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Characterization of Phytochemicals and the Evaluation of Anthelmintic Properties in the Extract of Phascolus Vulgaris L. Flowers.

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ABSTRACT

This study aimed to investigate the phytochemical composition and anthelmintic potential of flower extracts from Phaseolus vulgaris L. Qualitative phytochemical screening revealed the presence of several bioactive compounds, including flavonoids, alkaloids, tannins, and glycosides. The anthelmintic activity was evaluated using adult Indian earthworms, Pheritima posthuma, as a model organism, due to their physiological resemblance to human intestinal parasites. The study assessed the time taken for the worms to become paralyzed and die after exposure to different concentrations of the extract. The results demonstrated that the Phaseolus vulgaris flower extract possesses significant anthelmintic activity in a dose-dependent manner. These findings suggest that the identified phytochemicals may be responsible for the observed biological effects. Further research is warranted to isolate and identify the specific compounds and to elucidate their mechanism of action. The study provides a scientific basis for the traditional use of this plant and highlights its potential as a source for developing new natural anthelmintic drugs.

Keywords :- ***Phaseolus vulgaris L.*** , Phytochemical characterization, Anthelmintic activity,Plant extract, Albendazole (standard drug), Natural bioactive compounds.

INTRODUCTION

Herbal medicine

Herbal medicine, also referred to as phytomedicine or phytotherapy, is a field focused on using medicinal plants as a basis for traditional healing practices. A well-known example is artemisinin, an antimalarial medication developed from *Artemisia annua*, a plant traditionally used in Chinese medicine to treat fevers. This compound's journey from a traditional remedy to a modern drug demonstrates how global pharmacological research can translate herbal knowledge into new therapies.

However, scientific evidence regarding the safety and effectiveness of plants used in modern herbalism is often limited, and there are no standardized regulations for purity or dosage. The scope of herbal medicine is broad and may also include the use of fungi, bee products, minerals, shells, and even animal parts.Paraherbalism refers to the use of unrefined plant or animal extracts for alternative or pseudoscientific purposes.

The role of herbal medicines in traditional healing

The pharmacological treatment of disease began long ago with the use of herbs (Schulz et al., 2001). Methods of folk healing throughout the world commonly used herbs as part of their tradition. Some of these traditions are briefly described below, providing some examples of the array of important healing practices around the world that used herbs for this purpose.

PLANT PROFILE

Phaseolus vulgaris L.

The common bean, scientifically known as *Phaseolus vulgaris*, is an herbaceous annual plant cultivated globally for its edible dry seeds and green pods. The plant's leaves are sometimes used as a vegetable, and the straw can be used as animal fodder.

As a member of the Fabaceae family, the common bean, like other legumes, benefits from a symbiotic relationship with **rhizobia**, which are nitrogen-fixing bacteria that supply the plant with nitrogen While all wild *Phaseolus vulgaris* plants are climbers, cultivated varieties are categorized into two main types: **bush beans** and **climbing beans**. The common bean is grown on every continent except Antarctica.

Raw dry beans contain a toxic compound called **phytohaemagglutinin**. To render them safe for consumption, it is recommended to soak the beans for at least five hours and then boil them for ten minutes.

Figure No. 1. : Plant of Phaseolus vulgaris L.

Figure No. 2. : Flowers of Phaseolus vulgaris L.

Scientific Classification :-

Kingdom : Plantae

Order : Fabales

Subfamily : Faboidae

Tribe : Phaseolus

Sub tribe : Phaseolinae

Genus : Phaseolus

Species : P. vulgaris

Hindi **:** Bakla, Rajmah, Rajma

MATERIALS AND METHODS

Plant Material Collection and Preparation of Extract

he prompt you've provided is a description of a plant extraction process. It's not a question, but a statement detailing the collection and processing of ***Phaseolus vulgaris*** (common bean) flowers.

Here's a breakdown of the process described:

- **Plant Material:** Flowers of ***Phaseolus vulgaris*** were collected.
- **Location:** Bhopal, Madhya Pradesh, India.

Preparation:

The flowers were first **shade-dried**. This is a common method to remove moisture while preserving the active compounds.Next, they were **powdered** and **sieved** through a 40-mesh sieve. Sieving ensures a uniform particle size, which helps in efficient extraction.

The powdered material was then subjected to a **maceration** process.

- **Extraction:**

The solvent used was **90% ethanol**. Maceration involves soaking the powdered plant material in a solvent for a prolonged period, allowing the soluble compounds to dissolve.

After extraction, the solvent was removed by **evaporation under drying**. This concentrates the extract into a **paste**.

*** Final Product:** The resulting paste is the raw drug material used for further studies.

The entire process described is a standard procedure in ethnopharmacology and phytochemistry for preparing a crude plant extract for analysis.

Antibacterial Activity

Test organism used the various organisms like Staphylococcus aureus, Pseudomonas aeruginosa, Bacillus subtilis, Escherichia coli are procured from Department of Microbiology Dr. A.P.J. Abdul Kalam University, College of pharmacy, district, Madhya Pradesh, India.

Antibacterial Assay

he **antibacterial efficacy** of *Phaseolus vulgaris* flower extracts was tested against various **Gram-positive** and **Gram-negative** bacteria. The **agar cup-plate method** was employed for this evaluation.

Procedure

1. **Preparation of Plates:** Initially, 20 ml of sterile **nutrient agar** medium was poured into petri dishes and allowed to solidify. These plates were incubated at 37∘C for 24 hours to confirm their sterility before use.
2. **Inoculation:** The solidified medium was then inoculated with the test organisms using a **pour plate method**. This involved mixing the agar broth (4 ml) with 1 ml of the microbial culture.
3. **Sample Application: Bores** (wells) were aseptically created in the inoculated medium using a sterile borer. The *P. vulgaris* flower extracts were dissolved in water to achieve two concentrations: 100 mg/ml and 200 mg/ml. These solutions were sterilized by passing them through **Whatman filter paper No. 1**.
4. **Testing: 0.5 ml** of each extract concentration was dispensed into the respective bores. **Gentamicin** was used as the **standard reference drug** (0.5 ml was also added).
5. **Incubation and Measurement:** All prepared plates were then incubated at 37∘C for 24 hours. The presence of a clear **zone of inhibition** surrounding the well was indicative of antibacterial activity. The **diameter** of this zone was measured and recorded to quantify the extract's potency.

Anthelmintic Activity

Healthy adult Indian earthworms, *Pheretima posthuma*, were chosen for the antihelminthic assay. This species was selected due to its anatomical and physiological similarities to human intestinal roundworm parasites, as well as its easy availability. Earthworms of approximately equal size (6 cm) were collected from a moist area on the campus of Dr. A.P.J. Abdul Kalam University, College of Pharmacy, in Madhya Pradesh, India. The use of earthworms is a common practice for evaluating anthelmintic compounds.**Anthelmintic Assay**

The anthelmintic effects of flower extracts from *Phaseolus vulgaris* were assessed against adult earthworms, *Pheritima posthuma*. The methodology, a slight adaptation of Ghosh et al. [8], involved preparing fresh solutions of the ethanolic extracts. A minimal amount of water was used to dissolve the extracts before the final volume was adjusted.

Two different concentrations of the extract were tested. For each test, 10 ml of the prepared solution was placed in a petri dish containing six earthworms of uniform size. The experiment also included **Albendazole** (20 mg/ml) as a positive control.

The time to **paralysis** was documented, defined as the point at which no movement was observed, even with vigorous shaking. The time to **death** was subsequently recorded. A worm was considered dead when it showed no movement after vigorous shaking and a brief immersion in hot water (50°C), followed by a noticeable loss of body color..

RESULTS AND DISCUSSION

Results

Preliminary Phytochemical Screening of Phascolus Vukgaris flower indicated the presence of proteins, resins, steroids, tannins, glycosides, reducing sugar, carbohydrates, saponins, sterols, terpenoids, acidic compounds, cardiac glycosides, catechol, phenols, alkaloids, flavonoids. The results of the phytochemical screening are given in the following (Table 1)

Table 1: Phytochemical constituent's analysis of Phascolus Vukgaris.

S. No.	Name of the Test	Phytochemical analysis of Phascolus Vukgaris
1	Test for carbohydrates Molisch test	+
2	Test for reducing sugar Fehlingh's test	+
3	Test for Protein Xanthoprotein test	+
4	Test for alkaloids Mayer's test	+
5	Test for Cardiac glycosides Keller Killian's test	+
6	Test for glycosides Borntrager's test	+
7	Test for Terpenoids Salkowski test	+

+ = Prescence, - = Absence

Anti-Bacterial Activity

The flower extracts of Phascolus Vukgaris was studied for antibacterial activity employing standard cylinder method. Microbes used were Bacillus subtilis, Staphylococcus aureus, Pseudomonas aeruginosa, Escherichia coli. Both gram-positive and gram-negative bacteria were sensitive to the extract (Table 2, Figure 1). The antibacterial activity of the leaf extracts of Phascolus Vukgaris was related to their chemical composition. The diameters of the inhibition zones were measured in millimeter [9].

Table 2: Antibacterial activity of Phascolus Vukgaris leaf extract ** P< 0.01 as compared with control according to one way ANOVA.

S. No.		Zone of inhibition (in mm)			
		Ethanolic extract			
		50mg/ml	100mg/ml		
1	Bacillus subtilis ATCC11774	8±0.2887**	10±0.2887**	15±0.5774**	6±0.2887
2	Escherichia coli ATCC10536	12±0.2887**	15±0.5774**	10±0.2887**	6±0.2887
3	Staphylococcus aureus ATCCBAA1026	10±0.2887**	16±0.7077**	18±0.7077**	6±0.2887
4	Pseudomonas aeruginosa ATCC10662	9±0.2887**	10±0.2887**	12±0.2887**	6±0.2887

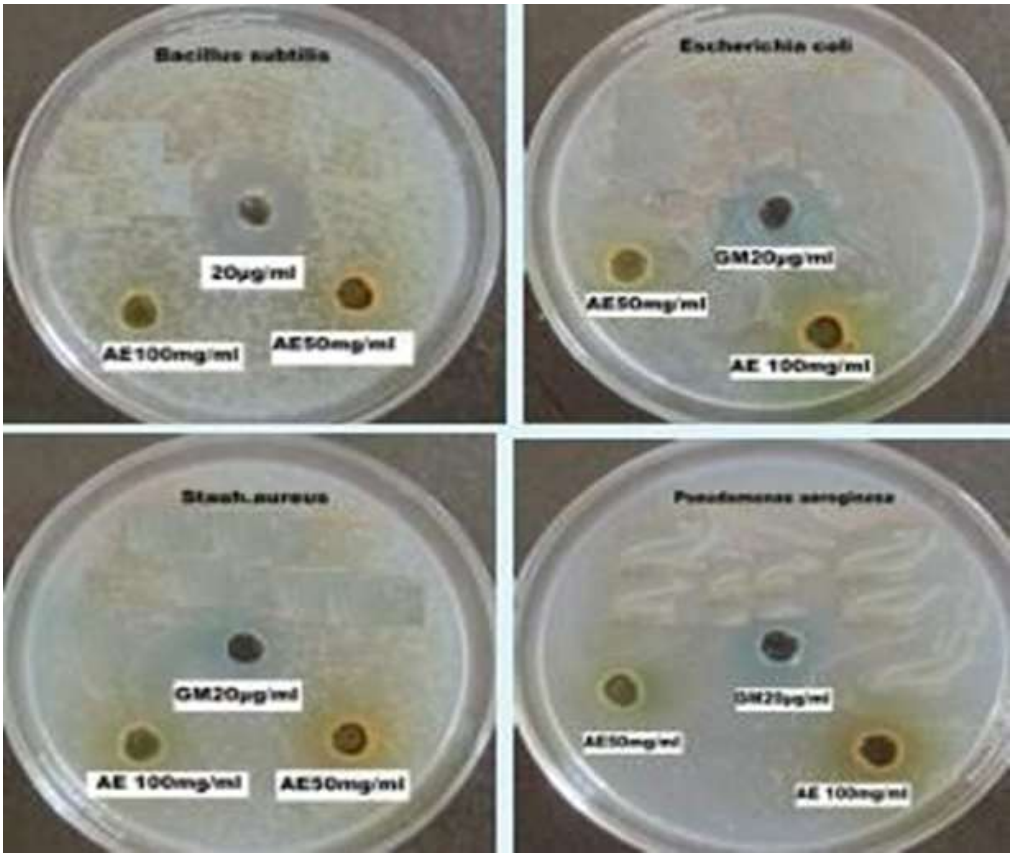

Figure 1: Antibacterial activity of Phascolus Vukgaris flower extract.

1. Bacillus subtilis 2. Escherichia coli 3. Staphylococcus aureus 4. Pseudomonas aeruginosa Anthelmintic Activity

The different concentrations of flower extracts of Phascolus Vukgaris were evaluated for Anthelmintic activity using adult Indian earthworm model. The extracts exhibited a dose- dependent inhibition of spontaneous motility (paralysis). It is evident from (Table 3, Figure 2) that ethanolic flower extracts of Phascolus Vukgaris demonstrated paralysis as well as death of worms in less time compared to standard Albendazole (20mg/ml). The results indicate that extract possesses vermicidal activity and thus, may be useful as a anthelmintic.

Table 3: Anthelmintic activity of Phascolus Vukgaris flower extract.

Treatment group	Dose in mg/ml	Time taken for paralysis(min)	Time taken for death(min)
	100mg/ml	8± 1.03	15± 2.03
	200mg/ml	6± 1.23	10± 2.09
	10mg/ml	8± 1.03	16± 1.64
	20mg/ml	7± 1.23	13± 2.09
Control	-	-	-

All values represent Mean ± SD; n= 6 in each group. ; - no activity

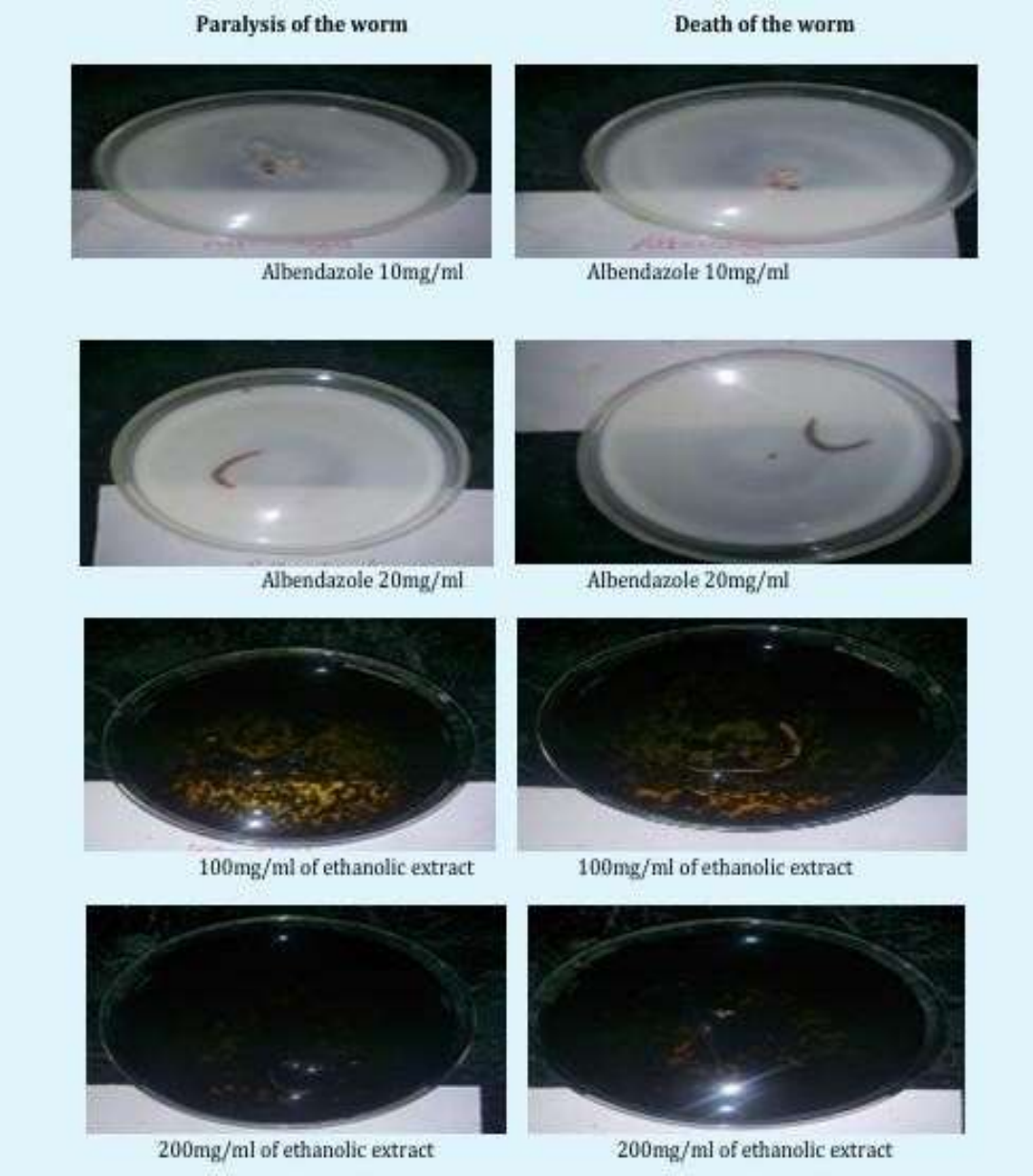

Figure 2: Anthelmintic activity of Phascolus Vukgaris flower extract.

Discussion

A preliminary phytochemical analysis of *Phaseolus vulgaris* extracts revealed the presence of several bioactive compounds, including **alkaloids, tannins, flavonoids, and saponins**. These compounds are known to contribute to a plant's medicinal properties, particularly its **antibacterial** and **anthelmintic** activities.

The ethanolic flower extract demonstrated strong **antibacterial activity**, especially against gram-negative bacteria, which was comparable to the standard drug **Gentamycin**. This finding is significant given the growing global concern over antibiotic resistance. The antimicrobial effect of saponins, for example, is attributed to their ability to disrupt the cell membranes of bacteria.

Anthelmintic Properties

The extract also exhibited **significant anthelmintic (anti-worm)** activity. Helminthic infections are a major health issue, causing chronic and debilitating diseases in both humans and livestock. The **ethanolic leaf extract** of *P. vulgaris* was found to be more effective than the flower extract in combating these parasites. The presence of **phytochemicals** such as **alkaloids, phytosterols, tannins, flavonoids, and saponins** is likely responsible for this effect.

These findings suggest that ***Phaseolus vulgaris*** could be a promising source for developing new, biologically safe, and cost-effective drugs to combat both bacterial and helminthic infections. The study highlights the immense potential of medicinal plants as an alternative to conventional drugs, especially in the face of widespread drug resistance.

Conclusion

Our research indicates that the flower extracts of *Phaseolus vulgaris* possess notable antibacterial and anthelmintic properties.

Further investigation is required to identify the specific **bioactive molecules** responsible for these effects. Additionally, future studies should focus on isolating and screening these compounds to assess other potential biological activities.

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