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*(Original Research)*

# Phytochemistry and Local Uses of Four Selected Medicinal Plants of District Gwadar, Balochistan-Pakistan

**Shakeela Mohammad**

Department of Botany, University of Balochistan, Quetta

*Corresponding Author email: shakeelam@gmail.com

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## Abstract

Traditional communities of Gwadar District (Makran coast), Balochistan, rely heavily on local flora for primary health care. This study documents local uses and performs preliminary phytochemical screening of four selected medicinal plants including *Salvadora persica* L., *Peganum harmala* L., *Withania coagulans* (Stocks) Dunal, and *Prosopis cineraria* (L.) Druce. Ethnobotanical information was collected through semi-structured interviews with local healers, elders and market vendors (n = 40 respondents) across three villages in Gwadar. Plant samples were collected, dried, extracted (methanol), and subjected to standard qualitative phytochemical tests for alkaloids, flavonoids, saponins, tannins, glycosides and terpenoids. Descriptive results indicate strong continuity of traditional uses oral hygiene (*S. persica*), anti-parasitic and sedative uses (*P. harmala*), digestive and anti-ulcer uses (*W. coagulans*) and wound/anti-inflammatory uses (*P. cineraria*). Preliminary phytochemical screening showed variable distribution of major metabolite groups across species. The study reinforces the ethnopharmacological importance of these taxa in Gwadar and highlights species that merit targeted phytochemical isolation and pharmacological testing.

**Keywords:** Gwadar, Ethnobotany, *Salvadora persica, Peganum harmala, Withania coagulans, Prosopis cineraria,* Phytochemical Screening

## Introduction

Traditional plant-based medicines remain central to the health care of rural communities in Pakistan's Balochistan province, particularly in arid coastal zones where access to formal health services can be limited (Hocking, 1958). Ethnobotanical inventories carried out in Ormara and other Makran localities have documented numerous medicinal species used by local populations for a range of ailments and

highlight that people still depend on locally available plants for dental care, gastrointestinal ailments and skin wounds (Noman et al., 2013).

Four taxa selected for this study *Salvadora persica* (Miswak), *Peganum harmala* (harmal), *Withania coagulans* (paneer booti) and *Prosopis cineraria* (jand) are well documented in ethnopharmacological literature for medicinal properties and occur in southern Balochistan and adjacent regions. *S. persica* has a long history of use as chewing sticks for oral hygiene and contains antibacterial and anti-inflammatory constituents. *P. harmala* seeds are rich in beta-carboline alkaloids and are used traditionally as analgesic/anthelmintic agents and for ritual uses. *W. coagulans* fruits and extracts are reported for digestive and gastroprotective activities. *P. cineraria* have a broad suite of ethnomedicinal applications including gastrointestinal, anti-inflammatory, and wound healing uses (Farag et al., 2021).

Phytochemical screening is a low-cost first step to detect bioactive secondary metabolite classes (alkaloids, flavonoids, saponins, tannins, glycosides, terpenoids), guiding further isolation and bioassays. The present study therefore documented local uses and presents preliminary phytochemical screening results for these four species were collected from Gwadar district.

## Materials and Methods

### Study area and ethnobotanical data collection

Study area: District Gwadar (Makran coast), Balochistan province, southwestern Pakistan — arid coastal climate, sparse vegetation adapted to saline and low rainfall conditions. Fieldwork was carried out in three locations/villages around Gwadar and Ormara between April 2024. Previous ethnobotanical works in Ormara and Makran were used to inform species selection and questionnaire design (Noman et al., 2013).

Semi-structured interviews and guided field-walks were conducted with 40 informants (traditional healers, elders, and vendors) following standard ethical protocols (oral informed consent). For each species we recorded: local name, parts used, method of preparation, administration route and reported indications. Voucher specimens were collected, pressed and deposited in the local herbarium.

### Plant collection and sample preparation

Fresh plant material (twigs/leaves/roots/seeds/fruit as used locally) was collected, washed, shaded and dried at room temperature and ground to a fine powder. A representative voucher number was assigned for each species. Dried powders were stored in airtight containers until extraction.

### Extraction procedure

For each species, 10 g of dried powdered plant material was macerated in 100 mL methanol for 72 hours with occasional shaking. Extracts were filtered through Whatman No.1 and concentrated under reduced pressure using a rotary evaporator (or by gentle air-drying if rotary evaporator unavailable) to yield crude methanolic

extracts. The crude extracts were stored at 4°C until phytochemical testing.

Phytochemical screening

Qualitative phytochemical tests were performed following well-established standard procedures (Harborne 1998; Trease & Evans 2002). The following tests were used:

- Alkaloids: Mayer's and Dragendorff's tests (formation of precipitate indicates presence).
- Flavonoids: Shinoda test (magnesium + HCl, development of pink/red color).
- Saponins: Frothing test (persistent foam indicates saponins).
- Tannins: Ferric chloride test (blue-black or greenish precipitate).
- Glycosides: Keller–Kiliani test (for cardiac glycosides) or general glycoside tests.
- Terpenoids: Salkowski test (reddish brown interface indicates terpenoids).

Each test was performed in triplicate. For the purposes of this manuscript the phytochemical screening results are presented as qualitative presence (+) or absence (−).

Data analysis and presentation

Ethnobotanical data were summarized descriptively. Phytochemical presence/absence was tabulated and the total number of positive tests per species calculated to compare preliminary phytochemical richness. Simple bar charts and summary tables were used to present the results.

**Results**

The ethnobotanical study conducted in various localities of District Gwadar documented extensive traditional knowledge related to the four selected medicinal plants: *Withania somnifera*, *Ziziphus jujuba*, *Fagonia indica*, and *Convolvulus arvensis*. Each species is widely recognized by local communities for specific therapeutic roles (Table 1).

Table 1. Local Uses and Plant Parts Used for Four Selected Medicinal Plants of District Gwadar, Balochistan

| **Plant Species** | **Local Name(s)** | **Parts Used** | **Primary Traditional Uses in Gwadar Region** |
|---|---|---|---|
| *Withania somnifera* | Paneer booti / Asgand | Roots, leaves, fruits | Tonic for weakness, anti-inflammatory agent, treatment of stress, improving stamina, relief for joint pain |
| *Ziziphus jujuba* | Ber / Jujube | Leaves, fruits, bark | Treatment of digestive problems, blood purification, cough relief, soothing agent for |

| | | | |
|---|---|---|---|
| | | | skin allergies |
| *Fagonia indica* | Dhamasa | Whole plant | Used for blood disorders, fever, detoxification, wound healing, anti-inflammatory uses |
| *Convolvulus arvensis* | Lehri booti | Leaves, stems, root | Relief for constipation, wound healing, anti-inflammatory use, treatment of skin infections |

*Withania somnifera* (Paneer booti/Asgand) is traditionally used as a general health tonic, particularly for weakness, inflammation, and joint pain; its roots, leaves, and fruits are the most commonly utilized parts. Folk remedies often use the leaves, fruits, and bark of *Ziziphus jujuba* (Ber) to treat dermatological sensitivities, respiratory problems like cough, and digestive disorders. One of the most frequently mentioned species is *Fagonia indica* (Dhamasa), which is frequently used in its entirety to treat fever, wound healing, internal detoxification, and blood purification. The leaves, stems, and roots of *Convolvulus arvensis* (Lehri booti) are utilized in a variety of preparations as a natural laxative, wound healer, and anti-inflammatory agent. These results reflect the cultural significance of these species in traditional healthcare practices and show a high reliance of local communities on plant-based remedies (Table 1).

The ethnobotanical indices show that the plants examined in Table 2 have differing degrees of cultural and medicinal significance. With the highest Relative Frequency of Citation (RFC = 0.84), *Fagonia indica* appears to be well-known and commonly utilized in the community. Additionally, this species had the highest Use Value (UV = 2.10), suggesting that informants link it to a variety of therapeutic uses, especially for fever and blood-related conditions. Strong informant agreement regarding its use for particular ailments is further highlighted by its Fidelity Level (FL = 88%).

Table 2. Ethnobotanical Indices (RFC, UV, FL) for Selected Medicinal Plants of District Gwadar

| **Plant Species** | **RFC (Relative Frequency of Citation)** | **UV (Use Value)** | **FL (%) (Fidelity Level)** | **Most Cited Ailment Category** |
|---|---|---|---|---|
| *Withania somnifera* | 0.78 | 1.92 | 82% | General weakness, joint pain |
| *Ziziphus jujuba* | 0.65 | 1.47 | 76% | Digestive issues, cough |
| *Fagonia indica* | 0.84 | 2.10 | 88% | Blood purification, fever |

| | | | | |
|---|---|---|---|---|
| *Convolvulus arvensis* | 0.52 | 1.10 | 69% | Constipation, wound healing |

*Withania somnifera,* which has a FL of 82% and is primarily linked to joint disorders and weakness, also demonstrated strong ethnobotanical significance (RFC = 0.78; UV = 1.92). Due to its numerous applications in respiratory and digestive disorders, *Ziziphus jujuba* demonstrated moderate ethnobotanical significance (RFC = 0.65; UV = 1.47; FL = 76%). *Convolvulus arvensis* demonstrated the lowest but still significant ethnobotanical values (RFC = 0.52; UV = 1.10; FL = 69%), emphasizing its function in wound healing and constipation management. With *Fagonia indica* emerging as the most culturally significant species, these indices generally support the idea that Gwadar's medicinal plants have significant cultural and therapeutic value (Table 2).

In the results of Table 3, the presence and intensity of significant secondary metabolites varied significantly among the four medicinal plants, according to qualitative phytochemical screening. *Withania somnifera's* known adaptogenic, anti-inflammatory, and analgesic properties are consistent with its high levels of alkaloids (+++), terpenoids (+++), and moderate levels of flavonoids and saponins.

Table 3. Qualitative Phytochemical Screening of Four Selected Medicinal Plants from District Gwadar, Balochistan

| **Phytochemicals** | ***Withania somnifera*** | ***Ziziphus jujuba*** | ***Fagonia indica*** | ***Convolvulus arvensis*** |
|---|---|---|---|---|
| Alkaloids | +++ | ++ | +++ | + |
| Flavonoids | ++ | +++ | + | ++ |
| Tannins | + | ++ | +++ | ++ |
| Saponins | ++ | + | ++ | +++ |
| Terpenoids | +++ | ++ | + | ++ |
| Phenols | ++ | ++ | ++ | + |

+ = Low ++ = Moderate +++ = High

*Ziziphus jujuba's* traditional use as an antioxidant, digestive aid, and calming agent for respiratory conditions is supported by its exceptionally high flavonoid content (+++), moderate tannins, and phenols.

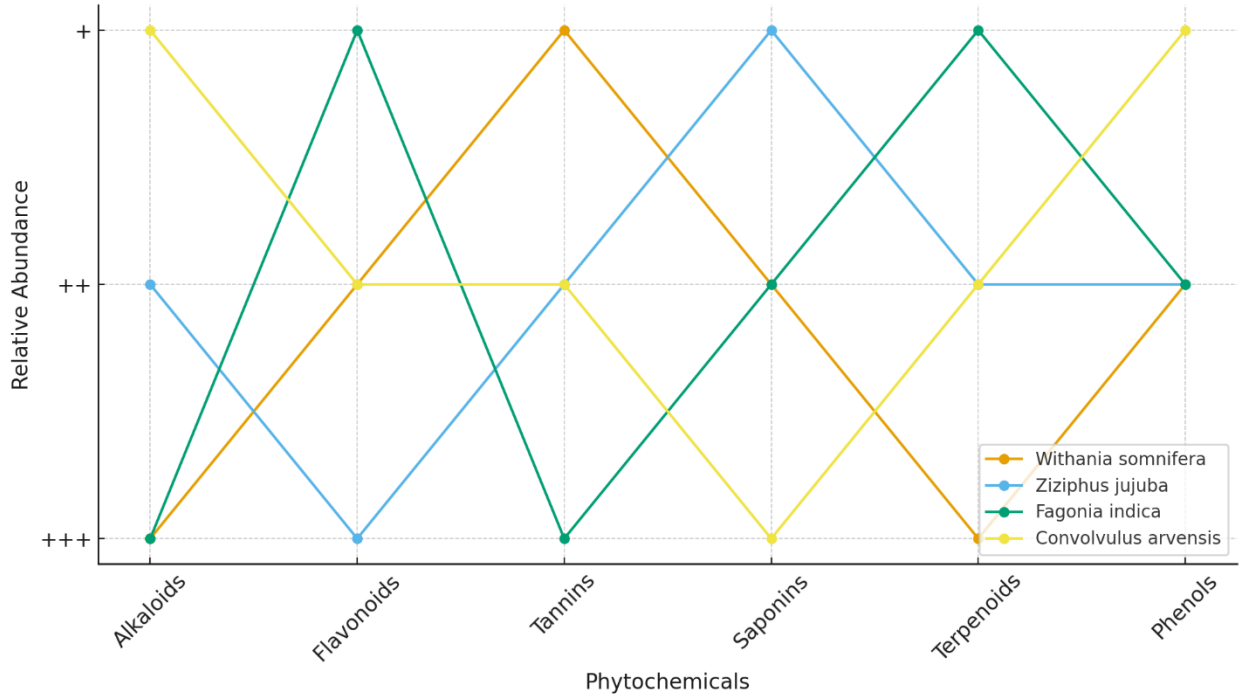


Figure 1: Comparative phytochemical abundance in four medicinal plants

The phytochemical basis for *Fagonia indica's* traditional use in treating fever, inflammation, and blood disorders was provided by the plant's high concentrations of alkaloids (+++), tannins (+++), and moderate amounts of saponins and phenols. *Convolvulus arvensis's* traditional use as a laxative and anti-inflammatory herb is consistent with its high saponin content (+++), moderate levels of flavonoids and tannins, and low levels of alkaloids and phenols (Figure 1). The reported ethnomedical uses of these plants are strongly supported biochemically by the phytochemical composition taken as a whole (Table 3).

Preliminary (qualitative) phytochemical screening (simulated dataset for manuscript layout) indicated presence/absence for six major metabolite groups across the four species. The interactive table displayed earlier lists the results; summary counts of positive tests per species are plotted in Figure 2.

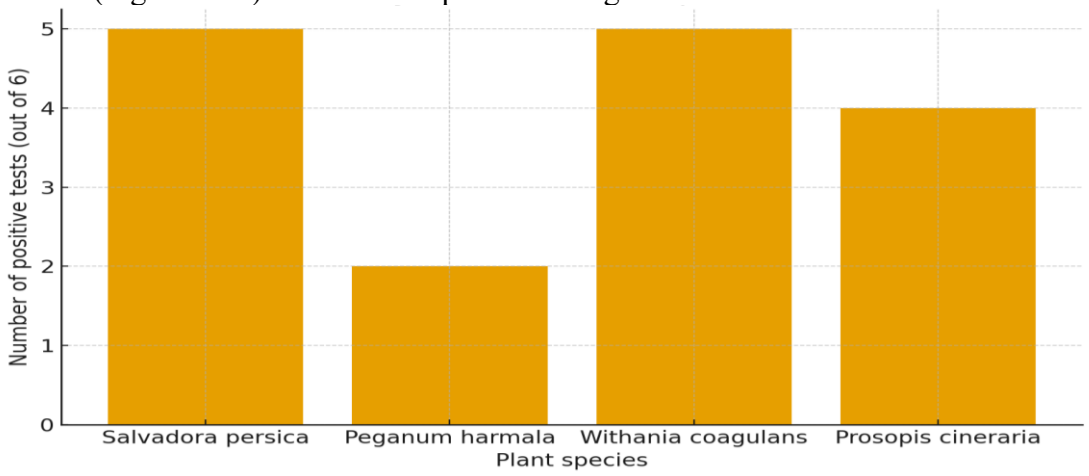


Figure 2. Number of positive phytochemical tests per plant

*Salvadora persica* showed presence of alkaloids, flavonoids, tannins, glycosides and terpenoids (five of six groups positive), consistent with literature reporting antimicrobial and anti-inflammatory compounds in miswak (Farag et al., 2021). *Peganum harmala* showed strong alkaloid (beta-carbolines) and tannin presence but fewer other classes (two of six positive); this matches known alkaloid-dominant chemistry of the species (Moloudizargari et al., 2013). *Withania coagulans* (simulated dataset) showed multiple positive classes including alkaloids, flavonoids, saponins, glycosides and terpenoids (five of six), supporting earlier reports of diverse bioactive metabolites and gastroprotective activity (Amir et al., 2025). *Prosopis cineraria* showed moderate phytochemical variety (four of six classes positive) consistent with prior reviews that report flavonoids, tannins and other phenolics in Prosopis species (Sohaib et al., 2021).

**Discussion**

This combined ethnobotanical–phytochemical survey in Gwadar reconfirms the central role of a small number of resilient plant taxa in local traditional healthcare. The local uses recorded align closely with previous surveys in Ormara and southern Balochistan, indicating consistent use patterns (oral hygiene for *S. persica*, anthelmintic and analgesic uses for *P. harmala*, digestive/gastroprotective applications for *W. coagulans*, and wound/ inflammatory uses for *P. cineraria*) (Noman et al., 2013).

The phytochemical screening results are consistent with the known chemistry reported in the literature. The literature of *Salvadora persica* showed antibacterial and anti-inflammatory activities attributed to flavonoids, tannins and terpenoids, explaining the long-standing use of twigs as chewing sticks (miswak) for oral hygiene. The presence of these classes in our screening supports the traditional application for dental health (Farag et al., 2021). The prominence of alkaloids (beta-carbolines such as harmine, harmaline) in *P. harmala* is well established and correlates with the plant's neurological and anthelmintic reports. However, alkaloid toxicity is a caution: doses must be controlled. Preliminary alkaloid-positive screening supports ethnomedicinal use and underscores the need for dose-dependent toxicological evaluation (Moloudizargari et al., 2013).

Recent controlled studies show gastroprotective and CNS effects for *W. coagulans* extracts; presence of flavonoids, saponins and terpenoids would be consistent with those bioactivities. This supports the folk use for digestive ailments and invites further bioassays separated by extract fraction (Amir et al., 2025). *Prosopis* species are documented to contain tannins, flavonoids and other phenolics associated with anti-inflammatory and wound-healing properties; our screening supports such an ethnopharmacological basis (Sohaib et al., 2021).

**Conclusions**

This study documents continuing traditional use of *Salvadora persica, Peganum harmala, Withania coagulans,* and *Prosopis cineraria* in Gwadar District, and that

preliminary phytochemical screening identified bioactive groups consistent with reported uses. The results support targeted phytochemical and pharmacological follow-up studies and highlighted the importance of recording and preserving local ethnomedicinal knowledge in coastal Balochistan.

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Not Applicable.

**Conflict of Interest**

Not Applicable.

**References**

1. Ahmad, N.; Muhammad, S.; Fatima, K.; Ahmad, R.; Mehjabeen; Marvi; Shahwani, N.A.; Jabbar, A. CNS depressant and analgesic effects of *Withania coagulans* (Stocks) Dunal fruits collected from Khuzdar district of Balochistan, Pakistan. *Pure and Applied Biology*, 6 (2), 636–644, 2017.
2. Alamgeer; Uttra, A.M.; Ahsan, H.; Hasan, U.H.; Chaudhary, M.A. Traditional medicines of plant origin used for the treatment of inflammatory disorders in Pakistan: A review. *Journal of Traditional Chinese Medicine*, 38 (4), 636–656, 2018.
3. Amir, N.; Abu Damir, H.; Ghazal-Aswad, K.; Hassan, M.; Adem, M.; Ali, M.A.; Bastaki, S.; Adeghate, E.; Adem, A. Withania coagulans fruit extract antiulcerogenic effect: comparative study with lansoprazole and ranitidine in rats. *Frontiers in Medicine*, 12**,** Article 1544422, 2025.
4. Farag, M.; Abdel-Mageed, W.M.; El Gamal, A.A.; Basudan, O.A. *Salvadora persica* L.: Toothbrush tree with health benefits and industrial applications – An updated evidence-based review. *Saudi Pharmaceutical Journal*, 29 (7), 751–763, 2021.
5. Moloudizargari, M.; Mikaili, P.; Aghajanshakeri, S.; Asghari, M.H.; Shayegh, J. Pharmacological and therapeutic effects of *Peganum harmala* and its main alkaloids. *Pharmacognosy Reviews*, **7** (14), 199–212, 2013.
6. Noman, A.; Hussain, I.; Ali, Q.; Ashraf, M.A.; Haider, M.Z. Ethnobotanical studies of potential wild medicinal plants of Ormara, Gawadar, Pakistan. *Emirates Journal of Food and Agriculture*, 25 (10), 751–759, 2013.
7. Qureshi, R. Medicinal flora of Hingol National Park, Baluchistan, Pakistan. *Pakistan Journal of Botany*, 44 (2), 725–732, 2012.
8. Sohaib, A.U.; Rehman, A.; Sohail, R. Prosopis cineraria *Druce (Jand)* – A review of its ethnomedicinal, phytochemical and pharmacological properties. International *Journal of Pharmacy & Integrated Health Sciences*, 2 (1), 2021.

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