Appendix

List of abbreviations

A: Adenine
Aₐ₅₁₅: Absorbance at 615nm
Aₐ₅₅₂: Absorbance at 652 nm
Aₐ₅₆₂: Absorbance at 562 nm
ARMD: Age-related macular degeneration
α: Alpha
APC: Allo-phycocyanin
Å: Angstrom
~: Approximately
β: Beta
BG-11: Blue Green Algae medium
BSA: Bovine Serum Albumin
BTA: Biotechnological Algae
BLAST: Basic Local Alignment Search Tool
BLASTN: Basic Local Alignment Search Tool for nucleotides
C: Cytosine
C: Carbon
Car: Carotenoids
CDM: Consensus Data Mining protein
°C: Degree Centigrade
CHD: Coronary heart disease
crtE: Geranylgeranyl pyrophosphate synthase
crtB: Phytoene synthase
crtP/crtI: Phytoene desaturase
cf.: Confer
cpcA: Carotenoid Protein complex A
cpcB: Carotenoid Protein complex A
crtQ: ζ-carotene desaturase
crtW/crtO: β-carotene ketolase
crtR: β-carotene hydroxylase
Cru F: Carotenoid 1,2-hydraztase
Cru A: Lycopene dicyclase
Cru P: Lycopene monocyclase
Cru G: Lycopene
Crt U: Calreticulin type U
Crt H: Calreticulin type H
CuSO₄: Copper sulphate
CuSO₄·5H₂O: Copper sulphate pentahydrate
o: Degree

dNTP: Deoxynucleoside triphosphate
1-D: Simpson’s index
E: East
E: Evenness
E value: Expected value
EDTA: Ethylene diaminetetraacetic acid

et al.: et alie (co-authors)
e.g.: exempli gratia (for example)
FAME: Fatty Acid Methyl Ester
FID: Flame Ionisation Detector
Fig.: Figure
FPP: Farnesyl pyrophosphate

g/kg DW: Gram per kilogram dry weight
G: Guanine
GC: Gas Chromatography
GGPP: Geranyleranyl pyrophosphate
GPS: Global Positioning system
gm: Gram
H: Shannon index
hrs: Hours
HIV: Human Immuno Deficiency Virus
HPLC: High Pressure Liquid Chromatography
IAA: Indole Acetic Acid
IBM: International Business Machines
IBSD: Institute of Bioresources and Sustainable Development
IDT: Integrated DNA technology
IGS: Intergenic spacer
ITS: Internal Transcribed Spacer
Kbp: Kilobase pair
K<sub>2</sub>HPO<sub>4</sub>: Dipotassium hydrogen phosphate
KH<sub>2</sub>PO<sub>4</sub>: Potassium di-hydrogen phosphate
L: Litre
LSD: Least Significant Difference
LTRR: Long Tandemly Repeated Repetitive
r: Ribosomal
m: Metre
λ<sub>max</sub>: Maximum Absorbance
μg: Microgram
MEGA: Molecular Evolutionary Genetics Analysis
MHz: Megahertz
mM: milli-Molar
μmol photon/m²/sec: Micro-mole photon per metre square per second
mg/m²/d: Milligram per metre square per dalton
M: Molar
ml: Millilitre
μM: Micromolar
μmol: Micromole
μg/mg: Microgram per milligram
Mg: Magnesium
MgCl₂: Magnesium chloride
mg/ml: Milligram per millilitre
Mins: Minutes
MP: Maximum Parsimony
mRNA: messenger Ribonucleic Acid
MSL: Metre above sea level
N: North
N: Normal
N₂: Nitrogen
Na₂CO₃: Sodium carbonate
Na₂SO₄: Sodium sulphate
NaOH: Sodium hydroxide
NCBI: National Centre for Biotechnology Information
NER: North East Region
NaCl: Sodium chloride
NaNO₃: Sodium nitrate
nm: Nanometre
nifH: Nitrogen fixing H gene
no.: Number
NTSYS: Numerical Taxonomy and Multivariate Analysis system
OCP: Orange Carotenoid Protein
O.D.: Optical Density
OTU: Operational Taxonomical Units
PAST: Palaeontological Statistics Software package for education and data analysis
PBS: Phycobilisomes
PC: Phycocyanin
PCR: Polymerase Chain Reaction
PCC: Pasteur Culture Collection
PC-IGS: Phycobil gene with Intergenic spacer
±: Plus minus
%: Percentage
PE: Phycoerythrin
pH: Puissance de hydrogen (Potential of Hydrogen)
PS: Photosystem
PSII: Photosystem two
psi: Pounds per square inch
$P_{\text{max}}$: Maximum potential photosynthetic rate per individual
RCP: Red carotenoid protein
RAPD: Random Amplified Polymorphic DNA
rDNA: Ribosomal Deoxyribonucleic acid
rRNA: Ribosomal Ribonucleic acid
rpm: Rotation per minute
S: Svedberg unit
SD: Standard Deviation
$S_0$: Ground state
$S_2$: Second singlet state
$S_9$: Stage nine
SN: Serial number
sp.: Species
spp.: Species
SOT: Sulphotransferase
SPSS: Software Package for the Social Sciences
STRR: Short Tandemly Repeated Repetitive
SW1: Splash white 1 gene
SW2: Splash white 2 gene
SW3: Splash white 3 gene
T: Thymine
Taq: *Thermus aquaticus*
TE: Tris-EDTA buffer
Tris-HCl: Tris Hydrochloric acid
TLC: Thin Layer Chromatography
tRNA: transfer Ribonucleic acid
U: Unit
UPGMA: Unweighted Pair Group Method with Arithmetic Mean
v: Volume
V: Volt
viz.: Videlicet (namely)
vis-a-vis: In relation to
W/cm²: Watt per square centimetre
w/w: Weight by weight
XS: Xanthogenate Sodium dodecyl Sulphate
Growth medium, standard graphs and FAME standard

**BG-11 medium (Stanier et al., 1971) composition:**

<table>
<thead>
<tr>
<th>Component</th>
<th>gm/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sodium nitrate</td>
<td>1.5000</td>
</tr>
<tr>
<td>2. Di potassium hydrogen phosphate</td>
<td>0.0400</td>
</tr>
<tr>
<td>3. Magnesium sulphate heptahydrate</td>
<td>0.0750</td>
</tr>
<tr>
<td>4. Calcium chloride dihydrate</td>
<td>0.0360</td>
</tr>
<tr>
<td>5. Citric acid</td>
<td>0.0060</td>
</tr>
<tr>
<td>6. Ferric ammonium citrate</td>
<td>0.0060</td>
</tr>
<tr>
<td>7. EDTA (di sodium magnesium salt)</td>
<td>0.0010</td>
</tr>
<tr>
<td>8. Sodium carbonate</td>
<td>0.0200</td>
</tr>
<tr>
<td>9. Trace metal mix</td>
<td>1.0000 ml</td>
</tr>
</tbody>
</table>

**Trace metal mix**

<table>
<thead>
<tr>
<th>Component</th>
<th>gm/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Boric acid</td>
<td>2.8600</td>
</tr>
<tr>
<td>2. Manganese chloride tetrahydrate</td>
<td>1.8100</td>
</tr>
<tr>
<td>3. Zinc sulphate heptahydrate</td>
<td>0.2220</td>
</tr>
<tr>
<td>4. Sodium molybdate dihydrate</td>
<td>0.0390</td>
</tr>
<tr>
<td>5. Copper sulphate pentahydrate</td>
<td>0.0790</td>
</tr>
<tr>
<td>6. Cobalt nitrate hexahydrate</td>
<td>0.0494</td>
</tr>
</tbody>
</table>

**Preparation of standard graph for total soluble protein:**

10 mg of bovine serum albumin (BSA) was dissolved in a standard flask and the volume was made up to 100 ml (conc. 100 µg/ml). Five (05) different protein concentrations and one blank solution were taken. All the reagents were added as in the Herbert et al. (1971) method. A standard curve having X-axis as concentration of protein in µg/ml and Y-axis as optical density (O.D.) was drawn and from the standard graph, the corresponding concentration of protein content of unknown Oscillatorialean strains were calculated.

**Preparation of standard graph of total carbohydrates:**

10 mg of glucose was dissolved in a standard flask and the volume was made up to 100 ml (conc. 100 µg/ml). Standard graph was plotted with 5 different concentration of glucose viz. 20, 40, 60, 80 and 100 µg/ml following the method of Spiro (1966). The concentration of glucose and optical density were plotted on X-axis and Y-axis respectively to get the standard graph and the corresponding concentration of carbohydrate content of unknown Oscillatorialean strains were calculated from the graph.
**Estimation of total carotenoids**

**Protocol at the glance (Jensen A, 1978)**

- Collection of cyanobacteria
- Isolation of Oscillatoriales
- Morphological identification of Oscillatoriales

Inoculum of 10 mg dry wt. biomass was inoculated in sterile 100 ml of BG-11 medium with nitrate content and kept for 15 days at 54-67 μmol photon/m²/sec of light intensity at 28±2°C with 14/10 hrs light and dark period

- Homogenized 10 ml of algal suspension of the log phase culture
- Centrifuged by refrigerated centrifuge at 6500 rpm for 10 mins and the supernatant was discarded

The pellets were air dried and weighed 5 mg dry weight by an electronic balance

- 3 ml of 85% acetone were added to the biomass in the centrifuge tube

- Subjected to repeated freezing and thawing at 4°C until the pellet becomes colourless. The volume of the extract were measured and the final volume were made up to 10 ml with 85% acetone

- Carotenoids content were estimated by optical density (O.D.) at 450 nm using 85% acetone as blank using spectrophotometer

The total amount of carotenoids were calculated in μg/mg dry wt. using the formula below: \( C = (D \times V \times f) \times 10 \div 2500 \), where, \( D = \) O.D. at 450 nm; \( V = \) Volume of the extract; \( f = \) Dilution factor; average extinction co-efficient of pigment is 2500
**Composition of SUPELCO™ 37 Fame Mix**
(Standard for lipid profiling and fatty acid)

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Butyric acid methyl ester (C4:0)</td>
<td>4%</td>
</tr>
<tr>
<td>2. Caproic acid methyl ester (C6:0)</td>
<td>4%</td>
</tr>
<tr>
<td>3. Caprylic acid methyl ester (C8:0)</td>
<td>4%</td>
</tr>
<tr>
<td>4. Capric acid methyl ester (C10:0)</td>
<td>4%</td>
</tr>
<tr>
<td>5. Undecanoic acid methyl ester (C11:0)</td>
<td>2%</td>
</tr>
<tr>
<td>6. Lauric acid methyl ester (C12:0)</td>
<td>4%</td>
</tr>
<tr>
<td>7. Tridecanoic acid methyl ester (C13:0)</td>
<td>2%</td>
</tr>
<tr>
<td>8. Myristic acid methyl ester (C14:0)</td>
<td>4%</td>
</tr>
<tr>
<td>9. Myristoleic acid methyl ester (C14:1)</td>
<td>2%</td>
</tr>
<tr>
<td>10. Pentadecanoic acid methyl ester (C15:0)</td>
<td>2%</td>
</tr>
<tr>
<td>11. Cis-10-heptadecenoic acid methyl ester (C15:1)</td>
<td>2%</td>
</tr>
<tr>
<td>12. Palmitic acid methyl ester (C16:0)</td>
<td>6%</td>
</tr>
<tr>
<td>13. Palmitoleic acid methyl ester (C16:1)</td>
<td>2%</td>
</tr>
<tr>
<td>14. Heptadecanoic acid methyl ester (C17:0)</td>
<td>2%</td>
</tr>
<tr>
<td>15. Cis-10-heptadecenoic acid methyl ester (C17:1)</td>
<td>2%</td>
</tr>
<tr>
<td>16. Stearic acid methyl ester (C18:0)</td>
<td>4%</td>
</tr>
<tr>
<td>17. Elaidic acid methyl ester (C18:1n9t)</td>
<td>2%</td>
</tr>
<tr>
<td>18. Oleic acid methyl ester (C18:1n9c)</td>
<td>4%</td>
</tr>
<tr>
<td>19. Linolelaidic acid methyl ester (C18:2n6t)</td>
<td>2%</td>
</tr>
<tr>
<td>20. Linoleic acid methyl ester (C18:2n6c)</td>
<td>2%</td>
</tr>
<tr>
<td>21. Arachidic acid methyl ester (C20:0)</td>
<td>4%</td>
</tr>
<tr>
<td>22. γ-linolenic acid methyl ester (C18:3n6)</td>
<td>2%</td>
</tr>
<tr>
<td>23. Cis-11-eicosenoic acid methyl ester (C20:1)</td>
<td>2%</td>
</tr>
<tr>
<td>24. Linolenic acid methyl ester (C18:3n6)</td>
<td>2%</td>
</tr>
<tr>
<td>25. Heneicosanoic acid methyl ester (C21:0)</td>
<td>2%</td>
</tr>
<tr>
<td>26. Cis-11, 14-eicosadienoic acid methyl ester (C20:2)</td>
<td>2%</td>
</tr>
<tr>
<td>27. Behenic acid methyl ester (C22:0)</td>
<td>4%</td>
</tr>
<tr>
<td>28. Cis-8, 11, 14-eicosatrienoic acid methyl ester (C20:3n6)</td>
<td>2%</td>
</tr>
<tr>
<td>29. Erucic acid methyl ester (C22:1n9)</td>
<td>2%</td>
</tr>
<tr>
<td>30. Cis-11, 14, 17-eicosatrienoic acid methyl ester (C20:3n3)</td>
<td>2%</td>
</tr>
<tr>
<td>31. Arachidonic acid methyl ester (C20:4n6)</td>
<td>2%</td>
</tr>
<tr>
<td>32. Tricosanoic acid methyl ester (C23:0)</td>
<td>2%</td>
</tr>
<tr>
<td>33. Cis-13, 16-docosadienoic acid methyl ester (C22:2)</td>
<td>2%</td>
</tr>
<tr>
<td>34. Lignoceric acid methyl ester (C24:0)</td>
<td>2%</td>
</tr>
<tr>
<td>35. Cis-5, 8, 11, 14, 17-eicosapentaenoic acid methyl ester (C20:5n3)</td>
<td>2%</td>
</tr>
<tr>
<td>36. Nervonic acid methyl ester (C24:1)</td>
<td>2%</td>
</tr>
<tr>
<td>37. Cis-4, 7, 10, 13, 16, 19-docosahexaenoic acid methyl ester (C22:6n3)</td>
<td>2%</td>
</tr>
</tbody>
</table>