



Current Application of *Adiantum Capillus-Veneris* L Based in Uses Mentioned by Ibn Rushd - A Review

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Abstract

This is a specific review of *Adiantum capillus-veneris* L. (*Maidenhair fern*) known as Barshawshan, and Kuzburat-el bir in Arabic, focusing in the current ethnopharmacological research confirming the uses mention by Ibn Rusd, such as alopecia, nephrolithiasis, chest and lung, scrofula and empyema.

Introduction

The Andalusian philosopher Ibn Rushd (1128-1198 A.D.), known in west by the name of Averroes. Ibn rush was a faithful disciple of Aristotle and he stuck to the organization of the Aristotelian corpus implemented by Andronicus of Rhodes. He wrote many books in natural physics and philosophy in addition one book in medicine known as “*Kulliyat Fi A-Tibb*, known in its Latin translation as *Colliget* [1,2]. Ibn Rushd wrote a full chapter of using medicinal plants used for treatment of verities of diseases in different dosage forms following Galen in their application [1]. In this paper I will focus on *Adiantum capillus veneris* L. (*Pteridaceae*), commonly known as “*Maidenhair fern*, *Venus hair fern*”, uses mentioned by Ibn Rushd and their current application based on scientific researches.

As early as in 100 A.C. Dioscorides described *Adiantum capillus-veneris* by the name of Adiaurov for having leaves serrated at the top like coriander. The Andalusian Arabs, however, appear to use *Adiantum capillus-veneris*, as they call the plant *Kuzburat-el bir* or “coriander of the well”, indicating a habitat where *A. capillus veneris* is not found. Ibn Rushd described the drug under the name of Barshawshan, while Ibn Sina and other medical writers describe the drug under the name of Barsiawashan, which is the Arabic form of its Persian name Parsiawashan. *Capillus-veneris* means hair of Venus, the goddess of love named by ancient Greeks because it has stunning fronds, 'capillus' means “hair” and 'veneris' comes from Venus [2-7].

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Uses mentioned by Ibn Rushd

“Barshawshan, also known as *Kuzburat-el bir* = coriander of the well”. This drug was approved by Galen as moderate in his first powers, even though it is a drug that has many seconds and tertiary function. Among them, it softens, dissolves and affects hair growth in case of alopecia, dissolves Scrofula and Empyema, lithotripsy and helps in blotting thick sticky humors that come out of the chest and lung. Galen says that it holds the abdomen. Resident (residents = physicians with lower rank than Galen) says that it has laxative effect. Such a drug should tighten the hand on it, I mean drugs that have seconds and tertiary actions, and nevertheless they are moderate for something that you will know later [1].”

Chemical composition of *Adiantum capillus-veneris*

Chemical analysis of the leaves of *A. capillus-veneris* showed that it contained triterpenoidal compounds belonging to adiantane and filicane groups were isolated from the fern (isoadiantone, isoadiantol-B; 3-methoxy-4-hydroxyfilicane and 3,4-dihydroxyfilicane). Flavonoids and flavonoglycosides (quercetin, quercetin-3-O-glucoside, quercetin-3-O-rutinoside and rutin) [8].

Four sulphate esters of hydroxycinnamic acid-sugar derivatives were isolated from the fronds of the fern; these compounds have been shown to be 1-p-coumarylglucose 6-sulphate, 1-p-coumarylglucose 2-sulphate, 1-caffeylglactose 3-sulphate, and 1-caffeylglactose 6-sulphate. The total phenolics and total flavonoids in the leaves were 224.76 ± 9.75 and 49.62 ± 0.875 in the aqueous extract, 156.34 ± 9.70 and 78.18 ± 1.741 in the methanolic extract and 36.53 ± 3.65 and 50.15 ± 4.79 mg/100 g in the ethanolic extract, respectively. Ten trace elements (Mg, Ca, K, Mn, Fe, Co, Na, Ni, Cu, and Zn) were determined in leaves [3,9].

Pharmacology of *Adiantum capillus-veneris* for the treatment of Alopecia

There are many forms of alopecia being the most common one is Androgenic Alopecia (AGA) which affects millions of men and women. Hair loss for both men and women may begin as early as adolescence but can start even in later decades of life. Hair loss severity in women is usually much less than in men [10]. Topical 5% minoxidil is approved drug, by FDA and EMA, for the treatment of (AGA). Minoxidil suppressed Steroid-5 α -Reductase type 2 (SRD5 α 2), Vascular Endothelial Growth Factor (VEGF) [11,12].

The ethanolic extract of Maidenhair fern was evaluated through testosterone-induced alopecia model in mice. The solution was applied topically to the back skin of animals in the respective group. Hair growth was evaluated by visual observation and histological study of several skin sections via various parameters as follicle density (number of follicles/mm) and anagen/telogen ratio. After 21 days, a patch of diffuse hair loss was seen in animals received testosterone while animals treated with *A. capillus-veneris* showed less hair loss as compared to those treated with testosterone only. Anagen/telogen ratio was significantly affected by *A. capillus-veneris*, which was 0.92 ± 0.06 as compared with 0.23 ± 0.03 and 1.12 ± 0.06 for testosterone and finasteride treated groups, respectively. According to visual observation and quantitative data (follicular density and anagen/telogen ratio), *A. capillus-veneris* was found to possess good activity against testosterone-induced alopecia [3,13].

Pharmacology of *A. capillus-veneris* for the treatment of Nephrolithiasis

Nephrolithiasis, a condition refers to the formation of calculus in the kidney due to deposition of calcium oxalate or phosphate from urine, is one of the common but serious problem due to its recurrence since antiquity, if not managed properly ends with renal failure. Today 12% of the global population suffering from the problem of nephrolithiasis with its recurrence rate higher in male (70% to 80%) than the female (47% to 60%) [14,15]. Leaves of *A. capillus-veneris* are used in renal and gallstones, urinary infection and to promote menstruation [16].

Investigation the anti urolithiasic effect of the hydro alcoholic extract of *A. capillus veneris* in male Sprague Dawley rats. A total of forty eight rats were used for the study. The animals were divided into six groups of eight animals each. Test groups were treated with 127.6 mg/kg and 255.2 mg/kg of test drug and standard control with Cystone (750 mg/kg) for 21 days. Urine microscopy showed significant ($p < 0.001$ and $p < 0.01$ respectively) reduction, in the number of crystals in test groups, serum levels of calcium, phosphorous, blood urea were found to be decreased significantly in all the groups, the findings approved the anti urolithic activity of *A. capillus veneris* [17].

In vitro calcium oxalate crystallization nucleation and aggregation assay. Crystallization was induced by addition of 50 μ l of 0.1M sodium oxalate in whole urine in the absence and the presence of extract at different. The rate was evaluated by comparing the slope of turbidity in the presence of extract with that of control using the spectrophotometer. Extract of the *A. capillus veneris* test drug inhibited the crystallization in solution; less and smaller particles were observed in the presence of extract. These results were further confirmed in the nucleation assay, though the rate of nucleation was not inhibited but number of crystals was found to be decreased. The test drug also inhibited crystal aggregation. It can be concluded

therefore, that the *A. capillus veneris* drug possesses significant antilithiasic activity [18].

The effects of oral administration of hydro alcoholic extract of *A. capillus veneris* drug were studied on calcium oxalate urolithiasis. A total of 48 rats were used for the study, certain groups were treated with distilled water only, where as in other groups nephrolithiasis was induced by providing drinking water containing 0.75% ethylene glycol and 1% ammonium chloride for 7 days. Test groups were treated with 127.6 mg/kg and 255.2 mg/kg of *A. capillus veneris* test drug and standard control with Cystone (750 mg/kg) for 21 days. Urine microscopy showed significant reduction ($p < 0.001$ and $p < 0.01$) in the number of crystals in test groups as a result *A. capillus veneris* extract confirmed its antiurolithic activity. It is supposed in this study that antiurolithiasic activity of *A. capillus veneris* may also be due to its flavonoids constituent [19,20].

Pharmacology of *Adiantum capillus-veneris* for the treatment of chest and lungs

A tea decoction, infusion and syrup of *A. capillus-veneris* is used in the treatment of coughs, throat afflictions, bronchitis, excessive mucous, lung problems, respiratory ailments to sooth membranes and increase perspiration [2-7].

Peruvian Amazon tribes used *A. capillus-veneris* as in infusion or syrup for cough and respiratory system disorders [21]. For whooping cough in children, a decoction of the root bark (50 ml) is given. Ash of the whole plant is given with honey for chronic cough and asthma [22].

Despite, the plant has ancient history for the treatment of respiratory disorders, no clinical research been done to validate these traditional uses [22].

Twenty four healthy Wistar rats were trained using interval training for 6 weeks followed by a 3-week stay in hypoxia conditions. Half of the hypoxia samples received 500 ml/gr/per body weight daily *A. capillus-veneris* within 3 weeks of hypoxia. At the end, the lung tissue was removed for histological and immunohistological analysis. After 3 weeks of hypoxia exposure following 6 weeks of exercise, expression of P53 and TNF- α increased and the respiratory surface decreased ($p \leq 0.05$). After 3 weeks of taking the *A. capillus-veneris* extract during hypoxia exposure, reduced P53 and TNF- α expression and the increased respiratory surface were observed ($p \leq 0.05$). Results suggest that the antioxidative properties of *A. capillus-veneris* extract could decrease the destructive structural and molecular events that happen along with hypoxia exposure or intense exercise training [23]. Similar finding strongly suggest that hypoxia and high-intensity exercise training can increase apoptosis of lung cells and *A. diantum capillus-veneris* extract can have anti-apoptotic effects.

An apoptosis state was induced in the lung parenchyma upon consuming *A. capillus-veneris* extract modulated this state [24].

Twenty-four male Wistar rats without clinically evident disease were used. The rats were exposed to hypoxia environment for 3 week following 6 weeks interval training. Twelve of the experimental samples were taken 500 ml *A. capillus-veneris* extract per body weight (kg) in during exposure to hypoxia environment. Finally lung tissue was removed for immunohistochemistry tests of HSP70 and HSP90. Expression of HSP70 and HSP90 protein decreased significantly in the supplement hypoxia group comparison with the hypoxia group ($P \leq 0.05$).

Conclusion: Reduction effects of *A. capillus-veneris* extract on expression of the parenchyma lung heat-shock protein in hypoxia conditions was observed that probably indicate decreased oxidative stress in the lung [25].

Pharmacology of *Adiantum capillus-veneris* for the treatment of Scrofula and Empyema

Scrofula is the Latin word for brood sow, and it is the term applied to tuberculosis of the neck. Scrofula (*Tuberculous lymphadenitis*) has been known to afflict people since antiquity, and during the Middle Ages, was known as the “king’s evil” in Europe, where the royal touch was believed to cure the disease until the 18th century. Cervical lymphadenitis is the most common presentation of extra pulmonary tuberculosis [26]. In modern times, surgery has played a pivotal role in the diagnosis and treatment of scrofula [27].

Empyema is also called pyothorax or purulent pleuritis. It’s a condition in which pus gathers in the area between the lungs and the inner surface of the chest wall. Empyema usually develops after pneumonia, which is an infection of the lung tissue. Many different types of bacteria may cause pneumonia, but the two most common are *streptococcus pneumoniae* and *staphylococcus aureus* [27].

Various *Adiantum spp.* extracts were tested for their antimicrobial agents against five gram positive, six gram negative, including multiresistant bacteria *staphylococcus aureus*. The maximum activity was exhibited by the methanolic extract of *Adiantum venustum* followed by *Adiantum capillus-veneris*. The methanolic extract of had very low MIC value (0.48 µg/ml) against *Escherichia coli* [2-6,28]. Ethanolic extract of *A. capillus-veneris* showed antibacterial activity against *S. aureus*. The results of current investigation are consistent with previous reports [29].

Conclusion

Modern Ethnopharmacology validated the uses of *A. capillus-veneris* written by Ibn Rushd.

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