studies, namely, salt extraction, alkaline extraction, heat treatment (Zamri et al., 2020), and enzymatic hydrolysis (Babji et al., 2018; Nurfatin et al., 2016).

Previous antioxidant reports for EBN were established based on several antioxidant assays such as DPPH, FRAP, ABTS, and TPC. The DPPH assay was used to quantify the primary antioxidant potentials available in EBN (Ling, Chang, Babji, & Lim, 2020a). The FRAP assay quantifies both primary and secondary antioxidant potentials available in EBN (Ling, Chang, Babji, & Lim, 2020b). While the ABTS involves both electron and hydrogen atoms from EBN antioxidants to stabilize the radicals (Ling et al., 2020b). The ABTS was used to determine the hydrophilic antioxidant compounds in the EBN (Gan, Chang, Nasir, Babji, & Lim, 2020; Ling et al., 2020a). TPC is involved indirectly in antioxidant methods of EBN. This method measures the amount of phenolic content and the free radical scavenging activity is assisted by the hydroxyl group of the antioxidant molecules (Aryal et al., 2019; Quek, Chin, Yusof, Law, & Tan, 2018).

Salt extracted EBN with 5% NaCl has provided high antioxidant activity. The values recorded for antioxidant activity using DPPH and FRAP were 58.29±3.30% and 1.81±0.24 AAE mM/g respectively. However, the phenolic content in this EBN was not detected (Zamri et al., 2020). The highest reported antioxidant activities of EBN were found in the EBN samples treated with alkaline extraction (0.5M NaOH), the EBN antioxidant activities quantified using DPPH, FRAP, and TPC were 58.10±11.61%, 5.13±0.02 AAE mM/g, and 0.08±0.01 GAE/g respectively (Zamri et al., 2020). In addition, the antioxidant activity of EBN steadily increased with the increase in temperature for the heat treatment method. The EBN treated at 100ºC depicted the highest antioxidant activity with a DPPH value of 51.76±1.08% and an FRAP value of 1.06±0.00 AAE mM/g (Zamri et al., 2020). The alcalase, papain, and papaya juice were also used for enzymatic hydrolysis of EBN. It was found that the antioxidant activity of EBN treated with papain for two hours has the highest antioxidant values with a DPPH scavenging value of 29.9±4.9% (Zulkifli et al., 2019).

EBN contains glycoprotein which holds the component responsible for its antioxidant activities known as sialic acid. Besides the sialic acid, the amino acids are also contributed for its antioxidant activities. A study reported the antioxidant activities of EBN after the drying method. It was found that sialic acid in the EBN decreased with the increment of drying temperature. The increase of drying temperature from 25ºC to 70ºC also reduced the ABTS radical-scavenging activity from 85.61±0.09 TEAC/g dry weight to 34.28±0.14 mg TEAC/g dry weight respectively (Gan, Ong, Chin, & Law, 2017). Different EBN hydrolysates have different antioxidant values. A study conducted using alcalase and papain resulted in different values of FRAP assay with the reducing power of 0.0175±0.002mg/ml and 0.0680±0.0004 mg/ml respectively (Muhammad, Babji, & Ayub, 2015).

3. Conclusion

In conclusion, it was found that the antioxidant activities of EBN were measured using many antioxidant quantification methods depending on the type of compound to be studied. EBN sample prepared by enzymatic hydrolysis yielded the highest antioxidant activities compared to other sample preparation methods.

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