

CHAPTER 18

ENVIRONMENTAL STUDIES

Doctoral Theses

01. BALYAN (Palak)
Bioaerosols : Enumeration & Impact on Human Health in Urban Environment.
Supervisors : Dr. Chirashree Ghosh and Prof. B. D. Banerjee
Th 24154

Contents

1. Introduction 2. Review of literature 3. Spatial variations and seasonal characterization of bioaerosols at different land-use configuration (Outdoor Environment) 4. Spatio-temporal variations of bioaerosols in different socio-economic zones of Delhi (Indoor Environment) 5. (a) Effect of micro-environment on size segregation of bioaerosols (b) Comparison of efficiency of active and passive method of bioaerosols estimation 6. Health effects of bioaerosol 7. Relationship between social, environmental factors, bioaerosols levels and respiratory dysfunctions 8. Effect of bioaerosol exposure on COPD exacerbation 9. Effect of bioaerosols exposure on intermediary cytokines in COPD patients. Conclusion, references and appendix.

02. GARG (Sonali)
Integrative Taxonomy, Molecular Phylogeny and Biogeography of Indian Ranoid Frogs.
Supervisor : Prof. Sathyabhama Das Biju
Th 24152

Abstract (Not Verified)

In this thesis, four families of Indian ranoid frogs are studied in seven chapters. The first three chapters focus on endemic natatanuran radiations of Peninsular India. Chapter 1 presents a systematic revision of family Ranixalidae by integrating molecular (mitochondrial and nuclear DNA) and morphological approaches, and describes two new species. Chapter 2 assesses species diversity in the genus *Nyctibatrachus* (Family Nyctibatrachidae) by using mitochondrial DNA, morphology, and bioacoustics, resulting in description of another seven new species. Chapter 3 shows *Fejervarya rufescens* (Family Dicroglossidae) to be a complex of five species, of which four are described as new, and categorises all known fejervaryan members of the Western Ghats in four morphologically recognised groups. Chapters 4–7 focus on Asian members of the subfamily Microhylinae (Family Microhylidae). Chapter 4 is a monograph of the genus *Uperodon* that reviews all known members using mitochondrial 16S, external morphology of adults and tadpoles, skeletal features, breeding ecology, and bioacoustics, and describes a new species. Chapter 5 resolves a century-old taxonomic confusion surrounding *Microhyla ornata* using mitochondrial DNA barcodes. Chapter 6 provides an integrated molecular, morphological, and acoustic assessment of *Microhyla* frogs of South Asia, along with recognizing a new species, and provides systematic insights on closely related Southeast and East Asian members. Chapter 7 reveals an entirely new microhylid genus and species from the Western Ghats. The close affinity of this new radiation with Southeast Asian microhylids provides insights on colonization of Microhylinae and the historical biogeography of Indian subcontinent. Altogether, this thesis has led to the discovery and formal description of 16 new species and a new genus, provided

novel insights and nomenclatural stability for several poorly known taxa, comprehensively reviewed various ranoid lineages using integrative approaches, as well as clarified phylogenetic relationships and geographical distributions of about one-third of Indian ranoid frogs.

Contents

1. Molecular and morphological study of leaping frogs (Anura, Ranixalidae) with description of two new species 2. Seven new species of night frogs (Anura, Nyctibatrachidae) from the Western Ghats biodiversity hotspot of India, with remarkably high diversity of diminutive forms 3. Description of four new species of burrowing frogs in the *fejervarya rufescens* complex (Dicroglossidae) with notes on morphological affinities of *fejervarya* species in the Western Ghats 4. An integrative taxonomic review of the South Asia microhylid genus *uperodon* 5. Delineating *microhyla ornate* (Anura, Microhylidae): mitochondrial DNA barcodes resolve century-old taxonomic misidentification 6. Systematic revision of *microhyla* (Microhylidae) frogs of South Asia: A molecular, morphological and acoustic assessment 7. New microhylid frog genus from peninsular India with Southeast Asian affinity suggests multiple cenozoic biotic exchanges between India and Asia. Future perspectives and publications.

03. GOYAL (Neha)
Plant Invasions in Heterogeneous Environments.
Supervisor : Dr. Gyan Prakash Sharma
Th 24156

Abstract (Not Verified)

Species' invasiveness is too complex to be simply predicted and managed. Exploring the performance strategies of invaders that contribute to their invasiveness in heterogeneous environments beholds prospects to manage plant invasions. The study focused on understanding the attributes and mechanisms at play during species' range expansion in heterogeneous environments. Two study species, *Lantana camara* L. (sensu lato)- an established invader and *Ricinus communis* L.- an aggressive colonizer, were investigated for their performance strategies. Performance of *Lantana camara* in variable light is a function of structural and functional trait differences, but, not an attribute of ploidy. The study led to an insight that removal of the plant in sun and shade would imply differential benefits in the local environment. Flower color was explored to be indicative of the ploidy level in *Lantana camara* invasive populations. Predominantly three color types were recorded with heterogeneous distribution pattern across India. DNA ploidy level and genome size estimates suggested tetraploids to be widespread across the country, irrespective of the color type and the inhabited geographical zone. Results suggest that genome size and ploidy level are not correlates of color types in *Lantana camara*, however, the findings provide intriguing insights crucial for species' range expanse. The other study species, *Ricinus communis* exhibits boom-bust cycles, triggered by the heterogeneous light availability in monospecific thickets. *Ricinus communis* possesses potential to modulate its performance ability in response to available light through significant trait modulations. Results caution that the species may pose a significant invasion risk in future. The study complemented the understanding of the role of key plant performance-related traits and their modulation in breaching a gamut of environmental barriers along the invasion continuum. The study species were hypothetically placed on the unified framework for biological invasions and the performance strategies affirmed placement of the two species on the framework.

Contents

1. General Introduction 2. Variable architectural strategies boost invasive success of *lantana camara* L. (sensu lato) in contrasting light environments 3. Flower color

is not indicative of ploidy level in *lantana camara* L. (sensu lato) 4. Intrinsic light heterogeneity in *ricinus communis* L. monospecific thickets drives species population dynamics 5. General discussion 6. Summary and conclusions. Literature cited and curriculum vitae.

04. PRASAD (Ravindra)

Immobilization of Microalgae on Cotton Cloth Pieces in Ideal for Conservation.

Supervisor: Prof. P. Pardha Saradhi

Th 24155

Abstract
(Not Verified)

Present investigations were initiated with an aim to develop an apt method for long-term preservation/conservation of microalgae through their immobilization on cotton cloth. Cotton cloth pieces were incubated in BG 11 medium containing cultures of *Chlorella minutissima* and *Chlamydomonas* sp. Scanning electron microscopic investigations confirmed immobilization of microalgal cells on/between fibers of cloth pieces. The immobilized microalgal cells on the cotton cloth pieces displayed typical Chlorophyll (Chl) a fluorescence transient with distinct O, J, I and P steps thus revealing that these cells were photosynthetically active. To ensure the storage and preservation of the immobilized microalgal cells on cotton cloth pieces over time, they were stored in Eppendorf tubes under various conditions (i) ambient conditions with light (14 h)/dark (10 h) cycle; (ii) ambient conditions in dark; and (iii) at 4 °C in dark for 18 months. However, on incubation in BG 11 medium, these 18-month stored cotton cloth pieces with cells turned dark green. These cotton cloth pieces which turned green upon incubation in BG 11 medium, displayed perfect Chl a fluorescence transients. Polarographic investigations revealed the evolution of oxygen in presence of light. These cotton fabrics with immobilized cells that decolorized during storage at 4°C, turned green upon incubating in BG 11 medium, suggesting the viability of these adhered cells. These findings pinpoint that decline in pigmentation and Chl a fluorescence derived parameters should not be taken as a criterion for loss in viability of microalgae. In summary, a simple, novel, environment friendly and low cost method has been developed for storage and preservation of microalgae.

Contents

1. Introduction 2. Materials and methods 3. Results 4. Discussion 5. Summary and conclusions. References.

05. SHARMA (Priyanka)

Role of Urban Vegetation in Attenuating Particulate Pollution in Delhi.

Supervisor : Dr. Chirashree Ghosh

Th 24153

Contents

1. General introduction 2. To understand the dynamics of the particulate matter pollution and dispersion in the city of Delhi 3. Spatio-temporal variation of heavy metal content within particulate matter 4. Foliar surface as an important receptor site of atmospheric particulate matter and heavy metal deposition and accumulation 5. Assessing the remediation potential of selected tree species by quantifying air pollution tolerance index (APTI) and anticipated performance index (API) 6. Potential of urban green space in attenuating particulate matter: Delhi ridge, A case study 7. Conclusion and recommendation.