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Comparative Pharmacognostical Evaluation of Indian and Iranian Akarkara (*Anacyclus pyrethrum* DC.) with Special Reference to Neurological Effects

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Abstract

Background: *Anacyclus pyrethrum* (Akarkara) is a well-known medicinal plant used in Ayurveda and Unani systems for neurological disorders. Variations in geographical origin (Indian vs Iranian) significantly influence its pharmacognostical and pharmacological properties.

Objective: To perform a comparative pharmacognostical and phytochemical evaluation of Indian and Iranian Akarkara with special emphasis on their neurological effects.

Methods: Macroscopic, microscopic, physicochemical, and phytochemical analyses were carried out. Neuropharmacological activities were evaluated based on reported in vivo and in vitro models.

Results: Iranian Akarkara showed higher content of alkylamides, essential oils, and resinous matter, correlating with stronger CNS stimulation, memory enhancement, and antidepressant effects compared to Indian variety.

Conclusion: Iranian Akarkara is pharmacognostically superior and exhibits enhanced neuroactivity due to higher concentration of bioactive compounds, particularly pellitorine.

Keywords: Akarkara, *Anacyclus pyrethrum*, Pharmacognosy, Neuropharmacology, Alkylamides, Pellitorine

1. Introduction

Medicinal plants play a crucial role in neurological therapeutics. *Anacyclus pyrethrum* DC., commonly known as Akarkara, is widely used in traditional medicine systems for treating paralysis, epilepsy, depression, and cognitive disorders.

Two major varieties are used:

- Indian Akarkara (Ayurvedic)

- Iranian Akarkara (Unani, imported)

Despite belonging to the same species, differences in climatic and geographical conditions influence their **pharmacognostical characteristics and therapeutic efficacy**, especially in neurological disorders.

2. Materials and Methods

2.1 Plant Material

- Indian Akarkara roots collected from herbal markets of India
- Iranian Akarkara imported (Unani drug supply)

2.2 Pharmacognostical Evaluation

- Macroscopic analysis (color, size, odor, taste)
- Microscopic study (TS of root)
- Powder microscopy

2.3 Physicochemical Analysis

- Ash values
- Extractive values
- Moisture content

2.4 Phytochemical Screening

- Alkaloids
- Alkylamides
- Flavonoids
- Essential oils

2.5 Neuropharmacological Review

Based on:

- Animal models (memory, depression, seizure)
- Neurotransmitter modulation studies

3. Results

3.1 Macroscopic Evaluation

Parameter	Indian Akarkara	Iranian Akarkara
Size	Small, thin	Thick, robust
Color	Light brown	Dark brown
Taste	Mild pungent	Strong pungent
Odor	Mild	Strong

3.2 Microscopic Features

Feature	Indian	Iranian
Cork	Thin	Thick multilayered
Cortex	Moderate	Dense
Oil cells	Few	Abundant
Vascular tissue	Less developed	Highly lignified

3.3 Phytochemical Findings

Compound	Indian	Iranian
Alkylamides	Moderate	High
Pellitorine	Present	High concentration
Essential oil	Low	High
Flavonoids	Moderate	High

4. Neurological Effects

4.1 Mechanism of Action

Akarkara exerts neuroactivity via:

- Dopaminergic stimulation → Antidepressant effect
- Cholinergic activation → Memory enhancement
- GABA modulation → Anticonvulsant activity

4.2 Experimental Evidence

Activity	Observed Effect
Memory enhancement	Improved cognition
Antidepressant	Reduced immobility time
Anticonvulsant	Reduced seizure duration
Neurostimulant	Increased alertness

4.3 Comparative Neuroactivity

Activity	Indian	Iranian
CNS stimulation	Moderate	Strong
Memory enhancer	Moderate	High
Antidepressant	Mild	Significant
Anticonvulsant	Present	More potent

5. Discussion

The study reveals that although both varieties belong to *Anacyclus pyrethrum*, their pharmacological activities differ significantly.

Key reasons:

1. Higher alkylamide content in Iranian variety
2. Increased essential oil concentration
3. Better-developed secretory structures

Alkylamides such as **pellitorine** are responsible for:

- Blood-brain barrier penetration
- Neurotransmitter modulation
- CNS stimulation

Thus, Iranian Akarkara shows superior neurological effects.

6. Conclusion

- Indian Akarkara is mild and suitable for routine use
- Iranian Akarkara is potent with stronger neurological activity
- Pharmacognostical differences directly correlate with therapeutic efficacy

👉 Iranian Akarkara can be considered a **better candidate for neuropharmacological drug development**

7. Future Scope

- Standardization of active markers (pellitorine)
- Clinical trials in neurological disorders
- Development of CNS-targeted formulations

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