Standardization the Crude Extracts of all Urtica plant Species Growing in Palestine for Quality Control of Cosmeceutical and Pharmaceutical Formulations

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Research Article

Standardization of Crude Extracts of Four Urtica plant Species in Palestine for Quality Control of Cosmeceutical and Pharmaceutical Formulations

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ABSTRACT
Background: The safety and therapeutic efficacy of pharmaceutical formulations are mainly dependent on the quality controls and standards by which they are formulated. Given the powerful actions of prescribed medicinal plants and their extracts, they have been used as sources of medications from ancient times until now and the usage of plants as a source of cosmetics and medications by the population seems to never stop, even with the chemical synthetic medicine evolution. Objective: This study aimed to evaluate the yields of standardized extracts of the active constituents of four species of native Urtica plants (Urtica kioviensis Rogow., Urtica membranacea Poir. ex Savigny, Urtica pilulifera L. and Urtica urens L.) growing wildly in Palestine and used for treatment as well as used in cosmetics. Methods: Serial exhaustive extraction method was performed for the four species of Urtica without boiling to avoid the hydrolysis of the active phytochemical compounds. Results: The best percentage of the aqueous extract yield was of Urtica kioviensis 6.09 g (24.36% of the total starting weight), while the best organic extract yield was of Urtica kioviensis 0.72 g (2.88% of the total starting weight). Conclusion: Urtica kioviensis, Urtica pilulifera, Urtica urens aqueous exhaustive extracts and Urtica kioviensis organic exhaustive extracts have the capability for manufacturing of cosmeceutical formulations and pharmaceutical preparations.

Keywords: Standardization; Serial extraction; Urtica kioviensis; Urtica pilulifera; Urtica urens; Urtica membranacea

INTRODUCTION

Most of the world's population, especially in the developing countries still depends on plant-based medicines for their primary health care according to the World Health Organization. This is a clear indicator for the value of plants in treatment of diseases and maintenance of health, as well as being therapeutic alternatives. Plants are still a very important source of medicines[1,2]. Recent years have witnessed a renewed interest in plants as cosmeceuticals, pharmaceuticals in the world. There is the need to open new channels for discovery of physiologically and biologically active compounds by the pharmaceutical and cosmeceutical industry. The process of cosmetics development from plants involves isolation, identification, extraction of active components from whole plants and, in some cases, synthesis of equivalent active compounds[3].

Now a day many studies show that about 25% of the medications prescribed around the world are from plants. Of the 252 drugs considered essential by the WHO, 11% are exclusively of herbal origin and a significant number are synthetic chemical medications synthesized from natural molecular precursors. Examples of important drugs obtained from plants are atropine from Atropa belladonna L., vincristine from Catharanthus roseus, papaverine, morphine and codeine from Papaver somniferum L. and a lot of other medications[4]. The utilization of medicinal plants has been developed, there has been a gradual revival of interest in the use of herbal medicines throughout the world, and over the last years herbal medicines have been reported safely with few adverse side effects especially in comparison with synthetic chemicals. Thus, a search for new medications with safer and better substitutes from natural origin is a current practice. The therapeutic values of these plants depend on some chemical molecules that produce physiological and biological activities[5].

Nettle (Stinging nettle), Urtica kioviensis Rogow., Urtica membranacea Poir. ex Savigny, Urtica pilulifera L. and Urtica urens L. (Fig. 1) are annual herbaceous plants belonging to the family Urticaceae naturally growing in the mountains, pathways, fields and wild Palestine. They are grown in mild climates and barriers, between cultivated lands, and waste tunnels in addition to all that they have a wide distribution in the world[6].

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Figure 1: A. Urtica kioviensis, B. Urtica membranacea, C. Urtica pilulifera, D. Urtica urens

Table 1: Urtica plant species voucher specimen codes

Urtica plants spec wildly in Palestine	Voucher sp code
Urtica kioviensis	Pharm-PC-1559
Urtica membranace	Pharm-PC-1560
Urtica pilulifera	Pharm-PC-1561
Urtica urens	Pharm-PC-1562

Nettle leaves are serrated, and have stinging, dark green color. The leaves are 4 cm long, 2 oval, and core in shape and can cause burning and blushing of skin if touched. The flowers of nettle are small and green usually cultivated from May to September. The fruits of nettle are arid and single germ[7].

Nettle leaves are rich with micronutrients like all green vegetables and considered a nutritious food but these leaves should be cooked or steamed before consumption to get rid of the stinging hairs, which contain formic acid, histamine, butyric acid, leukotrienes, acetylcholine, 5-Hydroxytryptamine and irritant compounds[6,8-10].

The skin contact with these hairs leads to a mildly painful itching, sting and numbness lasting from minutes to days also may dev erythematous macule but the nettle leaves do not cause this reaction in medicinal extracts if hairs are destroyed in preparing of them[11-13].

Stinging nettle contains lectins and poly(sacchar important particularly in prostate cancer)[14], it also contains lignans phytochemicals such as (-)-3,4-divanillyltetrahydrofuran (useful in benign prostatic hyperplasia) as well as contains Bis(2-ethylhexyl) maleate, Dibutyl phtaleate, Neophyta 1,2-benzenocli carboxylic acid, and Phthalic classes of natural phytochemicals like alkaloids, flavonoids, tannins, glycosides, proteins and ph compounds[15-17].

In the folk medicine Nettle leaves are used for the treatment of eczema, digestion and sexual disorders, muscle pains, mild menorrhagia, gout, anemia, hair loss, hypertension, hay fever, arthritis, and in the treatment of symptomatic benign prostatic hyperplasia as well as used as cleaning tonic, blood purifier, hy antiasthmatic, depurative, astringent an[11-18] [24].

In cosmetics the plant used for man shampoo, astringent and deodorizing spray, cleansers and hair conditioning cream[25,26].

Table 2: The weights of the resulted extracts

The serial extract	Urtica kioviensis extract weight in mg	Urtica membranacea extract weight in mg	Urtica pilulifera extract weight in mg	Urtica urens weight in mg
The organic extract	72	68	45	62
The first aqueous extract	433	343	421	411
The second aqueous extract	176	123	161	122
Total of the aqueous extracts	609	466	582	533

The recent evidence based study showed that Urtica can be used for treatment of benign prostatic hyperplasia and other urinary conditions[27,28], while the whole plant clinically approved their effect for treatment of arthritis and other related conditions[29-32]. Other recent scientific studies found that Nettle extracts have antibacterial effects on the gram positive and negative bacteria several times more than chemical materials[33,34], antiviral (viruses such as hepatitis and AIDS)[35] and antifungal activities[36]. Also useful in treatment of cardiovascular diseases (vasculitis), improve lipid profile, inhibition of platelet aggregation[37,38] and allergic rhinitis, it may be useful for allergic diseases of all types[39].

Table 3: The percentages of the extracts

Urtica plant species in Palestine	The percentage of the organic exhaustive extraction	The percentage of the aqueous serial exhaustive extraction
Urtica kioviensis	2.88	24.36
Urtica membranacea	2.72	18.64
Urtica pilulifera	1.8	23.28
Urtica urens	2.48	21.32

MATERIAL AND METHODS

Collection, identification and treatment of the four Urtica species samples:

The leaves of *Urtica kioviensis*, *Urtica membranacea*, *Urtica pilulifera* and *Urtica urens* were collected from different regions of Palestine between March and April 2014. The plant was botanically identified by Dr. Nidal Jaradat from the Pharmacy Department at An-Najah National University. Voucher specimen was deposited in the Herbarium of the Pharmaceutical Chemistry and Technology Division (Laboratory of Pharmacognosy) and the plants codes are presented in (Table 1).

Later the leaves of four species were cleaned and washed with soft clothes to remove all dust, mud and insects, then dried at 25±3 °C with continuous overturn to prevent mold. Then were ground well by mechanical grinder, placed in airtight bottles and stored in desiccator to be used later for extraction[40].

Chemicals & Instruments

Methanol, hexane, ethanol, distilled wate shaker device (Memmert Shaking Incubator, G rotary evaporator (Heidolph OB2000 Hei Germany), freeze dryer (Mill rock technology, model BT85, China), grinder (Moulinex, mod China), balance (Radwag, AS 220/C/2, Poland), filter paper (Macherey-Nagel, MN 617 and Whatman No.1) than chemical

The first extraction

The leaves of the four plant samples were dried in shade for about 2 weeks, at room tempe became completely dry. The leaves of the four plant species were obtained and cut into pieces, then powdered in a mechanical gram of the powdered plant, were suspe hexane which is relatively safe, largely unreactive and easily evaporated non-polar (hydrophobic) sol and 250 ml of 50% ethanol in triple dis ensure sterility) in a bottle, with contin round per minute) for 72 hours at 25 °C in the sh incubator. After that, the mixture wa Whitman s No.1 filter paper using Buchner funnel. The plant materials that had been acc filter paper were re-extracted again (2nd extraction).

The liquid filtrate was separated by sep 2 phases: lower phase which has higher phase) and upper phase which has lower densi phase). The aqueous phase was collecte a volumetric flask at room temperature (obtaining the powder of aqueous extra phase was collected second in preweighed placed glass beaker, which was placed in the temperature in order to evaporate the s (n-hexane), and to obtain the organic extract. The organic extract was weighed again after weight of the organic extract was determined calculating the difference of the weights was kept in sterile brown container at 4 °C in the refrigerator till la

The second extraction

This extraction was only for the aqueo plant materials that accumulated on the filter paper a the first filtration were re-extracted again, by addin ml of 50% ethanol in triple distilled continuous shaking for 72 hours in the at 25 °C as before. A second filtration for t done by using Whitman s No.1 filter p Buchner funnel. The second aqueous ph after filtration and kept in a volumetri temperature.

Figure 2: The percentage of the organic exhaustive extraction [illegible] plant species

Figure 3: The percentage of the aqueous exhaustive extractio

The rotary evaporator was used at 40°C for 1 hour to evaporate any leftover organic solvents from the aqueous phases obtained from the first and second extraction. Then both aqueous extracts were put separately in preweighed freeze dryer bottles and placed on the freeze dryer for 24 hours till they dried completely. Then the freeze dryer bottles were weighed again, and the dry weight of both extracts was calculated[11]. All these procedures repeated four times for each plant species.

RESULTS AND DISCUSION

The aqueous and organic extracts

Twenty five grams of four species of Urtica plant powders were subjected to exhaustive extrac

The weights and percentages of the dried aqueous and organic extracts that were produced from first and second extractions are shown in Table 2 and Table 3 and clarified in (Fig. 2) and (Fig. 3). The results showed that the best total aqueous yield was Urtica kioviensis 609mg (24.36% of the total starting p[illegible] weight), while the best organic extract yie[illegible] Urtica kioviensis 72mg (2.88% of the total st[illegible] powder weight). Urtica

The safety and efficacy of herbal medications are dependent upon the standards by which [illegible] and our knowledge base when presc[illegible] according to the American Herbal Phar[illegible] Therapeutic Compendium Nettle the aqueous extract yields must be no less 20% while the

organic extracts yields must be 2.5% at least. These results mean Urtica kioviensis, Urtica pilulifera, Urtica urens aqueous serial exhaustive extraction and Urtica kioviensis organic exhaustive extraction yields can be used in the quality control and standardization for products manufacturing of cosmetics formulations and pharmaceutical preparations

CONCLUSION

The leaves of Urtica kioviensis, Urtica membranacea, Urtica pilulifera and Urtica urens which were collected from different regions of the West Bank/ Palestine, were exhaustively extracted by using polar and non-polar solvents. This research scientifically confirmed that Urtica kioviensis is the best source for further manufacturing of standardized cosmeceutical and pharmacological active and evidence based pharmaceutical products. We recommend researchers to use Urtica kioviensis plant for their future scientific researches as well as it could be a source for natural foods supplements, pharmaceutical and cosmeceutical industry.

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