Antimicrobial Potential of Methanolic Extracts from Ageratum Conyzoides, Eupatorium Odoratum, and Mikania Micrantha

***Yogita Bhagubhai Gamit, **Prof. Dr. Pravin Bhagwat Cholke**

**Research Scholar, **Research Supervisor*

Department of Botany, Himalayan University,

Arunachal Pradesh, India

ABSTRACT

Weed plants, often misunderstood and marginalized as mere pests hold a wealth of untapped potential that extends beyond their invasive tendencies. Ageratum conyzoides, Eupatorium odoratum and Mikania micrantha are members of Asteraceae, which is an exceedingly large and widespread family of some common well-known weeds. Phytochemicals are secondary metabolites and are known to exert a profound influence on various activities of plants. Methanolic extract of the plants revealed the presence of major phytochemicals in all of them. Although E. odoratumand M. micrantha proved to be equally potent in inhibiting the test strains, E. odoratum showed activity against both bacteria and fungi while M. micrantha showed only antibacterial activity. A. conyzoides exhibited a lower inhibitory potential but exhibited both antibacterial and antifungal activities.

Keywords: *Weeds; Antibacterial; Phytochemical; Species; Bacteria*

INTRODUCTION

A weed is an invasive species of plant that has colonized an area where desirable plant life already exists. Weeds are plants that have invaded agricultural areas and do not belong there. Invasive weeds have a short vegetative phase and strong reproductive capacity, and they proliferate and compete with agricultural plants in fields. Human development has been linked to the domestication of plants for food and fiber. Carbohydrates, proteins, amino acids, phenolics, glucosides, saponins, tannins, terpenoids, and so on are all examples of secondary metabolites that plants are famous for. As a result, it is crucial to determine the chemical composition and antibacterial capabilities of these secondary metabolites found in plants. Purifying the pharmacologically significant active chemicals and determining which ones are responsible for the desired effects are two examples of their bioactivities. According to ancient Indian writings, every plant on Earth has some sort of practical application, whether it is in manufacturing, medicine, or allelopathy.

Throughout history, weed plants have been both friend and foe, intertwined in the tapestry of human civilization. From ancient civilizations using specific weeds as sources of food and medicine to modern-day struggles with herbicide-resistant strains, the interplay between humans and weed plants has been profound and dynamic. Understanding the biology, ecology, and cultural context of these plants is essential for managing and harnessing their potential benefits while mitigating their disruptive aspects.

Ecologically, weed plants have emerged as formidable players in ecosystems worldwide. Their adaptability to various environmental conditions, rapid growth rates, and effective seed dispersal mechanisms allow them to colonize diverse habitats, often outcompeting native flora. As such, weed invasion has become a critical concern for conservationists seeking to preserve the delicate balance of ecosystems and safeguard biodiversity. Simultaneously, some weed species, particularly those introduced to new regions, may serve as valuable habitat and food sources for native wildlife, presenting a more nuanced perspective on their ecological impact.

Furthermore, weed plants possess remarkable survival strategies that have sparked admiration and even led to their integration into traditional medicine and culinary practices. Indigenous cultures have long recognized the medicinal properties of certain weed species, using them to treat various ailments and health conditions. These plants contain an array of phytochemicals that exhibit potential pharmaceutical benefits, contributing to the discovery and development of novel drugs. Consequently, weed plants are both the source of health remedies and the subject of scientific research, exploring their therapeutic potential.

REVIEW OF LITERATURE

Oladimeji Mrsc, Ashaolu (2020) The cannabis plant is getting a lot of attention these days. The United Nations Convention on Narcotic Drugs (UNODC) has made it far more difficult for the medical benefits of cannabis to be recognized. However, cannabis dependence has increased as unlawful usage of the drug has increased. The consequences of cannabis dependence on the brain and body are potentially fatal because they target the Central Nervous System, which controls mental stability and motor skills. There are around 400 bioactive compounds in cannabis that have not been fully explored. Tetrahydrocannabinol (THC) is the main psychoactive ingredient in cannabis and is linked to a variety of neurological disorders. The amount of dopamine in the brain is boosted by this chemical. This article hopes to provide a more reasonable strategy for curing cannabis addiction by exploring the usage of a dopamine antagonist.

Ojha, Shruti & Goyal, Mamta (2019) Most plants, and especially medicinal plants, contain molecules called phytochemicals, which are a vital source of nourishment. Alkaloids, flavonoids, carotenoids, terpenoids, phenols, and many more of these chemical compounds have antibacterial effects against a wide range of microbes. This study relies on a phytochemical examination of Catharanthus roseus, Calotropis procera, Ocimum sanctum, and Nerium indicum, four medicinal plants native to the Indian state of Rajasthan. In order to extract their therapeutic properties, specific plants had their leaves, stems, and flowers washed, dried, and ground into a powder. The plant extracts were made using a variety of solvents, such as water, alcohol, and ether. All plant components were extracted using three different solvents and then analyzed for their phytochemical composition. This study set out to identify the phytochemicals in medicinal plants that contributed to their potent antibacterial effects. Alkaloids, flavonoids, terpenoids, and phenols were all found in significant amounts in plant extracts from therapeutic plants. The ability of phytochemicals to treat a wide range of plant diseases suggests they may have significant applications in agriculture and food security.

Shreshtha, Shah et al., (2017) No serious attempt has been made to investigate the potential of weeds as a source of medicine. In this study, we screened the two plants Ipomoea carnea and Alternanthera sessilis for their phenolic and flavonoid compounds and calculated their total concentration. Folin-Ciocalteau and the aluminum chloride methods were used for quantitative measurement of phenols and flavonoids, respectively. Flavonoids, phenols, tannins, terpenoids, proteins, carbohydrates, etc. were detected in both weeds, indicating their potential usage as herbal components. Ipomoea carnea and Alternanthera sessilis both had total phenol values of 0.0526 mg Gallic acid equivalent/g, while Alternanthera had a value of 0.0657 mg Gallic acid equivalent/g. Ipomoea carnea had a flavonoid concentration of 0.09 mg quercetin equivalent (QE) /g, whereas Alternanthera sessilis had a value of 0.2 mg QE /g. Both weeds have substantial levels of phenolic and flavonoid antioxidants or phytochemicals. In contrast to Ipomoea, Alternanthera had a greater concentration of Phenols and Flavonoids. Both of the chosen weeds are widely distributed, making it possible to make use of their therapeutic benefits. The overuse of antibiotics has led to the development of drug-resistant bacteria. Weeds, which have not previously been utilized by humans, present an opportunity for the development of novel antimicrobial medications.

Krishnaveni, Marimuthu & Dhanalakshmi, Ravi (2014) The phytochemical and nutritional analysis followed industry norms. The presence of carbohydrates, alkaloids, steroids, sterols, glycosides, tannins, phenolic compounds, saponins, flavonoids, and oils was investigated in a qualitative study of an aqueous leaf extract of Parthenium hysterophorus. Spectrophotometric analysis was used to quantify carbohydrate, protein, and amino acid content. The fluorescence and productivity of the aqueous extract were investigated. Parthenium hysterophorus leaf powder (processed) was tested with a variety of chemical reagents to determine how it would react. The majority of the phytochemicals, or

27.91 percent, were obtained from an aqueous extract of Parthenium hysterophorus leaves. The nutritional breakdown was determined to be 164.0±3.46mg/g carbohydrates, 4.17±0.15mg/g protein, and 0.88±0.07mg/g amino acids, respectively. Alkaloids, steroids, flavonoids, anthraquinones, and proteins were detected in an acceptable quantity in an aqueous leaf extract.

R.Chavan, Yogesh et al., (2013) Weeds are plants that are not desirable and can be found growing in locations that are otherwise useful, such as waste areas, farm yards, playgrounds, public areas, water bodies, etc. Weeds are widely recognized for their detrimental effects, but there is a plethora of them readily available. Utilizing weeds for beneficial purposes is one method of reducing their numbers. Since several weeds, including Alternanthera sessilis, Amaranthus spinosa, Lantana camera, and Xanthium strumarium, have therapeutic potential while being noxious and difficult to control, a qualitative phytochemical screening was conducted. Secondary metabolites like Alkaloids, Cellulose, Carbohydrates, Flavonoides, Glycosides, Phenols, Quinones, Saponins, Tannins, Terpenoids, Triterpenoids, and Steroids can be deduced from a weed's phytochemical profile.

Nyayiru Kannaian, Udaya Prakash et al., (2011) Twenty-six common weeds from 16 distinct families were collected in the northern districts of Tamil Nadu, and aqueous extracts were produced to test for the presence of phytochemical components. The weeds' extract was put through a qualitative phytochemical analysis to determine which active phytochemicals (such as tannins, phlobatannins, saponins, flavonoids, terpenoids, cardiac glycosides, and steroids) were present. Each test was performed twice, and the findings showed that 85 percent of the samples tested positive for tannins, 33 percent for phlorotannins, 74 percent for saponins, 70 percent for flavonoids, 22 percent for terpenoids, 12 percent for cardiac glycosides, and 14 percent for steroids.

MATERIALS AND METHODS

Preparation of plant extracts

The plant tissue samples were obtained and analyzed regionally. The dried, cleaned plant material was put into an electric blender and crushed into powder. The cold maceration technique was used to create plant extracts in methanol. 60 gms. of dry powder was soaked in 600 ml of methanol with intermittent shaking for 48 hours to extract the active ingredients. The concentrates were poured into beakers with scales already set. To ensure that each extract had the same dry weight, it was dried in an IKA RV 10 Digital rotatory vacuum evaporator. The leftovers were kept sterile at 5 degrees Celsius for further use.

Qualitative phytochemical analysis

Alkaloids, saponins, flavonoids, phenols and tannins, steroids, and glycosides were all identified by preliminary qualitative phytochemical analysis of the plant extract using industry-standard procedures.

Antimicrobial screening

The plants' methanolic extracts were tested against eight different bacterial strains (4 Gram-positive, 4 Gram-negative, and 1 fungal). The organisms used for testing were Bacillus subtilis. MTCC 441, Staphylococcus aureus MTCC 96, Proteus mirabilis MTCC 1429, Bacillus cereus MTCC 430, Escherichia coli MTCC 739, Salmonella enteric serv. typhi MTCC 3917, Pseudomonas aeruginosa MTCC 1688, Staphyllococcus epidermidis MTCC 435 and Candida albicans MTCC 3017. The test strains were obtained from the Gandevitaluka.

RESULTS AND DISCUSSION

A. conyzoides, E. odoratum, and M. micrantha all have alkaloids, saponins, flavonoids, phenolics and tannins, steroids, and glycosides detected in their methanolic extracts (Table 1). All three plants included alkaloids, phenolics and tannins, steroids, and glycosides, but only E. odoratum had saponins. M. micrantha lacked the flavonoids found in A.conyzoides and E. odoratum.

Table 1: Phytochemical analysis of methanol extract of plants

Phytochemicals	**A.conyzoides**	**E. odoratum**	**M. micrantha**
Alkaloids	+	+	+
Saponins	-	+	-
Flavonoids	+	+	-
Phenolics and tannins	+	+	+
Steroids	+	+	+
Glycosides	+	+	+
+ =	Present	- =	Absent

At a dosage of 200 mg/mL, the methanol extract of the three plants reduced the growth of both the bacterial and fungal test strains (Table 2). There was no inhibition of the test strains by the negative control. When compared to B. subtilis and S. aureus, A.conyzoides was more effective against S. epidermidis. E. odoratum was shown to be more effective against gram-positive bacteria than gram-negative bacteria. M. micrantha, on the other hand, was equally effective in inhibiting gram-positive and gram-negative bacteria.

Table 2: Methanol extract of plant antimicrobial and antifungal activity is measured by the size of the zone of inhibition (in millimeters)

MTCC NO.	**Microorganism**	**A. conyzoides**	**E. odoratum**	**M. micrantha**	**Standard Drug**
441	B. subtilis	10±0	10±0	23±1	28±1
96	S. aureus	10±0	15±1	19±1	28±1
1429	P. mirabilis	NA	NA	NA	26±1
430	B. cereus	NA	12±1	22±1	19±1
739	E. coli	NA	NA	10±0	27±1
3917	S. enteric serv. typhi	NA	NA	NA	27±1
1688	P. aeruginosa	NA	12±1	18±2	22±1
435	S. epidermidis	11±1	10±0	20±1	28±1
3017	C. albicans	10±0	12±1	NA	17±0

CONCLUSION

The investigation of the phytochemistry of weed plants has shed light on a wealth of opportunities. These resilient plants have a ton of potential in the fields of health, nutrition, and even technology due to their abundance of bioactive chemicals. To improve our understanding of nature and to help ensure humanity's continued survival and prosperity, we must learn to appreciate the many uses and ecological value of weed plants while simultaneously meeting the problems they provide. Weed plants are obstacles to a cleaner, healthier, and more vibrant planet, but by unlocking their latent potential, we can turn them into friends.

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