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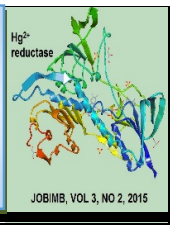

Comparison of Various Drying Techniques Towards the Total Phenolic Content in *Jatropha curcas* L. Root Sample

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ABSTRACT

Jatropha curcas is a multipurpose plant that has been suggested as a possible cure to inflammation. It can be used as a source of animal feed, live fence, biodiesel and in traditional medicine. Practitioners have used various extraction techniques to extract the active components of the plant. This article compares the efficiency of three methods of drying technique for the extraction of the total phenolic content from the plant. The freeze-drying method was the best method compared to oven dry and air dry. The freeze-drying method dries *J. curcas* root sample faster and preserve the total phenolic content better than the other methods.

INTRODUCTION

Jatropha curcas is locally known as "Pokok Jarak" [1]. It is grouped under the Euphorbiaceae family [2]. In Malaysia, *J. curcas* was firstly studied due to its biodiesel property [3]. Reports claim that *J. curcas* seed can produce biodiesel that can be used as a replacement for fossil fuel [4]. Whilst the main focus of *J. curcas* in many research is on it biodiesel property, the contribution of *J. curcas* in traditional medication is undeniable. An article reports that the traditional tribe from Central America specifically in Brazil, Peru and Mexico used *J. curcas* parts to treat several illnesses such as gout, inflammation, arthritis and jaundice [5].

Of the various parts of *J. curcas*, the root parts are usually claimed to possess anti-inflammatory and anti-oxidant properties [6,7,8]. This property was due to the presence of high phenolic content in the *J. curcas* root [9], as phenolic compounds are well known for their free radical scavenging property [10]. It is known that the anti-inflammation and anti-oxidant properties of *J. curcas* root is proportional to the phenolic content. There is no doubt that *J. curcas* root can be used as a traditional medication, but there are various extraction methods used by the practitioners in treating various illnesses. Extraction method is the most important part in preserving the *J. curcas* root compounds as it leads to the maximum capacity of *J. curcas* root as herbal medicine. Boiling, sun dried, and applied freshly are common techniques used by practitioners in extracting *J. curcas* root compounds [11]. None of the reports claim that the best extraction technique can preserve the active compounds or metabolites. Hence, this report provides scientific data in order to demonstrate the best method in preserving the phenolic content in *J. curcas* root.

MATERIALS AND METHODS

Sample collection

Jatropha curcas root sample was taken from Ladang 2, the Faculty of Agriculture, University Putra Malaysia, under the supervision of Mr. Shahril. The plant was send to Institute

Biosains UPM for identification. *J. curcas* tree identification was done by Dr. Shamsul Khamis and a voucher number was given (SK1764/2010) for this particular tree.

Drying Technique

Young roots were taken specifically for this experiment. The measurement of the roots was between 1 and 5 mm in diameter. Young roots were chosen due to the lower lignin content and also to preserve *J. curcas* tree. Twenty grams of roughly chopped *J. curcas* roots was measured and subjected to three different drying methods. Oven dry (40°C), air dry and freeze dry were chosen as the drying method. The difference in weight was monitored every day until a constant weight was reached.

Phenolic assay

Twenty uL of crude extract (1 g/mL) was added into 1.58 mL of distilled deionized water. A 100 µL of Folin Ciocalteau reagent (5%) was added and mixed thoroughly and incubated for 8 minutes at room temperature. After that, 300 µL of a concentrated sodium carbonate (Na_2CO_3) solution was added and incubated for 2 hours. The absorbance was read at 765 nm using a spectrophotometer (Labomed, inc. model Spectro 23). The phenolic content was expressed as milligram of Gallic acid equivalent (GAE) per gram of dried samples (mg GAE/g dw).

RESULTS AND DISCUSSION

Comparison between these three drying methods based on ANOVA analysis showed that there was no significant difference ($p>0.05$) amongst all of the methods throughout the drying period. Approximately 75% of water content in the root sample was removed during this period using all of the three methods. The water lost was constant until the 3rd day (Figure 1). Although oven dry and freeze dry methods are effective and rapid methods in drying sample [11,12], the results obtained indicate that all three methods are equally effective in removing water from the root sample.

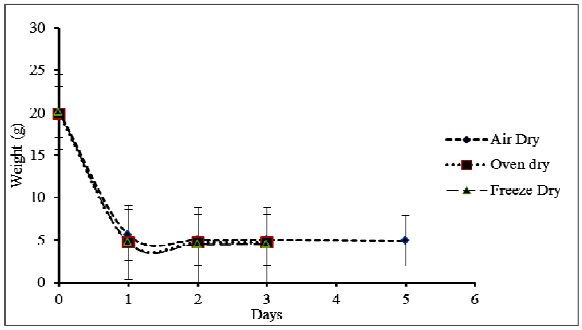

Fig. 1: Comparison between three drying methods. Error bars represent mean of three replicates.

Analysis of total phenolic content using Gallic acid as a standard is presented in figure 2. ANOVA analysis showed that the oven dry method showed the lowest total phenolic content among the three drying methods, while the phenolic content for the freeze dry method gave the highest total phenolic content. Air dry was a better method in preserving the total phenolic content compared to the oven dry method. Several reports have used the air dry method to dry and preserve phenolic content in various samples [13,9,14]. Though the air dry method is considered a better technique than the oven dry, it has a weakness as it requires a generally longer drying time compared to other methods [13,14]. The freeze dry method is a common technique used by researchers in drying and preserving plant samples [15,10]. Comparison between the various drying methods in preserving the total phenolic content in leaves of *Alpinia zerumbet*, *Etlingera elatior*, *Curcuma longa*, and *Kaempferia galanga* showed that the freeze dry method was the best method in preserving the total phenolic content in these plants [11,13,14].

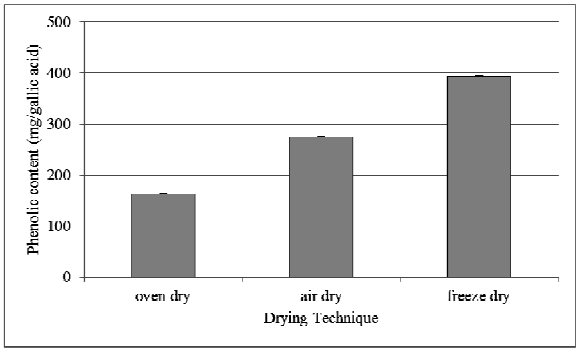

Fig. 2. The total phenolic content from three different drying methods. Error bars represent mean of three replicates.

CONCLUSION

From the three drying methods, all of the methods exhibited equal performance in drying *J. curcas* root sample. Analysis of total phenolic content using Gallic acid as reference indicate that the freeze dry method is the best method in preserving the phenolic content in *J. curcas* root.

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REFERENCES

1. Othman, A.R., Abdullah, N., Ahmad, S., Ismail, I.S. and Zakaria, M.P. Elucidation of in-vitro anti-inflammatory bioactive compounds isolated from *Jatropha curcas* L. plant root. BMC Complement Alt Med. 2015;15:11
2. Sabandar, C.W., Ahmat, N., Jaafar, F.M., and Sahidin, I. Medicinal property, phytochemistry and pharmacology of several Jatropha species (Euphorbiaceae): A review. Phytochemistry. 2013;85, 7-29.
3. Akbar, E., Yaakob, Z., Kamarudin, S.K., Ismail, M., Salimon, J. Characteristic and Composition of *Jatropha curcas* oil seed from Malaysia and its potential as biodiesel feedstock. Eur J Sci Res. 2009;29(3),396-403.
4. Vasudevan, P.T. and Fu, B. Environmentally sustainable biofuels: Advances in biodiesel research. Waste Biomass Valori. 2010;1:47–63.
5. Villegas, L.F., Fernandez, I.D., Maldonado, H., Torres, R., Zavaleta, A., Vaisberg, A.J., and Hammond, G.B. Evaluation of the wound-healing activity of selected traditional medicinal plants from Peru. J Ethnopharmac. 1997;55,193-200.
6. Mujumdar, A.M., and Misar, A.V. Anti-inflammatory activity of *Jatropha curcas* roots in mice and rats. J. Ethnopharmacol. 2004;90,11-15.
7. Nayak, B.S., and Patel, K.N. Anti-Inflammatory screening of *Jatropha curcas* root, stem and leaf in albino rats. Rom. J Biol. – Plant Biol. 2010;55,9-13.
8. Abdelgadir, H.A., and Staden, J.V. Ethnobotany, ethnopharmacology and toxicity of *Jatropha curcas* L. (Euphorbiaceae): A review. S Afr J Bot. 2013;88,204-218.

9. Atanassova, M., Georgieva, S., and Ivancheva, K. Total phenolic and total flavonoid contents, antioxidant capacity and biological contaminants in medicinal herbs. J Univ Chem Technol Metal. 2011;4(1),81-88.
10. Tabart, J., Kevers, C., Sipel, A., Pincemail, J., Defraigne, J.O., Dommes, J. Optimisation of extraction of phenolics and antioxidants from black currant leaves and buds and of stability during storage. Food Chem. 2007;105,1268–1275.
11. Chan, E.W.C., Lim, Y.Y., Wong, S.K., Lim, K.K., Tan, S.P., Lianto, F.S., and Yong, M.Y. Effects of different drying methods on the antioxidant properties of leaves and tea of ginger species. Food Chem. 2009;113,166-172.
12. Pirbaloutia, A.G., Oraie, M., Pouriamehr, M., Babadi, E.S. Effects of drying methods on qualitative and quantitative of the essential oil of *Bakhtiari savory* (*Satureja bachtiarica* Bunge.). Ind Crop Prod. 2013;46,324– 327.
13. Mediani, A., Abas, F., Khatib, A., Maulidiani, H., Shaari, K., Choi, Y.H., and Lajis, N.H. 1H-NMR-based metabolomics approach to understanding the drying effects on the phytochemicals in *Cosmos caudatus*. Food Res Int. 2012;49,763–770.
14. Salvamani, S., Gunasekaran, B., Shukor, M.Y., Shaharuddin, N.A., Sabullah, M.K., and Ahmad, S.A. Anti-HMG-CoA Reductase, Antioxidant, and anti-inflammatory activities of *Amaranthus viridis* leaf extract as a potential treatment for hypercholesterolemia. J Evid Based Complementary Altern Med. 2016;1-10.
15. Marinova, D., Ribarova, F., Atanassova, M. Total phenolics and total flavonoids in bulgarian fruits and vegetables. J Univ Chem Technol Metal. 2005;40(3),255-260.