

Tapping the Potentials of Lichens
Experimental Lichenology....
The way ahead

Lichens as Novel sources of Secondary compounds and Genetic material

- ✎ Lichens are considered as the first colonizers terrestrial environment under harsh climatic conditions
- ✎ Evolution of lichens is Polyphyletic in nature.
- ✎ Ability to colonize harsh and Extreme environments like Arctic, Antarctic and Desert ecosystems.
- ✎ Can withstand extended dry seasons, temperature fluctuations day / annual / Climatic regimes and rainfall (flooding of thalli), excess light & UV radiation, ability to withstand wide array of Abiotic & Biotic stresses
- ✎ The association with a suitable photosynthetic partner is mutual and evolutionary in nature – the kind of relationship – controlled parasitism to symbiosis is still not well understood.
- ✎ The molecular interaction between the “bionts” (symbiotic partners) is not clearly resolved.
- ✎ Molecular studies on signal transduction steps regulating the association between partners, secondary compound synthesis, ability to withstand biotic and abiotic stresses need to be elucidated.



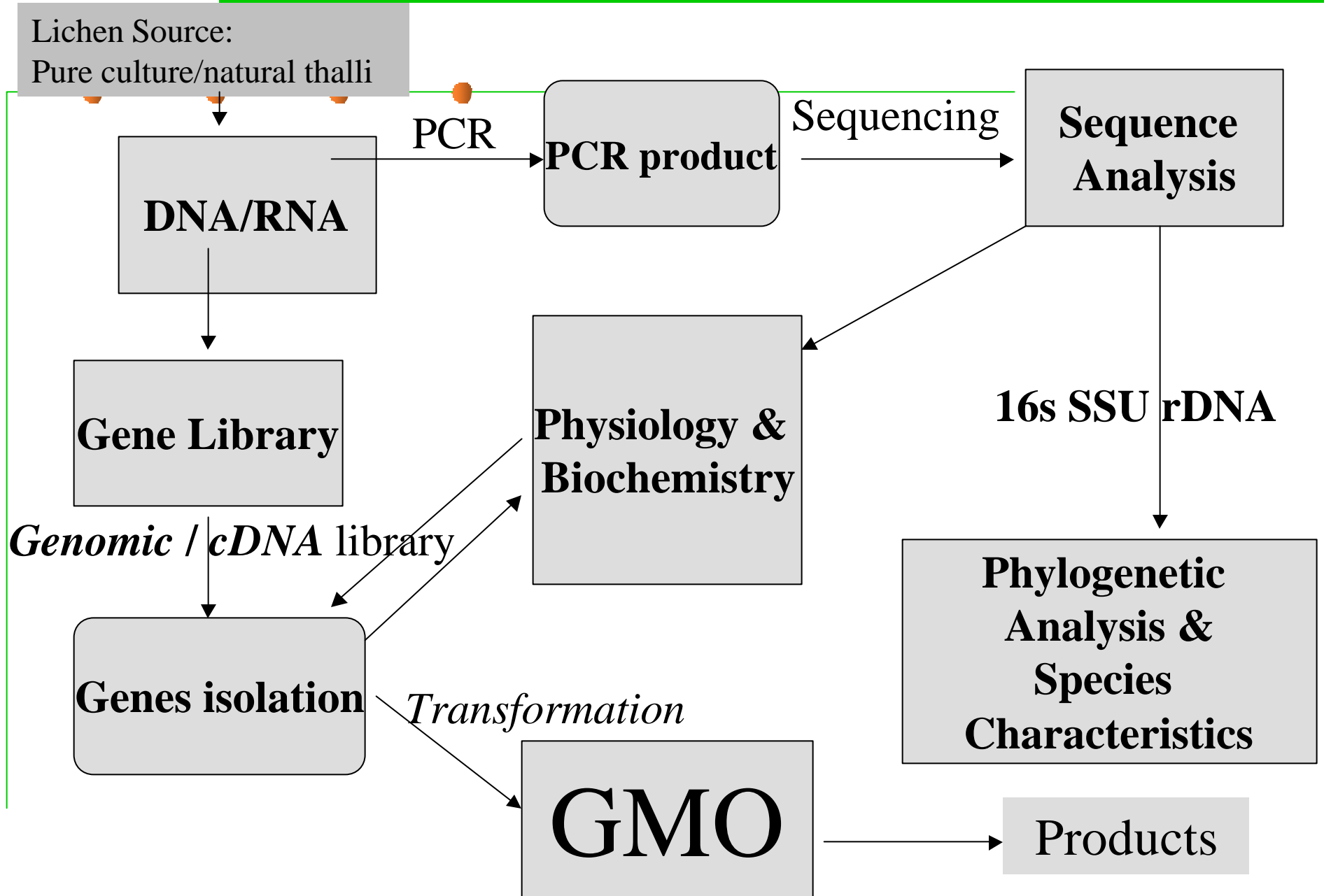
Approaches...

- Molecular phylogenetic analysis of the evolutionary significance of lichenized fungi through phylogenomic approaches.
- cDNA for the fungal partner and to characterize the genes involved
- PCR based approach to characterize the Polyketide gene cluster using degenerate primers and tail - PCR approach.

Further information on Fungal Tree of Life with data on fungal Molecular biology is available at <http://ocid.nacse.org/research/deephyphae>

DEEP HYPHA is a non-exclusive group of scientists who are committed to expanding the knowledge base of fungal systematics. It is open to all participants and its ultimate success depends on extensive input and participation of the global mycological community.

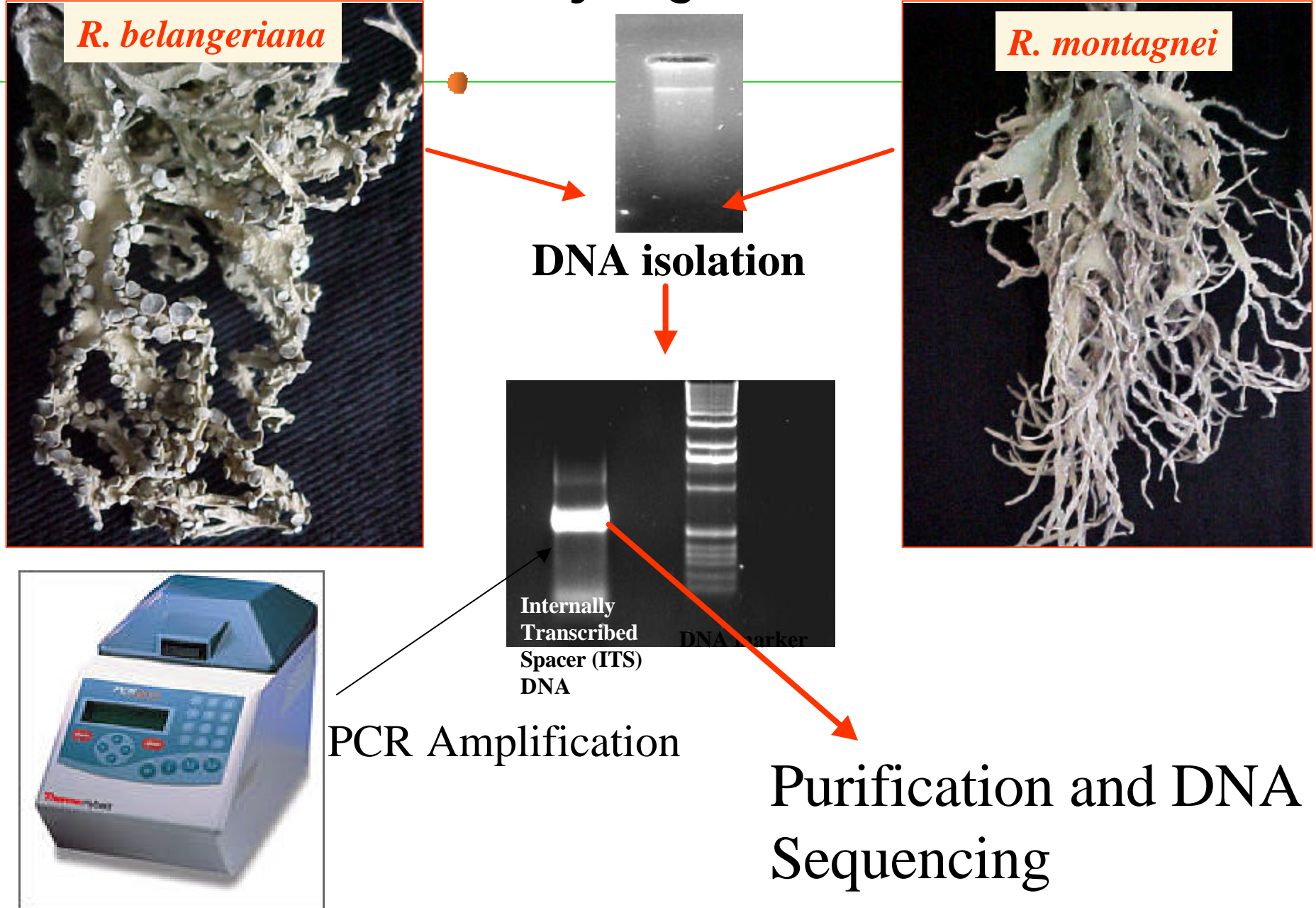
Biotech Flowchart



CURRENT RESEARCH TRENDS IN THE MOLECULAR BIOLOGY OF LICHENS

	Research Interest	Outcome
Molecular Phylogeny	Group 1 Introns and Sequence Phylogeny	Phylogeny of particular group of lichens
Molecular taxonomy	Sequence Variation on the Basis of tRNA Intron	To study diversity
	Mitochondrial DNA Restriction Site Mapping and Nuclear DNA fingerprinting	To Identify Differences in Populations of the Same Species
	ITS rDNA Sequencing	Identification of Photobiont & Mycobionts
Genomic libraries of lichens	Expression of genomic library clones	Understanding of Biochemistry, Physiology & Biosynthesis of 2'compounds
Gene isolation & Transformations	RAPD	To Study Variation in Lichenised Fungi
	Interfacial Self Assembly of Hydrophobins	Desiccation tolerance
	Mitochondrial DNA Restriction Site Mapping and Nuclear DNA Fingerprinting	Biosynthesis of Secondary compounds Catabolic pathway characterization

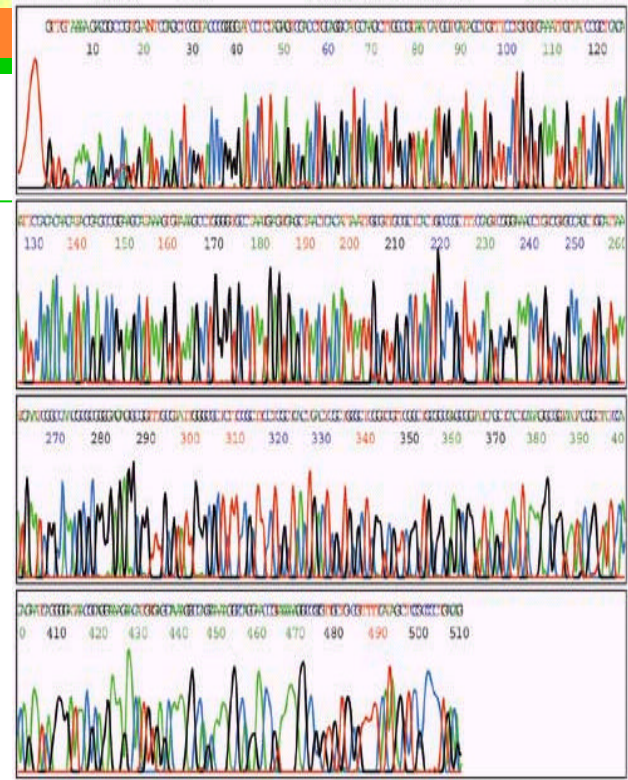
Molecular taxonomy of genus *Roccella* in India





ABI 310 Sequencer

DNA Sequencer



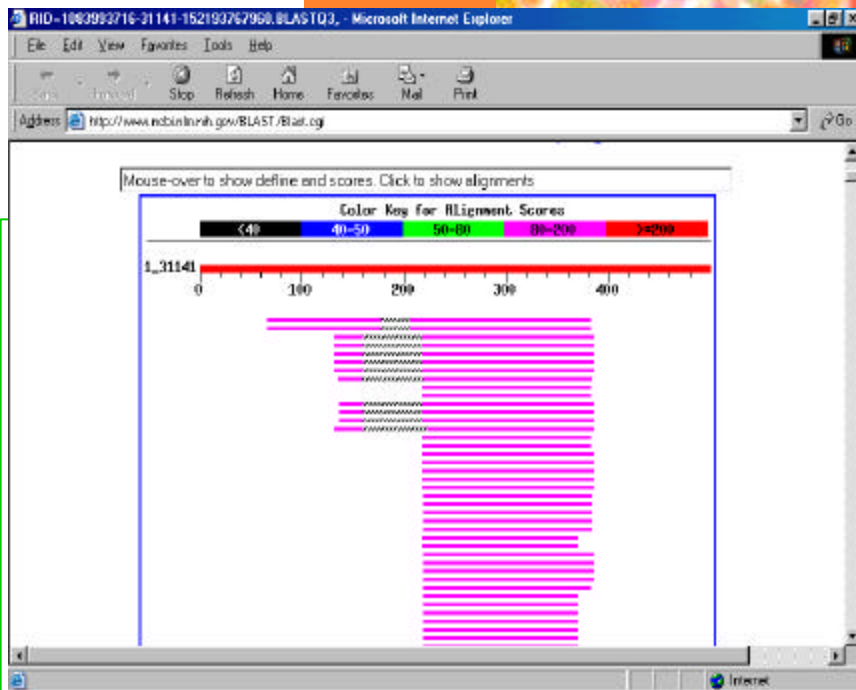
Electrophoregram

DNA sequence of the ITS region of *R. montagnei*

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Sequence ID	Accession	Description	bits	Value
gi 4731187 gb AF110355.1 AF110355	AF110355.1	Rocella montagnei specim...	192	5e-46
gi 4731186 gb AF110355.1 AF110355	AF110355.1	Rocella montagnei specim...	192	5e-46
gi 15817625 gb AF138830.1	AF138830.1	Sigridea californica specim...	170	2e-39
gi 15817625 gb AF138820.1	AF138820.1	Sigridea californica specim...	170	2e-39
gi 15817619 gb AF138823.1	AF138823.1	Rocella hypomecha small subunit ...	170	2e-39
gi 4731197 gb AF110366.1 AF110366	AF110366.1	Rocella tuberculata spec...	170	2e-39
gi 4731195 gb AF110364.1 AF110364	AF110364.1	Rocella tuberculata spec...	170	2e-39
gi 4731191 gb AF110360.1 AF110360	AF110360.1	Rocella canariensis spec...	170	2e-39
gi 4731190 gb AF110359.1 AF110359	AF110359.1	Rocella canariensis spec...	170	2e-39
gi 4731188 gb AF110357.1 AF110357	AF110357.1	Rocella canariensis spec...	170	2e-39
gi 4731104 gb AF110363.1 AF110363	AF110363.1	Rocella tuberculata spec...	168	7e-39
gi 4731193 gb AF110362.1 AF110362	AF110362.1	Rocella tuberculata spec...	168	7e-39
gi 4731192 gb AF110361.1 AF110361	AF110361.1	Rocella tuberculata spec...	168	7e-39
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gi 4731184 gb AF110353.1 AF110353	AF110353.1	Rocella babbingtonii small...	163	4e-37
gi 32815963 gb AY313265.1	AY313265.1	Celolopa peliophylla internal t...	161	2e-36
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gi 3916208 gb AF062480.1	AF062480.1	Roccellina capensis isolate Coll....	161	2e-36
gi 15817614 gb AF138810.1	AF138810.1	Dicinia ceratoniae small subunit ...	161	2e-36
gi 15787940 gb AF332111.1 AF332111	AF332111.1	Aspicilia cinerea clone ...	161	2e-36
gi 2501831 gb U92308.1	U92308.1	Lophoderium australe 18S ribosomal...	161	2e-36

NCBI BLAST Search for DNA Sequence Alignment, Comparison and Identity.

www.ncbi.nlm.nih.gov/BLAST/Blast.cgi

- Genes of Interest
- Hydrophobins
- Polyketide biosynthesis

Score = 139 bits (70), Expect = 6e-30
 Identities = 106/114 (92%), Gaps = 3/114 (2%)
 Strand = Plus / Plus

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 Sbjct: 65 tgcattggcgtacgctcgtcgtcgcgcacgcgcgtacggtcgggacgcacgcagccc 124

Query: 126 agcgtatcggggcgcgtcgtcgcgcacgcgcgtacggtcgggacgcacgcagccc 176
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 Sbjct: 125 ggcgtatcgc-gggcgcgtcgtcgcgcacgcgcgtacggtcgggacgcacgcagccc 177

gi|4731186|gb|AF110355.1|AF110355 Rocella montagnei specimen-voucher Tehler 7709 5 small
 ribosomal RNA gene, partial sequence; internal transcribed spacer 1 and 5.8S ribosomal RNA gene, complete sequence; and internal transcribed spacer 2, partial sequence
 Length = 548

Score = 107 bits (107), Expect = 6e-34

Lichen species....



Key steps in experimental lichenology to harness the molecular and secondary compound potentials of lichens without harming naturally occurring lichen species.

