



PHARMACOGNOSTIC AND PHYTOPHARMACOLOGY STUDY OF ANACYCLUS PYRETHRUM

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ABSTRACT

It is a well-known fact that most pharmacological active ingredients come from natural sources; this information predates both high-throughput screening and the post-genomic era. The akarkara roots are widely used in the ancient Eastern herbal medicinal systems of Unani and Ayurveda, which stress holistic health. The botanical name of the medicinal ingredient Akarkara is *Anacyclus pyrethrum* DC. (family: Compositae). Both traditional and contemporary medical systems assert that the plant *Anacyclus pyrethrum* DC, especially in its roots, has beneficial medicinal properties. Due to its ideal temperament—a mild, somewhat dry warmth—pyrethrum is pure and has a good, robust action. *A. Pyrethrum* roots have a deep longitudinal fissure, are brown on the exterior, and are compact, stiff, fusiform, and about the size of a little finger. It has few or no hair-like rootlets, and it may still contain leaf remnants at the tip. This analysis focuses on a number of *Anacyclus pyrethrum*'s biological characteristics, such as its acetylcholinesterase inhibition capacity, antimicrobial, antifungal, antidiabetic, antioxidant, anticonvulsant, antidepressant, and anxiolytic effects; it also discusses the herb's anabolic, aphrodisiac, and reproductive qualities as well as its immune-boosting and memory-boosting capabilities. These studies employ a variety of animal models for each activity. The primary finding of this review article is that a variety of solvents, such as ethanol, petroleum, etc., may be utilized to treat a variety of illnesses, including reproductive, anabolic, aphrodisiac, a diabetic, and Alzheimer's disease. The most reliable results are obtained with an ethanolic root extract of *Anacyclus pyrethrum*.

KEYWORDS: *Anacyclus Pyrethrum*, Asteraceae, Traditional Uses, Biological Studies, Chemical Composition.

INTRODUCTION

One plant in the Asteraceae family that performs well is *Pyrethrum anacyclus* (L.) Lag. Spain is where it all began. Algeria, Morocco, and it has been introduced into Poland, France, India, Myanmar, Ukraine, and Sri Lanka^[1] *Anacyclus Pyrethrum* is a naturally occurring plant found in Arabic and Indian countries. It is a member of the Asteraceae family and genus *Anacyclus*. The dark grayish brown roots, measuring five to ten centimeters, have therapeutic qualities. The roots have a peculiar smell and cause saliva to flow. It is reported that *Anacyclus Pyrethrum* possesses strong sialagogue roots. The main active component of *Anacyclus pyrethrum* is pyrethrine. Among the resinous components present in the plant are tannin, gum, carbonate, calcium phosphate, carbonate, and potassium chloride. *Anacyclus pyrethrum* is used for several purposes. It not only cures gingivitis but also eases oral discomfort. Treatment recommendations for various ailments are based on an *A. pyrethrum* examination. This review study aims to give a general overview of the various biological functions of the plant known as Akarkara, or *Anacyclus pyrethrum*.^[2]

It has a combination of isobutyl amide and an alkaloid called pellitorine, which is a very strong component. It also contains essential oils. Plants have long been utilized as tonics for the nervous system, antibacterials, and anti-inflammatory agents.^[3] The roots of *A. pyrethrum* (L) are used in traditional medicine to cure a variety of conditions, including angina, salivary secretion, toothaches, drowsiness, and even paralysis of the limbs and tongue. They are used to prevent disease and cure gout and sciatica in the form of cream-based animal fats.^[4]

Common names of *anacyclus pyrethrum*

English name: Pellitory

Hindi name: Akarkara

Sanskrit name: Akarkara

Gujrati name: Akkorakaro

Bengali names: Akkalkara

Marathi name: Akkalkara

Telugu name: Akar

Tamil name: Akkirakaram

The classification of the *anacyclus pyrethrum* as follows

Table no. 1: Classification of plant.

Kingdom	Plantae
Order	Asterales
Family	Asteraceae
Tribe	Anthemideae
Genus	Anacyclus
Species	pyrethrum



A. Pyrethrum flower.



A. Pyrethrum Plant

A chemical analysis of the plants' roots revealed the presence of three fatty acids, one sterol, and 10 unsaturated fatty amines. Amecyclenes, phenyl ethylamide, tannins, polyacetylene amides, gum, enetryne alcohol, and essential volatile oils are a few examples of amines. There is something else present in the roots as well.^[22]

Botanical Aspects

Morphology

Asteraceae is a family of perennial plants, including *A. pyrethrum*. This species grows to a height of 40 to 60 cm and is distinguished by several little or simple branching stems that emerge from the ground, bearing delicate, finely cut leaves that are hairy. Its yellow-hearted flowers with purple exterior ray florets and white interior florets. The roots are long, thick, fibrous, and have a white interior and a brown outside. Every fruit (Achene) has a weak crown or is bald.^[5,6] The plant peaks in May and August.^[7]



A. pyrethrum flower

The plant is highly valued by the locals for its therapeutic qualities as well as its social and economic merits, according to ethnological surveys on it carried out in Morocco. Therefore, the root is the most significant and frequently utilized portion of the plant from a medicinal standpoint.^[8,9]

The Geographical Distribution and Taxonomy

Asteraceae family native to Morocco and Algeria is *A. pyrethrum*.^[3] Boulos (1983) states that *A. pyrethrum* is primarily widespread in North Africa, the Mediterranean region, and India. Other authors claim that it is indigenous to Morocco, Algeria, and India.^[6,10] African pyrethrum is the colloquial term for *A. pyrethrum*. The names are Awd al-Attas, Akkar Karra, Tighuendeste or Ighuendes Hallala, Arq-Echlouh, Aqirqarha, and Kûkû in colloquial Arabic, Moroccan, and North African languages.^[11]



Anacyclus Pyrethrum

In Morocco, this species can be found at the level of the Saharan Atlas, against the Atlas, the High Atlas, Middle Atlas, North Atlantic Morocco, the plateaus of eastern Morocco, and the Rif at elevations ranging from 1000 to 2500 m. It can also be found in cut forests, matorrals, hermes, grasslands, low plains, middle and high mountains, and cold semi-arid, semi-humid, humid, high mountains. On the levels of vegetation over the Mediterranean, the *A. pyrethrum* seems to be most suited to well-drained soils and unshaded regions covered in trees or shrubs.^[6] The most common type of reproduction is sexual (seed). It is also feasible for asexual reproduction to occur in plant or rhizome parts. There are several ways that seeds can spread, including by wind, water, gravity, animals (such as birds, insects, and mammals), and people.^[12]

TRADITIONAL USES

The following is a list of *Akarkara*'s exceptional qualities.

Aphrodisiac: Plant root extracts stimulate sexual cravings and libido while delaying ejaculation.

Analgesic: It produces numbness in order to lessen or stop pain.

Anti-rheumatic & Anti-arthritis: By promoting circulation, it relieves rheumatic arthritis.

Anti-Bacterial & Anti-Viral: *Akarkara* has also demonstrated antibacterial and antiviral qualities, protecting you against a wide range of infectious disorders that are water- and air-borne and are brought on by bacteria and viruses.

Antibiotic: It also prevents the body's microbiological or biotic growth.

Anti-catarrhal: *Akarkara* root also possesses anti-catarrhal qualities, meaning that it drives out previous catarrh.

Carminative: It helps the intestines release gas.

Digestion: As food passes down the digestive tract, *akarkara* roots stimulate the secretion of saliva and other digestive secretions, which helps with digestion.

Diuretic: *Akarkara* root has a diuretic effect that makes urinating more frequent and productive, which aids in the body's detoxification process.

Emmenagogue: It relieves irregular, sluggish, or blocked menstrual flow.

Febrifuge: Because of its anti-microbial, antiviral, and antibacterial qualities, the alkaloids found in *akarkara* make it an effective febrifuge.

Nervine: Nervous or neurotic problems are well-treated with *arkarkara*.

Vermifuge: *Akarkara* roots are an excellent vermifuge because of the alkaloids' anti-biotic and anti-microbial qualities, which also aid in eliminating intestinal worms.

Sialagogue: It stimulates salivary gland secretion and output. This is often used to treat toothaches and can help with digestion and dry mouth.^[13,14]

Chemical Composition

A. pyrethrum's chemical constituents have been the focus of multiple studies. During phytochemical screening,

alkaloids, reducing agents, and catechic tannins were discovered in the roots, leaves, and flowers. Plants additionally include gallic tannins, triterpenes, sterols, mucilage, coumarins, saccharids, and holosids in addition to these extra substances.^[9] as well as a few trace minerals like Pb, Zn, Fe, Cu, Cd, Cr, and Ni.^[10] Flowers contain larger quantities of flavonoids, total phenol, and polyphenols than do leaves and roots. The roots are rich in alkaloids, whereas the aerial sections are copious in flavonoids and tannins. The root contains lignin, inulin, gum, various salts, and a little amount of tannic acid.^[9] The plant's roots have aphrodisiac qualities because of the bioactive chemical N-alkylamides.^[23] Seven pure alkamides were identified by mass- and NMR-spectroscopic methods: deca-2E,4E,9-trienoic acid isobutylamide; deca-2E,4E-dienoic acid isobutylamide (pellitorine); deca-2E,4E-dienoic acid 2-phenylethylamide; tetradeca-2E,4E-dien 8,10-dienoic acid isobutylamide; dodeca-2E,4E-dien acid 4-hydroxy-2-phenylethylamide; and isopentyl amide. By using column chromatography and preparative HPLC, two more alkamides were found: undeca-2E,4E-dien-8,10-dienoic acid 2-phenylethylamide and deca-2E,4E-dienoic acid 4-hydroxy-2-phenylethylamide. A detailed examination of the crystalline components of the roots revealed the presence of a mixture of isobutyl amides of unsaturated acids, with decadiene playing a significant role. Reversed-phase partition chromatography can be used to isolate the mixture of decanoic, dodecanoic, and tetradecanoic acids that result from the hydrogenation and acidic hydrolysis of the roots.^[24,25]

TOXICITY STUDIES

Anacyclus pyrethrum root was studied for acute (oral) toxicity in albino rats. At 175, 550, and 2000 mg/kg body weight, there was no mortality and notable changes in body weight and wellness parameters, indicating the safety of these extracts at dosages up to 2000 mg/kg body weight.^[15]

BIOLOGICAL STUDIES

Antibacterial Activity and Antifungal Activity

There are about 500 or more different kinds of bacteria in the mouth cavity. *Streptococcus mutans* colonies appear after the first year of life, whereas *Streptococcus sanguinis* colonies appear following tooth eruption. Regarding periodontal diseases, gingivitis and peri-implantitis are caused by *streptococcus sanguinis* and *staphylococcus aureus*, respectively.^[16,17]

The root of *Anacyclus pyrethrum* was examined in vitro for its antibacterial properties. An adaptable microplate bioassay technique is used to screen medicinal plants and identify their active ingredients, allowing for the rapid and accurate assessment of antibacterial activity.^[18] The *staphylococcus aureus* zone of inhibition was 20 mm, 17 mm, 18 mm, and 17 mm when the pure extract of *Akarkara* was used. The observed zone was subtracted from the disc's true diameter, or 5 mm, to determine the

effective zone. The alcoholic extract's antibacterial property was provided by *Anacyclus pyrethrum*.^[19] The disc diffusion method was used to determine the antifungal activity. Following a 72-hour incubation period at 28 °C, the activity of the inoculated agar plates was assessed. Measured in millimeters, the inhibition zone's diameter.^[20,21]

Anesthetic Activity

200 dental patients were given a solution containing 2% root alcohol extract, which had been newly mixed in sterile distilled water. The solution demonstrated anesthetic activity during lengthy mouth reconstructive procedures. The extract appeared safer at lower doses and showed no negative effects. This clinical experiment used xylocaine as a positive control.^[26]

Androgenic activity

Rats were given an oral dose of 50 mg/kg of root aqueous and ethanolic extracts, and in two separate tests, significant anabolic effects were noted.^[27,28]

Antidepressant Activity

investigated the antidepressant properties of root aqueous extract (50 mg/kg) in mice that were hypothermic due to reserpine and hypothermia caused by clonidine. Several techniques were used in this investigation, including the forced swim test, locomotor activity, tail suspension test, and catalepsy caused by haloperidol. An increase in ambulatory behavior indicative of a stimulant result and greater movability has been noted.^[29]

Anticonvulsive activity

Mice were given an oral dose of 200 mg/kg of root ethanolic extract, which demonstrated anticonvulsive effects by reducing the severity of maximal electroshock seizures.^[30]

Antiepileptic activity

By lowering oxidative stress, root hydroalcoholic extract prevented cognitive decline in mice given pentylenetetrazole-induced kindling at dosages of 250 and 500 mg/kg.^[31]

Anti-inflammatory activity

Mice with arachidonic acid-induced ear edema were topically administered with different extracts (3 mg) derived from roots in water, chloroform, and ethanol to reduce inflammation. In this study, indomethacin served as a positive control.^[32]

Antidiabetic Activity

Many different disorders have been successfully treated with *anacyclus pyrethrum*. In rats given alloxan to induce diabetes, the aqueous root extract of *Anacyclus pyrethrum* DC was assessed at various concentrations. The diabetic state was maintained in the experimental rats for a period of fifteen days. This extract has the potential to treat diabetes without having an adverse effect on blood sugar levels. In rats with alloxan

diabetes, the extract lowers the blood glucose level. This indicates that *Anacyclus pyrethrum* plant root aqueous extract is beneficial for treating diabetes mellitus.^[33]

Memory Enhancing Activity

The ethanolic extract of *Anacyclus pyrethrum* is beneficial for memory impairment. Learning and memory are evaluated using three different passive avoidance paradigms: elevated plus maze, social learning task, and elevated plus maze. The Elevated Plus Maze model shows improved cognition and a decrease in transfer latency if the group receives treatment with *Anacyclus pyrethrum* extract. When taken orally, the ethanolic extract of *A. pyrethrum* improves memory in various experimental paradigms in social learning tasks. Central cholinergic activity was assessed by measuring the amount of brain cholinesterase. By boosting central cholinergic neurotransmission, the ethanolic extract of *Anacyclus pyrethrum* has been shown to raise brain cholinesterase levels and contain memory-enhancing action in scopolamine-induced amnesia models.^[34]

Antioxidant Activity

The assay of lipid peroxidation method is done for the Ex vivo study, and the antioxidant activity in vitro is determined by various activity studies such as radical-scavenging, Hydroxyl radical scavenging, hydrogen peroxide scavenging, reducing power determination, and nitric oxide scavenging. In vitro results are attributed to antioxidant action. The ethanolic extract of *Anacyclus pyrethrum* demonstrated the ability to scavenge hydrogen peroxide and the hydroxyl radical in a dose-dependent manner. The active ingredient identified in the *Anacyclus pyrethrum* screening is phenol. Nitric oxide has a scavenging effect because phenolic compounds are present, and the scavenging action of EEAP rises in a dose-dependent way. When power was reduced, it was discovered that the result increased as the test compound's concentration increased.^[35]

Inhibit the Release of Acetylcholinesterase Enzyme

Alzheimer's disease (AD) is a degenerative illness primarily linked to neuronal alterations that impair both cognitive function and the loss of functional capacities. When a patient has AD, it indicates that their cholinergic system is malfunctioning. In order to cure AD, the brain's acetylcholine level must be raised, which can be done by inhibiting the acetylcholinesterase enzyme (AChE). The in-vitro anticholinesterase inhibitory impact of three extracts from different solvents, such as hexane, chloroform, and ethanolic extract of *Anacyclus pyrethrum*, was examined at various doses. *Anacyclus pyrethrum* extracts' inhibitory effect on the acetylcholinesterase enzyme was assessed, and the percentage of inhibition was computed. However, only the ethanolic extract exhibits activity among these three extracts, while the hexane extract has no anticholinesterase inhibitory properties. Conversely, the IC50 value of chloroform extract is 150±3.68µg/ml. The ethanolic extract's phytoconstituent may be used to

create a perfect and safe medication to treat Alzheimer's disease.^[36]

CONCLUSION

One plant species, *A. pyrethrum*, has several ethnomedical use. From it, several compounds have been identified. Nonetheless, there is a paucity of scientific data regarding bioactivity studies. Therefore, greater research on phytochemicals and bioactivities is needed to both generate more scientific evidence for the use of ethnomedicine and identify additional bioactive molecules that could potentially serve as lead compounds in future drug development studies. A. extract from pyrethrum. This herb is quite beneficial for diabetes and harmless. When it comes to oral bacteria like streptococcus aureus and streptococcus sanguis, it has a slight antibacterial impact. This research looked into, gathered, and recorded the bioactive scientific data on *A. pyrethrum* that is currently available.

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