

Supplementary Information

Green Silver Nanoparticles Formed by *Phyllanthus urinaria*, *Pouzolzia zeylanica*, and *Scoparia dulcis* Leaf Extracts and the Antifungal Activity

Dai Hai Nguyen ^{1,2}, Jung Seok Lee ³, Ki Dong Park ⁴, Yern Chee Ching ⁵, Xuan Thi Nguyen ⁶, V.H. Giang Phan ^{6,*} and Thai Thanh Hoang Thi ^{6,*}

¹ Institute of Applied Materials Science, Vietnam Academy of Science and Technology, 01 TL29 District 12, Ho Chi Minh City, 700000, Vietnam; nguyendaihai0511@gmail.com

² Graduate University of Science and Technology, Vietnam Academy of Science and Technology, Hanoi 100000, Vietnam

³ Biomedical Engineering, Malone Engineering Center 402A, Yale University, 55 Prospect St. New Haven, CT 06511, USA; jungseok.lee@yale.edu

⁴ Department of Molecular Science and Technology, Ajou University, Suwon 16499, Republic of Korea; kdp@ajou.ac.kr

⁵ Department of Chemical Engineering, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia; chingyc@um.edu.my

⁶ Biomaterials and Nanotechnology Research Group, Faculty of Applied Sciences, Ton Duc Thang University, Ho Chi Minh City, 700000, Vietnam; 186002007@student.tdtu.edu.vn

* Correspondence: phanvuhoanggiang@tdtu.edu.vn (V.H.G.P.); hoangthithaithanh@tdtu.edu.vn (T.T.H.T.)

Received: 1 March 2020; Accepted: 15 March 2020; Published: 17 March 2020

Table S1. The summary of phytoconstituents in *P. urinaria*, *P. zeylanica*, and *S. dulcis*.

Class	<i>P. urinaria</i>	<i>P. zeylanica</i>	<i>S. dulcis</i>
Lignans or Nor-lignans	Phyllanthin, phyltetralin, (-)-syringaresinol, evofolin B, neonirtetralin, 4-oxopinoresinol, urinalignan ...[1].	Nor-lignans: Pouzolignan D, pouzolignan K.[2]	Lignans: Nirtetralin, niranthin, ...[3]
Tannins	Repandinin B, repandinin A, furosin, geraniin, repandusinic acid A, mallotinin, acetonylgeraniin D, corilagin, isostrictinin, chebulagic acid, phyllanthusiin C, excoecarianin, ...[1]	Quercetin, quercetin-3-O-β-D-glucoside, apigenin [4] Be presented by qualitative tests.[5]	Phytochemical screening indicated the presence of tannins [6]
Flavonoids	Rutin, kaempferol, quercetin 3-O-α-L-(2,4-di-O-acetyl)rhamnopyranoside-7-O-α-lrhamnopyranoside, quercetin 7-methyl ether, quercetin 3-O-β-D-glucoside, quercitin, rhamnocitrin, urinariaflavone, ...[1]	Be presented by quantitative test [5]	Apigenin, acacetin, cirsimarin, cynaroside, linarin, luteolin, scutellarein, vicenin 2, vitexin, ...[7]
Phenolics	Gallic acid, brevifolincarboxylic acid, brevifolin, ferulic acid, protocatechuic acid, gentisic acid, p-hydroxybenzaldehyde, ellagic acid, (E)-3-(5'-hydroperoxy-2,2'-dihydroxy[1,1'-biphenyl]-4-yl)-2-propenoic acid, phyllanthusiin E, ...[1]	Epicatechin [4]	Phytochemical screening indicated the presence of phenolics [6]
Terpenoids	β-sitosterol-3-O-β-d-glucopyranoside, loliolide, cloven-2β,9α-diol, (6R)-menthiofolic acid, cleistanthol, spruceanol, oleanolic acid, glochidiol, β-amyrin, ...[1]	Oleanolic acid; 2α, 3α, 19α-trihydroxyurs-12-en-28-oic [4]	Scopadulcic acid, scoparic acid A, scoparic acid B, scoparic acid C, amyrin, dulcidiol, glutinol...[8]
Others	5-Hydroxymethyl-2-furaldehyde, succinic acid, triacontanol, (+)-cucurbitic acid,...[1]	Ascorbic, tartaric, malic, and pectic acids, gum, carotenoids, alkaloids, ... [5], daucosterol, β-sitosterol, α-amyrin, eugenyl-β-rutinoside, scopolin	Steroids [9]

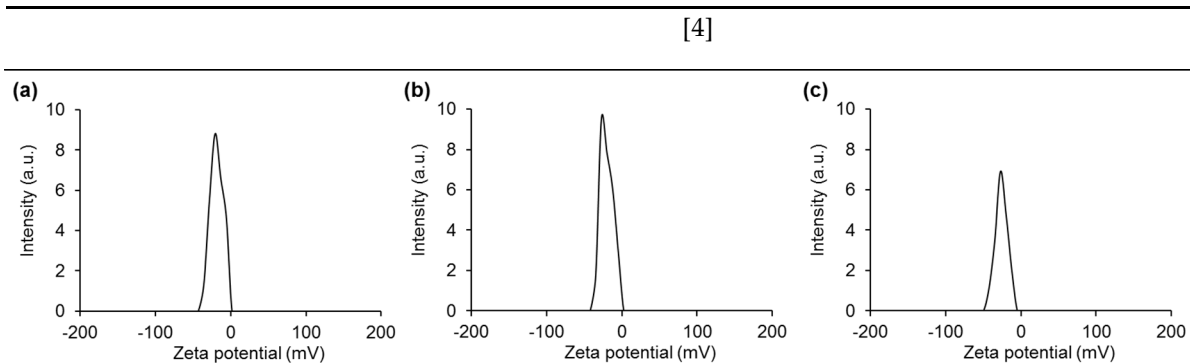


Figure S1. The zeta potential of P.uri.AgNP (a), P.zey.AgNP (b) and S.dul.AgNP (c).

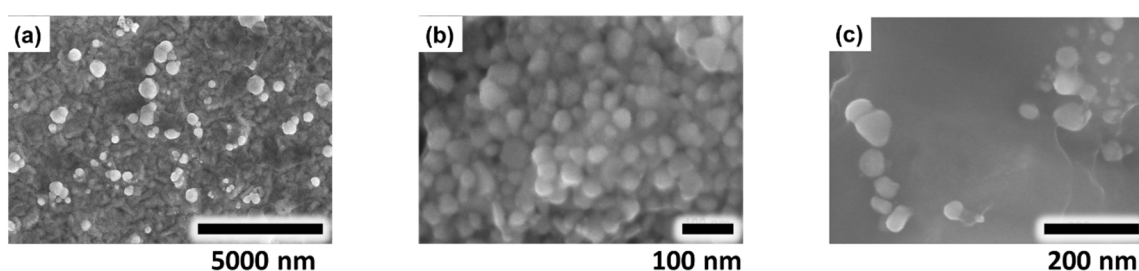


Figure S2. The SEM images of P.uri.AgNP (a), P.zey.AgNP (b) and S.dul.AgNP (c).

References

- Geethangili, M.; Ding, S.-T. A Review of the Phytochemistry and Pharmacology of *Phyllanthus urinaria* L. *Frontiers in pharmacology* **2018**, *9*, 1109-1109, doi:10.3389/fphar.2018.01109.
- Frezza, C.; Venditti, A.; Toniolo, C.; De Vita, D.; Franceschin, M.; Ventrone, A.; Tomassini, L.; Foddai, S.; Guiso, M.; Nicoletti, M., et al. Nor-Lignans: Occurrence in Plants and Biological Activities—A Review. *Molecules* **2020**, *25*, 197, doi:10.3390/molecules25010197.
- Phan, M.G.; Phan, T.S.; Matsunami, K.; Otsuka, H. Chemical and Biological Evaluation on Scopadulane-Type Diterpenoids from *Scoparia dulcis* of Vietnamese Origin. *Chemical and Pharmaceutical Bulletin* **2006**, *54*, 546-549, doi:10.1248/cpb.54.546.
- Fu, M.; Niu, Y.-Y.; Yu, J.; Kong, Q.-T. [Study on the chemical constituents in *Pouzolzia zeylanica*]. *Zhong Yao Cai* **2012**, *35*, 1778-1781.
- Hossain, M.S.; Rahman, M.S.; Imon, A.H.M.R.; Zaman, S.; Siddiky, A.S.M.B.A.; Mondal, M.; Sarwar, A.; Huq, T.B.; Adhikary, B.C.; Begum, T., et al. Ethnopharmacological investigations of methanolic extract of *Pouzolzia Zeylanica* (L.) Benn. *Clinical Phytoscience* **2016**, *2*, doi:10.1186/s40816-016-0022-7.
- M.R., M.; R.K., B.; S., J.; A.K., P.; A., M.; D.K., P.; P.R., C. A Brief Review on Phytoconstituents and Ethnopharmacology of *Scoparia Dulcis* Linn. (Scrophulariaceae). *International Journal of Phytomedicine* **2011**, *3*, 422-438.
- Liu, Q.; Yang, Q.M.; Hu, H.J.; Yang, L.; Yang, Y.B.; Chou, G.X.; Wang, Z.T. Bioactive diterpenoids and flavonoids from the aerial parts of *Scoparia dulcis*. *J Nat Prod* **2014**, *77*, 1594-1600, doi:10.1021/np500150f.
- Ahsan, M.; Islam, S.N.; Gray, A.I.; Stimson, W.H. Cytotoxic Diterpenes from *Scoparia dulcis*. *Journal of Natural Products* **2003**, *66*, 958-961, doi:10.1021/np020356j.
- Mishra, M.R.; Mishra, A.; Pradhan, D.K.; Panda, A.K.; Behera, R.K.; Jha, S. Antidiabetic and

Antioxidant Activity of *Scoparia dulcis* Linn. *Indian J Pharm Sci* **2013**, *75*, 610-614.



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).