

Fagonia Arabica Linn, a Miraculous Medicinal Plant with Diminutive Scientific Data but Hefty Potential

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ABSTRACT

Background: *Fagonia arabica* is a highly potential medicinal plant whose dried aerial parts are used in folk medicine for a number of diseases as reported in historical monographs. This review article covers the phytoconstituents and scientifically proven pharmacological activities of different parts of the plant.

Methodology: A thorough searching of scientific literature was conducted utilizing important sites like Researchgate, GoogleScholar, PubMed, WoS etc. using the key words *Fagonia*, *Fagonia arabica* and phytoconstituents, medicinal uses, pharmacological activities, traditional uses in combination with *Fagonia*.

Results: The phytoconstituents explored and reported up to now in *Fagonia arabica* include Glycosides, Flavonoids, Triterpenes, Saponins and Sulfur compounds. It was found that plant possesses highly significant bioactive compounds and pharmacological activities. The *F. arabica* extract also work as green corrosion inhibitor for the Cu thus supports environment safety.

Conclusion: Concluding shortly, Genus *Fagonia* possesses variety of species containing medicinally important phytoconstituents and pharmacological activities but a little research work is carried out on *Fagonia arabica* proving scientifically the traditional use of the herb. So the species offer a lot for future researchers.

Keywords: *Fagonia arabica*, phytoconstituents, medicinal uses, pharmacological activities.

INTRODUCTION

The genus *Fagonia* comprise of herbs, shrubs and shrublets up to 75cm height and 100cm width in average. It consists of flowers having purplish pink petals with pointed and scented spines. The fruit is capsule having locules [1-3]. The plant of this genus may be perennial or annual, while the shrublets are glabrous with sessile glands. The stem is woody with cylindrical branches having internodes. The leaves of this genus may or may not bear petiole, lanceolate or oblong, unifoliate or trifoliate having spine shape [4].

Fagonia arabica is a potentially active medicinal plant found in deserted and hilly areas of South Asia, Middle East, Central Europe, North Africa, California and Chilli. The plant belongs to family Zygophyllaceae and Genus *Fagonia*. Around twenty to thirty five species of *Fagonia* are found throughout the above mentioned areas [5]. Mostly used species of *Fagonia* genus in traditional medicine include *Fagonia arabica*, *F. Cretica*, *F. brugie*, *F. mycorrhizal* and *F. Indica* [6].

F. arabica is known as Dhamasa or suchi booti in Urdu, Cretan Prickly Clover, Khorasan thorn and

Virgin's Mantle in English, Badavard in Persian, Fagonie or Fagonia in German, Shawka al-Baidaa or Shukaaa in Arabic. Powdered whole herb is used in traditional medicine. Researchers had also carried out their studies on dried aerial parts.

It grows up to a height of one to three feet in circular pattern widely distributed in calcareous rocks of Mediterranean lands [7]. It has different taste in different stages. The leaves of this plant are thin like spines. It has two or more thorns. It has purple color flowers [8] Figure 1 and 2.

carbohydrates, flavonoids, glycosides, steroids, saponins, alkaloids, triterpenoids, amino acids, Chlorides, Sulfates, Anthraquinones, Irodoids, Cyanogenic glycosides and Coumarins [9]. *Fagonia cretica* is reported to possess alkaloids, cardiac glycosides, saponins and coumarins [10]. Another specie *Fagonia indica* contain sapogenins, saponins, glycosides and flavonoids [11]. Saponins are also present in the aerial parts of *Fagonia mollis* [12]. Flavonoids are also reported in some other species like *F. thebica*, *F. glutinosa* and *F. Isothricha* [13, 14]. A number of chemical constituents are reported in Genus *Fagonia* like tannins, saponins, flavonoids, terpenes, alkaloids, proteins, Hederagenin, ursolic acid, pinitol etc. by different researchers [15-22].

CHEMICAL CONSTITUENTS

Chemical composition of Genus *Fagonia*

All over Genus *Fagonia* have been reported to possess different phytoconstituents like



1a

1b

1c

Figure 1. Fresh *Fagonia arabica*; 1a (Flowers), 1b (Whole Plant) and 1c (Leaves).



2a

2b

2c

Figure 2. Dried *Fagonia arabica*; 2a (Powder whole herb), 2b (Plant) and 2c (Leaves).

Chemical composition of *Fagonia arabica*

Particularly considering *Fagonia arabica* several investigators have reported Glycosides, Flavonoids, Triterpenes, Saponins, Sulfur compounds and many other important medicinal phytoconstituents.

Flavonoids:

Six typical flavonoids were reported by Negoumy (1986) having rutenoside and glucoside linkages with isorhamnetin and herbacetin [23]. El-Wakil (2007) reported two different phytoconstituents in water-methanol extract of this plant having rhamnoside linkages with kaempferol and acacetin termed as flavonoid glycosides [24]. Khaled Tawaha (2007) reported certain phenolic compounds in the plant possessing antioxidant activity [25].

Triterpenes

Fagonia arabica aerial parts were investigated for triterpenoids and the researcher reported four triterpenoidal glycosides having glucopyranosyl and arabinopyranoside linkages with oleanolic acid and quinovic acid [23]. Another researcher Perrone *et al* (2007) found some novel sulfated triterpenes and sulfated triterpene glycosides from whole plant extracts [26].

Saponins

Mono and Didesmosidic saponins were found in *Fagonia arabica* as reported by a researcher [23]. Miyase (1996) reported seven novel triterpenoidal saponins with xylopyranosyl, glucopyranosyl and arabinopyranosyl linkages with oleanolic acid and ursolic acid [27].

PHARMACOLOGICAL ACTIVITY

Pharmacological Activities of Genus *Fagonia*

Different species of genus *Fagonia* reported to contain different pharmacological activities. Some authors reported anti inflammatory [28], anti allergic [29], neuroprotective [30], androgenic, endocrinological, antimicrobial [31] and cytotoxic activities [5]. Another author reported further activities of the genus *Fagonia* including cloylytic, analgesic, antioxidant, hepatoprotective and antihæmorrhagic activities [32].

Pharmacological Activities of *Fagonia arabica*

Different pharmacological activities have been reported by early researchers like blood, CNS and

Hormonal disorders [33-38]. The infusion of *Fagonia arabica* is used for stomatitis. The plant also purifies blood and used for the deobstruent action [39]. The plant also treats skin disorders, small pox, tumors and swelling of neck [40, 41]. The dried aerial parts of the plant possess diuretic activity [32, 42].

Antioxidant Activity

Some researchers reported antioxidant activity due to the phenolic compounds present in the plant [20]. Another researcher reported analgesic, anti-inflammatory and antipyretic activities previously discovered along with the antioxidant activity of the plant defining the mechanism of action. The plant helps in restoring antioxidant enzymes and decreases lipid peroxidation [43].

Thrombolytic Activity

Thrombolytic activity of *F. arabica* was tested *in vitro* on clot lysis model which exhibited 75.6% lysis of clot which could be formulated as a medicine for patients of Atherothrombotic diseases [44, 45]. Another researcher studied effect of *Fagonia arabica* in combination with fish extract of *Heteropneutesis fossilis* which exhibited better results than plant extract alone [46, 47]. A researcher also reported thrombolytic activity of this plant by thrombin-inducing tissue plasminogen activator (t-PA) and plasminogen activator inhibitor-1 (PAI-1) which was conducted in cells of human umbilical cord [48, 49].

USE FOR SAFE ENVIRONMENT

The influence of *F. arabica* extract as green corrosion inhibitor for the Cu in aqueous environment utilizing ML test, PP, and EIS techniques was studied and found that corrosion inhibition primarily takes place through adsorption of the *F. arabica* extracts on the Cu surface. This study shows that this extract has proven to be an important, environmentally friendly one and low-cost inhibitor [50].

CONCLUSION

Concluding shortly, Genus *Fagonia* possesses variety of species containing medicinally important phytoconstituents and pharmacological activities but a little research work is carried out on *Fagonia arabica* proving scientifically the traditional use of the herb. So the species offer a lot for future researchers.

REFERENCES

1. Manjunath BL. The Wealth of India, Council of Scientific and Industrial Research, New Dehli, 1956; 4: 01.
2. Beier AB. A revision of the desert shrub *Fagonia* (Zygophyllaceae). Systematics and Biodiversity. 2005; 3: 221-263.
3. Anwar AK, Ashfaq M, Nasveen MA. Pharmacognostic Studies of Selected Indigenous Plants of Pakistan. Peshawar NWFP, Pakistan: Pakistan Forest Institute; 1979:15-35.
4. Shinwari MI and Shah M. Medicinal Plants of Margalla Hills. National Park Islamabad, vol. 1. Pakistan Museum of Natural History, Islamabad., 2003; 72.
5. Puri D and Bhandari A. *Fagonia*: A Potential Medicinal Desert Plant, Journal of NPA. 2014; 27 (1):29-33.
6. Tayyaba Sarwar, Sidra Anwar, Iqra Amjad, Zakia Munir, Misbah Jameel, Asma Binish, Rimsha Mazhar and Arifa Khan. Ethno Medicinal and Pharmacological Activities of *Fagonia* Plant. World Journal of Pharmaceutical and Life Sciences. 2021; 7 (8): 1-5.
7. Rizvi MA, Ahmad L, Sarwar GR. Wild medicinal plants of Madinat Al-Hikmah and its adjacent areas. Hamdard Medicus. 1996; 39: 8–10.
8. <http://healthymanners.com/fagonia-dhamasa-benefits/> sited on 6-10-2018 at 1:15pm.
9. Kasture VS, Gosavi SA, Kolpe JB, Deshapande SG. Phytochemical and Biological Evaluation of *Fagonia* Species: A Review. World Journal of Pharmacy and Pharmaceutical sciences. 2014; 3 (5): 1206-1217.
10. Qureshi H, Asif S, Ahmed H, Al-Kahtani HA and Hayat K. Chemical composition and medicinal significance of *Fagonia cretica*: A review. Natural product research. 2016; 30(6): 625-639.
11. Pareek A, Batra N, Goyal M and Nagori BP. Phytochemicals and biological activities of *Fagonia indica*. International Research Journal of Pharmacy. 2016; 3(6): 56-59.
12. Melek FR, Miyase T, El-Gindi OD, Abdel-Khalik SM and Haggag MY. Saponins from *Fagonia mollis*. Phytochemistry. 1996; 42 (5): 1405-1407.
13. Alghanem SM. Antimicrobial and Antioxidant Evaluation of different solvent extracts of Medicinal Plant: *Fagonia mollis* Delile. Journal of Medicinal Herbs and Ethnomedicine 2018; 4: 7-11.
14. Al-Wakeel SAM and Shahnaz AM. Significance of flavonoid chemistry in the Egyptian *Fagonia glutinosa* and *F. Isothricha* complex. Biochem Syst. Ecol. 1992; 20: 259-64.
15. Al-Wakeel SAM, El-Garf IA and Salen NAM. Distribution of flavonoids in *Fagonia thebica* complex. Biochem. Syst. Ecol. 1988; 16: 57-58.
16. Al-Wakeel SAM, El-Nagoumy SI, El-Hadidi MN and Saleh NAM. Flavonoid pattern in *Fagonia mollis* complex. Biochem. Syst. Ecol. 1987; 15: 459-460.
17. El-Hadidi MN, Al-Wakeel SAM and El-Garf IA. Systematic significance of the flavonoid constituents in *Fagonia indica* complex. Biochem. Syst. Ecol. 1988; 16: 293-297.
18. Ansari AA, Kenne L, Atta-ur-Rehman and Wehler T. Isolation and characterization of a saponin from *Fagonia indica*. Phytochem. 1988; 27: 3979-82.
19. Ansari AA, Kenne L, Atta-ur-Rehman and Wehler T. Isolation and characterization of two saponins from *Fagonia indica*. Phytochem. 1987; 26: 1487-90.
20. Hamid A, Majid ACM and Atta-ur-Rehman. Isolation of docosyl docosanoate from *Fagonia cretica* Linn. Arab Gulf J. Sci. Res. 1989; A.7: 29-34.
21. Shaukat GA, Malik MA and Ahmad MS. Water-soluble protein from *Fagonia cretica* Linn. Pak. J. Bot. 1981; 13: 99-101.
22. Atta-ur-Rahman, Ansari AA, and Kenne L. Hederagenin, ursolic acid and pinitol from *Fagonia indica*. J. Nat. Prod. 1984; 47: 186-7.
23. El-Negoumy SI, Al-Wakeel SAM, El-Hadidi MN and Saleh NAM. The flavonoids of the *Fagonia arabica*-complex (zygophyllaceae), Phytochemistry. 1986; 25 (10): 2423-2424.
24. El-Wakil EA. Phytochemical and molluscicidal investigations of *Fagonia arabica*. Z Naturforsch C. 2007, 62(9-10):661-7.
25. Tawaha K, Alali FQ, Gharaibeh M, Mohammad M and El-Elimat T. Antioxidant activity and total phenolic content of selected Jordanian plant species. Food Chemistry. 2007; 104 (4): 1372-1378.
26. Perrone A, Masullo M, Bassarello C, Hamed AI, Belisario MA, Pizza C and Piacente S. Sulfated triterpene derivatives from *Fagonia arabica*. J Nat Prod. 2007, 70(4):584-8.
27. Miyase T, Melek FR, El-Gindi OD, Abdel-Khalik SM, El-Gindi MR, Haggag MY and Hilal SH. Saponins from *Fagonia arabica*. Phytochemistry. 1996; 41(4): 1175-9.
28. Alqasoumi SI, Yusufoglu HS and Alam A. Anti-inflammatory and wound healing activity of *Fagonia schweinfurthii* alcoholic extract herbal gel on albino rats. African Journal of Pharmacy and Pharmacology 2011; 5(17): 1996-2001.
29. Puri D, Bhandari A and Kumar GP. Screening of Anti-Histaminic Activity of *Fagonia schweinfurthii* Hadidi in Guinea Pig Ileum and Formulate Anti-

- Histaminic Syrup. *The Natural Products Journal*. 2015; 5(3): 176-179.
30. Rawal, AK, Muddeshwar, MG, and Biswas, SK. *Rubia cordifolia*, *Fagonia cretica linn* and *Tinospora cordifolia* exert neuroprotection by modulating the antioxidant system in rat hippocampal slices subjected to oxygen glucose deprivation. *BMC complementary and alternative medicine*. 2004; 4(1): 1-9.
 31. Abobaker, DM. Preliminary Phytochemical Analysis and Antibacterial Activity of the Aqueous and Ethanolic Extracts of *Fagonia arabica L.*, Used as Traditional Medicinal plant in Libyan. *International Journal of Science and Research*. 2017; 6 (10): 1056-1059.
 32. Farheen R, Mahmood I, Parveen R, Kishwar F and Anwar A. Review on Medicinal and Bioactive Role of Genus *Fagonia*. *FUUAST J. BIOL*. 2017; 7(1): 33-36.
 33. Chopra RN, Nayar SL, Chopra IC. Glossary of Indian Medicinal Plants. In: CSIR, New Delhi, editors. 1956.
 34. Saeed MA. *Hamdard Pharmacopeia of Eastern Medicine*. Karachi: Hamdard Academy. 1969: 41–43.
 35. Chopra RM, Handa KL, Kapur LD, Chopra IC. *Indigenous Drugs of India*. 2nd ed. New Delhi: Academic Publisher. 1982: 507.
 36. Hooker JD. *Flora of British India*. London: Reeva. 1975: 425.
 37. Saeed MA, Khan Z, Sabir AW. Effects of *Fagonia cretica L* constituents on various endocrinological parameters in rabbits. *Tr. J. Biol*. 1999; 23: 187–97.
 38. Saeed MA, Wahid SA. Effects of *Fagonia cretica L* constituents on various haematological parameters in rabbits. *J. Ethopharmacol*. 2003; 85: 195–200.
 39. Said HM. *Medicinal Herbal: a Textbook for Medical Students and Doctors*. Vol.1. Karachi: MAS Printers. 1996: 29.
 40. Rizvi MA, Ahmad L, Sarwar GR. Wild medicinal plants of Madinat Al-Hikmah and its adjacent areas. *Hamdard Medicus* 1996; 39: 8–10.
 41. Watt G. *Dictionary of the Economic Products of India*. Vol 1. Cosmo Publications, Delhi. 1972: 444–446.
 42. Kakrani HN, Saluja AK. Plants used for Diuretic Activity in traditional medicine in Kutch district, Gujrat', *Journal of natural remedies*. 2001; 1(2): 121-124.
 43. Satpute RM, Kashyap RS, Deopujari JY, Taori GM and Dagainawala HF. Protection of PC12 cells from chemical ischemia induced oxidative stress by *Fagonia arabica*. *Food and Chemical Toxicology*. 2009; 47(11): 2689-2695.
 44. Prasad S, Kashyap RS, Deopujari JY, Purohit HJ, Taori GM and Dagainawala HF. Effect of *Fagonia arabica* (Dhamasa) on in vitro thrombolysis. *BMC Complementary and Alternative Medicine*. 2007; 7(1): 36.
 45. Yamamoto J, Yamada K, Naemura A, Yamashita T and Arai R. Testing various herbs for antithrombotic effect. *Nutrition*. 2005; 21(5): 580-587.
 46. Das R and Koushik A. Synergistic activity of *Fagonia arabica* and *Heteropneustesfossilis* extracts against myocardical, cerebral infarction and embolism disorder in mice *Journal of Pharmacy and Bio Allied Sciences*. 2010; 2(2): 100-104.
 47. Rajapakse N, Won-Kyo J, Mendis E, Sung-Hoon Moon SH and Kim SK. A novel anticoagulant purified from fish protein hydrolysate inhibits factor XIIIa and platelet aggregation. *Life Sci*. 2005; 76 (22): 2607-2619.
 48. Nayak, AR, Chaurasia, SR, Deopujari, JY, Chourasia, C, Purohit, HJ, Taori, GM and Dagainawala, HF. Effect of *Fagonia arabica* on thrombin induced release of t-PA and complex of PAI-1 tPA in cultured HUVE cells. *Journal of Traditional and Complementary Medicine*. 2016; 6: 219-223.
 49. Nagase H, Enjyoji K, Minamiguchi K. Depolymerized holothurian glycosaminoglycan with novel anticoagulant actions: antithrombin and heparin cofactor independent inhibition of factor X activity by factor IXa-factor VIIIa complex and heparin cofactor dependent inhibition of thrombin. *Blood*. 1995; 85(6): 1527-1534.
 50. Abd El-Aziz El-Sayed Fouda, Abd El-Moneim Mohamed Ahmed, Salama Mohamed El-Darier, Sherif Elsayed Badr. *Fagonia arabica* extract as a safe-environment green corrosion inhibitor for Cu in HNO₃ solution. *Journal of the Chinese Chemical Society*. 2021; 68 (8): 1445-1455.
<https://doi.org/10.1002/jccs.202000571>.



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