Identification of *Cleome gynandra* L. by B.S.I., Kolkata
GOVERNMENT OF INDIA
BOTANICAL SURVEY OF INDIA
OFFICE OF THE Dy.Director
CENTRAL NATIONAL HERBARIUM
P.O.: BOTANIC GARDEN
HOWRAH - 711 103
Date. 25-10-2000

Dr. Suranjjan Roy
Head of the Dept. of Chemistry
Cachar College
Silchar 788 01
Assam

Subject: Identification/confirmation of plant specimen - regarding

Sir,

With reference to your letter No. CC/81-3 dated 1-9-2000 along with a sample packet containing a dry, pressed plant material handed over to this office on 21st Oct. 2000 for favour of identification, I am to inform you that the specimen has been identified as: \textit{Cleome gynandra} Linn. (\textit{Gynandropsis pentaphylla} (Linn. DC.) of the family Cleomaceae.

The receipt of rupees fifty is enclosed herewith along with the specimen for your perusal.

Thanking you,

Yours faithfully,

[Signature]

A. Panjappa
Deputy Director
Abstract of Poster presented at IUPAC International Conference on Biodiversity and Natural Products, 2004
ABSTRACTS

CONFERENCE PROGRAMME

Organized by

DEPARTMENT OF CHEMISTRY, UNIVERSITY OF DELHI
&
COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
CHEMICAL AND MEDICINAL PERSPECTIVES OF THE SEED OIL OF 
CLEOME GYNANDRA L.

S.B. Paul and S. Roy

Department of Chemistry, Assam University, Silchar - 788011, India
Fax : +91-3842-270802; Email: sbpaul@rediffmail.com

Cleome gynandra L. (Cleomaceae) is a wild and semi-cultivated annual herb growing throughout the Warmer parts of the globe and having ethnic use by tribals of Arunachal Pradesh and Bodo tribals of Assam as well as used in traditional system of medicine. The bruised leaves are used in headache, neuralgia, rheumatism and other local pains. Seeds are anthelmintic and seed oil is used in curing skin diseases. Decoction of root is used in expelling round worms. Essential oil has anti-tick property and leaf extract possess antifeedant and insecticidal property. It is a popular leafy vegetable in many parts of Africa.

Keeping this in view, this communication highlights the chemical and medicinal properties of the seed oil hitherto not used for edible or industrial purposes. Physico-chemical characterisation such as colour, odour, density, refractive index, viscosity, saponification value, iodine value, acid value, peroxide value and NSM are evaluated. A simplified method of analysis of sterols in the seed oil is also described. Toxicological evaluation of safety of the seed oil by feeding swiss albino mice ad libitum followed by examination of serum cholesterol level and histological examination of vital organs are reported. Antifungal property of the seed oil evaluated against a few fungal species on CDA medium is also incorporated.

The results revealed acceptable edible oil characteristics of the seed oil of cleome gynandra L. to encourage farmers in its exploitation. Moreover, this may provide breeders a better tool in his selection.
ANNEXURE III

NATIONAL SEMINAR
on
BIODIVERSITY CONSERVATION
THE POST-RIO SCENARIO IN INDIA

ABSTRACTS

April 19-21, 2006

Organized by
Department of Ecology and Environmental Science
Assam University, Silchar - 788 011
Assam

Sponsored by
Ministry of Environment and Forests, New Delhi
and
Department of Science and Technology, New Delhi
13. A study on Tall Grassland Habitat in Laokhowa Wildlife Sanctuary, Assam, India

S. K. Nath' & S. K. Sarma
1Dept. of Botany, Dhing College, Dhing, Nagaon
2Dept. of Botany, Guwahati University, Guwahati

Grasslands along with their associated fauna was widely distributed in Indian sub-continent but at present these are restricted only to some protected areas of India. In Assam, Laokhowa Wildlife Sanctuary is one of such sanctuary where grassland covers 35% of the total area. In the present paper, an attempt has been made to identify the dominant grass species and their associated fauna. The grasslands are studied according to the relative abundance of different dominant tall grass species. The grassland areas are dominated by grasses viz. Imperata cylindrica, Saccharum spontaneum, Erianthus ravannae, Sterostachys fusca etc. Cutting and extensive grazing affect the distribution of grasslands in Laokhowa Wildlife Sanctuary. Immediate conservation strategies are required to save the grassland habitat of the sanctuary, which is the major habitat for one horned Rhinoceros, wild Buffalo, wild Pig etc.

Key words : Dominant grasses, Laokhowa Wildlife Sanctuary.


S. B. Paul* & S. Roy
Department of Chemistry, Assam University, Silchar - 788011
*E-mail : sbpaul@rediffmail.com

Nature's ingenuity in creating variety of enchanting skeletons with generous sprinkling of functionalities and stereochemical delicacies is thrilling. Natural products will continue to play a crucial role in meeting the demand of novel molecular diversity for pharmaceuticals, nutraceuticals and agrochemicals.

Apart from a large number of cultivated plants with their wide diversity, the Indian region is very rich floristically, which may not have an obvious economic value at present but in the face of ever changing patterns of our needs regarding food, fuel, fibre, fodder, shelter, medicare, etc. one cannot foretell as to what species would be needed when.

Growing throughout the warmer parts of the globe, Cleome gynandra L. (Cleomaceae) is a wild and semi-cultivated annual herb used in traditional system of medicine. In view of this, a few products from the various part of the plant, growing in Barak Valley have been isolated, chemically characterised & investigated their toxicological antifungal and anthelmintic properties.
Abstract

Nature’s ingenuity in creating variety of enchanting skeletons with generous sprinkling of functionalities and stereochemical delicacies is thrilling. Natural products will continue to play a crucial role in meeting the demand of novel molecular diversity for pharmaceuticals, nutraceuticals and agrochemicals.

Apart from a large number of cultivated plants with their wide diversity, the Indian region is very rich floristically and many may not have an obvious economic value at present. But in the face of ever changing patterns of our needs regarding food, fuel, fibre, fodder, shelter, medicare, etc. one cannot foretell as to what species would be needed when.

Growing throughout the warmer parts of the globe, Cleome gynandra L. (Cleomaceae) is a wild and semi-cultivated annual herb used in traditional system of medicine. (In view of this, a few products from the various parts of the plant, growing in Barak Valley have been isolated, chemically characterized and their toxicological, antifungal and anthelmintic properties investigated.

Since the plant under study grows in abundance even in wastelands, it may be economically viable source of some useful pharmaceuticals, nutraceuticals and agrochemicals. But study on the whole gamut of parameters is needed to achieve the goal of conservation of the plant.

Key-words : molecular diversity, cleomaceae, natural products.

Introduction :

Biodiversity is intricately linked with diverse natural products in the form of pharmaceuticals, nutraceuticals, agrochemicals, botanicals etc. which have so far been isolated and will continue to be harnessed for the benefit of mankind. Nature is infinitely more inventive than chemists and natural molecules have withstood many tough tests of survival for millions of years. Nature’s ingenuity in creating variety of structures with generous sprinkling of functionalities and stereochemical delicacies is thrilling. This was highlighted by unraveling of many new and enchanting natural products from plant, marine and fungal sources having exotic properties. Cellulose (1) the most abundant organic molecule and most abundant single polymer of glucose in the biosphere having β-1, 4-linkage is the structural material while the α-1, 4-linked polymer starch (2) is a storage material. Both the ultrabitter (ca. 4,000,000) centapicrin (3) from century plant and supersweet (ca. 100) glycyrrhizic acid (4) from licorice root have carbohydrate moiety. Cytotoxic dimeric alkaloid dracemicin (5) from caribbean sponge, insecticidal isodamic acid A (6) from Japanese red algae and extreme toxin palytoxin from coelenterates having 64 chiral centers are a few of them. In contrast to terrestrial monoterpenes virtually all marine monoterpenes are halogenated.

Out of 2000 medicines described in Indian system of Medicine about 200 are of animal origin, another about 200 are of mineral origin and remaining 1500 are of plant origin. About 15000 plants of medicinal value are anticipated to be available in India. This richness is attributed to climatic conditions and geographical locations. Insecticides of diverse structures such as pyrethrins (7), rotenone (8) etc. from over 2000 species belonging to some sixty families, antioxidants effecting holistically in complicated disorders like diabetes and...
Fig. 1
biopesticides like azadiractin (9) with adjuvants (10) having enhanced pesticidal property and biodegradability\(^7\) are examples of molecular diversity. Bioactive natural products being considered as template in time-tested strategy for development of more active but safer products justify the need of exploring this diversity.

*Cleome gynandra* L. (Fam. Cleomaceae) syn *Gynandropsis gynandra* Briq., *Gynandropsis pentaphylla* D.C. commonly known as Cat's whiskers, spider herb is an annual herb etc. that grows up to 1m tall and common in tropical and sub-tropical climatic region\(^8\). The leaves are used in Africa as vegetable having high protein content, seeds and oils reported to be anti-nematode and the plant has been used in traditional medicine for treatment of rheumatism, headache, stomachache, severe infection of threadworms and as fish poison\(^9\). Anti-tick property of essential oil of the plant have been reported\(^10\). It finds use in Indian system of medicine\(^11\) and ethnomedicine\(^12\). A few chemicals have been isolated from the plant\(^13\)-\(^15\). Biological activities of extract of plant parts reported\(^17\),\(^18\). \(\beta\)-sitosterol (11) was found as the major phytosterol in seed oil\(^16\). Nutritive value and safety aspects of the seed oil was evaluated and it was found to have hypocholesteremic effects in experimental mice\(^19\). GC-MS analysis of the hydrodistillate of aerial parts of the plant growing in Barak Valley showed significant difference from that of Nairobi sample\(^20\).

In this paper isolation of a flavonoid and anthelmintic property of some extracts from the plant collected locally are reported.

**Materials and Methods :-**

**Isolation of flavonoid** – Fresh flowers (50g) of *Cleome gynandra* L growing to a height of about 1m were subjected to cold maceration with methanol (100ml x 2), extract collected by filtration was subjected to concentration in vacuo. The concentrate (50ml) was shaken successively with petroleum ether (40 – 60\(^\circ\)C) and diethyl ether, 25ml each and the aqueous fraction collected using separating funnel. To this 50ml of excess diethyl ether was added and kept in freezer for 15 days. After this period deposits were collected and repeatedly recrystallised from 50% aqueous methanol. The crystals analysed by chromatography, co-chromatography and spectroscopy.

**Anthelmintic study** – Whole plant was air dried and separated into aerial part and root part. Mature seeds were collected and air dried. These parts were crushed and subjected to soxhlet extraction. Extracts were evaporated in vacuo.

Live parasites (nematode : *Heterakis gallinarum*, Cestode : *Raillietina eclinobothrida* from domestic fowl and trematode : *Fasciolopsis buski* from freshly slaughtered pig at an abattoir in Shillong) were collected in 0.9% phosphate buffered saline (PBS) and incubated at 37 ± 1\(^\circ\)C in media containing no extract (control) or crude extract at 10, 20 and 50 mg/ml PBS with 1% dimethyl sulphoxide (DMSO). Five replicates were used for each concentration and time required for loss of movement and death were recorded. Mean time and SD values were calculated using standard methods.
Results and discussion:

**Flavonoid** - Recrystallised pale yellow needles, yield 0.2% fresh flower basis, m. pt. 186-187°C, P.C. Rf 0.52 in BAW (4 :1 : 5) shows characteristic UV spectra with $\lambda_{max}$ (MeOH) 259, 266, 299 and 359 nm, effect of shift reagents, colour reaction and Molisch test. The identity of the compound as rutin (Vitamin P) (12) confirmed by Co-chromatography and NMR spectroscopy.

The significance of isolation of the flavonol rutin are that it is scavanger of oxygen free radicals, suppressor of tumor growth, inhibitor of ascorbic acid oxidase and it prevents lipid oxidation by chelating transition metal ions, atherosclerosis and intramascular thrombosis. Rutin with vitamin C gives cold tolerance. Flavonoid identification is useful in chanotaxonomic studies of plants.

**Anthelmintic study** –

The results of the observation on time for loss of movement (P) and death (D), Table 1 shows that there is an orderly decline in time with concentration. Whereas *F. buski* in control survived $21.55 \pm 1.15$ h its paralysis and death occurred at $1.36 \pm 0.67$ and $1.45 \pm 0.70$ h respectively using aerial defatted methanolic extract (402) at 50 mg/ml concentration. Almost similar result was obtained using root ethnicolic extract (501).

For *H. gallinarum* surviving $27.25 \pm 2.35$ h in control, root ethanolic extract (501) at 50 mg/ml concentration gives maximum response, i.e. paralysis and death at $1.45 \pm 0.85$ and $1.98 \pm 0.57$ h respectively.

For *R. echinobothrida* paralysis and death occurred at a minimum time of $1.53 \pm 0.68$ and $2.05 \pm 0.95$ h using 50 mg/ml concentration of root ethanolic extract (501) although defatted methanolic extract of aerial part (402) shows quickest response at lower concentration of 10 mg/ml.

Anthelmintic efficacy of the extracts in this study compares very well with previously reported results.

**Conclusion:**

In view of the occurrence of bioactive constituents in *Cleome gynandra* L. and its world wide distribution further work in respect of chemical, biological and ecological aspects are warranted. Attempts in respect of its promotion and conservation may also be undertaken.

**Acknowledgement:**

The authors gratefully acknowledge help and guidance by Prof. V. Tandon, Department of Zoology, NEHU Shillong in conducting the anthelmintic study, Director, RSIC, Shillong for providing spectra and UGC (NER) for granting MRP to S. Roy.
Table 1: Efficacy of crude extracts (Seed, root, stem bark) of *Cleome gynandra* on *R. echinobothrida*, *H. gallinarium* and *F. buski*.

<table>
<thead>
<tr>
<th>Treatment (mg/ml)</th>
<th>Time (h) taken for complete loss of movement (P) and death (D)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Fasciolopsis buski</strong></td>
<td><strong>Heterakis gallinarum</strong></td>
</tr>
<tr>
<td><strong>402, Aarial part methanolic, defatted</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>21.55 ± 1.15</td>
<td>27.25 ± 2.39</td>
</tr>
<tr>
<td>10</td>
<td>P 3.95 ± 0.68</td>
<td>P 4.65 ± 1.05</td>
</tr>
<tr>
<td></td>
<td>D 6.15 ± 0.74</td>
<td>D 5.55 ± 0.56</td>
</tr>
<tr>
<td>20</td>
<td>P 2.64 ± 0.85</td>
<td>P 2.35 ± 0.56</td>
</tr>
<tr>
<td></td>
<td>D 4.65 ± 0.27</td>
<td>D 3.25 ± 0.75</td>
</tr>
<tr>
<td>50</td>
<td>P 1.36 ± 0.67</td>
<td>P 0.75 ± 0.26</td>
</tr>
<tr>
<td></td>
<td>D 1.45 ± 0.70</td>
<td>D 2.45 ± 0.65</td>
</tr>
<tr>
<td><strong>501, Root ethanolic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>21.55 ± 1.15</td>
<td>27.25 ± 2.35</td>
</tr>
<tr>
<td>10</td>
<td>P 5.30 ± 1.15</td>
<td>P 4.95 ± 0.96</td>
</tr>
<tr>
<td></td>
<td>D 6.85 ± 1.36</td>
<td>D 6.65 ± 0.87</td>
</tr>
<tr>
<td>20</td>
<td>P 2.85 ± 0.69</td>
<td>P 2.58 ± 0.63</td>
</tr>
<tr>
<td></td>
<td>D 3.64 ± 0.58</td>
<td>D 3.85 ± 0.35</td>
</tr>
<tr>
<td>50</td>
<td>P 1.31 ± 0.53</td>
<td>P 1.45 ± 0.85</td>
</tr>
<tr>
<td></td>
<td>D 1.42 ± 0.68</td>
<td>D 1.98 ± 0.57</td>
</tr>
<tr>
<td><strong>215, Seed methanolic, defatted</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>21.55 ± 1.15</td>
<td>27.25 ± 2.35</td>
</tr>
<tr>
<td>10</td>
<td>P 7.69 ± 1.24</td>
<td>P 6.58 ± 0.68</td>
</tr>
<tr>
<td></td>
<td>D 13.09 ± 0.95</td>
<td>D 7.95 ± 1.35</td>
</tr>
<tr>
<td>20</td>
<td>P 5.65 ± 0.86</td>
<td>P 3.46 ± 0.59</td>
</tr>
<tr>
<td></td>
<td>D 8.09 ± 0.89</td>
<td>D 4.67 ± 0.89</td>
</tr>
<tr>
<td>50</td>
<td>P 3.12 ± 0.54</td>
<td>P 1.34 ± 0.52</td>
</tr>
<tr>
<td></td>
<td>D 4.65 ± 0.95</td>
<td>D 2.68 ± 0.45</td>
</tr>
<tr>
<td><strong>232, Seed ethanolic, defatted</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>21.55 ± 1.15</td>
<td>27.25 ± 2.35</td>
</tr>
<tr>
<td>10</td>
<td>P 4.54 ± 0.69</td>
<td>P 5.65 ± 0.96</td>
</tr>
<tr>
<td></td>
<td>D 6.38 ± 0.95</td>
<td>D 8.52 ± 0.68</td>
</tr>
<tr>
<td>20</td>
<td>P 3.45 ± 0.62</td>
<td>P 2.61 ± 0.36</td>
</tr>
<tr>
<td></td>
<td>D 4.71 ± 0.92</td>
<td>D 4.09 ± 0.58</td>
</tr>
<tr>
<td>50</td>
<td>P 1.54 ± 0.68</td>
<td>P 0.69 ± 0.35</td>
</tr>
<tr>
<td></td>
<td>D 2.06 ± 0.90</td>
<td>D 2.29 ± 0.61</td>
</tr>
<tr>
<td><strong>401, Stem bark</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>21.55 ± 1.15</td>
<td>27.25 ± 2.35</td>
</tr>
<tr>
<td>10</td>
<td>P 4.68 ± 0.42</td>
<td>P 5.63 ± 0.97</td>
</tr>
<tr>
<td></td>
<td>D 6.26 ± 0.59</td>
<td>D 8.56 ± 0.35</td>
</tr>
<tr>
<td>20</td>
<td>P 2.45 ± 0.61</td>
<td>P 2.61 ± 0.94</td>
</tr>
<tr>
<td></td>
<td>D 4.10 ± 0.85</td>
<td>D 4.35 ± 0.68</td>
</tr>
<tr>
<td>50</td>
<td>P 2.57 ± 0.62</td>
<td>P 0.76 ± 0.89</td>
</tr>
<tr>
<td></td>
<td>D 2.36 ± 0.69</td>
<td>D 2.64 ± 0.39</td>
</tr>
</tbody>
</table>
References:

Short Communication: Published in Research Journal of Chemistry and Environment, September 2006
Short Communication:

**Isolation of Sterols from Seed Oil of North East Indian Cleome gynandra L. by Argentation-TLC**

S.B. Paul* and S. Roy

Department of Chemistry, Assam University, Silchar 788011 (Assam), INDIA

*au_examination@yahoo.com

**Abstract**

β-Sitosterol is isolated as the major phytosterol from seed oil of Cleome gynandra L. by Argentation-TLC.

Keywords: Cleome gynandra, argentation-TLC, β-Sitosterol.

**Introduction**

Cleome gynandra L. (Cleomaceae) is an annual weed in tropical countries cultivated as popular leafy vegetable in Africa. It finds use in the Indian medicine and as indigenous medicine. In our investigation on the nutritive and safety aspects of the seed oil, we observed lowering of serum cholesterol in experimental mice. Phytosterols are reported to impart hypocholesterolaemic effects in humans and phytosterol fed chicken produced significant lowering of cholesterol in the yolks of consumable eggs. Phytosterols possess anti-inflammatory, antibacterial, antifungal, antiulcerative & antitumor activity. The profile of phytosterols is characteristic of taxonomic classification & detection of adulteration. This communication deals with isolation of phytosterols from the seed oil of Cleome gynandra.

**Material and Methods**

Mature seeds of the herb collected from Barak Valley of North East India in Feb.-March, 2006 were air-dried at ambient temperature and ground. Oil was extracted from the ground seeds (100 g) by stirring for 3 hr. at ambient temperature in 400 ml hexane, suction filtration through Whatman No.1 paper and solvent removed by rotary vacuum evaporation. TLC of seed oil on aluminium-backed, pre-coated silica gel 60F thin layer chromatography plate, 0.2 mm thickness using hexane-dichlhyl ether - acetic acid (40:10:1) as developing solvent revealed eight fractions after spraying with 10% ethanolic phosphomolybdic acid and charring. Preparative TLC of the seed oil was done on standard silica gel G plate using hexane - diethyl ether - acetic acid (40:10:1) as developing solvent. Iodine was used for visualisation of separated lipid zones. Elution of the band at Rf 0.30 with hexane - ether (1:1) gives free sterol mixture (FSM). Unsaponifiable fraction (USF) of the oil was prepared by cold saponification, extraction with ether, washing and vacuum evaporation.

**Results and Discussion**

Argentation-TLC of FSM and USF was performed on standard Silica gel plate previously impregnated with saturated 95% methanolic AgNO₃ and activated for 30 min at 110°C. Chloroform - diethyl ether-acetic acid (97:2.3:0.5) was used as developing solvent and 0.2% ethanolic 2' ,7' - dichlorofluorescein (DCF) as visualisation agent under UV. After localisation, the sterol fractions are recovered with hexane-dichlhyl ether (1:1), silver ions and DCF removed. Each sterol fraction was recrystallised from aq. MeOH, characterised by IR spectra and estimated as complex with acid-FeCl₃. β-Sitosterol was identified as the major phytosterol in FSM (55.6%) as well as in USF (41.7%), it’s amount being 800-824 mg/100g of the oil. In spite of common occurrence of sitosterol, its isolation is significant in view of its reported biological properties.

**References**

1. Elfers J. et al, Flora of Tropical East Africa, 18 (1964)
4. Usher G., Dictionary of Plants used by Man (1973)
Spectra
SLNO-213-1  1H in COCl3  10.2.04
Mass Spectrum
File: JAN048.06  04-01-05  15:10
Comment: BGS  Input: JAN048.05  SR-22, Dr SB Paul [6758] 100-5-5-250 H

Scan:  12 (1612-384)  R.T.:  54.73min  Base Peak:  149.0  Int:  17700(=100%)  100.0%