Review Article

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Arnebia *hispidissima* an Analgesic – Phytochemical and Pharmacological Activities

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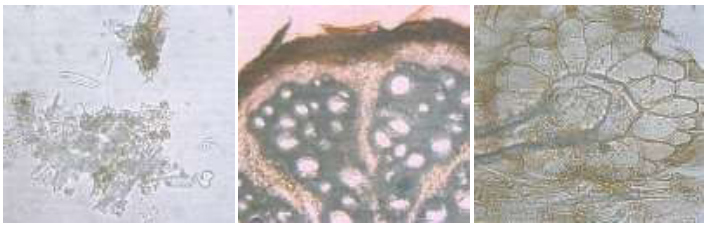
Arnebia hispidissima (Lehm.) DC. Commonly known as Arabian primrose Is an annual or perennial branched herb belonging to family Boaginaceae, found throughout Arabia in dry sandy areas. Also distributed in Northern and East Africa and Pakistan [1]. The plant is widespread in the U.A.E, especially in the northern Emirates and northern region of Abu Dhabi Emirate.

Whole Plant

The whole plant is used for fevers, including malarial fever. The plant is boiled in water (to which sugar may be added) and is taken as tea to lessen fever. The flowers and roots are used as a cosmetic. The roots yield a purple-blue dye, which is rubbed on the face as a cosmetic. The roots of *Arnebia decumbens* (kahal, kahla) give a red dye, which is also used on the face as a cosmetic [1,2]. The paste of the roots is applied on inflamed injury.



A B C

A. A group of different fragments showing broken warty covering trichomes, epidermal cells and mesophyll tissues containing colored pigments, vascular tissues, and an 8-shaped pollen grain (leaf with little floral parts).
B. A portion of a transverse section of the root showing the pattern of the vascular tissues (dark areas with light colored circular areas) and medullary rays. Shown also is the epidermal layer containing colored matter and underlain cortex zone (light pink).
C. Large characteristic cells surrounding the base of a large covering trichome of the lower epidermis of leaf.

Phyto Chemical Cnstituents:

Shikonin derivatives such as arnebin-5, arnebin-6, teracryl shikonin, arnebinone and acetyl shikonin (Singh, 2003). Arnebin-7, alkannin acetate, alkannin isovalerate, alkanet and β-sitosterol. Alkannin β- hydroxyisovalerate from the roots [3]. A flavonoid, characterised as vitexin, has been isolated from the fresh flowers of *Arnebia hispidissima*. A dye, commonly known as Ratanjot in Indo- Pakistan medicine, is obtained from the roots of *A. hispidissima.* Vitexin from flowers [4]. Red pigment in the roots is composed of a group of naphthoquinonic: shikonin (and esters), its optical isomer alkannin (and derivatives) and their common racemic form shikalkin, as well as arnebifuranone. The aerial parts include arnebins and the triterpenoid sbetulin, β-amyrin and lupeol.

Triterpenes and β-Amyrin (0.29%) [5]. In roots: alkannin (also arnebin-4), acetyl alkannin or arnebin-3, isovaleryl alkannin, β-hydroxy isovalerylalkannin, shikonin, deoxy alkannin, deoxy shikonin or arnebin-7 [6].

The following chemical studies have been carried out (Quality Control methods, 1998; Evans, (1996) on the plant *Arnebia hispidima.*

Physicochemical constants (%)

Loss of weight in drying at 105°C	: 10.40 Absolute
alcohol solubility	: 2.00
Water solubility	: 17.80

Successive extractives (%)

Petroleum ether (60-80°C)	: 1.40
Chloroform	: 0.90
Absolute alcohol	: 2.60

pH values (aqueous solution)

pH of 1% solution	: 9.114-9.140
pH of 10% solution	: 8.686-8.690

Ash values (%)

Total ash	: 17.98-25.67
Water soluble ash	: 5.00
Acid insoluble ash (10% HCl)	: 1.47-2.00

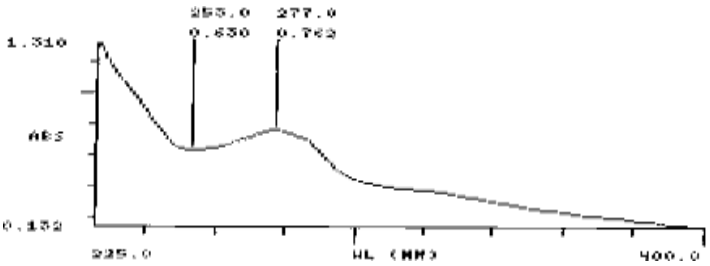
Elemental analyses:

Ash values (British Herbal Pharmacopeia- Reference)					
Assay and identification of metal (AOAC International- Reference)					
Apparatus (AA-6800 Shimadzu-Flame method)					
Element	Std. conc. µg/ml	Sample conc. mg/ml	sample absorbance	Actual conc. mg/ml	Actual conc. (%)
Cr	1, 2, 4	10	0.000	-Ve	-Ve
Zn	0.25,0.5, 1	10	0.1074	0.00928	0.000928
Cu	1, 2, 4	10	0.0234	0.01044	0.001044
Fe	1, 2, 4	10	0.5588	0.39579	0.039579
Ca	1, 2, 4	10	0.5883	3.5656599	0.35656599
Pb	1, 2, 4	10	0.0172	0.00172	0.000172
Cd	0.25, 0.5, 1	10	0.000	0.000	0.000
K	1, 2, 4	1	1.3872	13.7671	1.37671

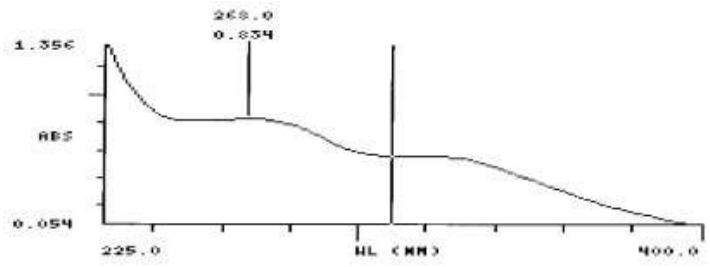
1ppm conc. = 1µg/ml; Actual conc. (%) =Actual conc. (ppm) x 0.0001 [1ppm=0.0001%]

UV Spectral studies:

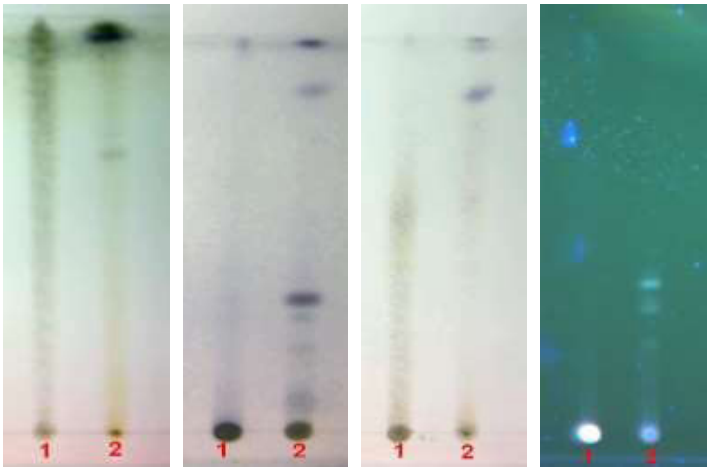
Sample conc. (mg/ml)	Solvent	λ max (nm)	λ min (nm)	Abs. (λ max – λ min)
0.625	Intestinal Fluid simulated without pancreatic pH = 7.5 ± 0.1	277	253	0.762-0.630
0.9979	Gastric Fluid simulated without pepsin pH = 1.2 ± 0.1	268	250	0.834-0.811



Gastric fluid simulated without pepsin pH=1.2±0.1



Intestinal Fluid simulated without pancreatic pH=7.5±0.1



A B C D

Thin layer chromatography (TLC): Wagner (1996)-Reference

TLC fingerprint of Pet. ether -60-80°C extract (track 1) and MeOH extract (track 2)
Mobile phase Fig A&C: Ethyl acetate, methanol, water (100:13.5:10).
B &D: Toluene, ethyl acetate (93:7)
Derivatization A, B& C: Vanillin-Sulphuric acid -vis.
Detection D: UV 366 nm

Pharmacological and Toxicological Studies:

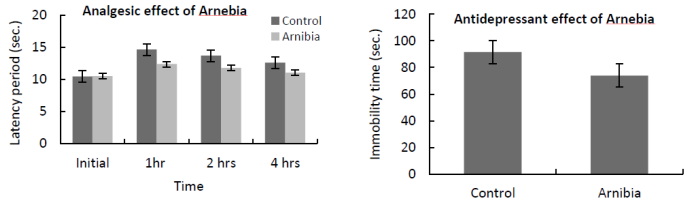
The crude hexane extract demonstrated a potent antimicrobial effect against bacteria and a mild effect against fungi. Likewise, the hexane extract on cell cultures of the plant also showed mild bioefficacy against the selected microorganisms [5]. The plant has been reported to have antimicrobial principles. Arnebins are associated with antimicrobial activity. The antimicrobial activities were tested against gram-positive and gram-negative bacteria and fungi.

Triterpenes of *A. hispidissima* was investigated and found to be active against selected bacteria and fungi. β-Amyrin demonstrated the maximum activity against *E. coli* [5]. The plant has been reported to contain shikonin derivatives, identified as arnebin-5, arnebin-6, teracrylshikonin, arnebinone and acetyl shikonin, which are known to have anti-inflammatory activity in carrageenan- induced paw edema and complete Freund's adjuvant-induced chronic arthritis in rats [7]. Moreover, arnebin-1, significantly suppressed the development of chronic arthritis. Chemical investigations into the constituents of the roots of *Arnebia hispidissima* have yielded 3 new naphthaquinone, which possess antibiotic and anticancerous properties. The quantification of naphthaquinones from *in vivo* and *in vitro* cell cultures of plant species and isolated compounds from intact plant tested for their swelling inhibitory potency. It has been reported that arnebin-1 was the major naphthaquinone both *in vivo* (0.62%) and *in vitro* (0.27%) cell cultures [8].

The plant is reputed for the treatment of nervine pain and rheumatism. Other compounds, alkanninmonoacetate, alknannin α-dimethylacrylate. (±) – Alkamnin and three new naphthaquinones, are reported as having antibiotic and anticancer activities.

The following pharmacological and safety evaluation studies were carried out [9,10] on the plant Arnebia *hispidissima* (70% ethanolic extract):

ACTIVITY	RESULTS			
	Strong	Moderate	Mild	Negative
Analgesic		√		
Antidepressant		√		
Anticonvulsant			√	
Adaptogenic (swim test)	√			
Effect on rabbit jejunum		√		
Effect on rat fundus			√	
Bronchodilatory effect (G. pig isolated tracheal chain)	√			
BP and heart rate				√
Effect on right rat atria		√		
Erectile function (Rabbit corpus cavernous strip)				√
Studies on hematological parameters				√
Rectal temperature				√
Body weight				√
Vital organs				√
Mortality				√



Summary of the Results

The plant extract administered for seven days demonstrated increase in the hot plate latency time, showing significant analgesic activity using writhing test. It showed pronounced anti-depressant-like activity; caused spasmodic action of the plant extract. It might produce relief of gastrointestinal spasm and improve the digestion; showed strong relaxant (Bronchodilatory) effects on histamine-induced tracheal chain of the guinea pig. The plant could be used for bronchial asthma and allergic disorders.

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