International Food Research Journal
Volume 26, Issue 1, February 2019, Pages 319-327

Antidiabetic and antioxidants activities of Clinacanthus nutans (Burm F.) Lindau leaves extracts (Article)

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Abstract

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Clinacanthus nutans (Acanthaceae) is a local plant consumed as tisane in Indonesia and 'ulam' in Malaysia. This plant has been claimed for its ability to prevent many diseases including diabetes. However, the scientific proof on this claim is still lacking. Therefore, the present work study was designed to evaluate the antidiabetic potential and antioxidant capacity of C. nutans leaves extracts using in vitro bioassay tests. The 80% methanolic crude extract of this plant was further partitioned using different polarity solvents namely hexane, hexane:ethyl acetate (1:1, v/v), ethyl acetate, ethyl acetate:methanol (1:1, v/v), and methanol. All the sub-fractions were analysed for antioxidant effect via 2, 2-diphenyl-2-picrylhydrazil (DPPH) scavenging activity, ferric reducing power (FRAP) and xanthine oxidase (XO) assays followed by antidiabetic evaluation via α-glucosidase and dipeptidyl peptidase-IV (DPP-IV) inhibitory assays and glucose uptake experiment. The ethyl acetate fraction showed a good antioxidant potential while the hexane fraction exhibited high α-glucosidase and DPP-IV enzyme inhibition. The hexane fraction also improved glucose uptake in a dose-dependent manner. The present work thus provides an informative data on the potential of C. nutans to be developed as a functional food in preventing diabetes. © 2018 Universiti Putra Malaysia.

Author keywords

Antidiabetic | Antioxidant | Clinacanthus nutans | α-glucosidase inhibition

Funding details

Funding sponsor	Funding number	Acronym
International Islamic University Malaysia	PRIGS18-027-0027	IIUM
	NRGS SP15-060-0182	

Funding text

The authors wish to thank the Malaysian Ministry of Agriculture and Agro-based Industry for the NRGS fund (NRGS SP15-060-0182) and International Islamic University Malaysia for the Publication Research Initiative Grant Fund (PRIGS18-027-0027).

ISSN: 19854668
Source Type: Journal
Original language: English
Document Type: Article
Publisher: Universiti Putra Malaysia

1 Abd Aziz, S.M., Low, C.N., Chai, L.C., Abd Razak, S.S.N., Selamat, J., Son, R., Sarker, M.Z.I., (...), Khatib, A.
Screening of selected Malaysian plants against several food borne pathogen bacteria

(2011) *International Food Research Journal*, 18 (3). Cited 13 times.
http://www.ifrj.upm.edu.my/Article%20in%20Press/IFRJ-2010-265.pdf

2 Alam, A., Ferdosh, S., Ghafoor, K., Hakim, A., Juraimi, A.S., Khatib, A., Sarker, Z.I.
Clinacanthus nutans: A review of the medicinal uses, pharmacology and phytochemistry (Open Access)

(2016) *Asian Pacific Journal of Tropical Medicine*, 9 (4), pp. 402-409. Cited 38 times.
http://www.elsevier.com/wps/find/journaldescription.authors/722894/description#description
doi: 10.1016/j.apjtm.2016.03.011

View at Publisher

3 Alothman, M., Bhat, R., Karim, A.A.
Antioxidant capacity and phenolic content of selected tropical fruits from Malaysia, extracted with different solvents

(2009) *Food Chemistry*, 115 (3), pp. 785-788. Cited 397 times.
doi: 10.1016/j.foodchem.2008.12.005

View at Publisher

4 Arullappan, S., Rajamanickam, P., Thevar, N., Kodimani, C.C.
In vitro screening of cytotoxic, antimicrobial and antioxidant activities of Clinacanthus nutans (Acanthaceae) leaf extracts (Open Access)

(2014) *Tropical Journal of Pharmaceutical Research*, 13 (9), pp. 1455-1461. Cited 35 times.
http://www.tjpr.org/vol13_no9/2014_13_9_11.pdf
doi: 10.4314/tjpr.v13i9.11

View at Publisher

5 Bahmani, M., Zargaran, A., Rafieian-Kopaei, M., Saki, K.
Ethnobotanical study of medicinal plants used in the management of diabetes mellitus in the Urmia, Northwest Iran (Open Access)

(2014) *Asian Pacific Journal of Tropical Medicine*, 7 (S1), pp. S348-S354. Cited 155 times.
http://www.elsevier.com/wps/find/journaldescription.authors/722894/description#description
doi: 10.1016/S1995-7645(14)60257-1

View at Publisher

6 Chelyn, J.L., Omar, M.H., Mohd Yousof, N.S.A., Ranggasamy, R., Wasiman, M.I., Ismail, Z.
Analysis of flavone C -glycosides in the leaves of clinacanthus nutans (Burm. f.) Lindau by HPTLC and HPLC-UV/DAD (Open Access)

(2014) *Scientific World Journal*, 2014, art. no. 724267. Cited 21 times.
http://www.hindawi.com/journals/tswj/
doi: 10.1155/2014/724267

View at Publisher

7 Choi, J.S., Nurul Islam, M., Yousof Ali, M., Kim, E.J., Kim, Y.M., Jung, H.A.
Effects of C-glycosylation on anti-diabetic, anti-Alzheimer's disease and anti-inflammatory potential of apigenin

(2014) *Food and Chemical Toxicology*, 64, pp. 27-33. Cited 90 times.
www.elsevier.com/locate/foodchemtox
doi: 10.1016/j.fct.2013.11.020

View at Publisher

8 Duong, N.T., Vinh, P.D., Thuong, P.T., Hoai, N.T., Thanh, L.N., Bach, T.T., Nam, N.H., (...), Anh, N.H.
Xanthine oxidase inhibitors from Archidendron clypearia (Jack.) I.C. Nielsen: Results from systematic screening of Vietnamese medicinal plants (Open Access)

(2017) *Asian Pacific Journal of Tropical Medicine*, 10 (6), pp. 549-556. Cited 6 times.
http://www.elsevier.com/wps/find/journaldescription.authors/722894/description#description
doi: 10.1016/j.apjtm.2017.06.002

View at Publisher

9 Elya, B., Handayani, R., Sauriasari, R., Azizahwati, Hasyyati, U.S., Permana, I.T., Permatasari, Y.I.
Antidiabetic activity and phytochemical screening of extracts from indonesian plants by inhibition of alpha amylase, alpha glucosidase and dipeptidyl peptidase IV (Open Access)

(2015) *Pakistan Journal of Biological Sciences*, 18 (6), pp. 273-278. Cited 20 times.
http://docsdrive.com/pdfs/ansinet/pjbs/2015/279-284.pdf
doi: 10.3923/pjbs.2015.279.284

View at Publisher

10 Fang, X.-K., Gao, J., Zhu, D.-N.
Kaempferol and quercetin isolated from Euonymus alatus improve glucose uptake of 3T3-L1 cells without adipogenesis activity

(2008) *Life Sciences*, 82 (11-12), pp. 615-622. Cited 209 times.
doi: 10.1016/j.lfs.2007.12.021

View at Publisher

11 Figueiredo, C., Barroso, J., Pedro, L., Scheefeer, J.
Factors affecting secondary metabolite production in plants: volatile components and essential oils
(2007) *Flavour and Fragrance Journal*, 24 (4), pp. 206-213. Cited 6 times.

12 Ghasemzadeh, A., Jaafar, H.Z.E., Rahmat, A.
Phytochemical constituents and biological activities of different extracts of Strobilanthes crispus (L.) Bremek leaves grown in different locations of Malaysia (Open Access)

(2015) *BMC Complementary and Alternative Medicine*, 15 (1), art. no. 422. Cited 16 times.
http://www.biomedcentral.com/bmccomplementalternmed/
doi: 10.1186/s12906-015-0873-3

View at Publisher

13 Gliozzi, M., Malara, N., Muscoli, S., Mollace, V.
The treatment of hyperuricemia (Open Access)

(2016) *International Journal of Cardiology*, 213, pp. 23-27. Cited 50 times.
www.elsevier.com/locate/ijcard
doi: 10.1016/j.ijcard.2015.08.087

View at Publisher

14 (2015) *Clinacanthus nutans (Burm.f.) Lindau*
http://www.globinmed.com/index.php?.option1/4com_content&view1/4article&id1/479320clinacanthus-nutans-burmf-lindau

15 Javadi, N., Abas, F., Hamid, A.A., Simoh, S., Shaari, K., Ismail, I.S., Mediani, A., (...), Khatib, A.
GC-MS-Based Metabolite Profiling of Cosmos caudatus Leaves Possessing Alpha-Glucosidase Inhibitory Activity

(2014) *Journal of Food Science*, 79 (6), pp. C1130-C1136. Cited 30 times.
http://www3.interscience.wiley.com/journal/118509799/issueyear?year=2008
doi: 10.1111/1750-3841.12491

View at Publisher

16 Mariya John, K.M., Vijayan, D., Raj Kumar, R., Premkumar, R.
Factors influencing the efficiency of extraction of polyphenols from young tea leaves (Open Access)

(2006) *Asian Journal of Plant Sciences*, 5 (1), pp. 123-126. Cited 11 times.
doi: 10.3923/ajps.2006.123.126

View at Publisher

17 Khoo, L.W., Mediani, A., Zolkeflee, N.K.Z., Leong, S.W., Ismail, I.S., Khatib, A., Shaari, K., (...), Abas, F.
Phytochemical diversity of Clinacanthus nutans extracts and their bioactivity correlations elucidated by NMR based metabolomics

(2015) *Phytochemistry Letters*, 14, pp. 123-133. Cited 20 times.
http://www.elsevier.com
doi: 10.1016/j.phytol.2015.09.015

View at Publisher

18 Kifayatullah, M., Mustafa, M.S., Senguptha, P., Sarker, M.R., Das, A., Das, S.K.
Evaluation of the acute and sub-acute toxicity of the ethanolic extract of Pericampylus glaucus (Lam.) Merr. in BALB/c mice
(2015) *Journal of Acute Disease*, 4 (4), pp. 309-315. Cited 22 times.

19 Kong, H.S., Musa, K.H., Abdullah Sani, N.
Clinacanthus nutans (Belalai Gajah / Sabah Snake Grass): Antioxidant optimization on leaves and stems

(2016) *AIP Conference Proceedings*, 1784, art. no. 030030. Cited 2 times.
http://scitation.aip.org/content/aip/proceeding/aipcp
ISBN: 978-073541446-4
doi: 10.1063/1.4966768

View at Publisher

20 Lee, S.Y., Mediani, A., Nur Ashikin, A.H., Azliana, A.B.S., Abas, F.
Antioxidant and α-glucosidase inhibitory activities of the leaf and stem of selected traditional medicinal plants

(2014) *International Food Research Journal*, 21 (1), pp. 165-172. Cited 39 times.
http://www.ifrj.upm.edu.my/21%20(01)%202014/24%20IFRJ%2021%20(01)%202014%20Faridah%20359.pdf

21 Manaharan, T., Ming, C.H., Palanisamy, U.D.
Syzygium aqueum leaf extract and its bioactive compounds enhances pre-adipocyte differentiation and 2-NBDG uptake in 3T3-L1 cells

(2013) *Food Chemistry*, 136 (2), pp. 354-363. Cited 25 times.
doi: 10.1016/j.foodchem.2012.08.056

View at Publisher

22 Ngo, T.V., Scarlett, C.J., Bowyer, M.C., Ngo, P.D., Vuong, Q.V.
Impact of different extraction solvents on bioactive compounds and antioxidant capacity from the root of Salacia chinensis L (Open Access)

(2017) *Journal of Food Quality*, 2017, art. no. 9305047. Cited 18 times.
https://www.hindawi.com/journals/jfq/
doi: 10.1155/2017/9305047

View at Publisher

23 Panuganti, S.J.
Principles involved in bioassay by different methods: a mini-review
(2015) *Research and Reviews: Research Journal of Biology*, 3 (2), pp. 1-18.

24 Pieroni, A., Janiak, V., Dürr, C.M., Lüdeke, S., Trachsel, E., Heinrich, M.
In vitro antioxidant activity of non-cultivated vegetables of ethnic Albanians in southern Italy

(2002) *Phytotherapy Research*, 16 (5), pp. 467-473. Cited 121 times.
doi: 10.1002/ptr.1243

View at Publisher

25 Raza, R., Ilyas, Z., Ali, S., Nisar, M., Khokhar, M.Y., Iqbal, J.
Identification of Highly Potent and Selective ?-Glucosidase Inhibitors with Antiglycation Potential, Isolated from Rhododendron arboreum

(2015) *Records of Natural Products*, 9 (2), pp. 262-266. Cited 11 times.
http://www.acgpubs.org/RNP/2015/Volume9/Issue%201/31-RNP-1404-061.pdf

26 Roffey, B.W.C., Atwal, A.S., Johns, T., Kubow, S.
Water extracts from Momordica charantia increase glucose uptake and adiponectin secretion in 3T3-L1 adipose cells

(2007) *Journal of Ethnopharmacology*, 112 (1), pp. 77-84. Cited 46 times.
doi: 10.1016/j.jep.2007.02.003

View at Publisher

27 Saito, K., Lee, S., Shiuchi, T., Toda, C., Kamijo, M., Inagaki-Ohara, K., Okamoto, S., (...), Minokoshi, Y.
An enzymatic photometric assay for 2-deoxyglucose uptake in insulin-responsive tissues and 3T3-L1 adipocytes

(2011) *Analytical Biochemistry*, 412 (1), pp. 9-17. Cited 34 times.
doi: 10.1016/j.ab.2011.01.022

View at Publisher

28 Sakdarat, S., Shuyprom, A., Pientong, C., Ekalaksananan, T., Thongchai, S.
Bioactive constituents from the leaves of Clinacanthus nutans Lindau

(2009) *Bioorganic and Medicinal Chemistry*, 17 (5), pp. 1857-1860. Cited 76 times.
doi: 10.1016/j.bmc.2009.01.059

View at Publisher

29 Sarega, N., Imam, M.U., Ooi, D.-J., Chan, K.W., Md Esa, N., Zawawi, N., Ismail, M.
Phenolic Rich Extract from Clinacanthus nutans Attenuates Hyperlipidemia-Associated Oxidative Stress in Rats (Open Access)

(2016) *Oxidative Medicine and Cellular Longevity*, 2016, art. no. 4137908. Cited 10 times.
http://www.hindawi.com/journals/oximed/
doi: 10.1155/2016/4137908

View at Publisher

30 Sulaiman, I.S.C., Basri, M., Chan, K.W., Ashari, S.E., Masoumi, H.R.F., Ismail, M.
In vitro antioxidant, cytotoxic and phytochemical studies of Clinacanthus nutans Lindau leaf extracts
(2015) *African Journal of Pharmacy and Pharmacology*, 9 (34), pp. 861-874. Cited 11 times.

31 Tanruean, K., Suwannarach, N., Choonpicharn, S., Lumyong, S.
Evaluation of phytochemical constituents and biological activities of leaves and stems of Marsdenia glabra Cost

(2017) *International Food Research Journal*, 24 (6), pp. 2572-2579.
http://www.ifrj.upm.edu.my/24%20(06)%202017/(40).pdf

32 Teshima, K.-I., Kaneko, T., Ohtani, K., Kasai, R., Lhieochaiphant, S., Picheansoonthon, C., Yamasaki, K.
C-glycosyl flavones from Clinacanthus nutans

(1997) *Natural Medicines*, 51 (6), p. 557. Cited 30 times.

33 Tu, S.-F., Liu, R.H., Cheng, Y.-B., Hsu, Y.-M., Du, Y.-C., El-Shazly, M., Wu, Y.-C., (...), Chang, F.-R.
Chemical constituents and bioactivities of Clinacanthus nutans aerial parts (Open Access)

(2014) *Molecules*, 19 (12), pp. 20382-20390. Cited 25 times.
http://www.mdpi.com/1420-3049/19/12/20382/pdf
doi: 10.3390/molecules191220382

View at Publisher

34 Yawadio Nsimba, R., Kikuzaki, H., Konishi, Y.
Antioxidant activity of various extracts and fractions of Chenopodium quinoa and Amaranthus spp. seeds

(2008) *Food Chemistry*, 106 (2), pp. 760-766. Cited 175 times.
doi: 10.1016/j.foodchem.2007.06.004

View at Publisher

35 Yang, H.S., Peng, T.W., Madhavan, P., Shukkoor, M.S.A., Akowuah, G.A.
Phytochemical analysis and antibacterial activity of methanolic extract of Clinacanthus nutans leaf

(2013) *International Journal of Drug Development and Research*, 5 (3), pp. 349-355. Cited 14 times.
http://www.ijddr.in/Dacuments/10/42.pdf

36 Yi, W., Wetzstein, H.Y.
Effects of drying and extraction conditions on the biochemical activity of selected herbs

(2011) *HortScience*, 46 (1), pp. 70-73. Cited 29 times.
http://hortsci.ashspublications.org/cgi/reprint/46/1/70.pdf

View at Publisher

37 Zulbadli, N., Alwi, H., Hamid, K.H.K.
(2011) *Study on Important Factors Affecting the extraction of Momordica charantia using pressurized boiling system*
Langkawi, Malaysia: IEEE Symposium on Business, Engineering and Industrial Applications (ISBEIA)

38 Zulkipli, I.N., Rajabalaya, R., Idris, A., Sulaiman, N.A., David, S.R.

Clinacanthus nutans: A review on ethnomedicinal uses, chemical constituents and pharmacological properties (Open Access)

(2017) *Pharmaceutical Biology*, 55 (1), pp. 1093-1113. Cited 9 times.
doi: 10.1080/13880209.2017.1288749

View at Publisher

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