PHARMACOGNOSTIC POTENTIAL FOR MEDICAL APPLICATION OF THE PLANT DRUG *JUSTICIA IRWINII* WASS. (ACANTHACEAE) OCCURRING IN THE CERRADO OF GOIÁS

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ABSTRACT

The family Acanthaceae, with about 240 genera and 3,240 species, is predominantly tropical. The genus *Justicia*, with about 900 species, is the largest in the family and contains various secondary metabolites such as alkaloids, lignans, flavonoids, and terpenoids with pharmacological potential. The species *Justicia irwinii* Wass., found in the Cerrado biome, has opposite, simple, lanceolate leaves with wavy margins. This study aimed to identify the main classes of secondary metabolites in the leaves of the species occurring in the city of Alexânia, GO, contributing to the botanical knowledge of Cerrado Acanthaceae. Adult leaves, fully expanded and located below the third node, were collected from 5–10 individuals from natural populations. The leaves were air-dried for seven days until constant weight. Qualitative phytochemical analysis, using methodologies adapted from the literature, revealed the presence of anthraquinone, cardioactive, and saponin glycosides, flavonoids, coumarins, and tannins. In the evaluation of essential oils, 49 common components were identified. This study is a promising start for the analysis of a genus found in the Cerrado of Goiás. However, additional biological assays are necessary to evaluate the pharmacological, genotoxic, and cytotoxic activities of the components found in the essential oil. The work contributes to the understanding of the therapeutic potential of plants in this region and opens the way for future research.

Keywords: secondary metabolites; phytochemical screening; herbal medicines.

INTRODUCTION

Studies on the Cerrado have concentrated on specific localities, generating uncertainties especially regarding estimates of its biodiversity (GUIMARÃES; SANTOS, 2006).

Among the families still unexplored in the biome, Acanthaceae deserves attention because of the small number of taxonomic and applied studies, particularly scarce in the Midwest Region. The family Acanthaceae comprises about 240 genera and 3,240 species widely distributed worldwide, with the New World representing approximately 85 genera and 2,000 known species (WASSHAUSEN, 2004).

Phytochemical studies on Acanthaceae species have shown their importance in traditional medicine for the treatment of urogenital infections, endometritis, urinary diseases, cystitis, leucorrhea, and pain in general. The species studied here was *Justicia irwinii* Wass., and in the literature, there are only pharmacognostic and essential oil composition studies for the species *Justicia pectoralis* Jacq., popularly known as *anador*.

In order to contribute to the chemical elucidation of the essential oil of the species under study, the aim was to describe the leaf morphology and phytochemical identification of the species occurring in Cerrado remnants along BR-060, in the municipality of Alexânia (16° 4' 42" S 48° 30' 35" W).

METHODOLOGY

For material collection, adult leaves of *Justicia irwinii* Wass. from 5 to 10 individuals were obtained along BR-060, Alexânia, Goiás. The leaves were air-dried for seven days, then pulverized in an electric mill for analysis. The samples were identified and stored for phytochemical screening. The morphological study was carried out on herbarium specimens with the aid of a stereoscopic microscope at the Herbarium of the *Universidade Estadual de Goiás* (MATOS, 1988; MATOS; MATOS, 1989; COSTA, 2001).

The essential oil was extracted by hydrodistillation using a modified Clevenger-type apparatus. Oil analysis was performed by gas chromatography coupled with mass spectrometry (GC/MS), using a capillary column and helium flow. Compounds were identified by comparison with digital mass spectrum libraries and retention indices from the literature (ADAMS, 2007; VAN DEN DOOL; KRATZ, 1963; FERRACINI, 1995).

O óleo essencial foi extraído por hidrodestilação com um aparelho tipo Clevenger modificado. A análise do óleo foi realizada por cromatografia gasosa

acoplada à espectrometria de massas (CG/EM), utilizando uma coluna capilar e fluxo de hélio. Os compostos foram identificados comparando-se com bibliotecas digitais de espectros de massa e índices de retenção de literatura (ADAMS, 2007; VAN DEN DOOL; KRATZ, 1963; FERRACINI, 1995).

RESULTS

The species *Justicia irwinii* Wass. is described as a subshrub 0.3–1.2 m in height, with ascending pubescent stems. Leaves are 5–10 × 2–6 cm, oval, both surfaces slightly tomentose, acuminate apex, rounded base, 10 pairs of veins; petioles 1–2 cm. Spikes are very reduced, 1–2 flowers, axillary or terminal, pedicels 5–13 mm long, pubescent; bracts 13–27 × 13–21 mm, leaf-like and slightly tomentose; bracteoles lanceolate, pubescent; sepals 9 × 2 mm, lanceolate, united only at the base, pubescent; corolla pink-purple or pink with distinct coloration on the lower lip, subcylindrical, basal tube 7 mm long, throat 1 cm long, upper lip 11–14 × 4 mm, lower lip 15–20 mm long; anthers with unequal thecae inserted at different heights of the connective, not spurred. Capsules 15–20 × 5–7 mm, glabrous.

The analyses revealed the presence of anthraquinone, cardioactive, and saponin glycosides, flavonoids, tannins, and coumarins. In the qualitative test for anthraquinone glycosides, in tubes (I) acidified medium with HCl and (II) non-acidified medium, a thin dark reddish-brown ring was observed. The Bornträger test is frequently used to detect free anthraquinones, where pink, red, or violet coloration is developed in a basic medium. After observing the colorations, it was concluded that the plant material of the analyzed sample contained anthraquinone glycosides. Free anthraquinone compounds are soluble in organic solvents and therefore migrate to the ether phase of the test tubes; moreover, they react with ammonium hydroxide, forming ammonia phenates, of pink coloration that intensifies over time, turning red. In acid hydrolysis, there is a release of combined anthraquinones; thus, in tube (I) the presence of anthraquinone glycosides was detected, and in tube (II) the presence of free anthraquinones.

In the search for cardioactive glycosides, all characterization reactions were positive, some with greater intensity. In the Liebermann-Burchard reaction, the extractive solution turned brown to dark brown-green. In the Keller-Kiliani reaction, a

reddish-brown ring was formed at the contact zone, and the acetic layer turned greenish-brown. In the Kedde reaction, the extractive solution showed dark brown-black to intense red coloration. In the characterization of the steroid nucleus under ultraviolet light (365 nm), yellow fluorescence was observed. Based on the observed colorations, it can be suggested that the plant material of the species *Justicia thunbergioides* analyzed contains cardioactive glycosides.

In the search for flavonoid glycosides, all characterization reactions were positive. In the studied species, the Shinoda reaction showed the extractive solution with brick-red to reddish-brown coloration. In the oxalo-boric reaction, yellow fluorescence under ultraviolet light (365 nm) was observed. In the concentrated sulfuric acid reaction, lemon-yellow fluorescence was observed under ultraviolet light (365 nm). In the aluminum chloride reaction, green-yellow fluorescence appeared under ultraviolet light (365 nm). In reactions with hydroxides, the extractive solution showed yellow-green and brown-yellow coloration. In the ferric chloride reaction, the extractive solution presented dark green-brown to blue-black coloration, probably due to the complexation of ferric chloride with hydroxyl groups present in flavonoid derivatives, forming colored products.

In the search for saponin glycosides, the samples formed persistent foam, even after the addition of dilute mineral acid. Foam formation mostly occurred starting from 6 mL of extractive solution. In tannin characterization, the gelatin reaction was positive, forming a white precipitate. In the search for coumarins, a yellow-green fluorescence was observed in the filter paper region containing the ether phase and a drop of NaOH 1M, under ultraviolet light at 365 nm.

The yield of the extracted oil from *Justicia thunbergioides* leaves was 0.05%.

In the analysis of the chemical composition of the essential oil of the species under study, in the vegetative stage, 49 components were identified. Among the 8 main components, 12.5% were monoterpenes, with monoterpene alcohols in smaller proportion. Sesquiterpenes corresponded to 82.50% of the total components of the essential oil, with sesquiterpene alcohols in greater proportion, representing 62.50% of the total.

CONCLUSION

This study enabled the description of the leaf morphology of the species studied and the determination of the chemical composition and yield of the essential oil.

Thus, this study contributes to understanding the chemical and ecological profile of the species of the Acanthaceae family and the genus, while also highlighting the need for biological assays to evaluate whether the components found in the essential oil of *Justicia irwinii* Wass. present pharmacological, genotoxic, and cytotoxic activities.

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