Anti-inflammatory and Antimicrobial Activity of the Different Conyza dioscoridis L. Desf. Organs

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Abstract

**Objectives:** This study was planned in order to assess the anti-inflammatory and antimicrobial potential of the different organs (leaf, flower and root) of *Conyza dioscoridis* (L.) Desf.

**Methods:** A preliminary phytochemical and chromatographic screening of the ethanol (70%) extracts was performed prior to the antimicrobial activity of the total ethanol (70%) extracts was evaluated in-vitro by the carrageenan-induced rat paw oedema method, as compared to Indomethacin. The antimicrobial activity of the total ethanol and successive extracts was assessed by the agar dilution method on a set of bacteria and fungi: MICs were determined.

**Results:** The acute toxicity study of the total ethanol (70%) extracts indicated their safety (LD 50 up to 5 g/kg body wt.). The ethanol (70%) extract of the leaf showed the highest percentage of oedema inhibition (76.20%). The in-vitro antimicrobial assay revealed that most of the fractions exhibited a significant activity against *Mycobacterium phlei*, as compared to the other tested strains (MICs ranging from 50 to 200 µg/ml); the lowest recorded MICs (50 µg/ml) were those of the successive ethanol extract of the roots and the ethyl acetate extract of the leaves. In addition, the successive ethanol extract of the roots exerted a noticeable effect against *Bacillus subtilis* (MIC, 100 µg/ml).

**Conclusion:** The data represented in this study demonstrate that the use of *C. dioscoridis* may lower the risk of microbial infections and exert an anti-inflammatory activity, probably due to the presence of phenolics. The use of extracts is recommended to achieve health benefits, rather than pure isolates due to the synergistic and additive effects of their components.

**Keywords:** *Conyza dioscoridis*; LD₅₀; Anti-inflammatory; Antimicrobial

Introduction

*Conyza dioscoridis* (L.) Desf. is a popular perennial shrub reputed for its folk medicinal uses. The antimicrobial effect of the ethanol extract of *C. dioscoridis* has been previously assessed against selected Gram-negative and Gram-positive bacteria, and unicellular and filamentous fungi [1]. The antinociceptive effect of the methanol extract of the aerial parts of the plant was evaluated on mice [2]; in addition to its anti-inflammatory effect on rabbits [3]. Another study revealed that oral administration of the methanol extract of the leaves (200 mg/kg) reduced the number of fecal discharge produced by castor oil in rabbits exerting a significant antidiarrheal effect [4]; this extract induced a dose-dependent relaxation of rabbit duodenal muscle, the inhibition was attributed to either a calcium-channel, or a possible ganglionic blocking effect. The insecticidal and anti-inflammatory activities of the aerial parts of the plant have been also recorded [5,6].

The present paper aimed to assess the anti-inflammatory and antimicrobial activity of three separate organs of *Conyza dioscoridis* (leaf, flower and root), in order to select the most suitable candidate for further pharmaceutical industrialization.

Materials and Methods

**Plant material**

*Conyza dioscoridis* was collected from El-Fayoum, Egypt, 2009. The plant was kindly identified and authenticated by Prof. Dr. Mounir M. Abdel-Ghani, Botany Department, Faculty of Science, Cairo University, Egypt. A voucher specimen is deposited at the Pharmacognosy Department, Faculty of Pharmacy, Beni-Suef University.

**Preparation of the extractives**

The different plant organs, leaf, flower and root (1 Kg, each) of *C. dioscoridis* were air-dried in shade and finely powdered.

A portion (0.5 kg) of each sample was extracted with 70% ethanol till exhaustion, and evaporated under reduced pressure to dryness. The remaining powdered organs were successively extracted with solvents in increasing polarity: petroleum ether (60-80), chloroform, ethyl acetate and ethanol (90%).

**Phytochemical and TLC screening of the extractives**

The different extractives were subjected to preliminary phytochemical screening [7-9], TLC screening [10], was carried out for detection of individual components.

**Determination of LD₅₀**

The total ethanol extracts of the leaf, flower and root of *Conyza dioscoridis* were estimated according to Spearman and Karber procedure [11]. Thirty male albino mice (25-30 g body weight) were divided into five groups each of six animals.

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Results

Yield, phytochemical and screening of the extractives

The percentage yields of solvent-free total ethanol (70%) extracts and successive extractives were recorded in Table 1.

Preliminary phytochemical screening of the fractions of the three organs revealed the presence of phenolic compounds, sterols, and/or triterpenes, carbohydrates, and/or glycosides in the three organs. TLC screening showed that terpenes and sterols are detected in petroleum ether and chloroform extracts of all the samples; and flavonoids in the ethyl acetate and ethanol extracts, being much more prominent in the ethanol extract of the root.

In vivo anti-inflammatory activity

The three alcoholic extracts exhibited as significant inhibition of inflammation in the following order (76.20%, 72.61% and 66.67% for the leaf, flower and roots, respectively), Table 2.

Antimicrobial activity

Results of the antimicrobial activity are presented in Table 3. The ethyl acetate extract of the leaf and ethanol extract of the root exhibited the highest growth inhibitory activity (MIC, 50 µg/ml) against Mycobacterium phlei. Concerning Bacillus subtilis, its susceptibility was chiefly to the ethanol extract of the root (MIC, 100 µg/ml). The chloroform extractives of the flower showed, on the other hand, a significant activity against Listeria innocua (MIC, 200 µg/ml). The chloroform extract of both the flowers and roots moderately inhibited the growth of Staphylococcus aureus "Non-pathogenic LMG 3242" (MIC, 200 µg/ml), while Candida albicans was mainly susceptible to the ethyl acetate and ethanol extracts of the root (MIC, 200 µg/ml).

Discussion

The present study was conducted to investigate the bioactivities of a plant used in folk medicine, in order to evaluate the scientific

| Extractives | Percentage yield (g/100 g) |
|-------------|---------------------------|
|             | Leaf | Flower | Root |
| Total ethanol (70%) | 4.97 | 3.66 | 3.11 |
| Petroleum ether | 1.33 | 2.99 | 1.17 |
| Chloroform | 10.6 | 0.71 | 0.24 |
| Ethyl acetate | 0.6 | 0.97 | 0.74 |
| Ethanol | 3.65 | 2.56 | 1.09 |

Table 1: Percentage yield of successive extractives of the different organs of C. dioscoridis (L.) Desf.

| Groups | Dose (mg/kg b.wt.) | Weight of rat hind paw ± S.E. | % of inhibition of inflammation |
|--------|-------------------|-------------------------------|-------------------------------|
| Gp 1: | -ve control | 1ml saline | 1.44 ± 0.22 | 0.60 ± 0.15 | 0.84 | -- |
| Gp2: | Leaf | 50 | 1.14 ± 0.07 | 0.94±.14 | 0.20* | 76.20%* |
| Gp3: | Flower | 50 | 1.18 ± 0.19 | 0.95±.12 | 0.23* | 72.61% |
| Gp4: | Root | 50 | 1.11 ± 0.16 | 0.83±.20 | 0.28* | 66.67% |
| Gp5: | Indomethacin | 30 | 1.16 ± 0.09 | 0.98±.07 | 0.18* | 78.57% |

± S.E.: Mean standard error.
*: Statistically significant compared to the normal control group at P<0.05.

Table 2: Acute anti-inflammatory activity of total alcoholic extracts of leaves, flowers and roots of C. dioscoridis (L.) Desf. in male albino rats (n=6) using carrageenan-induced rat hind paw oedema.
basis of its activity in rheumatic pain and diarrhea. It was reported that the antinflammatory, antioxidant and anti-infectious activities are related to the presence of phenolic compounds [16]. Inhibition of leukocyte chemotaxis may be involved in the anti-infectious activity of phenolic compounds, and that one of the anti-infectious actions of phenolic compounds is the prevention of the production of oxygen free-radicals by leukocytes [17,18]. Also, related the antinflammatory activity with the presence of phenolic compounds. Among literature, the chloroform extract is effective as antibacterial [19], which is in agreement with our finding as most of the chloroform fraction of the three organs are active as antibacterial with MIC ranging from 50-200 µg/ml. Investigation of the activity of plant against non-tuberculous mycobacteria, Mycobacterium phlei were reported previously [20], using ciprofloxacin and doxycycline as standard.s and by comparing these results with of Conyza dioscoridis fractions; Conyza has more activity than other extract and less than the standards. It is, however, important that further studies on isolated pure compounds of Conyza dioscoridis should be carried out.

Conclusion
The data represented in this study demonstrate that the use of C. dioscoridis may lower the risk of microbial infections and exert an anti-infection activity, probably due to the presence of phenolics. The use of extracts is recommended to achieve health benefits rather than pure isolates due to the synergistic and additive effects of their components.

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