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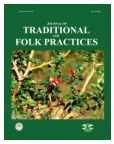

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Documentation and analysis of folk remedies in rural Goa: A step towards preservation

Denis Vaz

Department of Konkani, Rosary College of Commerce & Arts, Navelim, Salcete, Goa 403 707, India

*denis@rosarycollege.ac.in

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Abstract

This research paper explores folk remedies in rural Goa, aiming to document and preserve this traditional knowledge. As modernization and globalization advance, capturing and safeguarding indigenous medicinal practices, nurtured over generations, becomes crucial. This study employs qualitative research methodology, including ethnobotanical surveys to identify the medicinal plants, minerals and animal-derived remedies used in rural Goan healthcare. Key findings reveal a diverse array of medicinal plant species addressing various ailments, from common infections to chronic diseases. The study also highlights the essential role of traditional healers in rural Goa's healthcare system, emphasizing the cultural and social aspects of these practices. This research contributes to the academic discourse on traditional medicine and stresses the importance of integrating these practices into contemporary healthcare frameworks. By bridging traditional knowledge, the study advocates for a holistic approach to health and well-being, recognizing the potential of folk remedies in offering low-cost, accessible and culturally resonant healthcare solutions. Through preserving and scientifically examining these practices, the study aims to ensure the sustainability of Goa's medicinal biodiversity and cultural heritage, contributing to global efforts in conserving traditional medicine.

Keywords: Biodiversity, Cultural heritage, Healthcare integration, Traditional knowledge preservation

1. Introduction

Goa’s rural landscapes are rich tapestries woven with traditions, cultures and a deep-rooted sense of community, among which the practice of folk remedies stands out as a testament to the country's enduring relationship with traditional medicine. These remedies, often derived from plants, minerals and animals, are the culmination of centuries-old wisdom passed down through generations. They not only reflect the indigenous knowledge of natural resources but also embody the holistic approach to health and well-being that is intrinsic to rural life. However, as the winds of modernization sweep across these rural expanses, there is a palpable threat to the survival of this precious knowledge. The oral tradition that has been the backbone of this knowledge transfer is faltering under the pressure of rapid globalization, urbanization and the increasing reliance on modern medicine. This shift poses a significant risk of losing an invaluable part of Goa’s cultural heritage and biodiversity, as well as the potential health benefits these folk remedies offer. The urgency to document and analyze these folk remedies cannot be overstated. While the scientific community has begun to recognize the value of traditional medicine, much of Goa's folk knowledge remains undocumented, existing only in the memories of the elderly and practitioners of traditional medicine. This study, therefore, aims to bridge this gap by systematically documenting the folk remedies prevalent in selected rural areas of Goa. By doing so, it seeks to preserve this knowledge for future generations and lay the groundwork for scientific validation. Such validation could potentially integrate these remedies into mainstream healthcare, offering low-cost, accessible and culturally resonant health solutions to rural populations.

Moreover, this endeavor is not merely academic; it is a step towards acknowledging and respecting the wisdom of Goa's rural communities. It highlights the importance of traditional knowledge systems and their relevance in today's world, where sustainable, holistic approaches to health are increasingly sought after. By placing these folk remedies, this study also addresses the critical need for ensuring their safety and efficacy, thus paving the way for their informed use in public health initiatives. In essence, the documentation and analysis of folk remedies in rural India represent a confluence of preservation and progress. It is a recognition of the past's contributions to the future, ensuring that the legacy of traditional knowledge continues to benefit humanity in the contemporary age. This study sets out to contribute to this ongoing effort, recognizing the intricate balance between maintaining cultural integrity and embracing the advancements of modern science for the betterment of human health.

In the realm of traditional healthcare systems, the study by Chitra V (2022), serves as an enlightening exploration into the historical and cultural significance of folk medicine within human societies. The research underscores the foundational role of folk medicine as deeply intertwined with the cultural, social and spiritual fabric of communities, particularly emphasizing the Ayurvedic system's historical significance as one of humanity's oldest medicinal practices. In the evolving landscape of herbal medicine research, the study by Baruah *et al*, (2014), stands out as a significant contribution, particularly for its in-depth exploration of the traditional herbal medicine practices in the rural health care system of Assam, a region renowned for its rich biodiversity and vast repository of medicinal plants. This study underscores the critical role of indigenous knowledge in the primary healthcare practices of rural communities, a theme resonant with the World Health Organization's estimates that a substantial portion of the global population, especially in developing countries, relies on traditional medicine for their primary healthcare needs.

2. Materials and methods

This study adopts a qualitative research methodology approach to ensure a comprehensive understanding of folk remedies in the rural areas of Goa. The choice of Goa as the survey area is strategic due to its rich biodiversity and the unique blend of cultural influences that have shaped its traditional health practices. The region's diverse flora contribute to a wide range of medicinal plants and ingredients used in folk remedies, making it an ideal location for this research. Goa was selected based on its ecological and cultural diversity, which contributes to a rich tradition of folk medicine. The survey was conducted in the rural communities of Benaulim, Canacona, Curtorim, Fatorpa, Navelim, Ponda and Sanvordem (Fig.1.). where traditional practices are more likely to be preserved. The selection criteria also include accessibility, the presence of knowledgeable practitioners of folk medicine and the diversity of ecological zones within Goa to ensure a wide range of remedies and practices are covered. The data was collected over a period of 11 months spanning from March 2023 to January 2024.

The materials for this study are plants used in traditional remedies. Information regarding these materials were collected from local practitioners, including healers, herbalists and elders known for their expertise in traditional medicine. Ethnobotanical surveys were conducted to identify and catalog the plant species used in the remedies.

Fig. 1. Map of the study area

2.1. Methodology

2.1.1. Ethnographic data collection: Ethnographic methods were employed to document the traditional knowledge surrounding folk remedies. Semi-structured interviews were conducted with traditional healers, herbalists and elder community members who are custodians of this knowledge. The interview guide was developed based on Alexiades (1996) and aimed to capture detailed information on remedy preparation, use and the cultural context of their application. Participant observation sessions were conducted to witness the preparation and application of remedies firsthand, providing additional insights into the practical aspects of traditional practices.

2.1.2. Ethnobotanical survey: The ethnobotanical survey followed the method outlined by Martin, (1995) in "Ethnobotany: A Methods Manual". Plant species used in the remedies were identified, their local names, parts used and preparation methods were recorded. This data provided the basis for selecting specimens for further phytochemical and pharmacological analysis.

The study focuses on folk remedies derived from plants, minerals and animal products traditionally used in rural Goa. Specimen's were authenticated using the research article "Documentation of Some Medicinal Plant Species from Goa" by Bernad Rodrigues Senior Professor of Botany at Goa University (Sawant and Rodrigues 2015).

3. Results and discussion

During the research period of 10 months, a collection of 30 medicinal plant species was gathered directly from local communities from Benaulim, Canacona, Curtorim, Fatorpa, Navelim, Ponda and Sanvordem (Table 1). These plants are recognized for their potential to address distinct human ailments, leading to the documentation of different formulations for various conditions within this study. The details offer a concise overview of the local and botanical names of the medicinal plants that were explored. A total of 15 local practitioners were interviewed who have knowledge of the local plants. It was noted that local practitioners utilize various plant parts such as roots, stems, leaves, fruits or the entire plant to concoct herbal remedies. These plants may be used individually or in combination with others, with a prevailing belief among the locals that remedies derived from multiple plant species tend to be more efficacious than those based on a single species. The investigation uncovered that the plants identified are utilized to treat a wide range of health issues, including coughs, diarrhea, dysentery, wound healing, diabetes, jaundice, fever, vomiting, skin conditions, toothaches, menstrual disorders, hypertension and headaches, among others. Various mediums namely water, par-boiled rice water, coconut oil, coconut water and milk are reputed to augment the effectiveness of these herbal medicines. According to local insights, the predominant method for preparing these medicinal extracts involves using par-boiled rice water, followed by water, coconut oil, coconut water, milk and curd. The preparations are primarily in the form of decoctions, pastes and poultices. The information of the remedies were collected from primary sources (locals). Observations highlighted that inhabitants of several villages exclusively rely on local healers for treating illnesses, eschewing visits to certified medical practitioners. This firsthand research aimed to capture the efficacy and usage of these plants, which were found to treat a wide array of health issues. This study aims to document and thereby preserve this invaluable knowledge for future generations, which is at risk of being eclipsed by the shift towards modern allopathic treatments.

The findings from this study on folk remedies in rural Goa align with global trends emphasizing the integration and preservation of traditional medicinal practices. Studies like those by Baruah *et al.,* (2014) on Assam's traditional healthcare system and (Chitra, 2022) on the cultural relevance of folk medicine provide a comparative backdrop, reinforcing the critical role that indigenous knowledge plays in rural healthcare systems. Similar to this study, Baruah et al. highlighted the heavy reliance on plant-based remedies in rural healthcare and emphasized the urgency of preserving such practices in the face of modernization Further, the ethnobotanical richness observed in Goa mirrors findings in other biodiversity hotspots. For example, research in North-East India and Kerala shows overlapping uses of plants for common ailments like skin infections, digestive disorders, and respiratory problems, as documented by (Alam *et al.,* 2020) and (Iweala *et al.,* 2023). These studies underscore the antimicrobial and anti-inflammatory properties of regional flora, comparable to the plants identified in Goa for treating wounds and infections. The cultural dimension of traditional medicine in Goa aligns with (Chitra, 2022) assertion that folk medicine serves as a bridge between healthcare and cultural identity. While Goa's practices are deeply rooted in its unique Indo-Portuguese heritage, they face similar threats from globalization as noted in regions like North-East India and Sub-Saharan Africa.

Moreover, the documentation of multi-plant remedies in this study complements findings by (Shah *et al*., 2010) and (Fugare *et al.,* 2021), which emphasize that combinations of plant species often enhance medicinal efficacy. This synergy underscores the importance of preserving not only individual plant knowledge but also the complex traditional formulations passed down through generations. However, this study also highlights gaps, such as the lack of rigorous pharmacological validation of certain remedies, a limitation shared by other ethnomedicinal studies. Research by (Muthukrishnan *et al.,* 2016) advocates for deeper biochemical analyses to ensure the safety and efficacy of folk remedies, a recommendation that could also apply to Goa's practices The findings reinforce the need for collaborative frameworks involving traditional healers, researchers, and policymakers, as advocated in global discussions on integrating traditional medicine into modern healthcare systems. By aligning with such frameworks, the preservation of Goa's traditional medicinal knowledge can serve as a model for sustainable and culturally sensitive healthcare solutions worldwide.

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Table 1. List of Medicinal Plants: Scientific Classification, Local Names and Remedies

Sl. No.	Scientific name	Plant Name	Family	Local name	Part(s) used	Medicinal remedies
1.	*Acorus calamus* L. (Plate 2 a.)	*Sweet flag*	Acoraceae	*Vaikhand*	Leaves, essential oil and rhizome	a)While less commonly used than the rhizome, the leaves of is being applied topically in the form of poultices to clean wounds and promote healing, leveraging its antimicrobial properties. b)The essential oil is used in aromatherapy for its calming effects, helping to relieve stress and anxiety. Diluted essential oil can be applied topically to relieve pain, including joint pain and muscle aches, due to its anti-inflammatory properties. c)Rhizome is used in the form of a powder, tea, or tincture. Traditionally, it has been used to improve memory, concentration and to calm the mind, making it a remedy for headaches, anxiety and various neurological conditions. The rhizome's essential oil has antimicrobial and anti-inflammatory properties, making it useful for treating infections and conditions like arthritis. Chewing on the rhizome has been a traditional method to maintain oral hygiene, freshen breath and treat toothaches and gum infections.
2.	*Achyranthes aspera* L. (Plate 2 b.)	*Devil's Horsewhip*	Amaranthaceae	*Aagado*	Leaves, roots seeds and whole plant	a)The leaf paste is applied topically to treat skin issues such as wounds, boils and rashes. Decoction of the leaves is consumed to relieve symptoms of respiratory conditions like asthma and cough. b)A decoction of the root may be used as a mouthwash, or the root may be chewed directly for relieving toothache and treating gum diseases. Roots are also used to treat dysentery and diarrhea, where a decoction of the root is consumed to alleviate the symptoms. c)The seeds are used in traditional medicine to treat digestive issues, including indigestion, constipation and worm infestations. They are often consumed directly or in powdered form. Seeds are also known for their diuretic properties, aiding in the treatment of urinary tract infections and kidney stones. d)A decoction made from the entire plant is used to treat fever and general body malaise. It is believed to have antipyretic properties. The whole plant is also used for its anti-inflammatory and analgesic properties, providing relief from pain and inflammation in conditions such as arthritis.

3.	*Aerva lanata* (L.) Juss. ex Schult. (Plate 2 c.)	*Polpala*	Amaranthaceae	*Mutkha-Dyache Zhad*	Flowers, leaves, roots and whole plant	a)Flowers are used in some traditional remedies for treating eye diseases. An infusion made from the flowers can be used as an eye wash to alleviate irritation and infection. b)Leaves are used for their diuretic properties, aiding in the treatment of urinary tract infections, kidney stones and promoting overall kidney health. A decoction or tea made from the leaves is consumed for this purpose. Juice extracted from the leaves or a decoction is used to treat respiratory conditions like asthma and bronchitis. c)Roots are used for their analgesic properties, providing relief from rheumatic pain and headaches. A decoction of the root is consumed for pain relief. Traditional practices also include using the root to manage diabetes, with preparations made from the root believed to help regulate blood sugar levels. d)Whole Plant is used in traditional medicine to treat various digestive issues, including acidity, stomach ulcers and intestinal worms. A decoction made from the whole plant can be consumed to alleviate these conditions. The plant is used for skin ailments, such as wounds, rashes and infections. A paste made from the whole plant can be applied topically to affected areas.
4.	*Alstonia scholaris* (L.) R.Br. (Plate 2 d.)	*Chhatim tree*	Apocynaceae	*Santon*	Bark, flowers, leaves and roots	a)The bark is boiled to prepare a decoction that is consumed to treat fever, including malarial fever and respiratory disorders such as asthma and bronchitis. It is also used as a remedy for diarrhea and dysentery by drinking the decoction. Externally, a paste made from powdered bark is applied to wounds and ulcers to promote healing due to its antimicrobial and astringent effects. b)Flowers are used to alleviate respiratory conditions. An infusion of the flowers is consumed to treat colds and mild asthma. Additionally, the flowers are sometimes used in aromatherapy for their calming and soothing effects. c)The leaves are used in various remedies, primarily for skin and wound care. Fresh leaf paste is applied directly to boils, ulcers and other skin lesions to reduce inflammation and aid healing. In cases of respiratory issues such as asthma or chronic cough, the leaves are boiled and the steam is inhaled to clear the airways. Additionally, a leaf decoction is used as a gargle to relieve sore throat and oral infections. d)The roots of the plant are used in traditional medicine for treating digestive and nervous system disorders. A decoction of the roots is consumed to alleviate stomach aches, indigestion and flatulence. In some practices, the root extract is also believed to have sedative properties and is used to calm the nerves and improve sleep quality.

5.	*Andrographis paniculata* (Burm.f.) Wall. ex Nees (Plate 2 e.)	*Creat*	Acanthaceae	*Kiraitem*	Flowers, leaves and roots	a)Flowers are used in teas or infusions for their mild anti-inflammatory effects and are believed to aid in treating fevers and flu-like symptoms. The flowers are also thought to have mild antioxidant properties, helping to support the body's immune system. b)Leaf infusion is traditionally consumed to treat common colds, coughs and upper respiratory tract infections. The bitter-tasting leaves are also used in the treatment of digestive issues like dyspepsia, bloating and loss of appetite. They are known for their detoxifying effects and are used in traditional medicine to purify the blood and improve liver function. Additionally, fresh leaf juice is applied topically to treat skin infections, wounds and ulcers c)Root decoction is traditionally consumed to treat fever, especially in cases of malaria. The roots are believed to have strong immune-boosting effects and are used to alleviate symptoms of viral infections, including influenza. Root extracts are also used for gastrointestinal issues such as stomach ulcers, gastritis and indigestion. In some cultures, the root is used as a remedy for liver disorders, including jaundice, as it helps improve liver function and detoxification.
6.	*Anacardium occidentale* L. (Plate 2 f.)	*Cashew Tree*	Anacardiaceae	*Kaju*	Bark, Nut, Fruit and Leaves	a)Bark decoction or infusion made from the bark is used to treat diarrhea and is believed to have antimicrobial properties. The bark is also used for managing oral health problems. Chewing on the bark is believed to strengthen and heal gum issues and toothaches. b)Cashew nut shell liquid (CSNL) is applied topically to treat skin infections, warts and fungal infections. CNSL is also used for its anti-inflammatory properties to treat rheumatism and other inflammatory conditions. c)Fruit is consumed to aid digestion and treat stomach issues. Due to its high iron content, the cashew apple is used in traditional medicine to combat anemia. d)Leaves are used in traditional medicine to manage diabetes. A tea made from the leaves is believed to help lower blood sugar levels. A decoction of the leaves is used to treat inflammation and pain, including headaches and fever.
7.	*Ananas comosus* (L.) Merr. (Plate 2 g.)	*Pineapple Plant*	Bromeliaceae	*Ananas*	Fruit, leaves and roots	a)The juice, primarily extracted from *Ananas comosus,* aids in breaking down proteins, improving digestion and relieving indigestion. The juice contains bromelain enzyme which aids in improving digestion and relieving indigestion. (Kansakar *et al.,* 2024). b)Leaf decoctions are used in traditional remedies for colds, coughs and bronchitis. c)Root extract is used in traditional remedies to treat intestinal worms and parasitic infections. Roots are also utilized in decoctions as a diuretic to help with water retention and detoxification.

8.	*Annona reticulata* L. (Plate 2 h.)	*Custard apple*	Annonaceae	*Sitaphal*	Fruit, leaves and seeds	a)Ripe fruit is consumed to aid digestion and to treat digestive disorders such as diarrhea and dysentery. Being rich in vitamins and minerals, the fruit is consumed to boost overall health. b)Leaves are boiled in water to make a tea that is used to reduce fever and to aid in the treatment of diabetes. c)Powdered seeds are used to treat internal parasitic infections, but this must be approached with caution due to the seeds' toxicity.
9.	*Anethum graveolens L.* (Plate 2 i.)	*Dill*	Apiaceae	*Shepu*	Leaves and Seeds	a)The essential oil is used for its anti-inflammatory and analgesic properties. It can be applied topically (diluted) to relieve pain, including headaches and swollen joints. The essential oil is used in aromatherapy for its calming and stress-reducing effects, promoting a sense of well-being. b)leaves have antimicrobial properties and can be used in the treatment of minor wounds and infections. Applying the paste made from leaves or using them in baths is a traditional remedy. The antispasmodic properties (Rauf *et al*., 2021) of the leaves make it a traditional remedy for relieving menstrual cramps. Consuming a tea made from leaves is a common practice due to their expectorant properties, are used to treat respiratory conditions such as cough, cold and bronchitis. c)Seeds are well-regarded for their digestive benefits. They are used to alleviate indigestion, gas and stomach cramps. A tea made from dill seeds can be consumed to aid digestion. Chewing the seeds can freshen the breath and is often used as a natural mouth freshener. Due to its calming effects, tea made from the seeds is sometimes recommended to those suffering from insomnia or sleep disturbances.
10.	*Boerhavia diffusa L.* (Plate 2 j)	*Common Hogweed*	Nyctaginaceae	*Punanrvo*	Flowers, leaves and roots	a)Flowers are used in treating conditions like joint pain and general body aches. Extracts from the flowers are used for treating minor infections and skin diseases. b)Leaves are traditionally used to lower blood pressure, acting as a natural remedy for hypertension. c)Root extracts are used to protect and rejuvenate the liver, aiding in the management of liver disorders like jaundice and cirrhosis.

11.	*Brassica oleracea* L.	*Cabbage*	Brassicaceae	*Kobi*	Leaves	a)Leaves are traditionally used to detoxify the body by aiding liver function and promoting the removal of toxins. The leaves are rich in antioxidants, such as vitamin C and flavonoids (Ahmad *et al*., 2012), which help reduce oxidative stress and inflammation in the body. They are often used to treat conditions like arthritis and are believed to alleviate pain and swelling. The sulfur-containing compounds (Park *et al.,* 2017) in cabbage, like sulforaphane, help enhance the detoxification process. The leaves are used topically to treat wounds, bruises and swelling. The leaves are applied as a compress to reduce inflammation and promote faster healing.
12.	*Buchanania lanzan* Spreng.	*Chironji*	Anacardiaceae	*Char*	Bark, leaves and seeds	a)Bark gum extracted from the tree is used as a diuretic, helping in the treatment of urinary tract infections and promoting kidney health. The gum is applied topically to treat skin disorders, acting as a soothing agent for inflamed skin. b)Leaves are crushed and applied to wounds to promote healing and prevent infections, thanks to their antibacterial properties. A paste made from the leaves or a decoction is used to reduce inflammation and relieve pain in cases of arthritis and other inflammatory conditions. c)Seeds are used in traditional medicine to improve digestion and treat digestive disorders such as constipation and indigestion. Seed paste is applied topically to treat skin rashes, blemishes and to improve overall skin texture and complexion. The seeds are also used to treat coughs and colds. A paste made from the seeds mixed with honey can be consumed to provide relief from respiratory ailments.
13.	*Calotropis procera* (Ait.) R. Br.	*Small crown flower*	Apocynaceae	*Rui*	Flowers, leaves and roots	a)Flowers are used to prepare infusions that have antimicrobial effects against a range of pathogens. Flower extracts are used in traditional medicine to treat skin conditions like eczema, psoriasis and other inflammatory skin disorders. b)Leaves are used to treat asthma, bronchitis and other respiratory issues. The leaf extract has antispasmodic properties and is helpful in relieving chest congestion. The leaves possess potent anti-inflammatory properties and are used in treating inflammatory conditions like arthritis. c)Root is used as an anthelmintic remedy. The roots contain cardiac glycosides (Crout *et al*., 1963) that have been used to regulate heart function and treat heart-related issues, although caution is advised due to their potency.

14.	*Carica papaya* L.	*Papaya Tree*	Caricaceae	*Popay*	Fruit, leaves and seeds	a)The fruit is rich in enzymes like papain (Babalola *et al*., 2023), which aids digestion by breaking down proteins and alleviating issues such as indigestion and bloating. b)Mature, fresh leaves are crushed and the juice that is extracted is widely used to increase platelet count and reduce symptoms of dengue fever. Latex from the leaves is collected by making small incisions on the leaf stalk or stem. This latex is directly applied to minor wounds and cuts to speed up healing c)The Seeds are known for their hepatoprotective properties (Donga *et al.,* 2019), helping in detoxifying the liver and combating liver diseases. Crushed seeds mixed with honey are used to expel intestinal worms.
15.	*Cassia tora* L.	*Senna tora*	Fabaceae	*Taikillo*	Leaves, roots and seeds	a)Leaves are widely used in traditional medicine for their laxative, antimicrobial and anti-inflammatory properties (Arulpandi and Kanimozhi 2011). Fresh leaf juice is applied topically to treat skin ailments such as eczema, ringworm and other fungal infections. For constipation, the leaves are boiled to prepare a decoction that, when consumed, acts as a gentle purgative. Additionally, leaf paste is used to reduce swelling and alleviate pain in cases of joint inflammation and arthritis. b)Roots of this plant are employed in traditional remedies to treat fever and respiratory ailments. A root decoction is prepared by boiling the roots in water, which is consumed to reduce fever and manage symptoms of cough and cold. It is also believed to have anthelmintic properties, aiding in the expulsion of intestinal worms. c)Seeds are particularly known for their benefits in eye health. Roasted and ground seeds are mixed with water to create a paste or decoction that is traditionally applied to treat conjunctivitis and other eye irritations. Consuming a seed decoction is also believed to improve vision and relieve conditions such as night blindness. Additionally, the seeds are used in remedies for liver detoxification, as they help remove toxins and improve digestion.
16.	*Benincasa hispida* (Thunb.) Cogn.	*Ash Pumpkin*	Cucurbitaceae	*Kuvalo*	Fruit, Leaves and Seeds	a)Consuming fresh wax gourd juice alleviates constipation, acidity and indigestion. b)Crushed leaves are traditionally applied to cuts and wounds to reduce inflammation and promote healing. Decoctions made from leaves are used to treat inflammatory conditions, including arthritis. c)Oil extracted from the seeds has cardioprotective properties (Rolnik and Olas, 2022) due to its beneficial fatty acid profile. They are also effective in eliminating intestinal worms and parasites.

17.	*Curcuma longa* L.	*Turmeric*	Zingiberaceae	*Haladh*	Root	a)Rhizomes are a powerful anti-inflammatory agent used in treating arthritis, joint pain and other inflammatory conditions. Curcumin neutralizes free radicals and boosts overall health (Iweala *et al.*, 2023). A paste made from rhizome is applied to cuts and wounds to speed up healing and prevent infections. Supports liver detoxification and protects against liver diseases due to its hepatoprotective effects.
18.	*Cynodon dactylon* (L.) Pers.	*Bermuda grass*	Poaceae	*Haryalli*	Leaves and Roots	a)Fresh leaf juice is known to be effective in treating urinary disorders, including painful urination and is commonly used in the treatment of kidney stones and bladder infections. The leaves are also used to alleviate conditions such as fever, respiratory infections and digestive issues. A decoction made from the leaves is consumed to treat diarrhea, dysentery and other gastrointestinal disorders due to its soothing and antimicrobial effects. Additionally, the leaves are used externally as a poultice or paste to treat cuts, wounds and ulcers for their anti-inflammatory (Parihar and Sharma 2021) and healing properties. b)Root extracts are commonly used to treat kidney problems, such as kidney stones and urinary tract infections, as they help to cleanse the urinary system and promote the elimination of toxins. The roots are also known for their ability to reduce swelling and inflammation and thus are used to treat conditions such as arthritis and joint pain.
19.	*Erythrina variegata* L.	*Indian Coral Tree*	Fabaceae	*Pongro*	Bark, Leaves and Roots	a)Bark extracts are believed to improve heart health by reducing hypertension and lowering the risk of cardiovascular diseases. The bark is used to reduce inflammation and oxidative stress, making it useful for treating inflammatory (Bhagyasri *et al.,* 2017) conditions and preventing chronic diseases. b)Leaves are applied topically to minor cuts, burns and wounds to speed up healing and prevent infection. Leaf extracts are also used to relieve pain from joint aches and muscle soreness. c)Root is used in traditional medicine to treat conditions like arthritis and muscle pain. It is considered an analgesic and anti-inflammatory agent, often used in the form of a decoction or paste. The roots have hepatoprotective properties (Muthukrishnan *et al.,* 2016) and are used to support liver function and treat liver-related diseases such as jaundice.

20.	*Glycyrrhiza glabra* L.	*Liquorice*	Fabaceae	*Gondekasht*	Roots	a)Root extracts are included in formulations for treating respiratory issues such as asthma, cough and bronchitis, due to their anti-inflammatory (Bisht *et al.,* 2021) and expectorant properties. Root powder is consumed to treat digestive issues such as bloating, acid reflux and gastritis. The powder is also used to treat cough and respiratory conditions, as it helps to clear mucus and soothe the throat.
21.	*Justicia adhatoda* Mart. ex Nees	*Malabar Nut*	Acanthaceae	*Adulsa*	Leaves and Roots	a)Decoctions or teas made from the leaves help treat coughs, colds, asthma and bronchitis. Extracts from the leaves are used in traditional medicine as a supplementary treatment for tuberculosis due to their antimicrobial properties (Sharma and Kumar, 2016). b)Root decoctions are traditionally used to treat fevers and associated symptoms like body aches. Root extracts are employed in remedies for intestinal worms and other parasitic infections.
22.	*Mangifera indica* L.	*Mango Tree*	Anacardiaceae	*Aamo*	Bark, Fruit, Leaves and Seeds	a)Bark is used in traditional medicine to treat various ailments, including diarrhea, dysentery and gingivitis. A decoction of the bark is used as a mouthwash or gargle to treat tooth decay and gum inflammation. The bark's extract has antiseptic properties (Shah *et al.,* 2010) and is applied to heal wounds. b)Fruit is consumed for its laxative properties and to treat digestive disorders such as indigestion and constipation. Fruits are rich in vitamins A, C and E, as well as antioxidants (Yahia *et al.,* 2023), which contribute to overall health, immune system boosting and skin health. Consuming raw mango with salt helps to protect from heat stroke and to cool down the body during hot weather. c)Fresh or dried leaves are often used in traditional remedies for diabetes. The leaves are soaked overnight in water and the filtered water is consumed early in the morning to help manage blood sugar levels. A decoction made from mango leaves can be used to treat common respiratory problems such as colds, asthma and bronchitis. Mango leaves are also used to lower blood pressure and strengthen the blood vessels. d)Seeds are used in powdered form to treat diarrhea and dysentery. Mango seed extract is also believed to help in reducing body fat and controlling cholesterol levels.

23.	*Mimosa pudica* L.	*Sensitive Plant*	Fabaceae	*Lachki*	Flowers, Leaves and Roots	a)Flowers are utilized for their soothing and mild sedative properties. A flower infusion is consumed to relieve anxiety, stress and insomnia. The flowers are also applied topically to treat skin problems such as rashes and allergic reactions due to their anti-inflammatory (Mistry *et al*., 2012) and cooling effects. The flowers are sometimes used in treatments for headaches and to improve overall relaxation. b)Leaves are for their anti-inflammatory, sedative and antimicrobial properties (Mistry *et al.,* 2012). A common remedy is the preparation of a leaf paste, which is applied topically to wounds, cuts and burns to promote healing and reduce infection. The leaves are also used in a decoction to treat conditions such as fever and respiratory issues, including cough and asthma. Drinking the leaf infusion is believed to help soothe digestive disorders such as dysentery and diarrhea due to its antidiarrheal properties. c)Root is used in treating pain and digestive problems. A decoction made from the roots is traditionally consumed to relieve abdominal discomfort, including constipation, gas and bloating. The root is also used as a remedy for pain relief in cases of arthritis and joint pain due to its anti-inflammatory effects. In some cultures, the root is utilized to manage fever and reduce the symptoms of malaria. The roots are also believed to have mild sedative properties, helping to calm the nervous system and reduce anxiety.
24.	*Nerium indicum* Mill	*Karavira Indian Oleander*	Apocynaceae	*Kaner*	Flowers and Leaves	a)Flowers are applied in treating skin conditions such as eczema, rashes and burns. They are rich in antioxidants and are used for their anti-inflammatory properties (Dey and Chaudhuri, 2014). b)Leaves are known for their potent cardiac glycosides, such as oleandrin (Dey and Chaudhuri, 2014), which are used to treat heart conditions like congestive heart failure and arrhythmias. However, due to their toxicity, they should be used under strict medical supervision. The leaves possess anti-inflammatory properties and are used in treating conditions like arthritis and joint pain. They can be made into a paste and applied.
25.	*Pandanus odorotissimus* L. f.	*Kewda*	Pandanaceae	*Hato*	Flowers, Leaves and Roots	a)A flower infusion, prepared by soaking fresh flowers in warm water, is consumed to alleviate digestive issues such as bloating and indigestion. The flowers are also known for their calming effect and are used in aromatherapy by placing them in a bowl of warm water to reduce stress and anxiety. Additionally, chewing a petal or using a flower infusion as a mouthwash serves as a natural remedy for bad breath, owing to their refreshing properties. b)Leaves are recognized for their therapeutic potential in treating skin infections and promoting hair health. Fresh leaf juice, when applied directly to minor cuts, wounds, or skin infections, aids in healing due to its antibacterial and anti-inflammatory properties (Adkar and Bhaskar, 2014). For respiratory issues, dried leaves are traditionally burned and the smoke is gently inhaled to relieve nasal congestion. In hair care, chopped leaves boiled in coconut oil produce a nourishing oil that prevents dandruff and strengthens hair roots. c)The roots have been traditionally used to treat fever, body pain and menstrual cramps. A decoction made by boiling the roots in water is consumed to reduce fever and alleviate body aches. For rheumatism and joint pain, the roots are boiled, mashed and wrapped in a clean cloth to create a warm poultice, which is applied to the affected area to relieve inflammation and pain. During menstruation, drinking a root decoction helps to ease cramps due to its antispasmodic properties.

26.	*Pongamia pinnata* (L.) Pierre	*Indian beech*	Fabaceae	*Karanj*	Bark and Leaves	a)Bark is used in the treatment of various types of infections, including skin infections, wounds and ulcers, due to its potent antibacterial properties (Fugare *et al.*, 2021). A decoction made from the bark is traditionally consumed to treat fever, malaria and indigestion. b)A decoction of the leaves is consumed to treat fever, digestive issues and respiratory infections like cough and bronchitis. The leaves are also used externally in the form of a poultice or paste to treat skin infections, wounds and ulcers due to their antibacterial and healing properties.
27.	*Polyalthia longifolia* (Sonn.) Benth. & Hook.f. ex Thwaites	*Mast-Tree*	Annonaceae	*Ashok*	Bark and Leaves	a)Bark is used in traditional medicine to treat stomachaches and to improve overall digestive health. Decoctions made from the bark are used to reduce inflammation and to treat conditions such as arthritis. The bark extract is believed to possess antibacterial and antifungal properties, making it useful in treating infections. b)Leaves are used to prepare a decoction to reduce fever. A paste made from the leaves is applied topically to treat skin diseases and to improve skin health. The juice of the leaves or a paste made from them is applied to wounds to promote healing.
28.	*Ricinus communis* L.	*Castor Bean*	Euphorbiaceae	*Yerand*	Flowers, Leaves and Roots	a)Infusion is occasionally consumed to treat conditions like headaches and body pain due to its mild analgesic effects. b)A poultice made from fresh leaves is applied topically to treat swelling, pain and inflammatory conditions like arthritis and muscle pain. The leaf juice is also used to treat conditions such as boils, abscesses and skin infections due to its antimicrobial and soothing effects. The leaves are also used traditional remedies for fever, where a decoction of the leaves is consumed to reduce body temperature. c)The oil extracted from the seeds of is known for its potent anti-inflammatory, analgesic and laxative properties. It is used to treat constipation by acting as a stimulant laxative. The oil is also used topically to treat skin conditions like acne, wounds and burns due to its antimicrobial and moisturizing effects. It is applied to the scalp to promote hair growth, reduce dandruff and improve the health of the hair. Additionally, the oil is sometimes used as a remedy for joint pain, muscle aches and inflammation, often massaged directly onto the affected area. d)A decoction made from the roots is believed to have mild purgative effects (Suurbaar e*t al.*, 2017), helping to cleanse the digestive system. The roots are also used in some traditional practices to alleviate pain and swelling, particularly in cases of rheumatism and joint pain.

29.	*Spondias mangifera* Willd.	*Hog Plum*	Anacardiaceae	*Aamado*	Bark, Fruit, Leaves and Roots	a)The bark is often used in traditional medicine to treat severe cases of dysentery and diarrhea. A decoction of the bark is prepared and consumed to alleviate the symptoms. The bark is sometimes used as a traditional remedy for toothache and other oral health issues, due to its antibacterial properties (Acharyya *et al.*, 2010). b)The ripe fruit is consumed to aid digestion and to treat digestive issues such as diarrhea and dysentery. It is believed to have a soothing effect on the stomach and intestine. The fruit is rich in Vitamin C, making it a natural remedy to boost immunity and fight off infections. c)A paste made from the leaves is applied to wounds to promote healing and prevent infection; properties. The leaves are used to prepare a decoction or infusion that is consumed to reduce inflammation and relieve pain, especially in conditions like arthritis. d)Decoctions made from the roots are used traditionally to reduce fever and treat symptoms of malaria and other febrile conditions.
30.	*Zanthoxylum armatum* DC	*Winged prickly ash*	Rutaceae	*Tirfalam*	Bark, Fruit, Leaves and Roots	a)A decoction made by boiling the bark is traditionally consumed to treat conditions such as rheumatism, arthritis and joint pain due to its pain-relieving and anti-inflammatory effects (Alam *et al.*, 2020). The bark is also used to alleviate stomach-related issues like indigestion, gas and bloating. Externally, a paste of powdered bark is applied to wounds and infections for its antibacterial properties, promoting faster healing. b)The fruit is often used in traditional medicine to improve digestion and stimulate appetite. The dried fruit is commonly powdered and consumed with warm water to treat digestive disorders such as dyspepsia, indigestion and nausea. In some regions, the fruit is also used as a natural remedy to relieve toothache and to treat oral infections due to its numbing and antibacterial properties. It is also used to treat headaches by applying a mixture of crushed fruit to the forehead. c)The leaves are traditionally used for their antimicrobial and anti-inflammatory effects (Alam *et al.,* 2020). Fresh leaves are crushed and applied as a poultice to treat swelling, bruises and muscle pain. In some cases, a leaf decoction is consumed to treat fevers and improve appetite. The leaves are also used in traditional remedies for skin problems like acne and pimples, with a paste applied directly to the affected area to reduce inflammation and infection. d)The root of has a long history of use in treating digestive and respiratory issues. A decoction made from the root is consumed to relieve stomach ailments like indigestion, bloating and cramps. It is also traditionally used as a remedy for respiratory problems such as cough, cold and asthma, as it helps to expel mucus and clear the airways. In some cultures, the root is used to treat malarial fever and other febrile conditions.

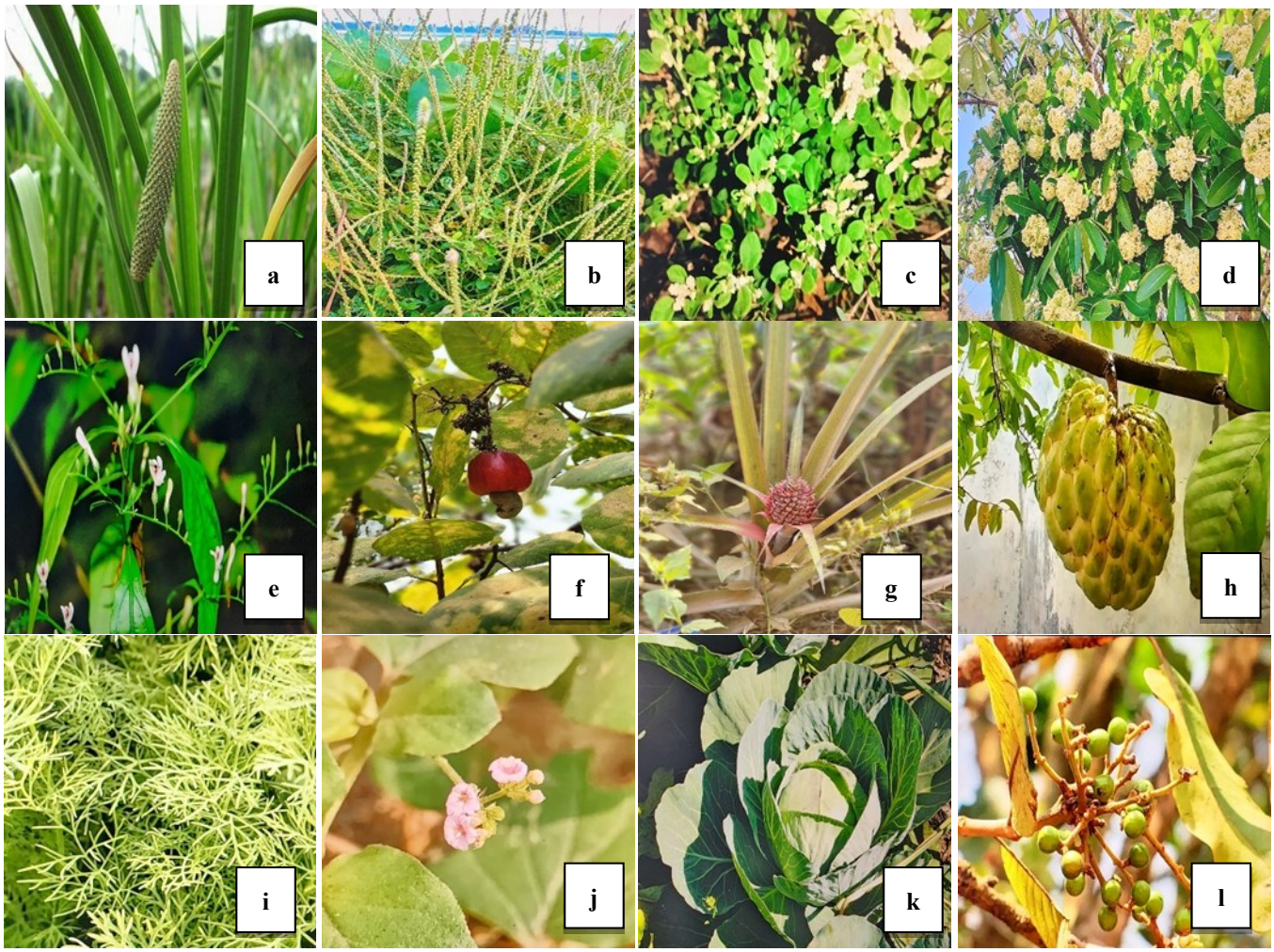

Plate 2. a. *Acorus calamus* L.; b. *Achyranthes aspera* L.; c. *Aerva lanata* (L.) Juss. ex Schult.; d. *Alstonia scholaris* (L.) R.Br.; e. *Andrographis paniculata*; f. *Anacardium occidentale* L.; g. *Ananas comosus* (L.) Merr.; h. *Annona reticulata* L.; i. *Anethum graveolens* L.; j. *Boerhavia diffusa* L.; k. *Brassica oleracea* L.; l. *Buchanania lanzan* Spreng.

4. Conclusion

In conclusion, this research has meticulously documented the folk remedies of rural Goa, revealing a profound repository of traditional medicinal knowledge. The findings underscore the rich biodiversity of Goa and its vital role in the local healthcare practices, which are deeply rooted in the community's cultural and ecological contexts. The significance of this study extends beyond the scientific validation of folk remedies; it highlights the urgency of preserving this invaluable cultural heritage amidst the threats posed by modernization and globalization. The oral tradition of knowledge transfer, once the cornerstone of these practices, is waning, underscoring the need for documentation efforts to safeguard and perpetuate this legacy.

Furthermore, the research opens avenues for the integration of validated folk remedies into mainstream healthcare, offering a complementary approach that could enhance accessibility and sustainability, particularly in rural settings. Such integration, however, requires careful consideration of cultural sensitivities and scientific rigor, advocating for a collaborative framework involving traditional healers, communities, healthcare professionals and policymakers. Moving forward, the study advocates for continued research into the pharmacological properties of these plants, alongside efforts to engage local communities in preserving and disseminating their medicinal knowledge. Ultimately, this research not only contributes to the global compendium of traditional medicine but also reinforces the importance of bridging traditional knowledge and modern science for the betterment of healthcare systems worldwide. In essence, exploration into the folk remedies of rural Goa is a step towards preserving a legacy that intertwines the past with the present, offering insights and opportunities for future healthcare innovations. It is a testament to the enduring value of traditional medicine and its potential role in enriching and complementing contemporary medical practices.

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