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Anthocyanin as potential source for antimicrobial activity in *Clitoria ternatea* L. and *Dioscorea alata* L.

By: **Mahmad, N** (Mahmad, Noraini)^[1]; **Taha, RM** (Taha, R. M.)^[1]; **Othman, R** (Othman, Rashidi)^[2]; **Abdullah, S** (Abdullah, Sakinah)^[1]; **Anuar, N** (Anuar, Nordiyannah)^[1]; **Elias, H** (Elias, Hashimah)^[1]; **Rawi, N** (Rawi, Norlina)^[1]

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Abstract

Purpose The purpose of this paper is to validate the antimicrobial activity (both antibacterial and antifungal) of in vivo and in vitro ethanolic anthocyanin extracts of *Clitoria ternatea* L. (vivid blue flower butterfly-pea) and *Dioscorea alata* L. (purple yam) against selected bacteria (*Bacillus subtilis*, *Staphylococcus aureus* and *Escherichia coli*) and fungi (*Fusarium* sp., *Aspergillus niger* and *Trichoderma* sp.).

Design/methodology/approach The freeze-dried samples (0.2 g) from in vivo vivid blue flowers of *C. ternatea* L. were extracted using 10 mL ethanol (produced ethanolic red extraction) and 10 mL distilled water (produced aqueous blue extraction) separately. Two-month-old in vitro callus samples (0.2 g) were only extracted using 10 mL ethanol. The anthocyanin extractions were separated with the addition (several times) of ethyl acetate and distilled water (1:2:3) to remove stilbenoids, chlorophyll, less polar flavonoids and other non-polar compounds. Furthermore, the antimicrobial properties were determined using agar diffusion technique. Three bacteria (*B. subtilis*, *S. aureus* and *E. coli*) and fungi (*F. sp.*, *A. niger* and *T. sp.*) were streaked on bacteria agar and dextrose agar, respectively, using hockey stick. Then, the sterile paper discs (6 mm diameter) were pipetted with 20 µL of 1,010 CFU/mL chloramphenicol (as control for antibacterial) and carbendazim (as control for antifungal) in vivo and in vitro extracts. The plates were incubated at room temperature for 48 h, and the inhibition zones were measured.

Findings Based on the results, both in vivo and in vitro ethanolic extracts from vivid blue flowers of *C. ternatea* L. showed the best antibacterial activity against the same bacteria (*B. subtilis*), 11 and 10 mm inhibition zones, respectively. However, different antifungal activity was detected in in vitro ethanolic callus extract (12 mm), which was against *T. sp.*, contrary to in vivo ethanolic extract (10 mm), which was against *F. sp.*; antibacterial activity of *D. alata* L. was seen against the same bacteria (*E. coli*) with the highest inhibition zone for in vivo extract (8.8 mm), followed by in vitro extract (7.8 mm).

Research limitations/implications Anthocyanins are responsible for the water soluble and vacuolar, pink, red, purple and blue pigments present in coloured plant pigments. These pigments (pink, red, purple and blue) are of important agronomic value in many crops and ornamental plants. However, anthocyanins are not stable and are easy to degrade and fade whenever exposed to light.

Social implications Plant extracts containing bioactive agents with antimicrobial properties have been found to be useful in treating bacterial and fungal infections, as well as showed multiple antibiotic resistance.

Originality/value Both in vivo and in vitro extracts from vivid blue flower petals (*C. ternatea* L.) and purple yam (*D. alata* L.) have important applications as natural antimicrobial (antibacterial and antifungal) agents in the coating industry, instead of natural pharmaceutical products.


Keywords

Author Keywords: Antibacterial; *Clitoria ternatea* L.; *Dioscorea alata* L.; Antifungal; Ethanolic extract; Inhibition zone

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Author Information

Reprint Address: Mahmad, N (reprint author)

 Univ Malaya, Fac Sci, Inst Biol Sci, Kuala Lumpur, Malaysia.

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Addresses:

- [+](#) [1] Univ Malaya, Fac Sci, Inst Biol Sci, Kuala Lumpur, Malaysia
- [+](#) [2] Int Islamic Univ Malaysia, Dept Landscape Architecture, Kuala Lumpur, Malaysia

E-mail Addresses: fara_aid@siswa.um.edu.my; rosna@um.edu.my; rashidi@iium.edu.my; raihani_84@yahoo.com; nordiyahanuar@yahoo.com.my; shv_03@yahoo.com; inna_linn@yahoo.com

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