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FAGONIA CRETICA L.: A COMPREHENSIVE LITERARY REVIEW WITH SPECIAL REFERENCE TO ITS AYURVEDIC PHARMACOLOGICAL ATTRIBUTES AND THERAPEUTIC POTENTIAL

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ABSTRACT

Fagonia cretica L. is a hardy medicinal shrub of the family Zygophyllaceae that has long been used in traditional healthcare practices of arid and semi-arid regions. In Ayurvedic-oriented literature it is commonly correlated with Dhamasa or Duralabha, although the identification of classical drug names with modern botanical species requires careful authentication. The plant has attracted scientific interest because extracts and isolated constituents have demonstrated antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, antidiabetic and cytotoxic activities in experimental models. Its reported phytochemical profile includes flavonoids, phenolic compounds, triterpenoids, saponins, sterols and other secondary metabolites. From an Ayurvedic pharmacological perspective, the drug is discussed in relation to Pitta-dominant disorders, inflammatory conditions and respiratory complaints. Modern findings concerning oxidative stress, inflammatory mediators and cellular signaling provide useful hypotheses for understanding some of these traditional applications. However, most available evidence is preclinical, and substantial variation may occur according to species authentication, plant part, geography and extraction method. Therefore, standardized pharmacognostic studies, safety evaluation, pharmacokinetic investigations and well-designed clinical trials are required to establish its therapeutic value. This review integrates Ayurvedic concepts with

contemporary phytochemical and pharmacological evidence and highlights the future scope of F. cretica as a potential source of therapeutically relevant natural products.

KEYWORDS: Fagonia cretica; Dhamasa; Duralabha; Ayurveda; Dravyaguna; phytochemistry; antioxidant; anti-inflammatory; hepatoprotective; antimicrobial; antidiabetic; anticancer.

1. INTRODUCTION

Medicinal plants remain an important source of traditional remedies and modern pharmacological leads. Ayurveda evaluates medicinal substances through an integrated understanding of Rasa, Guna, Virya, Vipaka and Karma, while contemporary pharmacology investigates their chemical constituents, molecular targets and measurable biological effects. Bringing these two perspectives together can generate useful research hypotheses without treating the two systems as identical.

Fagonia cretica L. is a xerophytic member of the Zygophyllaceae family. It occurs in dry and semi-dry environments and is traditionally employed in several regions for fever, inflammatory conditions, respiratory complaints, skin disorders, digestive problems and other ailments. The plant is popularly known by names such as Dhamasa, while some Ayurvedic-oriented publications correlate it with Duralabha or Dhanyavasaka. Because classical nomenclature may be shared by more than one botanical species, botanical authentication is essential in research involving this drug.

The growing number of phytochemical and experimental pharmacological studies has made F. cretica an interesting candidate for systematic review. Particular attention has been directed toward phenolic and flavonoid constituents, antioxidant effects, inflammatory signaling, antimicrobial activity and cytotoxic effects. The purpose of the present review is to examine these findings alongside the Ayurvedic pharmacological interpretation of the drug.

2. AIM

To provide a critical and original synthesis of the available literature on Fagonia cretica L., with particular emphasis on its Ayurvedic pharmacological attributes, traditional applications, phytochemistry, experimentally observed therapeutic activities and future research potential.

3. OBJECTIVES

- To review the botanical identity and distribution of Fagonia cretica L.
- To examine its Ayurvedic nomenclature and pharmacological attributes.
- To summarize important traditional and ethnomedicinal applications.
- To review major classes of phytochemicals reported from the plant.
- To evaluate experimentally investigated pharmacological activities.
- To discuss possible correlations between Ayurvedic concepts and modern pharmacology.
- To identify limitations in the current evidence and suggest areas for future investigation.

4. Botanical Profile

Fagonia cretica is a small, highly branched, spiny plant adapted to hot and water-limited habitats. It belongs to Zygophyllaceae. Modern taxonomic databases have undergone nomenclatural revisions concerning members of the Fagonia/Zygophyllum group; therefore, a research paper should report the accepted name, author citation, synonym where relevant, collection site and voucher specimen rather than depending only on a vernacular name.

The plant is associated with dry and semi-arid regions of the Indian subcontinent and other parts of the Middle East and surrounding regions. The aerial parts or whole plant are used in traditional practice, although the exact material employed varies between local traditions.

5. Ayurvedic Identity and Pharmacological Interpretation

Dhamasa and Duralabha are names used in Ayurvedic and regional medicinal literature, but their botanical correlations are not completely uniform across all secondary sources. For scholarly work, the identity should therefore be established from an authoritative Ayurvedic source together with pharmacognostic authentication.

Ayurvedic descriptions available in secondary literature commonly characterize Dhamasa/Duralabha with properties interpreted as cooling and Pitta-pacifying, with traditional relevance to disorders involving inflammation, fever, thirst, burning sensations and respiratory complaints. Exact Rasa-Guna-Virya-Vipaka descriptions should be checked against the specific classical Nighantu or edition cited by the investigator before publication.

The Ayurvedic concept of Karma provides a useful framework for discussing the plant's traditional actions. Terms such as Kasa-hara or Pitta-shamana should not be mechanically equated with a single modern molecular mechanism. Instead, they can be used as traditional therapeutic categories from which experimentally testable hypotheses may be generated.

6. Traditional and Ethnomedicinal Uses

Traditional reports describe the use of F. cretica preparations in fever, inflammatory complaints, respiratory problems, skin disorders, gastrointestinal disturbances, urinary conditions and hepatic ailments. Some regional traditions also describe the plant as a blood-purifying drug. Such expressions belong to traditional therapeutic language and should not be interpreted as proof of a specific modern hematological action.

The breadth of reported use makes the plant pharmacologically interesting, but traditional use alone cannot establish efficacy. The clinical relevance of each indication requires appropriate dose-finding, safety assessment and controlled human studies.

7. Phytochemical Constituents

Phytochemical investigations indicate the presence of several groups of secondary metabolites. Flavonoids and phenolic compounds are particularly relevant because of their recognized antioxidant and signaling effects. Reports have identified compounds or compound classes including quercetin, luteolin, apigenin, catechin, epicatechin, phenolic acids, triterpenoid derivatives, saponins and phytosterols.

The chemical profile is not fixed. It can change with genotype, geographical location, season, plant part, harvesting conditions, drying, extraction solvent and analytical method. Consequently, future pharmacological work should link biological activity with a defined chemical fingerprint rather than using an inadequately characterized crude extract.

8. Antioxidant Potential

Oxidative stress occurs when reactive oxygen and nitrogen species exceed the capacity of endogenous protective systems. Extracts of F. cretica have shown radical-scavenging and reducing activity in several laboratory assays. Phenolic and flavonoid constituents are plausible contributors to these effects.

Antioxidant findings are relevant to Ayurveda because many traditional inflammatory and Pitta-associated conditions can be studied through modern markers of oxidative injury. Nevertheless, chemical antioxidant assays do not automatically predict therapeutic antioxidant effects in humans. Cellular, animal and clinical evidence must be considered separately.

9. Anti-inflammatory Activity

Experimental research indicates that F. cretica may influence inflammatory processes through effects on mediators and signaling pathways involved in cytokine production and inflammatory gene expression. Candidate pathways discussed in the literature include NF-kB-related signaling, nitric oxide generation and cyclooxygenase-associated processes.

These observations provide a possible biological basis for some traditional uses in inflammatory disorders. However, the strength of evidence differs between extracts, experimental systems and plant preparations. Standardized comparative studies are needed before the plant can be positioned as a clinically established anti-inflammatory medicine.

10. Antimicrobial Activity

Extracts of F. cretica have demonstrated antimicrobial activity against selected bacterial and fungal organisms in laboratory experiments. The effect is likely to involve several constituents rather than a single compound, with phenolics, flavonoids, saponins and other metabolites potentially contributing.

The available findings support further investigation into standardized extracts, minimum inhibitory concentrations, mechanisms of microbial inhibition and possible synergism with established antimicrobial agents. They do not, by themselves, justify replacing clinically proven antimicrobial therapy.

11. Hepatoprotective Potential

Traditional use of F. cretica in hepatic complaints has encouraged experimental investigation of its hepatoprotective potential. Proposed explanations include reduction of oxidative injury, modulation of inflammatory responses and preservation of cellular antioxidant defenses.

The evidence is promising but predominantly experimental. Future studies should include authenticated material, standardized chemical markers, dose-response assessment, established hepatotoxicity models, histopathology, liver-function biomarkers and detailed toxicological evaluation.

12. Antidiabetic and Metabolic Potential

Preliminary studies have explored the ability of F. cretica extracts or constituents to influence enzymes involved in carbohydrate digestion and glucose regulation. Antioxidant and anti-inflammatory properties may also be relevant to metabolic disorders.

These findings should be considered hypothesis-generating. Demonstration of enzyme inhibition in vitro is not equivalent to clinically meaningful glucose lowering. Animal studies and controlled human trials are necessary to determine whether the plant has a reproducible metabolic benefit and to establish safe dosing.

13. Anticancer Potential

F. cretica has received considerable attention in experimental oncology. Extracts and isolated constituents have shown cytotoxic or antiproliferative effects in selected cancer-cell models. Proposed mechanisms include apoptosis induction, cell-cycle modulation, oxidative stress regulation and interference with signaling networks associated with cell survival.

The distinction between cytotoxicity in cultured cells and anticancer efficacy in humans is essential. A compound may be active against tumor cells in vitro yet fail because of poor absorption, rapid metabolism, inadequate tumor exposure or toxicity to normal tissues. Therefore, the anticancer potential of F. cretica should currently be regarded as an experimental research area rather than an established cancer treatment.

14. Respiratory and Kasa-related Relevance

Ayurvedic-oriented literature associates Duralabha with Kasa and related respiratory presentations. A modern interpretation may consider antioxidant and anti-inflammatory actions as possible contributors to respiratory supportive effects. Nevertheless, no single modern mechanism can fully represent the Ayurvedic concept of Kasa-hara Karma.

Future research may evaluate standardized preparations in validated models of airway inflammation, mucus production and oxidative stress. Clinical studies should define the respiratory diagnosis precisely and assess the plant as an adjunct or independent intervention only when ethically and scientifically justified.

15. Ayurvedic–Modern Pharmacological Correlation

Ayurvedic perspective	Possible research correlate	Interpretive caution
Shita Virya	Anti-inflammatory and redox-modulating effects	Not a direct molecular equivalent
Pitta-shamana	Potential modulation of inflammatory/oxidative processes	Conceptual correlation only
Kasa-hara	Possible respiratory anti-inflammatory support	Needs disease-specific clinical evidence
Raktaprasadana / traditional blood-purifying use	Possible antioxidant, hepatic or inflammatory effects	No single modern endpoint represents the classical concept
Tikta/Kashaya-associated use	Potential antimicrobial and metabolic relevance	Exact pharmacological mapping is uncertain

16. Safety and Standardization

Safety is a major requirement before therapeutic translation. Botanical medicines can vary substantially in chemical composition, and traditional history of use does not eliminate the need for toxicological assessment. Research should examine acute, subacute and chronic toxicity, reproductive safety where relevant, genotoxicity, organ-specific effects and potential herb–drug interactions.

Standardization should include authenticated botanical identity, defined plant part, extraction procedure, physicochemical parameters and quantitative chemical markers. A reproducible chromatographic fingerprint would improve comparability between studies.

17. Research Gaps

• Variation in botanical identification and nomenclature.
• Limited availability of well-characterized standardized extracts.
• Insufficient pharmacokinetic and bioavailability data.
• Need for systematic dose-response studies.
• Limited long-term toxicity and herb–drug interaction data.
• Scarcity of high-quality randomized clinical trials.
• Need to connect Ayurvedic pharmacodynamic descriptions with measurable clinical outcomes without forcing one-to-one mechanistic equivalence.
• Need for validated biomarkers and chemical fingerprints for quality control.

18. Future Perspectives

Future research should follow a multidisciplinary pathway combining Dravyaguna, pharmacognosy, phytochemistry, molecular pharmacology and clinical Ayurveda. Authentication of the plant should precede extraction and biological testing. Standardized extracts can then be evaluated using validated in-vitro and in-vivo models, followed by pharmacokinetic and toxicological studies.

Clinical development should focus initially on clearly defined indications supported by both traditional rationale and preclinical evidence. Randomized controlled trials should report botanical identity, preparation, dose, duration, concomitant medication and standardized outcome measures. Such an approach would make it possible to determine whether the promising experimental profile of F. cretica translates into meaningful clinical benefit.

19. CONCLUSION

Fagonia cretica L. is a pharmacologically promising medicinal plant with a long history of traditional use and a growing body of experimental evidence. Its phytochemical diversity, particularly the presence of phenolic, flavonoid, triterpenoid and saponin constituents, may contribute to antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, metabolic and cytotoxic effects reported in laboratory studies.

From an Ayurvedic viewpoint, its traditional association with Dhamasa/Duralabha and Pitta-related and respiratory conditions provides an important ethnomedical foundation for further investigation. The most appropriate modern interpretation is not to equate Ayurvedic attributes directly with molecular pathways, but to use them as structured traditional hypotheses that can be examined through contemporary research.

Overall, F. cretica should be regarded as a promising candidate for pharmacological and Ayurvedic drug research rather than as a clinically proven treatment for major diseases. Botanical authentication, phytochemical standardization, safety evaluation, pharmacokinetic investigation and rigorous clinical trials are essential for establishing its therapeutic role.

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