



Phytological Aspects of Fagonia Cretica Linn

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Review Article

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Abstract

Fagonia cretica L. is a potential desert plant that belongs to Zygophyllaceae family. The genus *Fagonia* comprises of 40 species that are found in Mediterranean, Saharo-sindian regions, subtropical regions of North & South America and South Africa. The genus is also known for distribution in warm arid regions of all continents except Australia. North Africa may also be considered as the center for the distribution of genus *Fagonia* to the Old World. The plants belonging to the genus *Fagonia* have valuable medicinal properties and are used in treatment of various health disorders in the traditional medicine practices. Therefore, the purpose of this review is to succinctly appraise the recent progress and all the phytological aspects of *Fagonia cretica* L. to assist the traditional medicines practitioners for its use in their current practices.

Keywords: *Fagonia cretica*; Phytology, Phytochemistry; Pharmacological Actions; Diosgenin

Abbreviations: VCAM: Vascular Cell Adhesion Molecule; VEGF: Vascular Endothelial Growth Factor.

Introduction

The sun shines only one side of our planet for half a day while other side remains in the dark. The unevenness of earth's surface receives uneven spread of sunlight. This condition and earth's atmosphere produces varying climate on our planet. Our planet exhibits both kinds of atmospheres, extreme cold temperatures and extreme hot environments. Irrespective of climatic conditions, life started its existence in every environment. One of these is deserts. Some forms of life have learned to survive in deserts. These include both plants and animals. Camels and cacti are few good examples that have learned to bear the austerity of deserts. Deserts are home to a variety of plant species. *Fagonia cretica* L. is also a potential desert plant [1]. It (Figure 1) belongs to Zygophyllaceae family. The genus *Fagonia* comprises of 40 species that are found in Mediterranean, Saharo-sindian regions, subtropical regions of North & South America and South Africa [2]. The genus is also known for distribution

in warm arid regions of all continents except Australia.

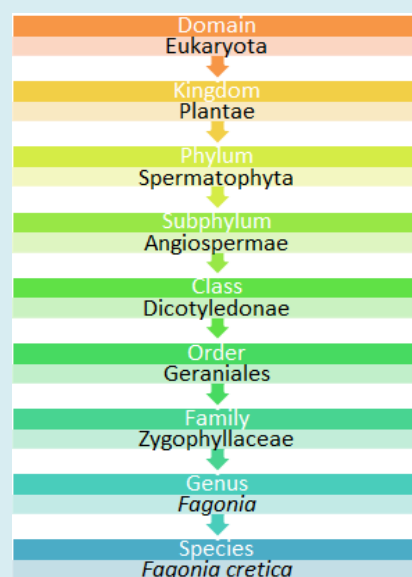


Figure 1: Taxonomic Position.

North Africa may also be considered as the center for the distribution of genus *Fagonia* to the Old World [3]. The plants belonging to the genus *Fagonia* have valuable medicinal properties [1] and are used in treatment of various health disorders in the traditional medicine practices. Therefore, the purpose of this review is to succinctly appraise the recent progress and all the phytological aspects of *Fagonia cretica* L. to assist the traditional medicines practitioners for its use in their current practices.

Lexicon

Fagonia cretica L. is popularly known as Dhamasa, Badavard, Sachchibooti in Urdu [4-7]; Dama, Dhamah, Dhamaha in Punjabi; Shukai, Badavard, Umm Showeika, Sholib, UmmShok, Al-Shokaa in Arabic [8-10]; Bádávard in Persian; Abrojo de Creta, Rosal de la Virgen, Manto de la Virgen in Spanish; Fagone in French; Khorasan thorn, Virgin's Mantle, and *Fagonia* in English.

Synonyms

Fagonia cretica L. is an accepted name of a species in the genus *Fagonia* [11]. In popular cultures, it is also known as:

- *Fagonia viscosa* Hochst. ex Boiss.
- *Fagonia virens* Coss. ex T. Anderson
- *Fagonia hispanica* L.

- *Fagonia forskalii* Pfund
- *Fagonia erecta* Mill.
- *Fagonia elongata* Salisb
- *Fagonia deflexa* Moench
- *Zygophyllum creticum* (L.) Christenh. & Byng
- *Fagonia cistoides* Delile ex T. Anderson
- *Fagonia desertorum* [11].

Phytography

F. cretica L. exhibits unpleasant odour and bitter taste [12]. *F. cretica* L. is a small shrub having thorns growing to a height of 1-3 feet in dry regions. The small branches are thick that bear nodules. The thorns present on plant are thick and strong. The morphological characteristics of this plant species are summarized in the Table 1. The leaves of *F. cretica* L. are isobilateral and comprise of single layered epidermis consisting of mostly tangentially elongated cells covered with thick cuticle. Both of epidermis exhibit anomocytic stomata and polygonal epidermal cells. There are 2 or 3 layered palisade cells present on both sides adjacent to the epidermis. In vascular bundles, xylem is present towards lower side and phloem towards upper side. Sclerenchyma tissue occurs as a bundle cap just above the phloem. Small lateral vascular bundles are also present in the leaf lamina. Total of 16-17 stoma are found on lower epidermis while 5 to 7 on upper [1,2].

Plant Part	Morphological Characteristics	Ref.
Leaves	Opposite; Compound; Trifoliolate on short petioles; Smooth and Spinescence stipules	[14]
Stem	Young – Green; Mature –Brown; Spiny; Slender; Bears 2 pairs pf spines at each node	[1]
Root	Tap root; brownish green; rough with longitudinal striations; core yellowish-green; fracture, fibrous	[1]
Seed	Flat rounded and brown in color	[1]
Flower	Small; pale rose or purple; solitary; 5 free mucronate sepals; 5 free clawed imbricate petals; 10 free stamens inserted on a disc; filaments filiform without appendages; 5-celled sessile ovary, 2 ovules at the base of each cell; 5-angled style persistent, simple stigma; septicidal capsule fruit, pentagonous, deeply 5-lobed, splitting along the axis into 5 carpals; carpals 1-seeded	[1,13]
Fruit	Pentagonous; Schizocarp composed of five compressed, two valved cocci; 10 mm broad & 7 mm long on short, thick, reflexed peduncles, with deciduous calyx	[1]

Table 1: Morphological characteristics of *F. cretica* L.

Transverse section of stem shows single layered epidermis with thick cuticle. The unicellular trichomes are occasionally present. The cortex consists of 7-10 layers of parenchymatous cells and narrow lumen sclereids. Both secondary xylem and phloem are composed of fibres, tracheids, vessels, and parenchyma cells. Three to four layers of vascular cambium are also present [1].

Transverse section of root shows outermost cork represented by 4-5 layers of small, narrow, tangentially

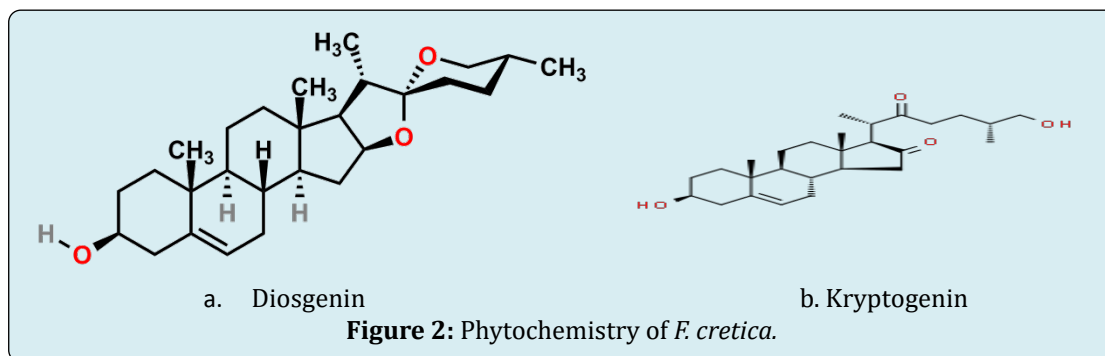
elongated cells. The phelloderm is composed of 6-10 layers of tangentially elongated, thin walled parenchymatous cells. The secondary phloem consists of thick walled phloem fibres; and traversed seriate medullary rays [1].

Phytochemistry

Phytochemical investigation of the plant revealed the presence of alkaloids, flavonoids, terpenoids, saponins, tannins, coumarins, sterols, and glycosides in different

polar and non-polar extracts of its parts [14-16]. Diosgenin, kryptogenin (Figure 2), lanosterol, beta-sitosterol, harmine, fagogenin and oleanolic acid are important chemical

constituents found in *F. cretica* [17,18]. Fruits are rich in ascorbic acid [7].



Pharmacological Actions

A number of studies have been carried out on *F. cretica L.* in recent years showing that it possesses diverse pharmacological effects.

Effects on Nervous System: *F. cretica* is effective in elevation of glutathione levels and expression of the gamma-glutamylcysteine ligase. It exhibits strong free radical scavenging properties against reactive oxygen and nitrogen species. In addition, the herb significantly diminishes the expression of iNOS gene after 48 hours which plays a major role in neuronal injury during hypoxia/ischemia [19].

Effects on Blood and Circulatory System: *F. cretica* possess potentials as haemorrhagic inhibitor against snake venom (*Naja naja karachiensis* spp.) at a dose of 15 µg per 1.5 µL phosphate buffer saline [20]. It also exhibits thrombolytic activity in animal studies [21]. *F. cretica* is very effective in Thalassemia Major at a dose of 120mg/kg of body weight [22]. Aqueous extract of *F. cretica* showed antipyretic effect in animal studies [23]. *F. cretica L.* plant and its two triterpenoids isolated from ethanol extract showed significant decrease in total leukocyte count in rabbit blood [24].

Effects on Digestive System: *F. cretica* exhibits a dose-dependent relaxant activity similar to that produced by standard adrenaline in animal models. Moreover, the extract shows less affinity to adrenoceptors than adrenaline. Its major chemical constituent, harmine, is a known monoamine oxidase A and B inhibitor that decreases the degradation of monoamine in the gut and increases their relaxation effect on the smooth muscle of the gut [25].

Effects on Musculoskeletal System: *F. cretica L.* down-regulates the expressions of COX2 (Cyclooxygenase) and vascular cell adhesion molecule (VCAM) genes, in animal studies while up-regulates vascular endothelial growth factor (VEGF) expression and inhibits platelet aggregation thus mediating the inflammation [26].

Effects on Reproductive System: *Fagonia critica* induces distortion in the regularity of the estrous cycle of the rats in

which there is random omission of the heat period (estrous phase). It acts as an anti-implantation agent in the dose of 250mg/kg per oral. The drug suspension has significant androgenic activity as the weights of both seminal vesicles and ventral prostate is increased. It does not seem to possess any anti-androgenic activity [27].

Effects on Endocrine System: *F. cretica* saponins in 30 mg doses had significant decrease in prolactin and in the serum TSH levels in animal models. A significant increase in serum cortisol occurs with the crude drug in a 1g dose and with both saponins in 30 mg doses in animal studies. *F. cretica* is a common blood purifying agent in Pakistan and its aerial parts juice or decoction is used for treatment of diabetes. The water extract at dose of 500 mg/kg was effective in the management of diabetes, causing a 45% decrease in the plasma glucose level [28,29].

Infections and Infestations: Various compounds isolated from *F. cretica* had antimicrobial activity against *Bacillus subtilis*, *Shigella flexneri*, *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Trichophyton longifusus*, *Candida albicans*, *Aspergillus flavus* and *Candida glabrata* [14,15,30-32].

Miscellaneous: Significant cytotoxic activity of *F. cretica* was found against brine shrimps, while antitumor assay showed that the extract inhibited tumor induction on potato discs. *F. cretica* extract can induce cell cycle arrest and apoptosis via p53-dependent and independent mechanisms, with activation of the DNA damage response. It indicates that *F. cretica* aqueous extract contains potential anti-cancer agents acting either singly or in combination against breast cancer cell proliferation via DNA damage-induced FOXO3a and p53 expression [33,34].

Drug Temperament

The temperament of *Fagonia cretica* Linn is cold and dry in the first order [35]. However, there is controversy for its temperament. One school of thought considers it as warm & dry in first order while other school confers it as warm in

second and dry in third order [36].

Pharmacotherapeutics

Indications: It is bitter, astringent, antiseptic, tonic, blood-purifier, febrifuge and useful in dropsy, liver trouble, delirium and any disorder which is caused by poisoning. It is also useful in cough, fever, asthma, chronic fever, chronic bronchitis, spitting of blood, stomatitis, dysentery, skin diseases and as a cooling agent. Boiled residue of the plant in water is used for abortion. It is applied on abscesses, scrofulous glands and wounds; also given as a prophylactic agent against smallpox. Bark is used for dermatosis. Extract of aerial parts acts as an antiviral, anti-amphetaminic, and spasmogenic agent. Plant ash is given to children suffering from anemia. It is also used as deobstruent, diuretic, styptic, analgesic, antidote, stomachic, anti-hepatotoxic, antiemetic, stimulant, alterative, and anti-carcinogenic. Leaves of *F. cretica* are ground in lemon juice and applied as hair tonic, which prevents greying of hair [37,38]. The leaves are beneficial in fevers, thirst, vomiting, boils, leucoedema, and biliousness [39].

Side Effects: *F. cretica* extracts were found to have anti-breast cancer activity devoid of side effects common to standard cytotoxic therapy [33]. However, it may cause harmful effects on lungs [11].

Posology

The recommended dose of *F. cretica L.* powder is 3-5 Grams. The decoction of whole plant (50-100 ml) is used in treatment of various diseases [35].

Pharmacognostical Evaluation

- Foreign Matter: Not more than 2 percent
- Total ash: Not more than 10 percent
- Acid insoluble ash: Not more than 0.4 percent
- Alcohol soluble extractive: Not less than 5 percent
- Water soluble extractive: Not less than 10 percent [40,41]

Conclusion

F. cretica L. has valuable medicinal properties and very less toxicity in nature. It has enormous health benefits. It is the need of the time to use this precious plant in daily common practices and standardize its dose for various defined disorders.

- **Conflicts of Interest:** Authors declare no conflict of interest.

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