STUDIES ON THE CHEMICAL COMPOSITION AND ANTIOXIDANT ACTIVITY OF *GARCINIA ATROVIRIDIS* (ASAM GELUGOR) STEM BARK EXTRACT

Khalisanni, K.[1*], Aijaz, A.Q[2], Siti Mazleena, M.[3]

[1] Malaysian Agricultural Research and Development Institute, MARDI Headquarters,
Persiaran MARDI-UPM, 43400 Serdang, Selangor, Malaysia
[2] Islamic University of Science & Technology (IUST), Awantipora,
Kashmir, Jammu & Kashmir-192122 (INDIA)
[3]Faculty of Applied Sciences, Universiti Teknologi MARA, Perak Branch
Tapah Campus, 35400 Tapah Road, Perak, Malaysia

*sanni@mardi.gov.my

Abstract: The crude extract of the stem bark of *Garcinia atroviridis* was used to study the antioxidant activity. The percentage of inhibition showed antioxidant activity in the crude extract. The ethyl acetate extract showed a higher percentage of inhibition (96.47 %), followed by hexane extract (96.28 %) and chloroform extract (77.40 %). Thus, ethyl acetate extract has a higher potential for antioxidant activity.

Keywords: *Chemical composition, Antioxidant, Garcinia atroviridis, Stem bark extract*

INTRODUCTION

As commonly named among locals, *Garcinia atroviridis* (*G. atroviridis*) or 'Asam Gelugor' is used mainly as a flavouring agent to provide a sour taste. *G. atroviridis* is one of the Guttiferae (Clusiaceae) family, with over 1000 species mainly confined to the tropics (Kumar et al., 2013). The *G. atroviridis* tree can grow to 20 meters tall and above. This tree is a popular herbal treatment in Southeast Asia, especially Thailand (Mackeen et al., 2012). Guttiferae (Clusiaceae) plant species have been proven to be a rich source of bioactive compounds. Garcinia species are rich in sources of secondary metabolites, including xanthones, flavonoids, benzophenone, lactones, and phenolic acids (Kumar et al., 2013). The Garcinia species are commonly used to treat illnesses such as coughs and improve blood circulation. The leaves of the *G. atroviridis* tree has been traditionally used for treating ear ache. Higher anti-inflammatory properties in the *G. atroviridis* leaves have been found useful in cases of acne (Abdullah et al., 2013). The Garcinia species' isolation compounds resulted in antioxidative, antiglycation, anti-lipogenic, antifungal, and antibacterial activity, and Bacillus cereus (Kumar et al., 2013). Although various studies have been conducted to investigate the pharmacological activities of *G. atroviridis*, the chemical investigation to identify the compounds responsible for the precise biological mode of action of this natural product has not yet been reported.

METHODOLOGY

Methanolic extraction of *G. atroviridis* stem bark

Ten kilograms of *G. atroviridis* as a raw material were collected from Pasir Mas, Kelantan. The stem bark was cut evenly before entering the vacuum dryer and the grinding process. The raw material was cleaned before entering the grinding process. After the cleaning process, the stem bark was entered the vacuum dryer for 24 hours at 80°C with zero pressure. After 24 hours of drying, the dried stem bark was ground until the stem bark powder. About 1.2 kg of powdered stem bark was obtained after the drying and grinding. Five hundred grams of powdered stem bark was soaked into methanol. After several days, the crude obtained from methanolic extraction was 20 ml using a rotary evaporator.

Characterization of *G. atroviridis* crude extract

A Fourier Transform Infra-Red Spectrometer (FTIR) was used to identify functional groups in the crude extracts. A 1.0 mg of crude extract was mixed with 100 mg potassium bromide (KBr) and was compressed to obtain a thin film of 1 mm thick. The FTIR range was scanned from 400 cm^{-1} to 4000 cm^{-1} using a Perkin Elmer GX- FTIR spectrometer.

Antioxidant Activity

0.5 ml of DPPH reagent, 1,1-diphenyl-2-picrylhydrazyl, was mixed with 4 ml of the fractionated compound into a vial. Then, the mixture was incubated in the dark for 30 minutes at room temperature. Four standards were used, vitamin E, quercetin, catechin, and butylated hydroxytoluene (BHT), and were carried out triplicate for each sample. The absorbance was measured at the wavelength of 517 nm using a UV-vis spectrophotometer. The percentage of inhibition was calculated as in (Eq. (1)):

$$[((AB-AA))/AB] \times 100 \qquad \text{Equation 1}$$

Where AB in (Eq. (1)) is the absorption of a blank sample, and AA is the absorption of the sample or standard extract.

RESULTS AND DISCUSSION

Characterization of *G. atroviridis* crude extract

Figure 1 shows the FTIR results for hexane, chloroform extract, and ethyl acetate extract. The FTIR analysis showed several peaks in *G. atroviridis* crude extract. Based on the spectrum, the crude extract had weak, medium, strong, sharp, and broad absorption peaks.

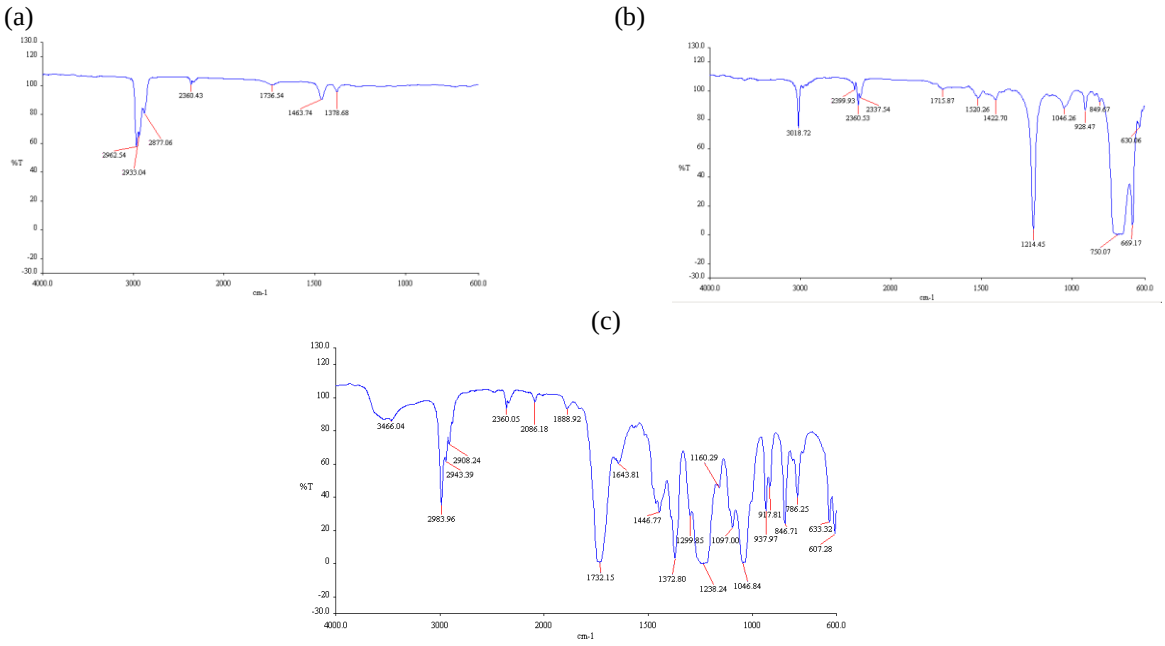

Figure 1. FTIR spectra of crude extraction by three different solvents were (a) Hexane, (b) Chloroform, and (c) Ethyl Acetate

Few peaks showed the medium and weak absorption peaks in the hexane extract solution. A peak fall on 2962.54 cm^{-1} indicated alkane groups (C-H); the 1736.54 cm^{-1} represents the aromatic overtone group (C-H). From Figure 1(b), the chloroform extract solution showed sharp and broad peaks. The intense and weak absorption peak around 3018.72 cm^{-1} was called a hydroxyl group (O-H). They also had strong and sharp peak falls around 1214.45 cm^{-1}, which showed the presence of fluoro group (C-F) and ether group (C-O) representing the alkyl aryl ether bond. The halogen group (C-H) was shown at 750 cm^{-1} and 669.17 cm^{-1} peaks. For the ethyl acetate extract that is shown in Figure 1(c), the alkene group (C-H) appears at 2983.96 cm^{-1}. A strong peak of 1732.15 cm^{-1} was identified as a carbonyl group (C=O) and characterized as aldehydes. There was also the presence of an alkyl aryl ether bond (C-O) on the wavenumber of 1732.15 cm^{-1}, 1238.24 cm^{-1}, and 1046.86 cm^{-1}. An alkyl aryl bond indicates the phenol content in the three different extractions.

Free radical scavenging activity

Free radical scavenging activity was performed to evaluate the antioxidant properties of the *G. atroviridis* stem bark extracts. Table 1 shows the percentage of inhibition for hexane crude extract was 96.28 %, chloroform crude extract was 77.40 %, and ethyl acetate crude extract was 96.47 %. The percentage of antioxidants from ethyl acetate extract was the highest, while the chloroform extract was the lowest. The extracts' antioxidant was expected as it has been shown by xanthones isolated from other species of Garcinia (Mackeen et al., 2000).

Table 1. Percentage of inhibition (%) of *G. atroviridis* stem bark extract.

Extracts	Percentage of inhibition (%)
Hexane Extract	96.28
Chloroform Extract	77.40
Ethyl Acetate Extract	96.47

CONCLUSIONS

Based on the FTIR characterization, there is a presence of phenol in the ethyl acetate and chloroform extracts. Thus, the findings suggested that the *G. atroviridis extracts* possess antioxidant activities, making them suitable as potential therapeutics. Different profiles of biological activities of the various extracts indicate the presence of other constituents.

REFERENCES

Abdullah, A. R., Bakhari, N. A., & Osman, H. (2013). Study on the relationship of the phenolic, flavonoid and tannin content to the antioxidant activity of Garcinia atroviridis. Activity of Garcinia Atroviridis. Universal *Journal of Applied Science*, 1(3), 95-100.

Kuetea, V., Komguem, J., PenlapBeng V., Meli, A.L., Tangmouo J.G., Etoa F-X., Lontsi D. (2007). Antimicrobial components of the methanolic extract from the stem bark of Garcinia smeathmannii Oliver (Clusiaceae). *South African Journal of Botany*,73, 3, 347-354.

Kumar, S., Sharma, S., & Chattopadhyay, S. K. (2013). The potential health benefit of polyisoprenylated benzophenones from Garcinia and related genera: Ethnobotanical and therapeutic importance. *Fitoterapia*, 89, 86-125.

Mackeen, M. M., Ali, A. M. Lajis, N. H., Kawazu, K., Hassan, Z., Amran, M., Habsah, M., Mooi, L. Y., Mohamed, S. M., (2000). Antimicrobial, antioxidant, antitumour-promoting and cytotoxic activities of different plant part extracts of Garcinia atroviridis Griff. ex T. Anders. *Journal of Ethnopharmacology.* 72, 3, 395-402.

Mackeen, M. M., Mooi, L. Y., Amran, M., Mat, N., Lajis, N. H., & Ali, A. M. (2012). Noncytotoxic and Antitumour-Promoting Activities of Garcinia Acid Esters from Garcinia atroviridisGriff. ex T. Anders (Guttiferae). Evidence-Based Complementary and Alternative Medicine.

Pejabat Perpustakaan
Library Office

Universiti Teknologi MARA
Cawangan Perak
Kampus Seri Iskandar
32610 Bandar Baru Seri Iskandar,
Perak Darul Ridzuan, MALAYSIA
Tel: (+605) 374 2093/2453 Faks: (+605) 374 2299

UNIVERSITI TEKNOLOGI MARA

Surat kami : 700-KPK (PRP.UP.1/20/1)
Tarikh : 20 Januari 2023

Prof. Madya Dr. Nur Hisham Ibrahim
Rektor
Universiti Teknologi MARA
Cawangan Perak

Tuan,

PERMOHONAN KELULUSAN MEMUAT NAIK PENERBITAN UiTM CAWANGAN PERAK MELALUI REPOSITORI INSTITUSI UiTM (IR)

Perkara di atas adalah dirujuk.

2. Adalah dimaklumkan bahawa pihak kami ingin memohon kelulusan tuan untuk mengimbas (*digitize*) dan memuat naik semua jenis penerbitan di bawah UiTM Cawangan Perak melalui Repositori Institusi UiTM, PTAR.

3. Tujuan permohonan ini adalah bagi membolehkan akses yang lebih meluas oleh pengguna perpustakaan terhadap semua maklumat yang terkandung di dalam penerbitan melalui laman Web PTAR UiTM Cawangan Perak.

Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Setuju.

27.1.2023

PROF. MADYA DR. NUR HISHAM IBRAHIM
REKTOR
UNIVERSITI TEKNOLOGI MARA
CAWANGAN PERAK
KAMPUS SERI ISKANDAR

Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

nar