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PRELIMINARY PHYTOCHEMICAL SCREENING OF SELECTED MEDICINAL PLANT SEEDS USED IN TRADITIONAL HERBAL MEDICINE

G. M. Shende, RFNS Senior Science College Akkalkuwa, Dist. Nandurbar
M. R. Patil, Nanotechnology Research Laboratory, G.T. Patil College Nandurbar
T. A. Dongare, Brijlal Biyani Science College Amravati
V. R. Jogdand, RFNS Senior Science College Akkalkuwa, Dist. Nandurbar

Abstract

Phytochemicals are biologically active compounds derived from plants and have been extensively utilized in traditional herbal medicine. These natural remedies are commonly employed by local communities to treat a range of ailments, including major health conditions such as Diabetes Mellitus, Cancer, and HIV. The primary aim of this study gives an exhaustive account of the pertinent information procured from the tribal informant and preliminary phytochemical screening of six different plant specimens belonging to different families for phytochemical constituents was performed using generally accepted laboratory technique for qualitative determinations. The constituents screened for Tannins, Saponins, Flavonoids, Glycosides, Steroids, Proteins, Phenols, Carbohydrate's, Alkaloids and Terpenoids. The plant seed studied were Caesalpinia bonducella Flem, Abrus precatorius L, Mucuna pruriens DC, Plantago ovata Forssk, Trigonella foenum graecum (L.) Delile and Tribulus terrestris L.

Keywords: Phytochemical screening, Ethnomedicine, Tribal informants' Medicinal plants, Qualitative analysis

Introduction

Plants have been integral to human life since ancient times, adapting to diverse environments while humans have developed knowledge to utilize them. There is a strong link between indigenous, cultural and biological diversity.[1] Historical records show that civilizations like the Sumerians, Assyrians, Egyptians, and Chinese used medicinal plants such as Atropa belladonna, Claviceps purpurea, Cassia angustifolia, Ephedra, and Cannabis sativa for treating pain, bleeding, and respiratory issues. [2]

In India, medicinal plant use dates back to the Vedic period (3500–2000 B.C.), with notable physicians like Atreya, Nagarjuna, Patanjali, Sushruta, and Charaka documenting herbal treatments in Sanskrit texts, forming the basis of Ayurveda. However, after significant advancements between 200 B.C. and 642 A.D., there was a decline in research for nearly 1000 years. [3]

Modern allopathic medicine, though effective for quick relief, has raised concerns due to side effects. This has led to a resurgence of interest in herbal medicine as an alternative healthcare system. Many tribal communities still rely on medicinal plants for treating common and chronic ailments, but their knowledge remains undocumented and unverified scientifically. [4]

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Ethnomedicine, which studies traditional healing practices, plays a crucial role in preserving and validating indigenous healthcare knowledge. Proper documentation, identification, and conservation of medicinal plants are essential for further research and integration into modern medicine. [5]

Tribal communities in India, constituting about 8% of the total population, have preserved their indigenous healthcare traditions. Residing in remote villages, they rely on locally available medicinal plants to treat common ailments such as fever, bronchitis, arthritis, wounds, and scorpion stings. [6] Field investigations reveal that tribal doctors (Vaidya's) effectively use herbal remedies, sometimes even curing diseases that do not respond to modern medicine. [7] However, they are reluctant to share their knowledge without trust. This hidden wisdom is crucial for the pharmaceutical industry. With the growing popularity of herbal medicine, various organizations and NGOs are documenting traditional healthcare practices and producing herbal medicines.[8] This study highlights the importance of ethnomedicinal knowledge in raising awareness among tribal populations about their natural resources while ensuring the availability of authentic medicinal plants for further use.

Following medicinal plants gain more attention due to their various medicinal properties.

1. Abrus precatorius L.

Tribes across India and Nepal use Abrus precatorius seeds for various medicinal purposes. In Bundelkhand, the seeds are used as a purgative and expectorant when combined with ginger and milk. They are known to have toxic effects on the nervous system also used as an abortifacient. [9] Different tribal groups use the seeds for arthritis, nervous diseases, hair care, and livestock treatment. Studies reveal the presence of flavonoids and phenolic compounds, contributing to their antioxidant properties. [10]

2. Caesalpinia bonducella Flem.

The seeds of Caesalpinia bonducella have been studied for antidiabetic properties. Various studies have documented its pharmacognostic characteristics, chemical composition, and traditional uses indicating its potential in new medicinal formulations. [11-17]

3. Mucuna pruriens DC.

Taxonomically complex, Mucuna pruriens has been revised by Wilmot-Dear. Studies on genetic diversity show its importance in molecular identification. Phytochemical analysis reveals high amounts of oxalates, tannins, steroids, phenols, and terpenoids, suggesting its nutritional and medicinal potential [18]

4. Plantago ovata Forssk.

Research highlights Plantago ovata husk's role in improving gastrointestinal health. Studies indicate its fibre content shortens gastrointestinal transit time and increases stool weight It also enhances short-chain fatty acid production, helping in digestion. Its pharmacological properties include anti-diarrheal, hypoglycemic, and wound-healing effects. [19]

5. Trigonella foenum-graecum L. (Fenugreek)

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Studies have demonstrated Trigonella foenum-graecum as a therapeutic remedy for various ailments. Its antioxidant properties protect cellular structures, and it exhibits anti-ulcer and anti-inflammatory effects The plant is also linked to improved fertility and diabetes management [20-21]

6. Tribulus terrestris L.

Tribulus terrestris has been widely studied for its impact on male fertility and reproductive health It reduces triglyceride and cholesterol levels and is used in treating atherosclerosis, hypertension, and urinary tract infections Phytochemical screening reveals high concentrations of saponins, flavonoids, glycosides, and alkaloids, suggesting its therapeutic potential [22]

The reviewed literature highlights the ethnomedicinal significance of various plant species, emphasizing their pharmacological potential. The traditional uses, combined with modern phytochemical studies, suggest that these plants can be explored for novel therapeutic formulations. [23-29]

Materials and Methods

The fresh seeds of Caesalpinia bonducella Flem., Abrus precatorius L., Mucuna pruriens DC., Plantago ovata Forssk., Trigonella foenum-graecum (L.) Delile, and Tribulus terrestris L. were collected from the field and seeds ware confirmed and identified at Botany Research Laboratory at Brijlal Biyani Science College, Amaravati. The seeds were properly clean by distilled water and air-dried at room temperature for 4 to 5 days. The seeds ware ground into a fine powder and kept it air tight jar for further phytochemical analysis.

Phytochemical Analysis

Approximately 20 grams of dried seed powder were subjected to extraction using an aqueous solvent in a Soxhlet extraction system. The phytochemical screening of the aqueous extract was performed following the methodology described by Nweze et al. (2004). The extracts were tested for the presence of various bioactive compounds using standard qualitative methods:

Tests for Phytochemical Constituents

1. Tannins (Ferric Chloride Test)

To 1 mL of extract, 2 mL of 5% ferric chloride was added. Formation of dark blue or greenish-black coloration indicated the presence of tannins.

2. Saponins (Foam Test)

To 2 mL of extract, 5–10 mL of distilled water was added and shaken in a graduated cylinder for 15 minutes. Formation of a 1 cm layer of foam indicated the presence of saponins.

3. Flavonoids (Sulfuric Acid Test)

A fraction of the extract was treated with concentrated H_2SO_4. Formation of an orange coloration indicated the presence of flavonoids.

4. Glycosides (Sulfuric Acid Test)

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To 2 mL of plant extract, 2 mL of glacial acetic acid and 5% ferric chloride were added. Few drops of concentrated sulfuric acid were then added. Formation of a greenish-blue color indicated the presence of glycosides.

5. Proteins and Amino Acids (Ninhydrin Test)

To 2 mL of extract, few drops of 0.2% ninhydrin were added and heated for five minutes. Formation of a blue color indicated the presence of proteins.

6. Steroids and Phytosterols (Sulfuric Acid Test)

To 2 mL of plant extract, equal volume of chloroform and few drops of concentrated H_2SO_4 were added. Formation of a brown ring indicated the presence of steroids, while a bluish-green color indicated the presence of phytosterols.

7. Phenols (Ferric Chloride Test)

To 2 mL of extract, 2 mL of distilled water followed by a few drops of 10% ferric chloride were added. Formation of a blue or green color indicated the presence of phenols.

8. Carbohydrates (Molisch's Test)

To 2 mL of plant extract, 1 mL of Molisch's reagent and a few drops of concentrated sulfuric acid were added. Formation of a purple or reddish ring indicated the presence of carbohydrates.

9. Alkaloids (Mayer's Test)

To 2 mL of plant extract, 2 mL of concentrated hydrochloric acid was added. Few drops of Mayer's reagent were then added. Formation of a green color or white precipitate indicated the presence of alkaloids.

10. Terpenoids (Sulfuric Acid Test)

5 mL of extract was mixed with 2 mL of chloroform, followed by the addition of 3 mL of concentrated H_2SO_4 to form a layer. A reddish-brown coloration at the interface indicated the presence of terpenoids.

The phytochemical analysis results were recorded based on the observed colour changes or precipitate formations, indicating the presence or absence of various bioactive compounds in the tested plant extracts. These findings were documented for further correlation with their traditional ethnomedicinal uses.

This study focuses on the phytochemical analysis of six significant medicinal plants, specifically their seeds, commonly used by tribal and herbal practitioners.

Selected Plants for Analysis

1. Caesalpinia bonducella
2. Abrus precatorius
3. Mucuna pruriens
4. Plantago ovata
5. Trigonella foenum graecum

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6. Tribulus terrestris

Results

The preliminary phytochemical screening of these six plants tested ware summarized in the table -1 The results reveals The phytochemical screening of the selected ethnomedicinal plant seeds revealed the following results that.

Caesalpinia bonducella Flem.

Tested negative for tannins, glycosides, proteins, and phenols, but showed a high concentration of saponins, flavonoids, steroids, carbohydrates, alkaloids, and terpenoids.

Abrus precatorius L.

Exhibited a high concentration of tannins, steroids, phenols, carbohydrates, alkaloids, and terpenoids, while testing negative for saponins, flavonoids, glycosides, and proteins.

Mucuna pruriens DC.

Showed the presence of tannins, steroids, phenols, carbohydrates, alkaloids, and terpenoids, but tested negative for saponins, flavonoids, glycosides, and proteins.

Plantago ovata Forssk.

Tested positive for saponins, glycosides, steroids, carbohydrates, alkaloids, and terpenoids, while showing negative results for tannins, flavonoids, proteins, and phenols.

Trigonella foenum-graecum L.

Exhibited a high concentration of flavonoids, glycosides, steroids, phenols, carbohydrates, alkaloids, and terpenoids, but tested negative for tannins and proteins.

Tribulus terrestris L.

Showed the presence of tannins, saponins, flavonoids, carbohydrates, alkaloids, and terpenoids, but tested negative for glycosides, steroids, and phenols, while proteins were detected in high concentration

Table 1. Phytochemical constituents of six medicinal plants studied.

Sr. N0	Name of ethnomedicinal plant	Tannin	Saponine	Flavenoids	Glcosides	Proteins	Steroids	phenol	Carbohydrate Molisch Test	Alkaloid Mayer test	Terpanoids
1	Caesalpinaia bonducella	–	+	+	–	–	+	–	+	+	+
2	Abraus precatorious	+	–	–	–	–	+	+	+	+	+
3	Mecuna pruriens	+	–	–	–	–	+	+	+	+	+

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4	Plantago ovata	–	+	–	+	–	+	–	+	+	+
5	Trigonella foenum graecum	–	+	+	+	–	+	+	+	+	+
6	Tribulus terrestris	+	+	+	–	+	–	–	+	+	+

Conclusion

The seeds of folk medicinal plants Caesalpinia bonducella possess several pharmacological activities like antibiotic, antidiabetic, anti-inflammatory, antipyretic etc. Seeds of Abrus precatorious L. can be used as an antioxidant as it contains flavonoids and moderate amount of phenol is induced antioxidant activities, even though the seeds are not use as an edible seeds, according to reports Abras precatorius seeds find its application in medicine largely. The seeds of Mucuna purunes are very good source of phytochemical , minerals and vitamins .These indicates that a Well proceed extract of seed will after nutritional , medicinal and chemoprotective benefit to its user .Seed (husk)of Plantago ovata has remarkable pharmaceutical properties like super disintegrant , binder gelling agent suspending agent and can be widely use in the preparation of FDTS, Suspension, oral gels and it also possesses excellent pharmacological properties like wound healing, antidiarrheal, and ant constipation using to aphrodisiac notable properties of Plantago ovata can be use in manufacture of novel drug delivery system using advance technique and can be formulated in a safe , effective and economical drug .

The preliminary phytochemical screening of Trigonella foenumgricum gives good results in the presence of saponin, flavonoids, glycosides, steroids, phenols, carbohydrates, alkaloids and terpenoids. The herbs Tribulous terestris L. is well known as use in folk medicine of many countries for a number of diseases. The high contain of steroidal saponin is a characteristic feature of this plant.

The plant seed screened for phytochemical constituents seems to have potential as a source of useful drugs and also to improve the health status of its users as a result of the presence of various compounds that are vital for good health.

Conclusively it can be said that traditional medical practices have the potentialities definitely have the curative properties and can be use as a genuine source of material in drug formulation in pharmaceutical industry.

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