PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

OPEN ACCESS Pakistan Journal of Nutrition

ISSN 1680-5194
DOI: 10.3923/pjn.2019.146.152

Research Article
Mangampo: A Traditional Method from West Sumatra to Extract Gambir from *Uncaria gambir*

Tuty Anggraini, Neswati and Alfi Asben

Faculty of Agricultural Technology, Alas University, Kampus Limau Manis 25163, Indonesia

Abstract

Background and Objective: This study is the first to explain in detail the process to extract gambir from *Uncaria gambir.* The aim of this study was to identify the process used to produce gambir. The process is called 'mangampo,' which yields dried gambir extracts. This unique traditional process can be useful for researchers to understand the conventional processing of natural resources with beneficial compounds. **Materials and Methods:** The materials used in this research were the leaves and branches of *Uncaria gambir.* This study conducted a survey of gambir processing methods in Pesisir Selatan and Lima Puluh Kota, the central regions of gambir production in West Sumatra. **Results:** The results of this study showed that the procedure of 'mangampo' consists of harvesting the leaves and branches, steaming until condensed water appears on the leaves and branches, pressing the steamed leaves and branches, collecting the extract, thickening the extract (until a paste forms), forming the gambir paste and drying the paste. **Conclusion:** In both regions (Pesisir Selatan and Lima Puluh Kota), the same principle of extracting gambir is used and 'mangampo' is a unique traditional method to produce gambir.

Key words: Gambir, *Uncaria gambir*, traditional extraction, mangampo, steaming

Received: July 31, 2018 Accepted: September 18, 2018 Published: January 15, 2019

Citation: Tuty Anggraini, Neswati and Alfi Asben, 2019. Mangampo: A traditional method from west sumatra to extract gambir from *Uncaria gambir*. Pak. J. Nutr., 18: 146-152.

Corresponding Author: Tuty Anggraini, Faculty of Agricultural Technology, Alas University, Kampus Limau Manis 25163, Indonesia

Competing Interest: The author has declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Gambir is a crude, dried extract of the leaves and young twigs of *Uncaria gambir* and has many benefits[1]. In West Sumatra, Pesisir Selatan and Lima Puluh Kota are the main regions that produce gambir. This research describes the traditional processing of gambir in both the Pesisir Selatan and Lima Puluh Kota regions. Traditionally, gambir is used as medicine for ailments such as diarrhea, stomach-ache and sore throat and as a food preservative. In studying the processing of gambir, a natural resource, it is important to develop its yield. In Pesisir Selatan and Lima Puluh Kota, many farmers produce gambir. This study summarizes the process to produce gambir in each region.

A native plant of Indonesia, *Uncaria gambir* belongs to the Rubiaceae family and catechin is the major compound in gambir[1,2]. Gambir has the ability to alleviate certain diseases, to prevent atherosclerosis and to inhibit xanthine oxidase activity caused by hyperuricaemia[3-5]. Gambir comprises components such as catechin, epicatechin, caffeic acid, alkaloids, terpene, quinovic acid glycosides, flavonoids (uncariechin, epiafzelechin) and coumarin[1,3,6]. Catechin belongs to the flavonoid group and the types of catechin found in *Uncaria gambir* are epigallocatechin, gallocatechin, catechin hydrate, epicatechin and epicatechin gallate[7,8]. Studies have shown that the main component of gambir is a flavon-3-ol derivative and 40-80% of the dry weight-based extract is catechin, 1.5% is epicatechin and approximately 1% is gambirin B1, B3, A1[7,9]. Catechin content is heavily influenced by its extraction method and the origin of the gambir[9].

Uncaria gambir has gained much interest as a medicinal plant because of its function in treating certain diseases. This study first describes procedures that are important for the extraction to be successful. Until now, in West Sumatra, gambir has been extracted with a traditional method, namely, 'mangampo.' The local farmers named this method 'Mangampo' for the whole process of producing gambir. Even though different methods of extraction have been developed recently, the farmers in West Sumatra still maintain the traditional process. Due to the uniqueness of the extraction method of the gambir compound, this research presents a survey of gambir processing in Pesisir Selatan and Lima Puluh Kota. This study about gambir processing in the Pesisir Selatan and Lima Puluh Kota regions can be beneficial for other researchers to discover and understand the tradition of gambir.

MATERIALS AND METHODS

Materials: *Uncaria gambir* plant from Pesisir Selatan and Lima Puluh Kota.

Methods: To obtain data on gambir processing, this research used a survey methodology. The survey was conducted to study gambir processing in the Lima Puluh Kota and Pesisir Selatan regions. Due to the survey methods, three different places in each region were selected for the study on gambir processing by using a purposive sampling method. The chosen places in Pesisir Selatan were Siguntur Mudo, Siguntur Tuo and Barung-Barung Belantai, while the places chosen in the Lima Puluh Kota region were Jorong Bio-Bio, Simpang Kapuak and Muaro Paiti. The observed variable was the procedure used to produce gambir.

RESULTS AND DISCUSSION

Mangampo is a term commonly used in both Pesisir Selatan and Lima Puluh Kota regions to produce gambir. Therefore, 'mangampo' denotes the whole process of extraction in producing gambir. Extraction is the process of separating the functional/bioactive compounds of plants in certain procedures[10]. The survey of gambir processing in the Pesisir Selatan and Lima Puluh Kota regions found that the same principle was used in the process of producing gambir. The procedure of gambir processing is listed in Table 1.

After surveying both the Pesisir Selatan and Lima Puluh Kota Region, it was found that mangampo is the traditional process to make gambir. In both Pesisir Selatan and Lima

Table 1: The procedure of gambir processing (mangampo) in the Pesisir Selatan and Lima Puluh Kota regions

Procedure	Pesisir selatan	Lima puluh kota
Harvest the leaves and branches	V	V
Steam until water condensates form on the leaves and branches	V	V
Press the leaves and branches	V	V
Collect the extract	V	V
Thicken the extract (until a paste forms)	V	V
Remove the water	V	V
Form the gambir paste	V	V
Dry the paste	V	V

Puluh Kota, the same procedures were used to extract *Uncaria gambir*. The *Uncaria gambir* plant is shown in Fig 1. The procedures to produce gambir is explained as follows:

- **Harvest:** *Uncaria gambir* is harvested manually, where farmers use knives (Fig. 1c) to cut the gambir branches (Fig. 1b). The farmers usually see a sufficient number of leaves with ages ranging from 6-8 months after the previous harvest. Harvesting is done using special knife (local name is 'ani-ani') to cut all the branches of the plant at a distance of 2-3 cm from the base, except for young branches located at the ends. The leaves and branches are tied and placed into a wicker basket with a capacity of 15 kg and are immediately taken to the place of processing located in the center of the garden. Thus, the harvested part consists of the leaves and young branches of the gambir plant. There has been no previous research on the content of each leaf of gambir based on its position on the plant. In the regions of Pesisir Selatan and Lima Puluh Kota, the same terms were used for the raw materials

The leaves and the branch used for processing become the fresh form of gambir. According to a previous study, fresh or dried samples are commonly used as medicinal plant extracts[11]. Another study showed that there is no correlation between the freshness of the samples and polyphenol content[12].

After harvesting, the leaves and branches are arranged into a bamboo container (ST1), Fig. 2. The inside of the bamboo container is lined with a plastic cage and netting to bind tightly to the harvested leaves and branches. The bamboo container has no base or lid, so that the steaming direction can be reversed.

Fig. 1(a-c): (a) The *Uncaria gambir* plant, (b) Harvested leaves and branches of *Uncaria gambir* and © Knife used to harvest *Uncaria gambir*

Fig. 2(a-b): (a) A bamboo container and (b) A bamboo container with *Uncaria gambir* leaves and branches

The type of container used is important for adjusting the yield of the produced gambir. Bamboo containers that have been covered by plastic sacks absorb the catechins and other components present in gambir at the time of steaming (next process). This is certainly detrimental to the farmers. Using thicker layers of plastic sacks further reduces the yield of gambir.

- **Steam:** The steaming process is done inside a large cauldron. This large cauldron is named 'kancah' in both the Pesisir Selatan and Lima Puluh Kota regions. The cauldron is filled with water (20 L), which is usually obtained from the river. ST1 is inserted to the kancah and steamed. During the steaming process, the farmer usually sprinkles the remaining water on the container. The steaming process is finished when water condenses out of ST1, which indicates that heat has penetrated into the leaves and young branches of gambir; this step is the first steam (Fig. 3). This steaming process uses wood for firing. Therefore, the length of the steaming process depends on the amount of energy produced by wood firing. The second steaming process is done after pressing the leaves and branches of gambir, Fig. 3 b. Therefore, it can be concluded that there were two steamed processes: before and after pressing

Steaming is one of the most important factors that affects the extraction efficiency of *Uncaria gambir* and their functional compound content. The provision of heat to the material damages and softens the cell wall and the desired components of the plant are thus easily separated. The factor that influences the extraction is high temperature[13]. Gambir is extracted from the *Uncaria gambir* plant, whose components are utilized in the medicine, food and other industries. Thus, the components of gambir are then separated and isolated.

- **Pressing:** After the completion of the steaming process, the leaves and branches are removed and stacked (Fig. 4) in such a way that they resemble a cylinder. The leaves and branches of gambir are bundled using a rope and the rope binds to the leaves and branches of the gambir, thereby facilitating the extraction process (Fig. 4b). The extracts are processed using pulleys, where the leaves and twigs are clamped between two pieces of wood so that the extracts from the leaves and twigs can be steamed; this is mechanical extraction (Fig. 4c). The pressing process is carried out at a high temperature and the removal of leaves and twigs is done quickly so that they are still hot at the time of forging. Pressure and pressing temperature are important parameters for the extraction process. A study of jatropha kernel showed that pressing at high temperature resulted in increased oil recovery[14]. The same study also showed that the seed and kernel of rapeseed jatropha had high oil yields at high pressure and/or temperature[15]. A natural antioxidant, gambir contains phenolics and flavonoids, which are therapeutic agents that prevent the aging process[16]

After the extraction of the leaves and branches of gambir, the second steaming step was performed for approximately 15 min. The steaming process and the pressing process were done twice to obtain the optimal yield of gambir, to maximize the extraction results and to extract the components of gambir perfectly. Hot extraction results in a sufficiently high yield[17].

- **Collect the extracts:** The building used for gambir processing consists of two stages: the second stage is used for steaming and pressing, while the first stage is used for collecting the extract. After pressing, the extract is flown to wooden crevices and is collected in a container

Fig. 3(a-b): (a) First steam and (b) Second steam

Fig. 4 (a-d): (a) A farmer arranging *Uncaria gambir* leaves and branches after steaming, (b) Cylinder form of *Uncaria gambir* leaves and branches ready for pressing, © Pressing process using mechanical extraction and (d) Collection of the extract

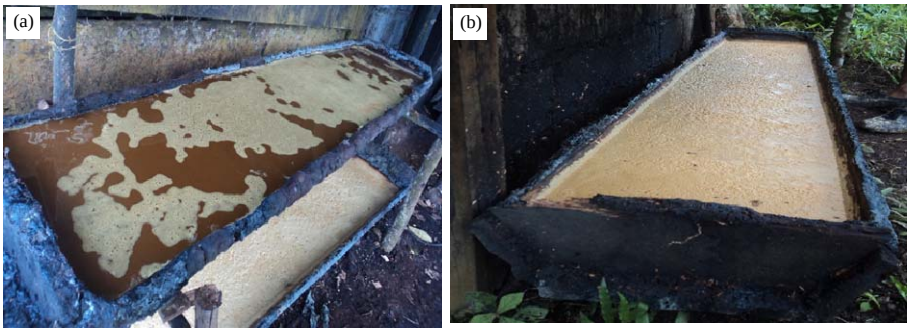

Fig. 5(a-b): (a) Hot extract and (b) Gambir paste

located on the ground floor or the first floor. The collected extracts then undergo a clumping process. The collection of the extract is done manually, Fig. 4d. Due to the manual processing, some of the extracts are collected ineffectively, resulting in the reduced yield of gambir

- **Thicken the extract (gambir paste):** The gambir extract is inserted into a wooden container with a size of 2×40×15 cm; this container is called a 'paraku. 'Clumping occurs when the temperature of the gambir extract is reduced and equals the ambient temperature and the gambir extract changes into the paste form. Figure 5 shows the gambir before and after changing from the liquid to the paste form. Usually, the gambir paste is collected in the afternoon to reduce the water content. The gambir extract thickens due to the sudden crystallization of catechins[18]
- **Reduce the water content:** Figure 6 shows the reduction of the water content is done using a bamboo wrap as the barrier. The clumped extract is placed in a sack to reduce the water content. The process of reducing the water content is done for one night or approximately 12 h

Fig. 6: Gambir paste surrounded by bamboo to reduce the water content

Fig. 7(a-b): (a) A farmer forms the gambir paste and (b) Die used to form gambir

Fig. 8(a-b): (a) Sun drying of gambir and (b) Gambir

- **Form the gambir paste:** The gambir paste is formed in a cylinder or tube with a diameter of 3 cm and a height of 5 cm. This process is done in the morning so that the paste is dried by the sun. In Fig 7a and b, a farmer forms the gambir paste using a die; this tool is used in both Pesisir Selatan and Lima Puluh Kota. By following the previous procedure of reducing water in the gambir paste, the paste becomes thicker and is ready to be formed; in Malaysia, gambir is found in other forms, such as thin cakes, flakes and small cubes[18]
- **Dry:** The drying process uses heat from the sun to dry the paste, as seen in Fig. 8a. If the sun is shining brightly, it takes about four days for the gambir to dry with 8% water content. The water content is a critical factor in maintaining the gambir process; if the water content is more than 15%, microbes grow easily in gambir. In addition, the contamination reduces the quality of gambir. Figure 8b shows the dried gambir

CONCLUSION

In the Pesisir Selatan and Lima Puluh Kota regions, the same method is used to produce gambir. The processing of gambir consists of harvesting, steaming, pressing,

thickening, reducing water, forming and drying. Mangampo is a unique traditional method for the production of gambir.

SIGNIFICANCE STATEMENT

This study provides information about the traditional method of extracting gambir and can be applied to other countries that produce gambir; however, this study shows that the process has some weaknesses that need to be addressed. This study will help researchers to uncover a critical area about the traditional extraction of gambir that many researchers were not able to explore previously. Thus a new method may be achieved.

ACKNOWLEDGMENT

The research was funded by KRP2GB-PDU, a research grant from Andalas University, West Sumatra Indonesia.

REFERENCES

1. Anggraini, T., A. Tai, T. Yoshino and T. Itani, 2011. Antioxidative activity and catechin content of four kinds of *Uncaria gambir* extracts from West Sumatra, Indonesia. Afr. J. Biochem. Res., 5: 33-38.
2. Hussin, M.H. and M.J. Kassim, 2011. The corrosion inhibition and adsorption behavior of *Uncaria gambir* extract on mild steel in 1M HCl. Mater. Chem. Phys., 125: 461-468.
3. Ibrahim, N., N.Z.M. Yusuff and R. Ahmad, 2015. Quantification of catechin in leaves and stems of Malaysian *Uncaria gambir* (Hunter) Roxb by HPLC-DAD. Malays. J. Analitical Sci., 20: 567-572.
4. Yunarto, N. and N. Aini, 2015. Effect of purified gambir leaves extract to prevent atherosclerosis in rats. Health Sci. J. Indones., 6: 105-110.
5. Rismana, E., S. Ningsih and F. Fachruddin, 2017. *In vitro* study of xanthine oxidase inhibitory of gambir (*Uncaria gambir*) Hunter Roxb extracts. Pharmacogn. J., 9: 862-865.
6. Heitzman, M.F., C.C. Neto, E. Winiarz, A.J. Vaisberg and G.B. Hammond, 2005. Ethnobotany, phytochemistry and pharmacology of *Uncaria* (Rubiaceae). Phytochemistry, 66: 5-29.
7. Taniguchi, S., K. Kuroda, K. Doi, K. Inada and N. Yoshikado *et al*., 2007. Evaluation of gambir quality based on quantitative analysis of polyphenolic constituents. Yakugaku Zasshi: J. Pharm. Soc. Jap., 127: 1291-1300.
8. Kassim, J.N., M.H. Hussin, A. Achmad, N.H. Dahon, T.K. Suan and H.S. Hamdan, 2011. [Determination of total phenol, condensed tannin and flavonoid contents and antioxidant activity of *Uncaria gambir* extracts]. Majalah Farmasi Indonesia, 22: 50-59, (In Indonesian).
9. Hayani, E., 2003. Analisis kadar *Catechin* dari gambir dengan berbagai metode. Buletin Teknik Pertanian, 8: 31-33.
10. Handa, S.S., S.P.S. Khanuja, G. Longo and D.D. Rakesh, 2008. Extraction Technologies for Medicinal and Aromatic Plants. International Centre for Science and High Technology, Trieste, Italy, Pages: 260.
11. Azwanida, N.N., 2015. A review on the extraction methods use in medicinal plants, principle, strength and limitation. Med. Aromat. Plants, Vol. 4. 10.4172/2167-0412.1000196
12. Vongsak, B., P. Sithisarn, S. Mangmool, S. Thongpraditchote, Y. Wongkrajang and W. Gritsanapan, 2013. Maximizing total phenolics, total flavonoids contents and antioxidant activity of *Moringa oleifera* leaf extract by the appropriate extraction method. Ind. Crop Prod., 44: 566-571.
13. Rezazi, S., S. Abdelmalek and S. Hanini, 2017. Kinetic study and optimization of extraction process conditions. Energy Procedia, 139: 98-104.
14. Subroto, E., R. Manurung, H.J. Heeres and A.A. Broekhuis, 2015. Optimization of mechanical oil extraction from *Jatropha curcas* L. kernel using response surface method. Ind. Crops Prod., 63: 294-302.
15. Willems, P., N.J.M. Kuipers and A.B. de Haan, 2008. Hydraulic pressing of oilseeds: Experimental determination and modeling of yield and pressing rates. J. Food Eng., 89: 8-16.
16. Amir, M., M. Mujeeb, A. Khan, K. Ashraf, D. Sharma and M. Aqil, 2012. Phytochemical analysis and *in vitro* antioxidant activity of *Uncaria gambir*. Int. J. Green Pharm., 6: 67-72.
17. Carre, P., M. Citeau and S. Dauget, 2017. Hot ethanol extraction: Economic feasibility of a new and green process. Oilseeds Fats Crops Lipids, Vol. 25, No. 2. 10.1051/ocl/2017061
18. Lim, W.J., A.T. Yap, M. Mangudi, C.Y. Hu and C.Y. Yeo *et al*., 2017. Gambir, "Gambir Sarawak" and toad venom. Drug Test. Anal., 9: 491-499.