A REVIEW ON EXTRACTION COUPLED WITH ANALYTICAL TECHNIQUES USED IN MEDICINAL PLANTS: TORCH GINGER (*Etlingera elatior*)

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Abstract: The presence of active compounds in medicinal plants provides physiological effects and acts as a pharmacological agent in preventing and treating diseases since the last decade. This has resulted in an increase of interest in the medicinal plant due to the high demands of the current pharmaceuticals and nutraceuticals industry. However, the extraction parameters will negatively affect the extraction yield due to the degradation of the thermosensitive compounds. Therefore, it is very crucial to develop an effective and selective method for the extraction, separation and isolation of those bioactive compounds, especially from unexplored plants. Torch ginger is an unexplored medicinal plant that serves benefits on human health including medicament for cardiovascular diseases and cancer. This review intends to provide a comprehensive insight into the variety of extraction methods coupled with analytical techniques on torch ginger with a view to identify novel active compounds for global health benefits. This review will discuss the main parameters involved such as time, temperature, solvent, and sample pre-treatment. It is found that conventional extraction techniques are being replaced by non-conventional techniques to reduce energy and solvent consumption, increase efficiency and selectivity, and meet environmental regulations. The chromatography technique prevails in others due to its separation efficiency. However, the lab-intensive and time-consuming extraction, separation and isolation process has been the bottleneck for the bioactive compounds in pharmaceutical development. Further investigation is needed to improve the extraction, separation and isolation technique to maximize yields and reduce degradation associated with environmental concern and costs.

Keywords: Medicinal plant, conventional extraction method, non-conventional extraction method, analytical technique

1. Introduction

A poisonous and toxic plant was only discovered in prehistoric times after it was consumed and side effects such as stomach discomfort, vomiting, or other toxin responses were seen. Medicinal plant is defined as the variety of plants that provide medicinal properties to consumers (Jamshidi-Kia et al., 2018). The medicinal properties can be extracted from various parts of the plant such as leaf, root, skin, flowers and fruit.

The active compounds in the medicinal plants are extracted using extraction techniques whereas, the plants are processed before being subjected to any suitable extraction techniques. In the extraction process, it is advisable for the extraction techniques used to be devoid of degradation of the active compounds in plant samples. Analytical technique is conversely known as the process

that is used to analyse and determine the presence of compounds in the extracted yield after the extraction process (Marguí & Grieken, 2013).

Torch ginger or its scientific name *Etlingera elatior* is one of the ginger family known as Zingiberacea and natively found in Indonesia and Malaysia (Pitopang et al., 2019). Torch ginger contains medicinal properties and is considered one of the medicinal plants. The essential oil from torch ginger has the properties of therapeutic agents in treating sore throats, sea and travel sickness. It also relieves rheumatic pains and cramps (Choon & Ding, 2016). Therefore, this review aims to study the correlation of the extraction techniques with the presence of the analytical techniques with torch ginger as one of the medicinal plants.

2. Discussion

2.1. Extraction technique coupled with analytical techniques in torch ginger

Depending on the country or continent, torch ginger has been used for a variety of purposes. Torch ginger is used as a decoration in some countries, but it is also used as a condiment in Asian and Middle Eastern cuisines to enhance the aroma of their dishes. Apart from its fragrant perfume, torch ginger also has health benefits for humans, as previously indicated. To gain the benefits from the torch ginger, the extraction of the torch ginger essential oil is required along with the analytical techniques to analyse the compounds in the extracted yield.

Torch ginger has been the subject of numerous studies. Few researchers conducted extraction of torch ginger using conventional extraction techniques and obtained the yield of the torch ginger extract. However not many conducted the extraction process along with the analytical technique. For example, Khor et al. (2017) and Rachkeeree et al. (2018) conducted extraction of torch ginger using the same hydro distillation techniques and were able to yield torch ginger extract without involving any analytical techniques. The authors were able to detect the presence of phytochemical, phenolic content, flavonoid content and antioxidant activity but were unable to determine the mass of the compounds in the torch ginger extract. On the other hand, Fathin et al. (2017) conducted torch ginger extraction along with an analytical process and were able to conclude the compounds in the torch ginger were suitable for industrial use.

In addition, there are very few researchers that utilized the use of non-conventional extraction techniques due to the difficulty in handling the extraction process. Very few researchers incorporated these extraction techniques in their research moreover, extraction techniques coupled with analytical techniques. As such, Sungthong and Srichaikul (2018) and Nor et al. (2020) conducted extraction using ultrasound-assisted with ethanol and water as the solvent, respectively were able to determine the presence of phenolic, flavonoid content and antioxidant activity. However, Marzlan et al. (2020) found presence of chemical compounds in the torch ginger extract after putting the torch ginger extract through the gas chromatography analytical process.

The extraction process conducted without involving any analytical techniques were only able to determine the presence of compounds in the extract. Analytical techniques incorporated in the research with torch ginger as the sample would be able to determine the individualization and determination of the mass of chemical compounds in the extract, regardless of the extraction techniques used. However, as discussed in the advantages and the disadvantages of the extraction techniques, non-conventional extraction technique offers more improvements when compared to conventional extraction techniques. From the extraction and analytical techniques conducted by

the researchers, they were able to determine the presence of beneficial compounds in the torch ginger extract and utilize its medicinal properties in the future.

3. Conclusion

In this review, conventional extraction techniques are well-known among the researchers despite the few drawbacks. However, there are researchers that have been developing the non-conventional extraction techniques to counteract the drawbacks of the conventional extraction techniques. The use of analytical techniques in a research is also crucial to identify and analyse the presence of the compounds in the sample specifically in analysing the plant extract.

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