Phytochemical and chemotaxonomic study on *Iris albicans* Lange leaves

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**Article info**

Article history:
Received 14 June 2017
Received in revised form 9 October 2017
Accepted 27 November 2017

**Abstract**

Phytochemical investigation of the leaves of *Iris albicans* afforded eleven known compounds, including seven isoflavonoids (1–7) and four xanthones (8–11). The structures of these compounds were elucidated on the basis of spectral analysis and literature data. All compounds were reported for the first time from *I. albicans*. The chemotaxonomic significance of the isolated compounds was summarized. © 2017 Published by Elsevier Ltd.

**1. Subject and source**

Iridaceae is a family of more than 60 genera and 800 species and most abundant in both tropical and temperate regions (Shu et al., 2009). The genus *Iris* is a big genus comprises about 300 species (Farag et al., 2009; Evans, 2002). *Iris* species extends across the north temperate zone to North America, and is most diverse in Asia (Mathew, 1981). *Iris albicans*, known as the white cemetery iris or the white flag iris, is widely grown in many countries throughout the Middle East and North Africa as an ornamental plant due to its beautifully coloured flowers. The leaves are incurved markedly at tips, strongly glaucous. The stem is usually simple with two terminal flowers which are normally white with a yellow beard on falls, rarely mid-blue. The leaves of *I. albicans* were collected during the flowering stage in April 2015 from Assiut city, Egypt, altitude 64 m asl; latitude: 27°10’ 48.4824” N, longitude: 31°11’ 21.4188” E.

The plant was kindly authenticated by Prof. Dr. G. El-Naggar, Prof of Taxonomy, Faculty of Science, Assiut University, Assiut, Egypt. A voucher sample (No. 2015-IRTALB) has been deposited in the Herbarium of Pharmacognosy Department, Faculty of Pharmacy, Assiut University, Assiut, Egypt.

**2. Previous work**

Phytochemical investigations of various *Iris* species showed the presence of flavones, isoflavones, flavanones, xanthones, triterpenoids, stilbenes, coumaronochromones, quinones and triterpenes (Hanawa et al., 1991a, 1991b; Al-Khail et al., 1994; Seki et al., 1994, 1995; Minami et al., 1996; Williams et al., 1997; Atta-ur-Rahman et al., 2003; Reynaud et al., 2005; Qi et al., 2006; Fang et al., 2007). Although many reports have explored the phytochemical and biological diversity of various species of the genus *Iris*, few studies reported on *I. albicans*. Most of the previous studies focused the biological activities of its extract (Mothana et al., 2010; Hacibekiroglu and Kolak, 2015; Basgedik et al., 2015) with less attention on its chemical constituents (Williams et al., 1997; Masson et al., 2014). Herein, we will present the first report on
the phytochemical investigation on the leaves of *I. albicans* and discuss the chemotaxonomic significance of the isolated natural compounds.

3. Present study

A phytochemical study on the leaves extract of *I. albicans* Lange leads to isolation and identification of seven isoflavonoids (1–7), in addition to four xanthones (8–10). The structure determination was based on spectral methods, including UV, 1D, 2D NMR and HRMS.

450 g of the air-dried powdered leaves were refluxed with 70% EtOH till complete exhaustion (2L × 3) to provide an aqueous alcoholic extract (211 g). The alcoholic extract was mixed with 1 L of distilled H2O, and subjected to defatting with n-hexane to give n-hexane fraction (5.3 g), and aqueous fraction (15.1 g).

The aqueous fraction was subjected to Diaion-HP20 CC using CHCl3 (3:2) as eluent and monitored on TLC (Kiesel gel 60 F254) using hexane fraction (5.3 g), and aqueous fraction (15.1 g). The compounds were isolated as yellow amorphous powder and identified as isorosilbene (3) to provide an aqueous eluate (7.7 g), respectively. The alcoholic extract was mixed with 1 L of distilled H2O, and subjected to defatting with 16.1 min. Fraction (16.2 mg, Rf 18.8 min), (2) (8.3 mg, Rf 18.2 min), (6) (11.4 mg, Rf 14.4 min), (7) (14.9 mg, Rf 15.5 min) and (10) (9.1 mg, Rf 12.3 min) whilst Fraction (IA-2) afford compounds (3) (9.5 mg, Rf 22.5 min), (4) (8.2 mg, Rf 24.8 min), (5) (13.6 mg, Rf 26.1 min), (8) (22.8 mg, Rf 16.1 min), (9) (36.8 mg, Rf 16.7 min) and (11) (5.3 mg, Rf 23.0 min). The compounds were isolated as yellow amorphous powder and identified as irisilbene-4′-O-β-D-glucopyranosyl-(1 → 6)-β-D-glucopyranoside (germanasim E) (1) (Rahman et al., 2002), irisolone 4′-O-β-D-glucopyranosyl-(1 → 6)-β-D-glucopyranoside (2) (Rigano et al., 2007), tectorigenin 7-O-β-D-glucopyranoside (3) (Singab, 2004; Shawl and Kumar, 1992), irisolone 7-O-glucoside (tectoridine) (4) (Rahman et al., 2003), irigenin 7-O-β-D-glucopyranoside (iridin) (5) (Qin et al., 2005), iristectorigenin B 7-O-β-D-glucopyranosyl-(1 → 6)-β-D-glucopyranoside (6) (Farag et al., 1999), irisolide–7-O-β-D-glucopyranosyl-(1 → 6)-β-D-glucopyranoside (7) (Shi et al., 2012), mangiferin (8) (Abdel-Mageed et al., 2014), iso-mangiferin (9), neomangiferin (10) (Ichiki et al., 1998), and irixanthone (11) (Arisawa et al., 1973; Ali et al., 1993). All physical and spectral data of the isolated compounds were in agreement with the respective published data.

4. Chemotaxonomic significance

The family Iridaceae can be chemically distinguished from other monocot families in the diversity of its phenolic profile and the presence of several rare constituents, especially biflavonoids, quinones and xanthones (Williams et al., 1986, 1997).

The present study reports the isolation and identification of eleven compounds from the leaves of *I. albicans*, which could be grouped into: isoflavonoids (1–7) and C-glycosylxanthones (8–11) classes (Fig. 1). Notably, this is the first report of compounds (1–11) from the species of *I. albicans*.

Isoflavonoids are typical secondary metabolites of the genus *Iris*. The present study is one of the few research works that deal with constituents of *I. albicans* and is considered evidence that isoflavonoids can occasionally be synthesized in the leaves as well as the rhizomes. The study also showed isolation of four xanthone C-glycosides for the first time from *I. albicans*. Among the isolated xanthones, mangiferin (8) and isomangiferin (9) are the most abundant xanthone C-glycosides in the leaves of *I. albicans*.

[Fig. 1. Chemical structures of compounds 1–11 isolated from *I. albicans*.]
general, mangiferin does not apparently have any phyletic significance within the family but has systematic interest in its linking of the Tigrideae with the Irideae (Williams et al., 1986, 1997).

Xanthones as mangiferin and isomangiferin are widely distributed in the bearded irises, and sporadically occur in some sections of subgenus as Limniris, as well as in other genera of the Iridaceae (Williams et al., 1997). The present work shows the occurrence of mangiferin and isomangiferin in I. albicans (subgenus Iris, section Iris) which confirmed their chemical characteristic for this species and other members of section Iris, such as I. florentina (Fujita and Inoue, 1981, 1982), I. unguicularis (Arisawa et al., 1976), I. germanica (Ali et al., 1993), I. atrofuscus (Al-Khalil and Al-Eisawi, 1995), I. atropurpure (Al-Khalil and Al-Eisawi, 1995) and I. inbricata (Mykhalienko and Kovalyov, 2016).

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.bse.2017.11.007.

References


