International Journal of Botany Studies
www.botanyjournals.com
E-ISSN: 2455-541X
Received: 09-10-2026, Accepted: 08-11-2026, Published: 23-11-2026
Volume 11, Issue 4, 2026, Page No. 136-140

Akkarkara (*Anacyclus pyrethrum*): Traditional uses, phytochemistry and pharmacological potential analysis

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DOI: https://doi.org/10.66856/ijbs.2026.11.4.11263

Abstract
Akkarkara, commonly associated with *Anacyclus pyrethrum* (L.) Lag. or *Anacyclus pyrethrum* DC. in the literature, is a medicinal herb of the family Asteraceae whose root is valued in several traditional systems, including Unani and Ayurveda. The plant is also known as akarkara, aqarqarha, pellitory and Spanish chamomile, although vernacular names may be applied inconsistently to different species and traded materials. Traditional applications include oral and dental complaints, reduced salivation, neuralgic pain, selected neurological symptoms, musculoskeletal discomfort and reproductive health. Modern investigations have examined extracts and isolated constituents for antimicrobial, anti-inflammatory, analgesic, antioxidant, immunomodulatory, neuroactive, metabolic and reproductive effects. N-alkylamides, especially pellitorine and related compounds, are frequently discussed as characteristic bioactive constituents; reports also describe fatty acids, sterols, lignans, carbohydrates and other secondary metabolites. However, the chemical profile depends on plant identity, provenance, plant part, extraction solvent and analytical method. Much of the pharmacological evidence remains preclinical, with variation in models, extract standardization and outcome measures. Human clinical evidence is limited and does not justify treating traditional indications as established therapies. Safety, dose, interactions, reproductive effects and long-term toxicity require systematic evaluation. This narrative review summarizes the available evidence, distinguishes traditional use from experimentally demonstrated activity, and identifies priorities for authentication, quality control, mechanism-based research, toxicology and well-designed clinical trials.

Keywords: Akkarkara, Pellitorine, ethnomedicine, phytochemistry, pharmacology

Introduction

Medicinal plants remain important sources of traditional healthcare and starting points for pharmacological discovery. Their use reflects long-standing empirical knowledge, local availability and cultural practice, but a history of use does not by itself establish clinical efficacy or safety. Plant based products can vary substantially in identity, composition and potency, making botanical authentication and chemical standardization essential when traditional materials are evaluated scientifically.

Akkarkara is a commonly used South Asian name associated with *Anacyclus pyrethrum*, a member of the Asteraceae. The roots are the best-known medicinal part. In Unani literature the drug is commonly referred to as aqarqarha, while akarkara is used in Indian materia medica. The plant has also been discussed in North African and Mediterranean contexts. Modern reviews describe a broad range of traditional uses and experimental activities, but there is also important gaps in evidence and standardization (Choudhary, 2016; Elazzouzi *et al*., 2022; Fuard *et al*., 2025) [2, 3, 4].

Anacyclus pyrethrum roots contain pungent bioactive constituents, including N-alkylamides, that may interact with sensory pathways and inflammatory processes. The extracts have been investigated in laboratory and animal models for analgesic, anti-inflammatory, antimicrobial, antioxidant, neuroactive and reproductive effects. Such findings are promising as hypotheses, but preclinical effects cannot be assumed to occur in humans at safe oral doses. This review therefore considers the plant from a botanical and pharmacognostic perspective, evaluates the strength and limitations of the evidence, and proposes a research agenda. This research paper mainly focusses on botanical identity, traditional uses, phytochemistry, pharmacological evidence, safety and research gaps.

Botanical identity and classification

Taxonomy and nomenclature

Anacyclus pyrethrum belongs to the kingdom Plantae, order Asterales and family Asteraceae (Compositae). The scientific name appears in the literature in forms including *Anacyclus pyrethrum* (L.) Lag. and *Anacyclus pyrethrum* DC. The related names and common names can be confusing, “pellitory” may refer to more than one plant in trade and the common name Spanish chamomile is not sufficient to authenticate a sample.

Morphological features

Anacyclus pyrethrum is a low-growing herb with finely divided foliage and daisy-like flower heads typical of the Asteraceae. The medicinally traded part is usually the root, which is pungent and produces a characteristic tingling or salivation-inducing sensation when chewed. The morphology may vary with habitat, cultivation conditions and developmental stage.

Distribution and habitat

The precise distribution depends on the taxonomic treatment and source of the material. The wild collection, local

cultivation, trade and substitution can complicate provenance.

Authentication and quality control

The authentication should combine macroscopic and microscopic pharmacognosy with a voucher specimen and where appropriate, DNA-based methods. The chemical fingerprints using chromatographic techniques can complement taxonomy but should not replace it. A robust quality-control protocol would assess foreign matter, moisture, ash values, extractive values, microbial contamination, pesticide residues, heavy metals and relevant marker compounds because alkylamide content may differ among samples, marker-based assays should be validated and reported alongside extraction yield and chromatographic conditions.

Traditional knowledge and ethno-medicinal uses

Akkarkara has been described in traditional systems as a pungent, stimulating medicinal root. The historical and materia-medica sources report its use for oral discomfort, toothache, gum complaints, reduced salivation, nasal congestion, headache, neuralgic pain, selected paralytic or neurological complaints, musculoskeletal symptoms and sexual or reproductive concerns. These are records of traditional practice, not proof that the plant is effective for each condition. The traditional indications also vary by region, preparation and medical system (Choudhary, 2016; Elazzouzi *et al*., 2022; Fuard *et al*., 2025) [2, 3, 4].

A prominent traditional feature is its sialagogue action, contact with the pungent root may stimulate salivation and create tingling or local sensory irritation. This sensory response may explain some historical oral uses, but it should not be equated with treatment of dental infection or periodontal disease. The toothache can reflect caries, pulpitis or abscess and requires appropriate dental assessment. Similarly, traditional use for weakness, paralysis or epilepsy should not replace evidence-based neurological evaluation and care. The root has also been described as an aphrodisiac in traditional materia medica. The experimental research has investigated effects on sexual behaviour, reproductive hormones or related endpoints in animals. These studies are biologically interesting but do not establish a safe or effective human treatment for infertility, erectile dysfunction or low libido.

The claims in commercial marketing may exceed the evidence, particularly when products do not disclose species identity, dose or chemical composition. The ethnobotanical documentation should record not only the claimed indication but also the preparation, route, quantity, frequency, the benefit-risk assessment must account for modern medicines, pregnancy, chronic illness and the possibility of adulteration.

Phytochemical composition

N-alkylamides and pungent constituents

N-alkylamides are among the most discussed constituents of *Anacyclus pyrethrum*. The pellitorine and related alkylamides have been reported in the plant and are often proposed as contributors to its characteristic pungency and biological activity. These compounds are of interest because some N-alkylamides in medicinal plants can influence sensory receptors, inflammatory signalling or other biological pathways. Nevertheless, the presence of a compound in an extract does not establish that it is responsible for a whole-extract effect, isolation, dose-response testing and mechanistic experiments are needed (Elazzouzi *et al*., 2022; Boudjelal *et al*., 2020) [1, 3]. The terms anacycline, pellitorine and other alkylamide names appear in the literature, but spelling, structure assignments and reported abundance should be checked in the original analytical studies. The chemical names are not interchangeable and results obtained from different species or plant parts should not be merged. The analytical confirmation with reference standards and appropriate mass-spectrometric or spectroscopic evidence is important, especially where a compound is proposed as a quality marker. The fatty acids and their derivatives, sterols such as stigmasterol, lignans including sesamin, carbohydrates and fructans such as inulin, phenolic compounds, flavonoids, tannins, terpenoid-related constituents and small amounts of volatile material. The researchers have used roots, seeds, leaves, flower heads and different solvent systems. Some compounds may occur at low concentrations or may be influenced by extraction and analytical conditions. Consequently, a list of compounds compiled across studies should be interpreted as a catalogue of reports rather than a single definitive chemical profile.

Effect of extraction and plant material

The water, alcohol, hydro-alcoholic mixtures, non-polar solvents and other extraction systems recover different chemical fractions. The root extracts may not be chemically equivalent to leaf or seed extracts. The drying temperature, storage duration, particle size, geographical origin, season, maturity and processing may also influence composition. The comparisons of pharmacological activity are difficult when studies do not report a voucher specimen, extraction ratio, yield, solvent-removal procedure, storage conditions and quantitative chemical profile.

Analytical approaches

The GC–MS has been used to investigate volatile and semi-volatile compounds, while HPLC or UHPLC coupled to UV or mass spectrometry can support analysis of less volatile constituents. The NMR spectroscopy may assist in structural confirmation and quantitative profiling. A recommended strategy is to combine botanical authentication, broad fingerprinting and quantitative measurement of selected marker compounds. Reference standards, system suitability, calibration, precision, recovery, limits of detection and quantification should be reported for assays intended for quality control.

Table 1: Major reported phytochemical groups and research considerations

Constituent group	Examples reported in literature	Interpretive note
N-alkylamides	Pellitorine and related alkylamides	Important candidates for marker analysis; content varies

		by sample and method.
Fatty acids and derivatives	Palmitic, lauric and other fatty-acid-related compounds	May reflect lipid fraction and analytical method; not all are specific markers.
Lignans and sterols	Sesamin; stigmasterol	Reported in chemical surveys; biological contribution needs direct testing.
Carbohydrates	Inulin and other polysaccharides/fructans	Composition depends on plant material and extraction procedure.
Phenolics and flavonoids	Various phenolic compounds and tannins	May contribute to *in-vitro* antioxidant results; assays are not proof of clinical benefit.
Volatile constituents	Trace essential-oil/volatile fractions	Results depend strongly on distillation, extraction and instrument settings.

Pharmacological activities

The research on *Anacyclus pyrethrum* spans *in-vitro* assays, animal models and traditional-use reports. A consistent limitation is that studies frequently evaluate crude extracts rather than standardized products or isolated compounds. The differences in dose, solvent, species, route and outcome measures complicate comparison. A positive laboratory result is best treated as evidence for further investigation, not as confirmation of clinical efficacy (Elazzouzi *et al*., 2022; Zhang *et al*., 2024) [3, 7].

Analgesic and anti-inflammatory potential

The extracts from different plant parts have been examined in experimental models of pain, inflammation and wound repair. Boudjelal *et al*. (2020) [1] investigated chemical composition alongside analgesic, anti-inflammatory and wound-healing properties of hydroalcoholic extracts from roots, seeds, leaves and capitula. Such work provides a basis for investigating whether selected fractions influence inflammatory mediators or pain-related responses. However, whole-animal assays may be affected by sedation, motor changes, stress or nonspecific toxicity. Future studies should use standardized extracts, validated models, appropriate positive and vehicle controls, blinded assessment and mechanistic endpoints.

The Traditional use for toothache or neuralgic pain may be related to the pungent sensory effects of the root. The local tingling or irritation is not equivalent to safe anaesthesia and direct application to oral tissues may cause discomfort. The available evidence does not support substituting Akkarkara for dental treatment, prescribed analgesics or evaluation of persistent pain.

Antimicrobial activity

The antimicrobial effects for certain extracts or compounds reported, but activity may be limited to specific organisms and concentrations. *In-vitro* inhibition zones and minimum inhibitory concentrations depend on the extraction solvent, diffusion properties, inoculum, growth medium and assay design. Results should be reported with recognized standards, reference antimicrobial agents and solvent controls. Antimicrobial activity in a test tube does not demonstrate that oral consumption or topical application treats infection in humans. The clinical development would require safety studies, pharmaco-kinetic evidence and trials with clinically meaningful outcomes.

Antioxidant activity

The phenolic compounds and other constituents have been discussed in relation to antioxidant assays. The chemical tests such as radical-scavenging capacity measure activity under specific assay conditions, they do not directly show that a preparation prevents oxidative damage in human tissues. The cell-based studies can add biological context but still require attention to concentration, cytotoxicity and assay interference. The future studies should connect chemical composition to validated cellular outcomes and avoid using antioxidant capacity alone as a broad health claim.

Neuroactive and cognitive effects

The nootropic, memory-related, anticonvulsant or neuroprotective effects are areas of interest because some traditional indications involve neurological symptoms. Nonetheless, evidence from animal behaviour tests is vulnerable to confounding by locomotor stimulation, sedation, stress and learning effects. A convincing programme would require replicated findings, dose-response relationships, pharmacokinetic data, target engagement and careful safety assessment. The plant must not be used as a replacement for anti-seizure medication or treatment of neurological disease.

Metabolic and immunomodulatory effects

The anti-hyperglycaemic and immunomodulatory actions are mentioned in the review literature. These claims need to be interpreted according to the models used and whether effects were observed with isolated compounds or complex extracts. The changes in glucose in an animal model do not establish that a product is appropriate for diabetes management. The potential interactions with glucose-lowering or immune-modifying medicines are particularly important to investigate before human use. The clinical studies should define the preparation precisely and monitor adverse events as well as efficacy.

Reproductive and aphrodisiac Properties

Anacyclus pyrethrum has a long-standing reputation as an aphrodisiac in some traditional systems, and animal experiments have examined sexual behaviour and reproductive endpoints. The results may be influenced by dose, animal strain, stress, endocrine status and the composition of the extract. The findings cannot be translated directly into claims about human sexual function, fertility or testosterone. The reproductive toxicology is also essential: a preparation proposed for sexual health should be assessed for effects on fertility, pregnancy, fetal development and hormone-sensitive conditions before broad use is considered.

Wound healing and other activities

The wound-healing activity has been studied experimentally, including in work comparing extracts from different plant parts (Boudjelal *et al*., 2020) [1]. The wound models can identify candidate mechanisms but do not establish efficacy for chronic wounds, burns or infected

lesions. Other reported activities include insecticidal effects and possible effects on general physiological responses. Each activity should be evaluated independently; a broad pharmacological profile should not be interpreted as evidence that one preparation is a universal remedy.

Table 2: Evidence map for frequently discussed activities

Research area	Evidence described in literature	Key limitation
Pain and inflammation	*In-vitro* and animal experiments with extracts	Standardization and clinical relevance uncertain.
Antimicrobial	Laboratory assays against selected microorganisms	*In-vitro* inhibition does not prove treatment of infection.
Antioxidant	Chemical and some biological assays	Assay results are not equivalent to clinical benefit.
Neuroactive effects	Preclinical behavioural and physiological studies	Confounding and lack of robust human trials.
Metabolic effects	Preclinical reports, including glucose-related outcomes	Dose, safety and drug interactions not established.
Reproductive effects	Traditional claims and animal studies	Human efficacy and reproductive safety remain uncertain.
Wound healing	Experimental wound models	No basis to replace standard wound care.

Safety, toxicity and precautions

The safety evidence for medicinal plants is often less complete than efficacy screening. The absence of reported adverse effects in traditional use or small experimental studies does not demonstrate safety for long-term use, high doses or concentrated extracts. The pungent constituents may cause oral irritation, unpleasant burning or gastrointestinal discomfort, depending on dose and formulation. The product contamination, misidentification, adulteration and batch-to-batch variation create additional risks.

Akkarkara should not be assumed safe during pregnancy or breastfeeding, for children, or for people with significant chronic disease because reliable safety data may be lacking. People taking prescription medicines, especially medicines affecting glucose control, blood pressure, the nervous system, immune function or reproductive hormones should consult a qualified clinician or pharmacist before using concentrated products. The potential interactions are not sufficiently characterized to provide a reliable list of safe combinations. Do not stop or reduce prescribed treatment in order to use the herb.

The researchers should evaluate acute and repeated-dose toxicity, genotoxicity where appropriate, liver and kidney markers, neurological effects, reproductive and developmental toxicity, and local irritation. Studies should report all adverse events, mortality, body-weight changes, clinical observations, pathology and exposure levels. The toxicology should be conducted using the same chemically characterized preparation proposed for further development. If products are sold as supplements or traditional medicines, applicable national regulations and labelling requirements should be followed.

Formulation, standardization and translational development

Traditional preparations and commercial products may differ in root particle size, extraction method, dosage form and co-ingredients. A research-grade product should have a defined botanical source, a deposited voucher specimen, a reproducible manufacturing process, a chemical fingerprint and quantitative marker specifications. The good agricultural and collection practices can support traceability, while good manufacturing practices can reduce contamination and batch variability.

The standardization should not rely on a single marker unless that marker is shown to track relevant activity and quality. A multi-marker approach may be more appropriate when several chemical classes contribute to the observed effects. The stability studies should examine marker degradation under different temperatures, humidity and packaging conditions. The finished-product testing should include microbial limits, heavy metals, pesticide residues, residual solvents and adulterants where relevant.

Before a product is tested in humans, preclinical studies should establish a plausible exposure range and an adequate safety margin. Early clinical studies should use a clearly specified formulation, prospective registration, ethics approval, informed consent and transparent reporting. The trial outcomes should be clinically meaningful and prespecified.

Research gaps and future directions

First, botanical authentication requires attention. The studies should use accepted taxonomic names, record synonyms, deposit vouchers and describe provenance. The trade names alone are inadequate. DNA barcoding can be useful in complex supply chains, but it should complement morphology and chemistry rather than replace them. Second, chemical research should prioritize reproducible profiling and validated quantification of alkylamides, including pellitorine where appropriate. The studies should disclose extraction yield, marker concentrations and batch information. The activity-guided fractionation may help determine which compounds are responsible for particular effects, while testing purified compounds and reconstituted mixtures can clarify whether effects are additive, synergistic or antagonistic.

Third, pharmacology needs stronger experimental design. Randomization, blinding, power calculations, appropriate controls, dose-response curves, sex-balanced animal studies where relevant, and transparent reporting should become routine. An independent replication is important, especially for dramatic claims. The mechanistic assays should be connected to *in-vivo* exposure and not rely solely on docking or nonspecific antioxidant tests.

Fourth, toxicology and pharmacokinetics are major priorities. The researchers need to know which constituents are absorbed, metabolized and eliminated, whether active concentrations can be reached safely and whether repeated exposure causes harm. The drug-interaction studies and reproductive safety testing are particularly important given the plant's traditional use for reproductive and neurological complaints.

Fifth, clinical evidence remains limited. If preclinical results and safety data justify human research, trials should be prospectively registered, adequately powered and designed around a specific indication rather than a broad claim. They

should compare a standardized preparation with an appropriate control, use validated outcome measures and report adverse events. The trials should also document concomitant medication and clinically relevant subgroups. Systematic reviews should follow transparent protocols and assess risk of bias.

Finally, sustainability and equitable knowledge governance deserve attention. The wild collection can place pressure on local populations if demand increases. The cultivation protocols, seed and germplasm conservation, traceable supply chains and benefit-sharing arrangements can support responsible development. The traditional knowledge holders should be appropriately acknowledged and engaged in line with applicable ethical and legal frameworks.

Discussion

The literature presents *Anacyclus pyrethrum* as a pharmacologically interesting plant with a distinctive pungent root and a complex chemical profile. The strongest general conclusion is not that the plant is a proven treatment for a wide range of diseases, but that it contains constituents and extracts worthy of carefully controlled investigation. Multiple reviews agree that N-alkylamides are important chemical features and that a variety of biological activities have been explored (Elazzouzi *et al*., 2022; Zhang *et al*., 2024; Fuard *et al.*, 2025) [3, 4, 7].

The interpretation is complicated by heterogeneous methods. A study of a hydro-alcoholic root extract cannot automatically be compared with a seed extract, a volatile fraction or a product sold under the same common name. Even when two papers report the same activity, differences in extraction, dose and assay can make their findings non-equivalent. This limits the ability to identify a clinically relevant dose or determine which constituent is responsible.

Another challenge is the gap between biological plausibility and clinical utility. Antioxidant assays, antimicrobial screening and animal behavioural tests can generate useful hypotheses, but they are early stages of evidence development. Human trials require a standardized intervention, credible comparator, relevant outcomes and adequate safety monitoring. Until that evidence is available, therapeutic claims should remain qualified. In particular, Akkarkara should not replace dental, neurological, metabolic or reproductive healthcare.

The future of Akkarkara research will depend on integration of ethnobotany, taxonomy, analytical chemistry, pharmacology, toxicology and clinical science. High-quality reporting can turn a diverse body of preliminary findings into a reproducible research programme. Clear separation of traditional claims from demonstrated effects is essential for scientific integrity and public safety.

Conclusion

Akkarkara, commonly associated with *Anacyclus pyrethrum*, is a traditional medicinal plant of the Asteraceae with a long history of use, particularly for oral and sensory complaints and in some reproductive and neurological contexts. Its reported chemistry includes N-alkylamides such as pellitorine and a range of other constituents whose abundance varies with plant part, provenance and extraction method. Experimental literature describes analgesic, anti-inflammatory, antimicrobial, antioxidant, neuroactive, metabolic, immunomodulatory, reproductive and wound-healing potential, but the evidence is predominantly preclinical and heterogeneous. The robust conclusions about human efficacy, optimal dosage, interactions and long-term safety cannot yet be drawn. The future progress requires authenticated plant material, validated chemical standardization, reproducible pharmacology, comprehensive toxicology and well-designed clinical trials. Until then, Akkarkara is best regarded as a promising research subject rather than a proven substitute for established medical care.

References

1. Boudjelal A, Henchiri C, Sari M, Sarri D, Hendel N, Ruberto G. *Anacyclus pyrethrum* (L.), chemical composition, analgesic, anti-inflammatory, and wound healing properties. Molecules,2020:25(22):5469. https://doi.org/10.3390/molecules25225469
2. Choudhary VKAK. Akarkara, a versatile medicinal plant, a review. Journal of Ayurveda and Holistic Medicine,2016:4(5). https://doi.org/10.70066/jahm.v4i5.91
3. Elazzouzi H, Fadili K, Cherrat A, Amalich S, Zekri N, Zerkani H, *et al*. Phytochemistry, biological and pharmacological activities of *Anacyclus pyrethrum* (L.) Lag., a systematic review. Plants,2022:11(19):2578. https://doi.org/10.3390/plants11192578
4. Fuard F, Zarnigar, Jamaldeen FN. A complete review of ethnopharmacology, pharmacology and phytochemistry of *Anacyclus pyrethrum* DC. Traditional and Integrative Medicine,2025:10(3). https://doi.org/10.18502/tim.v10i3.19764
5. Indian Medicinal Plants, Phytochemistry and Therapeutics (IMPPAT). *Anacyclus pyrethrum*, plant profile and phytochemical information. Institute of Mathematical Sciences. Available at: https://cb.imsc.res.in/imppat/phytochemical/Anacyclus%20pyrethrum.
6. Kishor K, Lalitha KG. Pharmacognostical studies on the root of *Anacyclus pyrethrum* DC. Indian Journal of Natural Products and Resources,2012:3(4):518–526.
7. Zhang Y, *et al*. Traditional use, chemical composition, and pharmacological activity of *Anacyclus pyrethrum* (L.) DC. Clinical Traditional Medicine and Pharmacology,2024:5(4):200179. https://doi.org/10.1016/j.ctmp.2024.200179
8. Deore DS, Bacchav PP, Dighe RS. A comprehensive review of akkalkara (*Anacyclus pyrethrum*) for voice enhancement and throat health. Journal of Pharmacognosy and Phytochemistry,2025:14(2):463–476. https://doi.org/10.22271/phyto.2025.v14.i2f.15321