

Marker Profiling – Evidence Based Approach for Quality Evaluation of Herbs in Indian System of Medicine

**International
Symposium
for HPTLC BASEL
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Associate Editor,

J. Ethnopharmacology,

Elsevier Science



**International Symposium for
High Performance Thin Layer Chromatography**
Congress Center, Basel, Switzerland
July 6–8, 2011

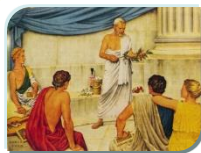
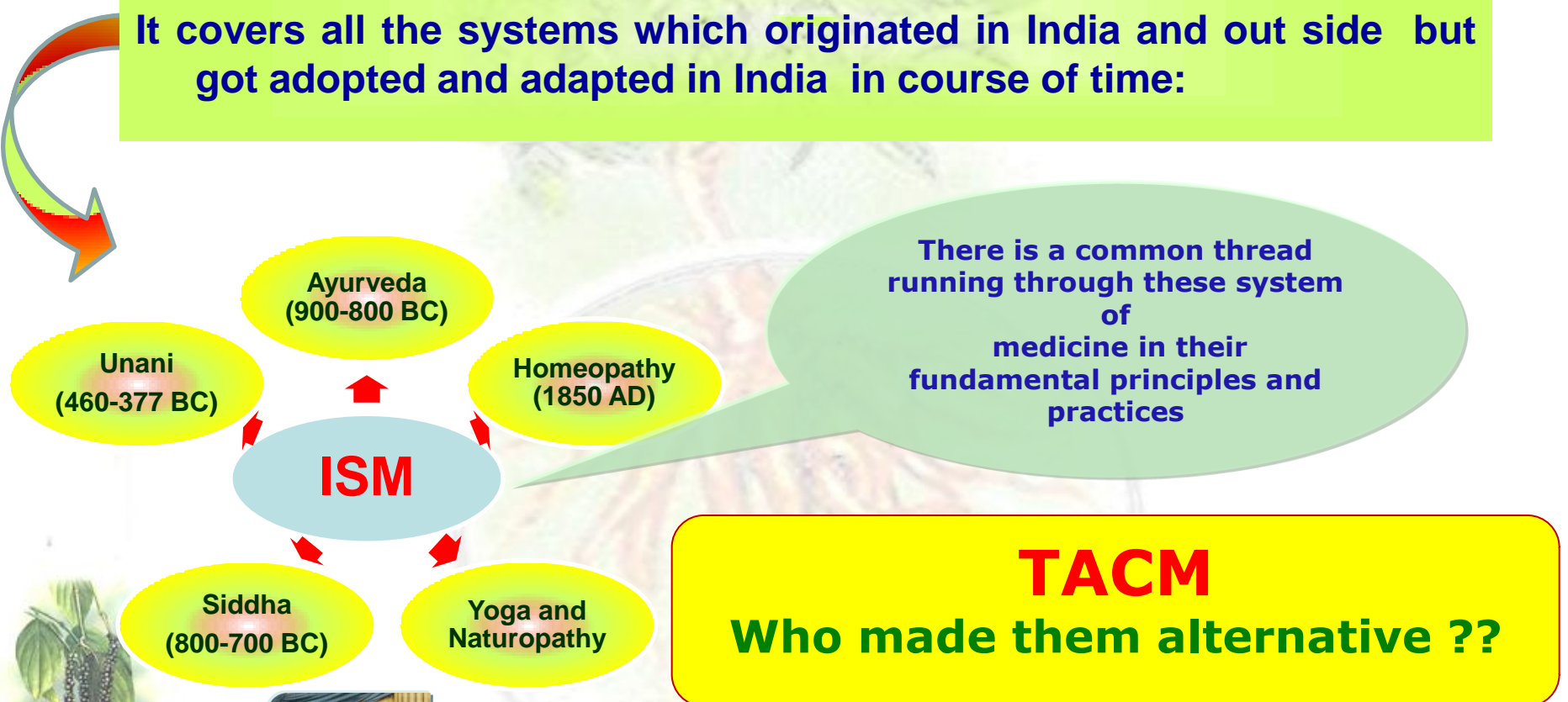




Indian System of Medicine (ISM)

Traditional health care system of India

It covers all the systems which originated in India and outside but got adopted and adapted in India in course of time:



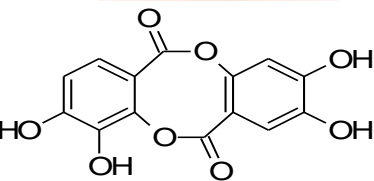
Mukherjee et al, 2010 "Ayurveda in Modern Medicine: Development and Modification of Bioactivity" in Comprehensive Natural Products-II - Chemistry and Biology, Elsevier Science:, Vol - 3, pp. 479-507



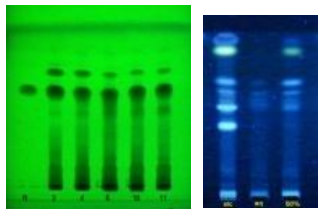
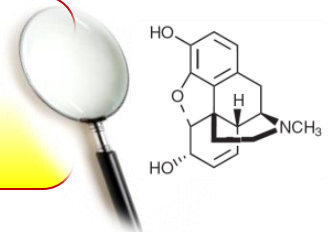
Promotion & Development of Indian System of Medicine



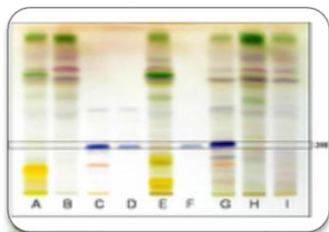
Evidence Based Approach



Traditional Medicine Inspired Drug Discovery & Development



Evaluation of Traditional Medicine- Evidence Based Health Care Claim



Globalizing Local Knowledge - Localizing Global Technology

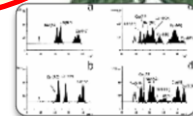




Evaluation of therapeutic activity

Marker analysis

Confirm the potency



shelf life & stability studies

Anticipate the active constituents



Ensure the quality and consistency

Detection of adulterants



To explore the bioactive natural products

Marker analysis is a standardization tool for natural health products

To conform

- Potency
- Uncommon chemical entities
- Validation of therapeutic doses
- Shelf life & stability

To ensure & Validate

- Consistency
- Safety
- efficacy
- Active constituent

To detect & evaluate

- Adulteration
- Toxicity
- Quality of the raw material
- characteristic fingerprints

To study Post marketing surveillance





Quality related Safety issues with Herbal Remedies



Quality of regulated herbal products



Adulterations/Substitution (Premixes)



Illegal manufacturing / Contract Mfg



Unregistered / counterfeit products (Hologram)



Misleading advertisements / Exaggerated claims



Adverse Drug Reactions (ADRs Reporting)

Self-Medication

Intrinsically toxic constituents present naturally in herbal ingredients

Toxicity as a result of exposure to contaminants

Herb-Drug interactions

Specific patient groups, e.g. Pregnant or nursing mothers, children etc.

Challenges with Quality of herbal products

- Complex mixture of constituents
- Use of combination of herbal ingredients in TM
- Constituents vary considerably depending on Genetic, environmental factors
- Constituents responsible for the claimed therapeutic effects are frequently unknown or partly explained

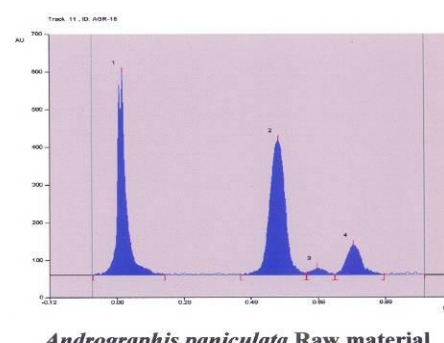
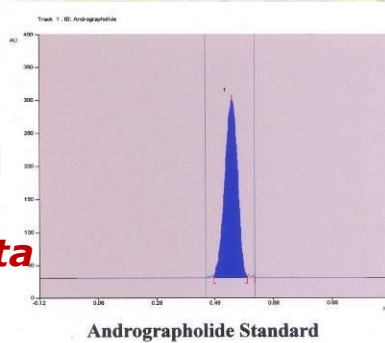
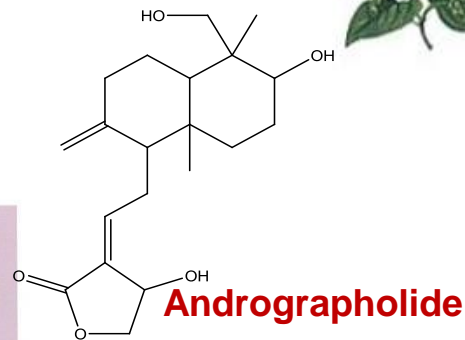




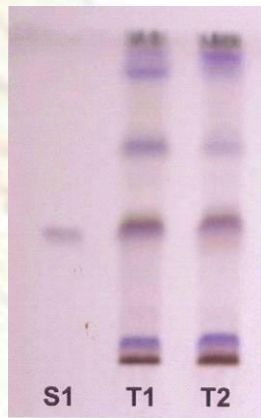
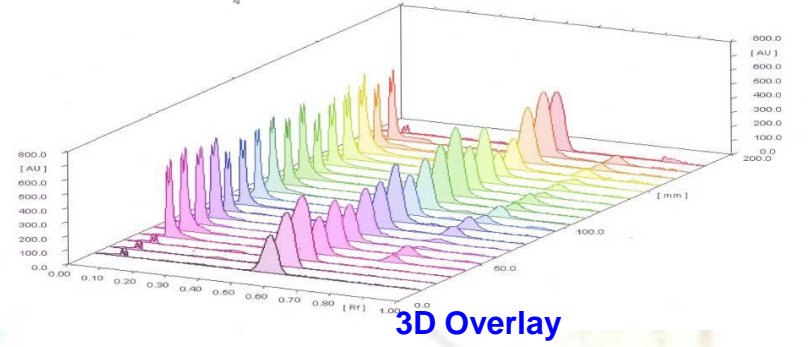
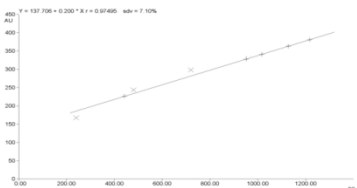
HPTLC Chromatogram of *Andrographis paniculata* Extract with Standard Andrographolide



Andrographis paniculata
Acanthaceae



Prakash K. Hazam



P. Venkatesh

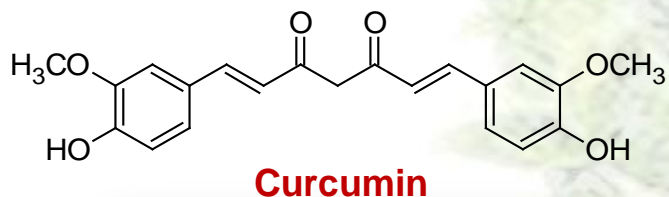
Solvent system-
Chloroform: Acetone: Benzene (20:20:10)

S1 – Andrographolide (Standard)
R_f ≈ 0.52
T1, T2 – Test Samples



Standardization of herbs with marker profiling

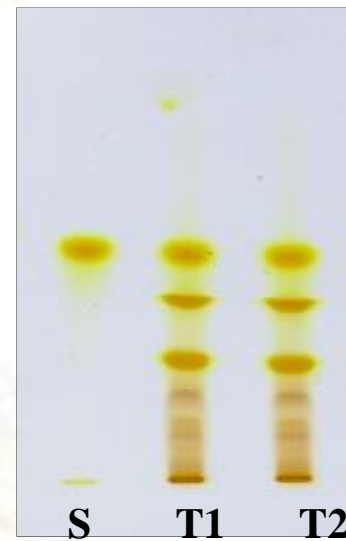
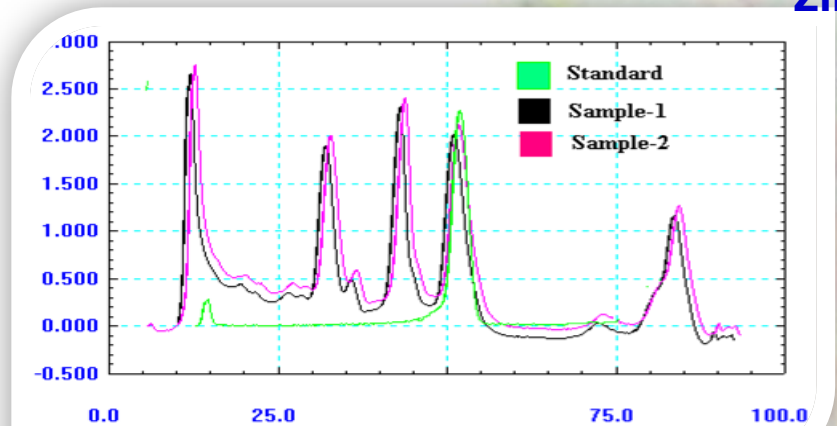
HPTLC Chromatogram of *Curcuma longa* Extract With Standard Curcumin



Curcuma Longa
Zingiberaceae



Arunava Gantait



S – Curcumin (Standard)
R ≈ 0.5; T1, T2 – Test Samples



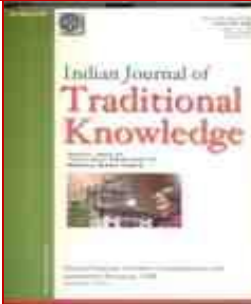
V. Kumar

Solvent System: Chloroform : Ethanol : Glacial acetic acid (95:5:1)

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Vol. 10 (2), April 2011, pp. 247-250

Validated method for estimation of curcumin in turmeric powder

Arunava Gantait, Topu Barman & Pulok K. Mukherjee*
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Jadavpur University, Kolkata 700 03, West Bengal
E-mail: naturalproductm@gmail.com

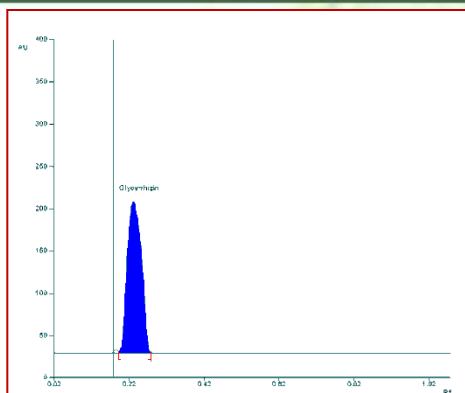




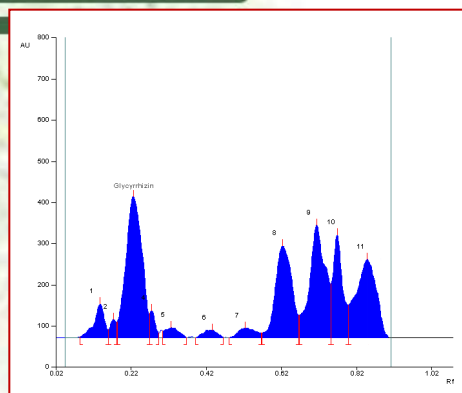
HPTLC Chromatogram of *Glycyrrhiza glabra* extract with standard Glycyrrhizin



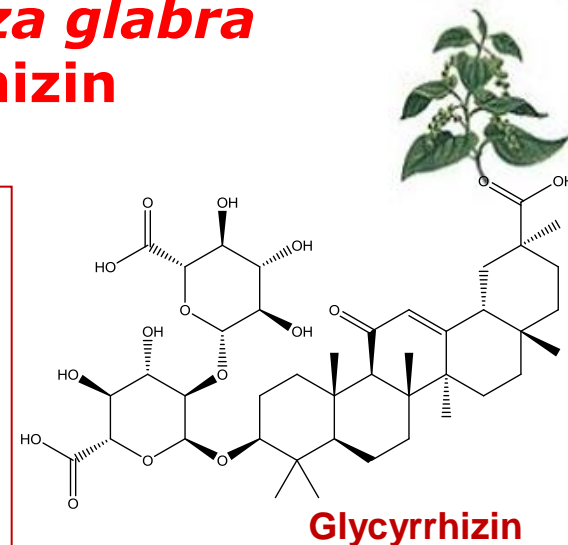
Glycyrrhiza glabra
Fabaceae



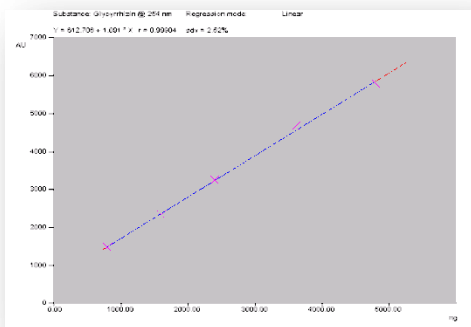
Typical HPTLC chromatogram of Glycyrrhizin



Typical HPTLC chromatogram of *Glycyrrhiza glabra*

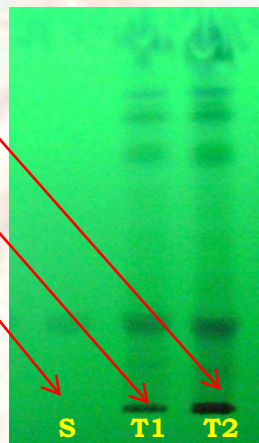


Glycyrrhizin



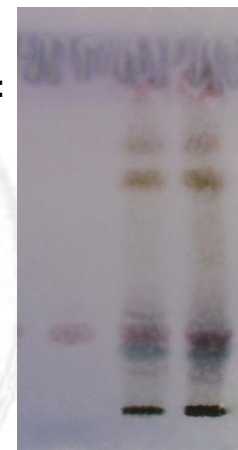
Typical HPTLC standard curve of glycyrrhizin

T1-T2:
test sample
Standard



Solvent System:
Chloroform:
Methanol:
Water
(65: 36:7.5)

Under UV light



Neelesh Nema

Under visible light
after using spray
reagent



DIETARY SUPPLEMENTS

Quantification of Glycyrrhizin in *Glycyrrhiza Glabra* Extract by Validated HPTLC Densitometry



HPTLC Chromatogram of *Nelumbo nucifera* Rhizome extract



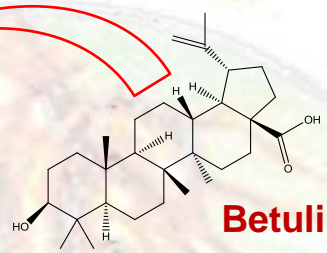
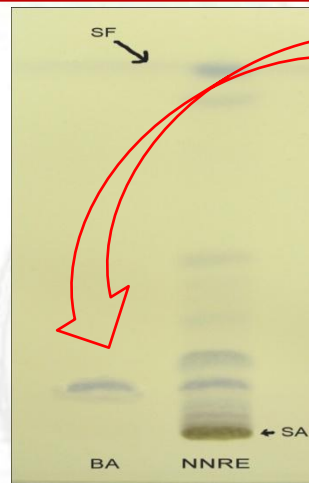
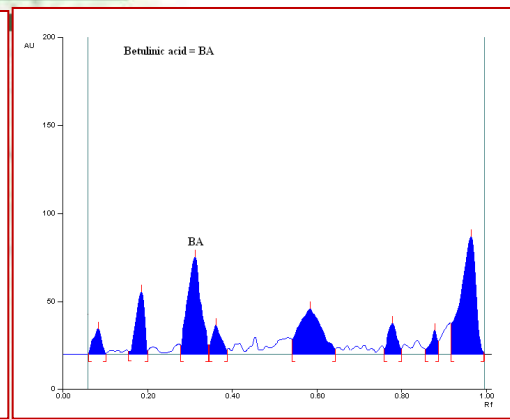
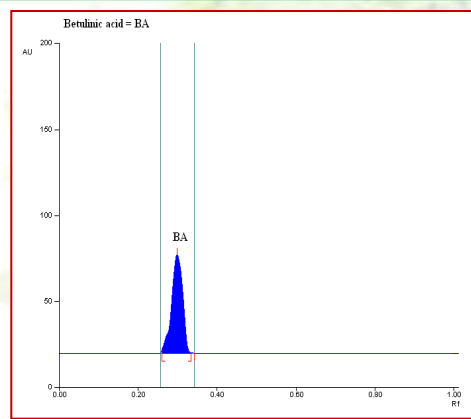
Debajyoti



Santanu

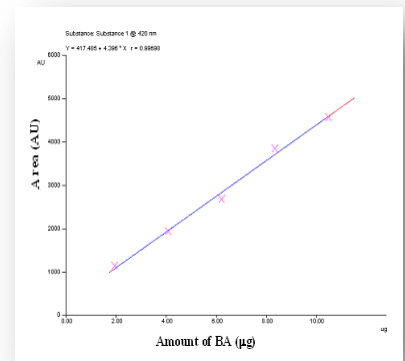
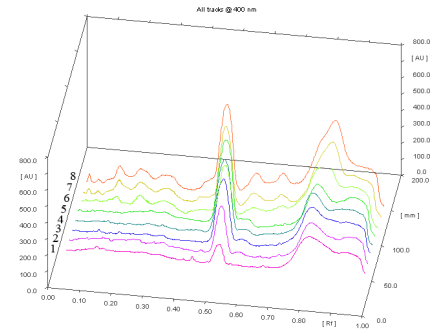


Nelumbo nucifera
(Nymphaeaceae)



Betulinic acid content = 1.56 % w/w

Solvent system:
Chloroform: Methanol: Formic acid (49:1:1)



Typical HPTLC standard curve of Betulinic acid

Research Article

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Published online in Wiley InterScience

(www.interscience.wiley.com) DOI 10.1002/pca.1232

Rapid Validated HPTLC Method for Estimation of Betulinic acid in *Nelumbo nucifera* (Nymphaeaceae) Rhizome Extract

Debajyoti Mukherjee, N. Satheesh Kumar, Taraknath Khatua and Pulok K. Mukherjee*

Phytochemical Analysis





Planta Med 2009; 75
DOI: 10.1055/s-0029-1234679

Standardization of two different varieties of Capsicum obtained from North East India

A Gantait ¹, A Maji ², T Barman ¹, P Banerji ², PK Mukherjee ¹

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J. Sep. Sci. 2006, 29, 2292–2295



2292

Sujay Rai
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Original Paper

Determination of 6-gingerol in ginger (*Zingiber officinale*) using high-performance thin-layer chromatography

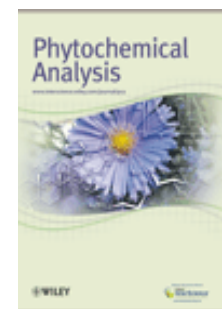


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Phytochemical Analysis
Phytochem. Anal. (2007)

Published online in Wiley InterScience (www.interscience.wiley.com) DOI: 10.1002/pea.1042

Phytochemical
Analysis



Validation of HPTLC Method for the Analysis of Taraxerol in *Clitoria ternatea*

VENKATESAN KUMAR, KAKALI MUKHERJEE, SATHEESH KUMAR, MAINAK MAL and PULOK K. MUKHERJEE*

School of Natural Product Studies, Department of Pharmaceutical Technology, Jadavpur University, Kolkata-700032, India

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0933-4173/\$20.00 © Akadémiai Kiadó, Budapest

DOI: 10.1556/JPC.23.2010.5.3 323

Isolation of Taraxerol from *Coccinia grandis*, and its Standardization

Arunava Gantait, Amita Sahu, Pichairajan Venkatesh, Pradeep K. Dutta, and Pulok K. Mukherjee*

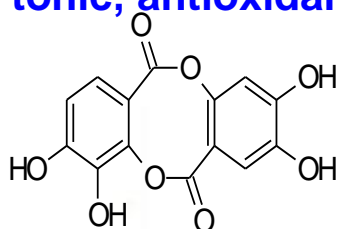


Polyherbal Formulation- An Ayurvedic Preparation



***Emblica officinalis* (Amla)**

Carminative, cerebral and G.I. tonic, antioxidant, anti-scorbutic



Ellagic acid



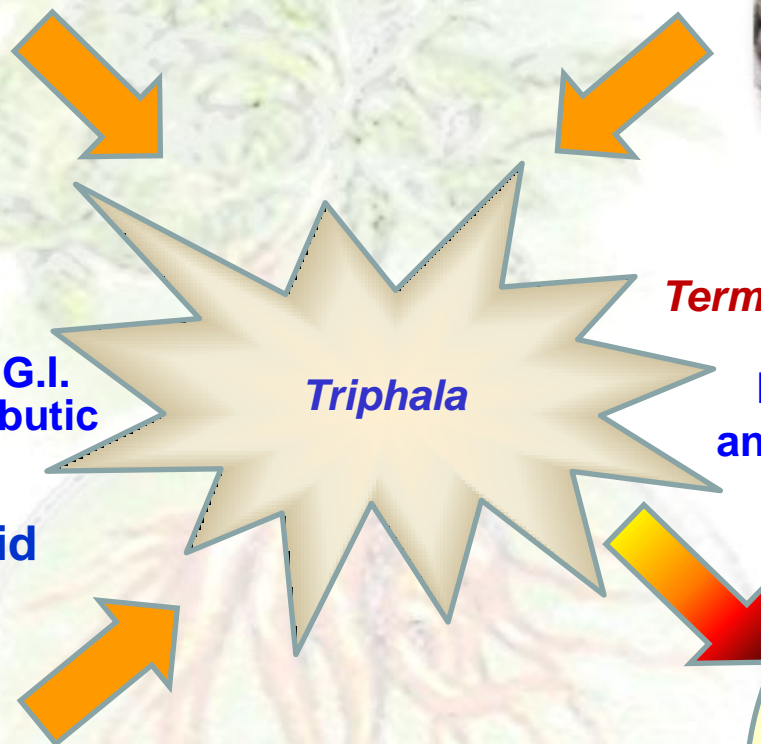
***Terminalia chebula* (Haritaki)**

Astringent, laxative, stomachic, tonic, anthelmintic

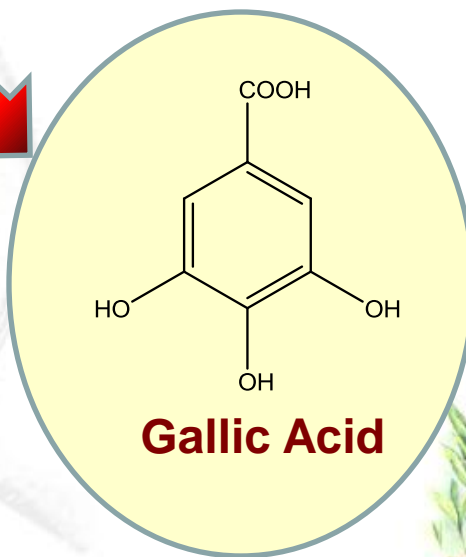


***Terminalia belerica* (Bahera)**

Laxative, astringent, anthelmintic, antacide & antibacterial



Triphala

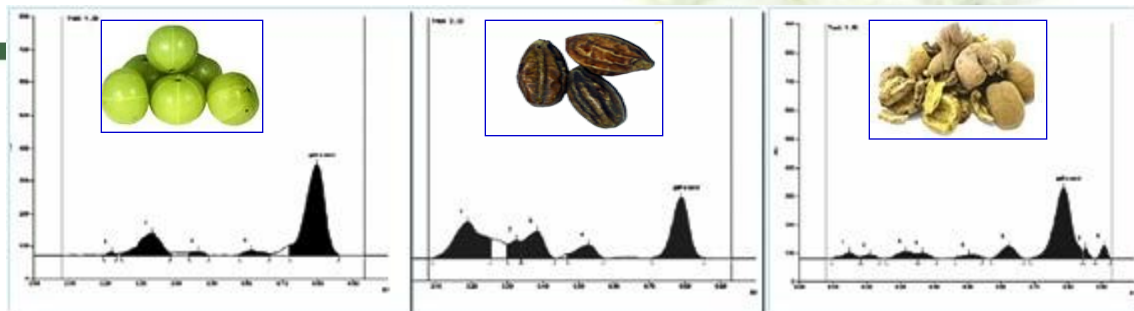


Gallic Acid





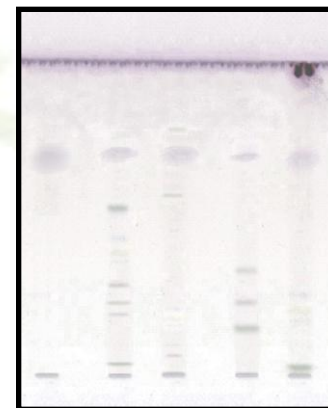
Marker Profiling of Triphala (HPTLC)



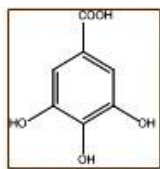
HPTLC chromatogram of *Emblica officinalis*

HPTLC chromatogram of *Terminalia chebula*

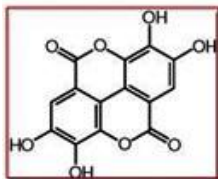
HPTLC chromatogram of *Terminalia bellerica*



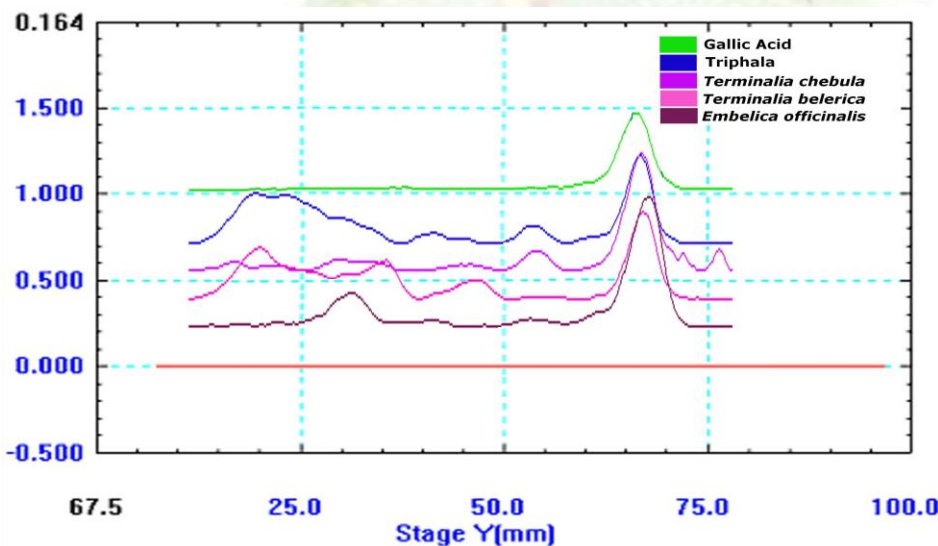
S1 T1 T2 T3 T4



Gallic acid



Ellagic acid



- S1 – Gallic Acid
- T1- Triphala
- T2- *Terminalia chebula*
- T3- *Terminalia bellerica*
- T4- *Emblica officinalis*



Sujay



Souvik



Satheesh Kumar

Indian Journal of Traditional Knowledge
Vol. 7(3), July 2008, pp. 379-383

Marker analysis of polyherbal formulation, *Triphala* – A well known Indian traditional medicine

Pulok K Mukherjee*, Sujay Rai, Sauvik Bhattacharya, Atul Wahile & Bishnu Pada Saha

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Triphala – Ayurvedic formulation, its standardization and metabolism studies



Emblica officinalis (Amla)



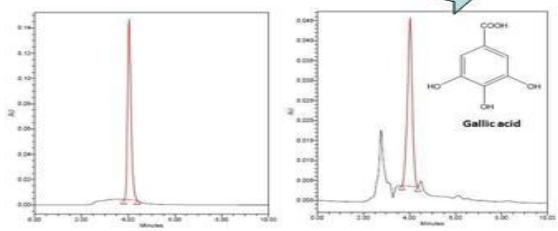
Terminalia chebula (Haritaki)



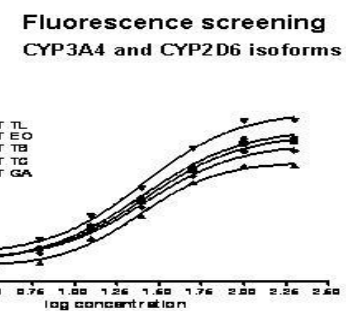
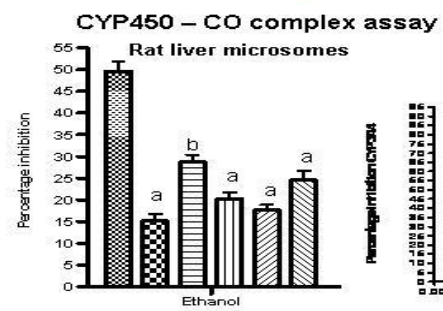
Terminalia bellerica (Bahera)



Standardization and quantitative estimation using HPLC



Safety evaluation using CYP inhibition assay



Ponnusankar S.



Subrata

Journal of Ethnopharmacology xxx (2010) xxx–xxx



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Journal of Ethnopharmacology

journal homepage: www.elsevier.com/locate/jethpharm



Cytochrome P450 inhibitory potential of Triphala—A Rasayana from Ayurveda

S. Ponnusankar^{a,*}, Subrata Pandit^a, Ramesh Babu^b, Arun Bandyopadhyay^c, Pulok K. Mukherjee^{a,*}

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^b Central Council for Research in Ayurveda and Siddha (CCRAS), Department of AYUSH, Ministry of Health and Family Welfare, Govt. of India, No. 61–65, Institutional Area, Janakpuri, New Delhi 110058, India

^c Indian Institute of Chemical Biology, Kolkata 700 032, India



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ANCHROM

CAMAG

HPTLC Training Centre to propagate HPTLC

Dedicated to R & D in chemical analysis

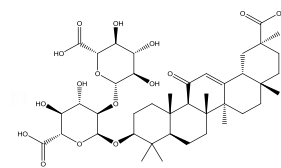
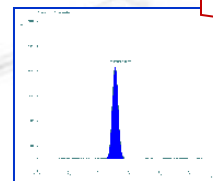
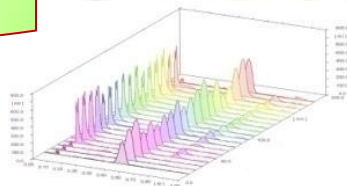
Method development for HPTLC

International Training Program on HPTLC

Special workshops on hands-on training on HPTLC technique

Anchrom Enterprises (I) Pvt. Ltd
"101, Shree Aniket Apartment,
Navghar Road, Mulund (E),
Mumbai - 400 081. INDIA
Tel: +91 022 2163 9928 - 31
Fax: +91 022 2163 9927
E- mail : info@anchrom.com

Testing of samples for those who may not have HPTLC





School of Natural Product Studies, Jadavpur University



To empower individuals with the skills, spirit and experience for development of natural products based on its quality, safety and efficacy



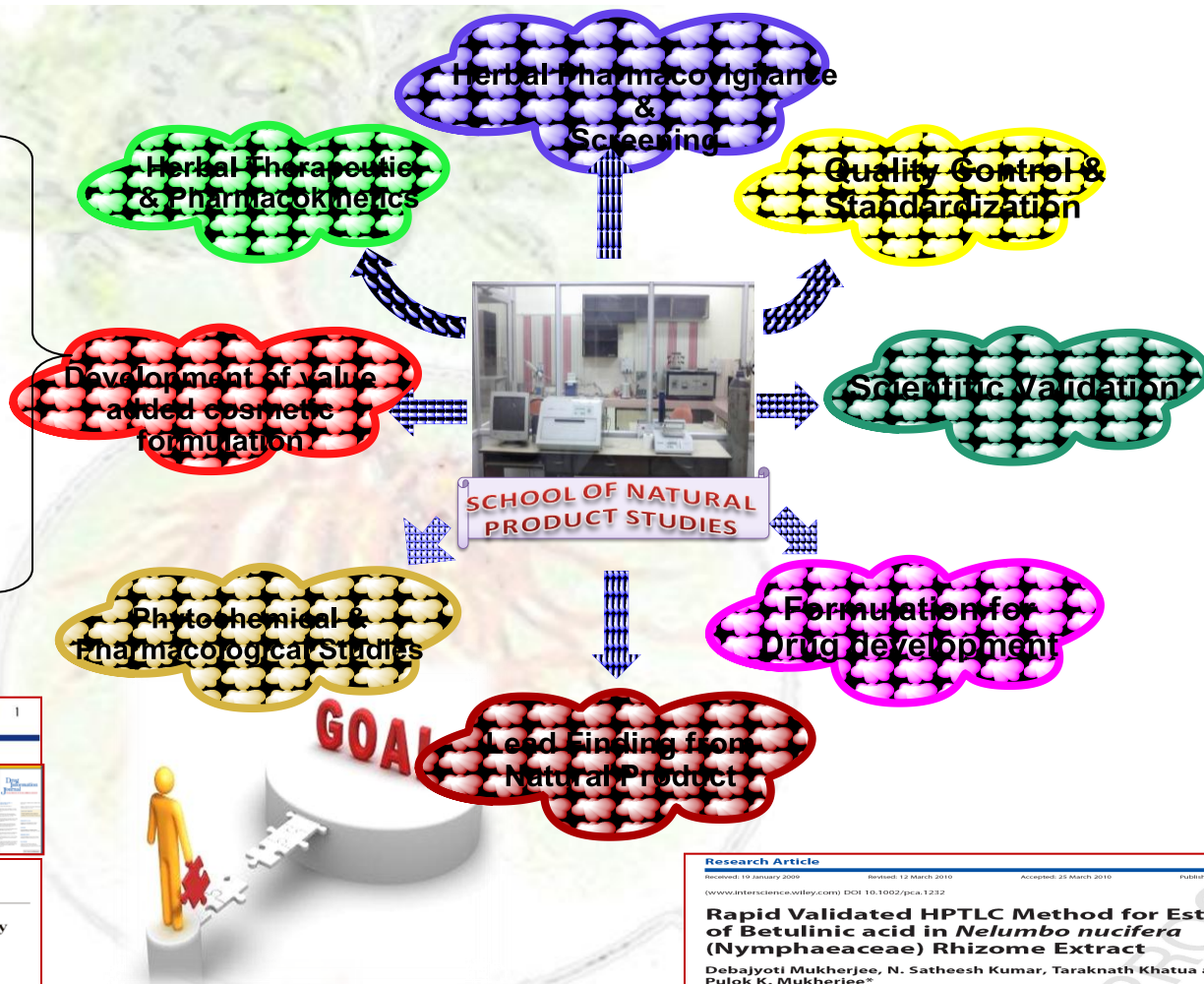
Knowledge



Skills



Practices



NATURAL HEALTH PRODUCTS 1

Palok K. Mukherjee, PhD, FRSC
 School of Natural Product Studies, Department of Pharmaceutical Technology, Jadavpur University, Kolkata, India

Marker Profiling: An Approach for Quality Evaluation of Indian Medicinal Plants

492 GANTAIT ET AL. | JOURNAL OF AOAC INTERNATIONAL VOL. 93, NO. 2, 2010

DIETARY SUPPLEMENTS

Quantification of Glycyrrhizin in *Glycyrrhiza Glabra* Extract by Validated HPTLC Densitometry

ARUNAVA GANTAIT, SUBRATA PANDEI, NEELISH K. NEMA, and PULOK K. MUKHERJEE¹
 Jadavpur University, School of Natural Product Studies, Kolkata-700 032, India

Research Article

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Rapid Validated HPTLC Method for Estimation of Betulinic acid in *Nelumbo nucifera* (Nymphaeaceae) Rhizome Extract

Debajyoti Mukherjee, N. Satheesh Kumar, Taraknath Khatua and Pulok K. Mukherjee*

Indian Journal of Traditional Knowledge
Vol. 10 (2), April 2011, pp. 247-250

Validated method for estimation of curcumin in turmeric powder

Arumava Gantait, Topsi Barman & Pulok K. Mukherjee*
School of Natural Product Studies, Department of Pharmaceutical Technology
Jadavpur University, Kolkata-700 032, West Bengal
E-mail: natprod@studnet@gmail.com



Planta Med 2009; 75
 DOI: 10.1055/s-0029-1234679

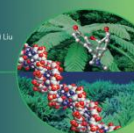
Standardization of two different varieties of Capsicum obtained from North East India

A Gantait¹, A Maji², T Barman¹, P Banerji², PK Mukherjee¹
¹ School of Natural Product Studies, Jadavpur University, Kolkata-700 032, India
² Ulysses Research Foundation, 125, Rashbehari Avenue, Kolkata-700 029





Comprehensive
Natural Products II
Chemistry and Biology
Editors: Chai
Liu, Mander
Hung, Wen (Ben) Liu



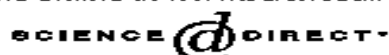
3.14 Ayurveda in Modern Medicine: Development and Modification of Bioactivity

Pulok K. Mukherjee, M. Venkatesh, and Arunava Gantait, Jadavpur University, Kolkata, India

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Journal of Ethnopharmacology 103 (2006) 25–35

Perspective paper

Integrated approaches towards drug development from Ayurveda and other Indian system of medicines[☆]

Pulok K. Mukherjee^{*}, Atul Wahile

School of Natural Product Studies, Department of Pharmaceutical Technology, Jadavpur University, Kolkata 700032, India



Journal of
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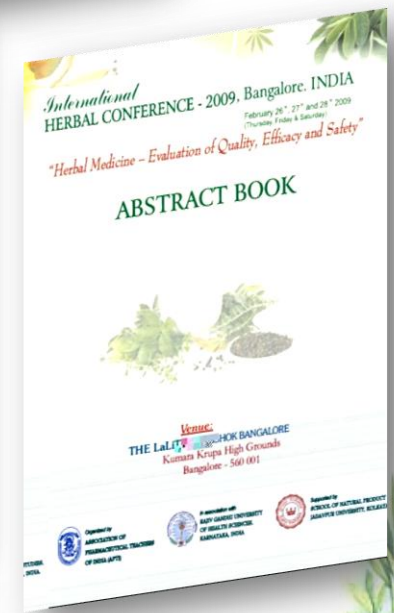
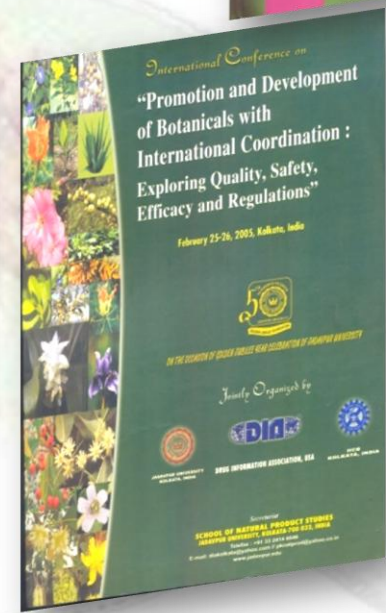
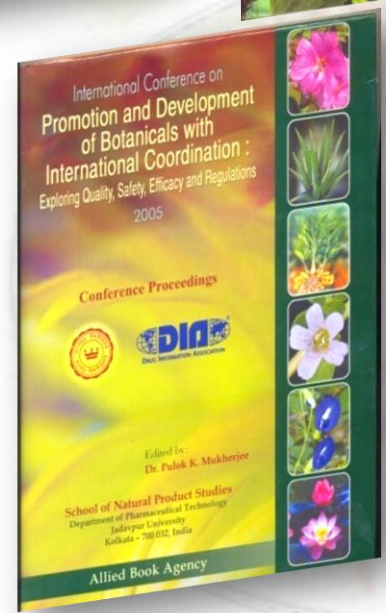
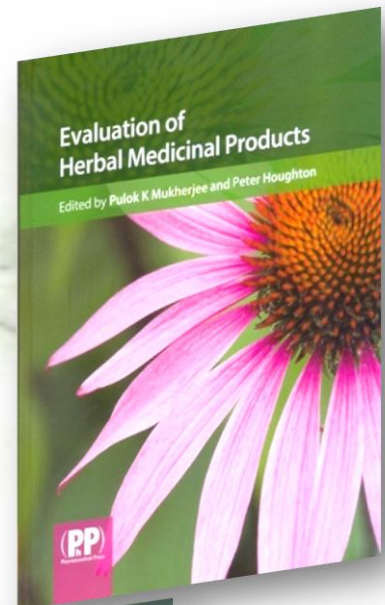
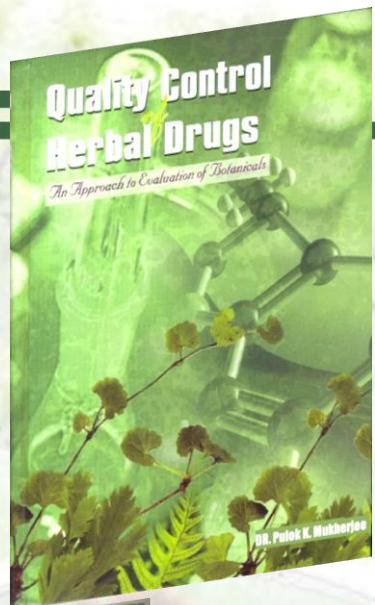
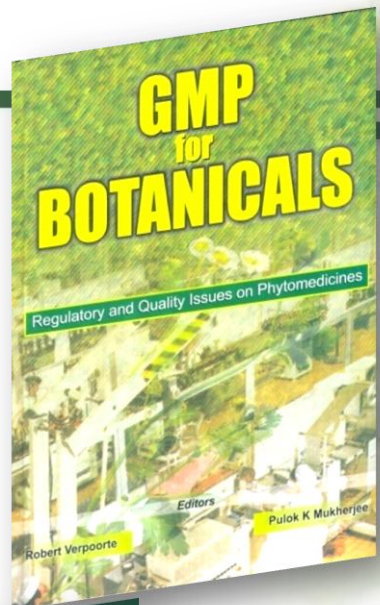
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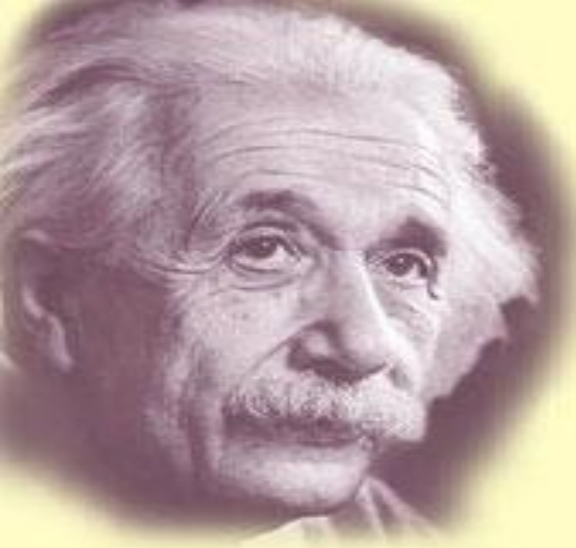
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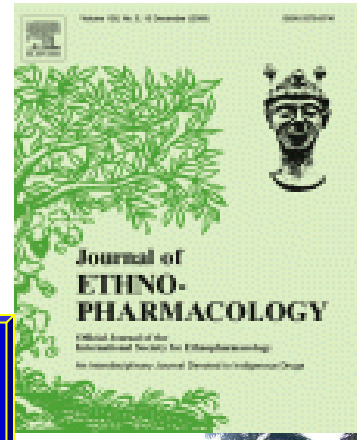
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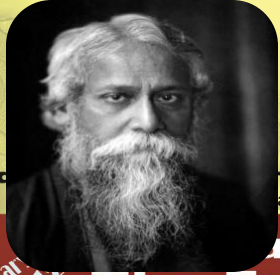
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