Comparison of curcumin content and antioxidant activity of turmeric samples collected from Indonesia and Thailand: Considerations for the future sharing of the natural resource

A. Dechakhamphu, J. Junlatat, M. Agil, B. Prajogo & N. Pursariwati
Ubon Ratchathani Rajabhat University, Thailand

ABSTRACT: Turmeric has been used as a spice and a medicine in traditional Thai and Indonesian medicine since ancient times. It contains antioxidant, anti-inflammatory, anti-cancer and anti-bacterial properties. As both Thailand and Indonesia are producers of turmeric in the world market, this makes the sharing of this resource and the creation of trade bargain possible. However, the geographical area may have an impact on the medicinal properties of this plant. Therefore, this article aims to study curcumin content and some biological properties of turmeric, including its antioxidant and anti-bacterial properties, by using in vitro experiments. Turmeric samples were collected from Madura Island, Indonesia and from Ubonratchathani Province, Thailand during May–June 2015. Curcumin content was measured by using the UV spectrum. Antioxidant activity was measured by using DPPH assay. The experimental data showed that turmeric samples collected from Indonesia and Thailand contain similar curcumin content and biological properties. From the data from this study, it can be concluded that sharing of the turmeric resource between the studied areas is possible, not only for material use but also for scientific knowledge.

Keywords: biological property, sharing resource, traditional Thai medicine, traditional Indonesian medicine, turmeric

1 INTRODUCTION

Turmeric (Curcuma longa L.) is a perennial herb which is distributed throughout the tropical and subtropical regions of India, South-East Asia and China (Sahne, F. 2016). The underground rhizome not only imparts a distinctive flavor to the food but also provides a deep, indelible orange color. Turmeric is often sold to customers in developed countries in the form of a fine, dried, yellow powder. It is used in a wide variety of South Asian cuisines, but locally it is also used as an antiseptic for skin abrasion (Robbins, P., 1995). In Indonesia and Thailand, it is used as a food ingredient and natural remedy. Turmeric has also been proven to have powerful anti-diabetic, anti-asthmatic, anti- peptic ulcer, and wound healing effects, as well as the ability to improve brain conditions such as Alzheimer’s disease (Lim, G.P., 2001).

India is the leading producer, consumer, and exporter of turmeric in the world. It is followed by other Asian producers such as Bangladesh, Pakistan, Sri Lanka, Taiwan, China, Myanmar, and Indonesia (Weiss, E.A., 2002). The major importers are the Middle East and North African countries. The United States imports turmeric from India to the amount of 97%, and the rest is supplied by the islands of the Pacific and Thailand (ASTA, 2002). The increasing demand for natural products as food additives makes turmeric an ideal candidate as a food colorant. In addition, recent medical research has demonstrated the anti-cancer and anti-viral activities of turmeric, thereby increasing its demand in Western countries (Weiss, E.A. 2002). Although India is the largest producer of turmeric in the world (846,700 tons), it exports only 6% of the total production. During 2006–2007, it exported 51,500 tons of turmeric. It also exported some amounts of turmeric to ASEAN countries such as Malaysia (2,263 tons)
and Singapore (622 tons) (Apeda.gov, 2017). The global consumption rate of turmeric is expected to increase in the near future. The export of turmeric may increase the local income of some countries, including Indonesia and Thailand. Nowadays, Indian turmeric is preferred to that of other countries due to its high curcumin content, a major bioactive compound of turmeric which plays a crucial role in preventing and treating diseases. Therefore, the standardization of this raw material is also important. In general, high curcumin content and good biological activities are the main factors for its commercial advantage.

Several studies have reported the genetic diversity and variation found in the active compounds of turmeric collected from different parts of Thailand (Thaikert, R. and Paisooksanitvatan, Y. 2009). A study conducted in India revealed that bioactive compounds depend on the region of cultivation (Sinkar, P.V., 2005). Ashraf, K. et al. (2012) reported that major bioactive compounds of turmeric were mainly found in different geographical regions. Therefore, the superior quality of turmeric with high bioactive properties is regarded as a strategy for turmeric trade. From these reports, it can be concluded that ASEAN countries such as Indonesia and Thailand are likely to gain profit from turmeric trade. Evidence for testing of major bioactive components and biological properties will be a source of competitive advantage. Therefore, this study aims to verify curcumin content and antioxidant activity of turmeric collected from Indonesia and Thailand. The results from this study provide not only scientific data but also the prospect of sharing turmeric between the two countries. In addition, this will pave the way for working together to create trade bargain at the international level.

2 METHODOLOGY

This study was conducted under the cooperation between the Faculty of Thai Traditional and Alternative Medicine, Ubon Ratchathani Rajabhat University, Thailand and the Faculty of Pharmacy, University of Airlangga, Indonesia. The rhizome of turmeric was collected in triplicates from Madura Island, Indonesia and from Ubonratchathani Province, Thailand during May–June 2015. Bioactive compounds were extracted from the samples by using a standard protocol. Curcumin content was measured by using the UV spectrum. Antioxidant activity was measured by using DPPH assay.

The comparison of turmeric samples collected from Indonesia and Thailand is presented in Table 1.

3 DISCUSSION

Turmeric is commonly used as a spice for preparing food in India and ASEAN countries such as Indonesia and Thailand. It is also used in the traditional medicine for various therapeutic purposes, including antioxidant, anti-cancer, anti-inflammation, and improved brain functions. Therefore, turmeric is considered as a natural panacea, which is supported by scientific research. Consequently, the world consumption rate of turmeric is expected to increase in the near future. Although turmeric crops may become a good income for local cultivators, high curcumin content and good biological activities are the key determining factors for the purchaser. Many reports have demonstrated that curcumin content varied depending on geographical areas. Hence, the objective of this study was to verify curcumin content and antioxidant activity of turmeric collected from Indonesia and Thailand. The results are summarized in Table 1.

Table 1. Comparison of curcumin content and antioxidant activity of turmeric samples collected from Madura Inland, Indonesia and Ubonratchathani Province, Thailand.

<table>
<thead>
<tr>
<th>Sample collection areas</th>
<th>Curcumin content (%)</th>
<th>Antioxidant activity (SC_{50}, ug/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>5.9</td>
<td>1.69</td>
</tr>
<tr>
<td>Thailand</td>
<td>5.1</td>
<td>1.74</td>
</tr>
</tbody>
</table>
According to the data from Table 1, curcumin content and antioxidant activity of turmeric samples collected from Madura Island, Indonesia were similar to those of the samples collected from Ubonratchathani, Thailand. Kanjilal et al. (2002) and Chandra et al. (2005) reported the highest curcumin content of 6.8–7.3% in turmeric samples collected from the regions of Meghalaya and Lakadong, India. Kotoky et al. (1999) reported that Tamenglong turmeric had the highest curcumin content (7.3%) among the seven Curcuma longa cultivars grown in Manipur, India. Compared with these reports, curcumin content found in this study was slightly lower. Nevertheless, it was classified as good quality. Therefore, we anticipate the approach of sharing the turmeric resource, scientific research, and trade competition. To increase more quality and reliability, influencing factors of curcumin content and biological activity such as harvest times, climate conditions, cultivation handling, storing conditions and age of vegetable materials should be considered. In addition, biological activities of turmeric such as anti-cancer, antimicrobial and anti-inflammatory effects should be further investigated.

4 CONCLUSION

Turmeric is used both as a spice and a medicine in the world. Although India is the leading producer and exporter of turmeric, other countries such as Indonesia and Thailand are also in the trade race. This study conducted an experimental analysis to verify the quality of turmeric collected from Madura Island, Indonesia and Ubonratchathani Province, Thailand. The results indicated that curcumin content and antioxidant activity of turmeric samples collected from both studied areas were similar. Therefore, it can be concluded that sharing of the turmeric resource between the studied areas is possible, not only for material use but also for scientific knowledge.

REFERENCES


