Isolasi dan Screening Mikroalga Laut Sebagai Bahan Baku Biodiesel

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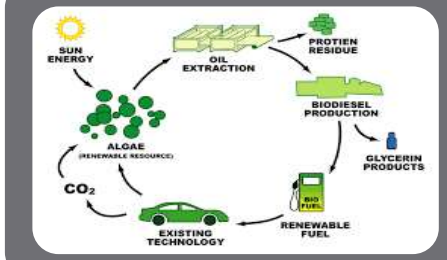
Pendahuluan

Bahan bakar fossil yang semakin terbatas sementara konsumsi bahan bahan bakar yang semakin meningkat – Diperlukan biofuels yang renewable



Mikroalga sangat potensil sebagai bahan baku biodiesel

Seleksi species/strain – Faktor paling penting dan kritis

Tujuan Penelitian

1. Untuk mengisolasi spesies lokal mikroalga dari perairan Kendari

2. Untuk melakukan skrining terhadap isolate mikroalga yang potensil sebagai bahan baku biodiesel

3. Untuk membudidayakan isolate terpilih di kolam raceway di outdoor

Metode Penelitian

- Lokasi Sampling : Batu Gong Beach, Toronipa Beach, Bokori Island, Nambo Beach and Tanjung Tiram Beach

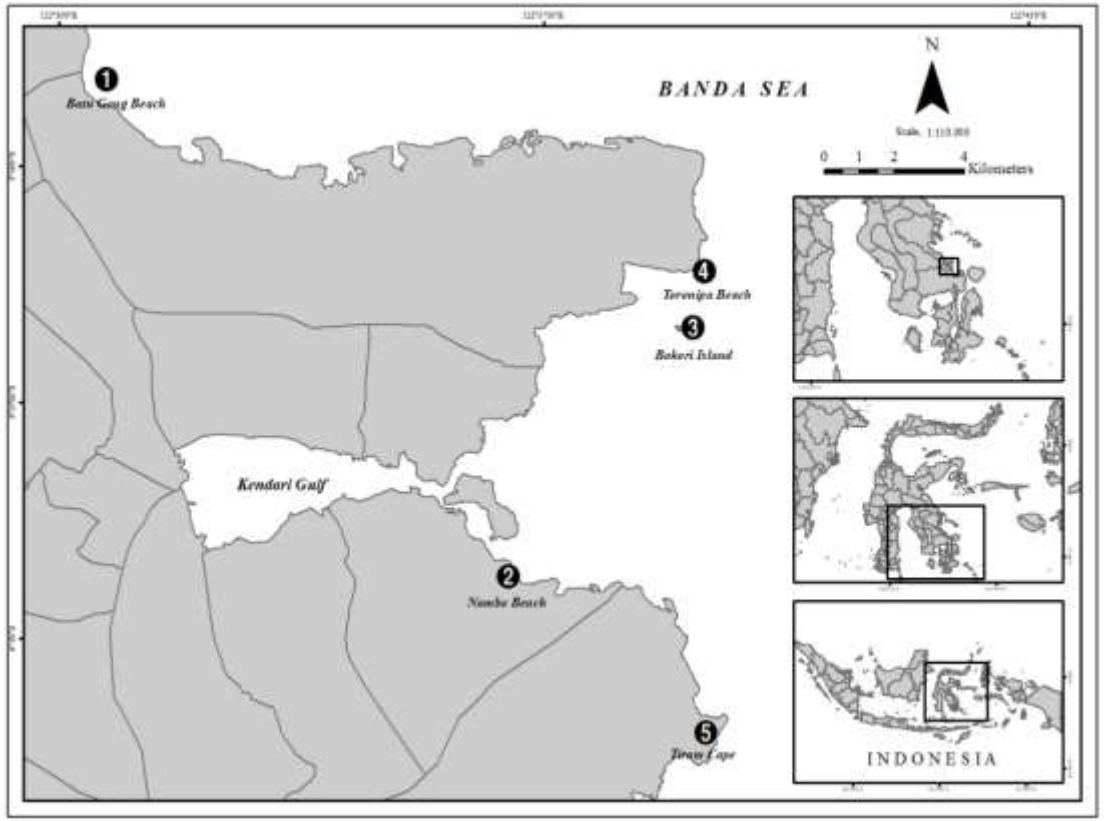


Fig 1. Sampling sites

Metode Penelitian

Isolasi

- Sampel collected manually and using a planktonet
- Isolation with agar plating and enrichment methods
- Repeated streaking on agar plates to obtaine pure isolates

Skrining

- Scale-up isolates from colonies-2mL-10mL-100mL
- Preliminary screening
- Grow the selected isolates under different salinity (2-7% NaCl), ambient room temp, f/2 medium, 12 h LD cycles, 100 µmol.photon.m^{-2}.s^{-1}, bubling with air to facilitate mixing
- Determine growth, biomass and lipid yields, lipid content, biomass and lipid productivities, fatty acid compositions

Outdoor culture

- Inoculum preparation in the laboratory
- Inoculation in outdoor raceway ponds (2x0.8x0.4m) (PxLxT)
- Culture for 3 months under semi-continuous mode
- Sampling for cell counting every 2 days
- Sampling for biomass dan lipid every 4 days

Metode Penelitian

Analytical Methods

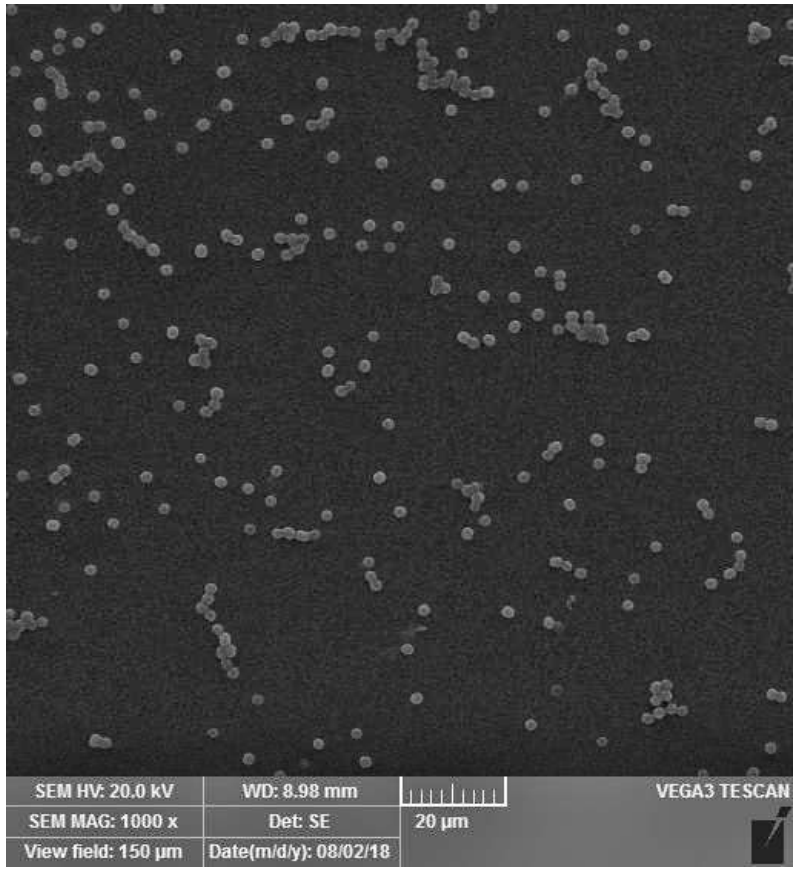
- Cell numbers determined using Neubauer haemocytometer
- The specific growth rate (μ) was calculated using the following equation: μ=(Ln (N2/N1)/(t2-t1)
  - Where *N1* and *N2* are the cell density at time 1 (*t1*) and 2 (*t2*).
- Biomass Productivity = μ x biomass yield
- Total lipid determination was conducted by the method of Bligh and Dyer (1959) as modified by Kates and Volcani (1966)
- Lipid Productivity = μ x lipid yield
- Fatty acids composition using GC-MS

Statistical Analysis

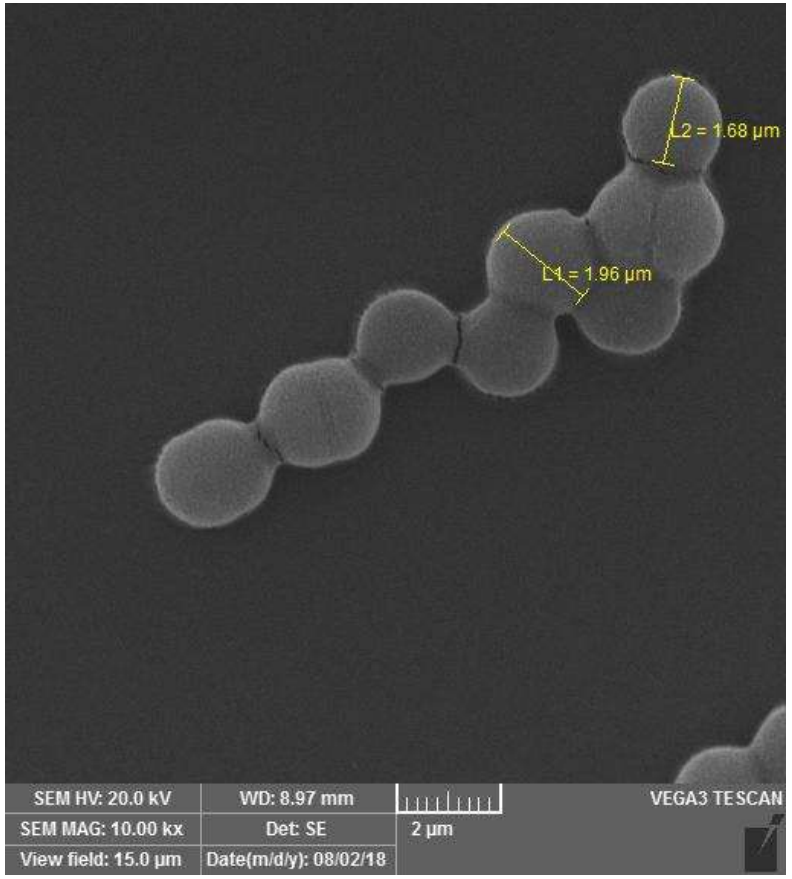
- Significant differences between treatments were analysed with a one-way analysis of variance (ANOVA).
- All statistical analysis was performed using Sigma-Plot 14 Systat Software Inc., USA.

Hasil

- Ratusan isolates berhasil ditumbuhkan pada media agar
- 67 isolate yang tumbuh dengan baik pada media cair
- 8 isolate memiliki pertumbuhan yang baik dan tidak menempel pada wadah kultur
- 8 isolate ini yang selanjutnya di skrining kemampuannya tumbuh pada salinitas tinggi diatas salinitas air laut
- 2 isolate yaitu isolate IND-UHO-029, IND-UHO-003 menunjukkan pertumbuhan yang sangat baik pada kisaran salinitas 3-7% NaCl

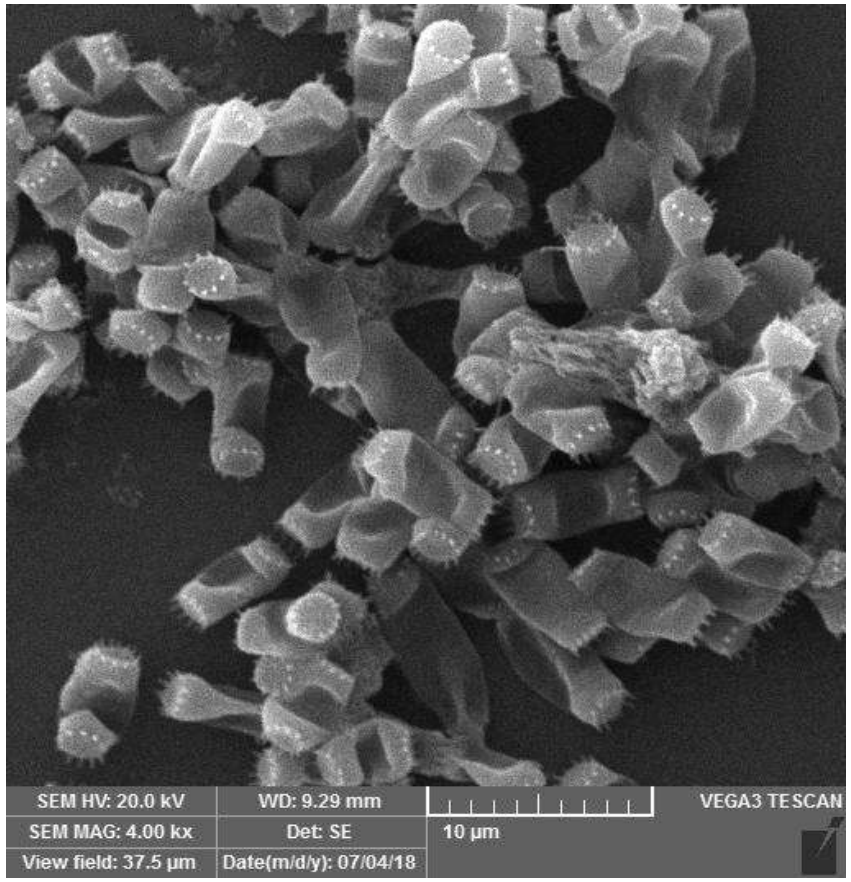


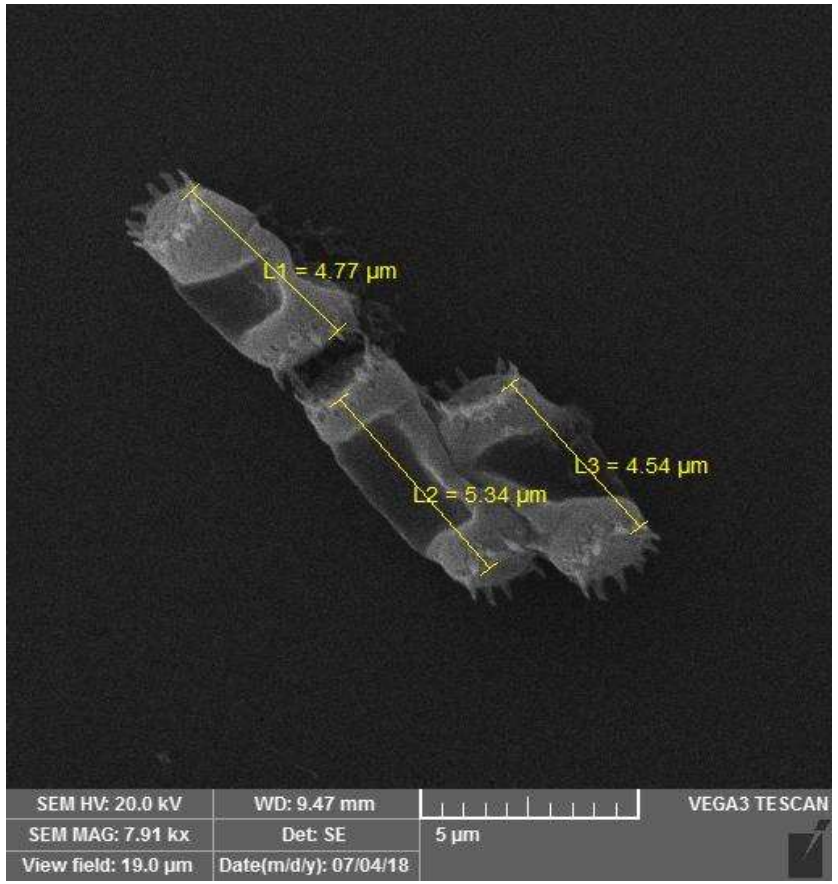
1000x magnification



10000x magnification

Gambar 1. SEM Images of Isolat *Nannochloropsis* sp.UHO 003



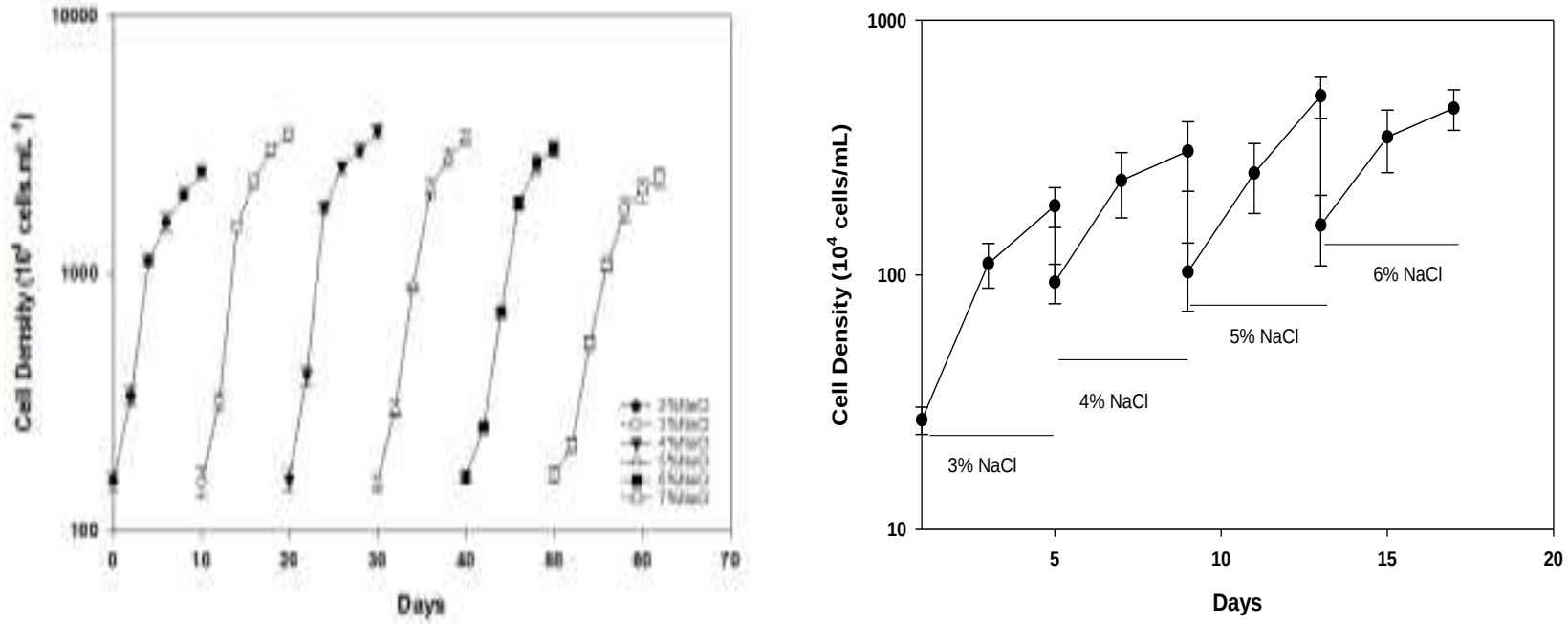


4000x magnification

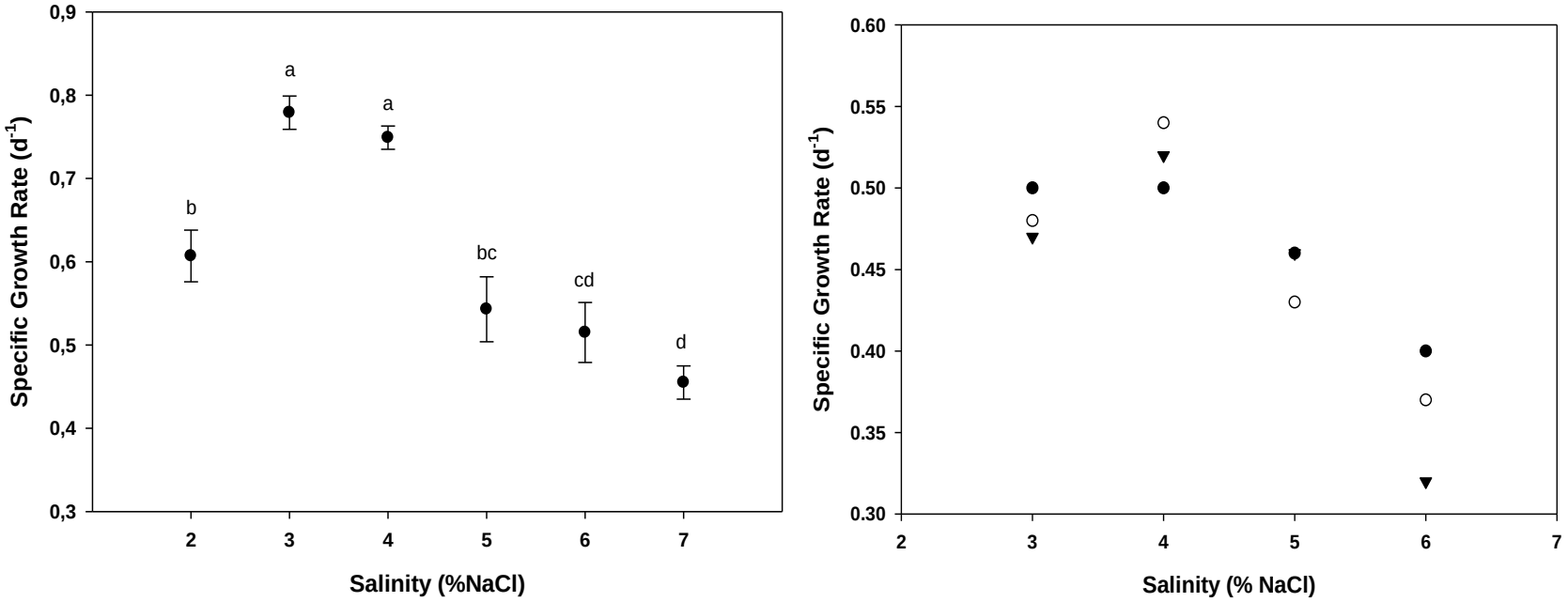
8000x magnification

Gambar 2. SEM images of *Skeletonema* sp.UHO 029

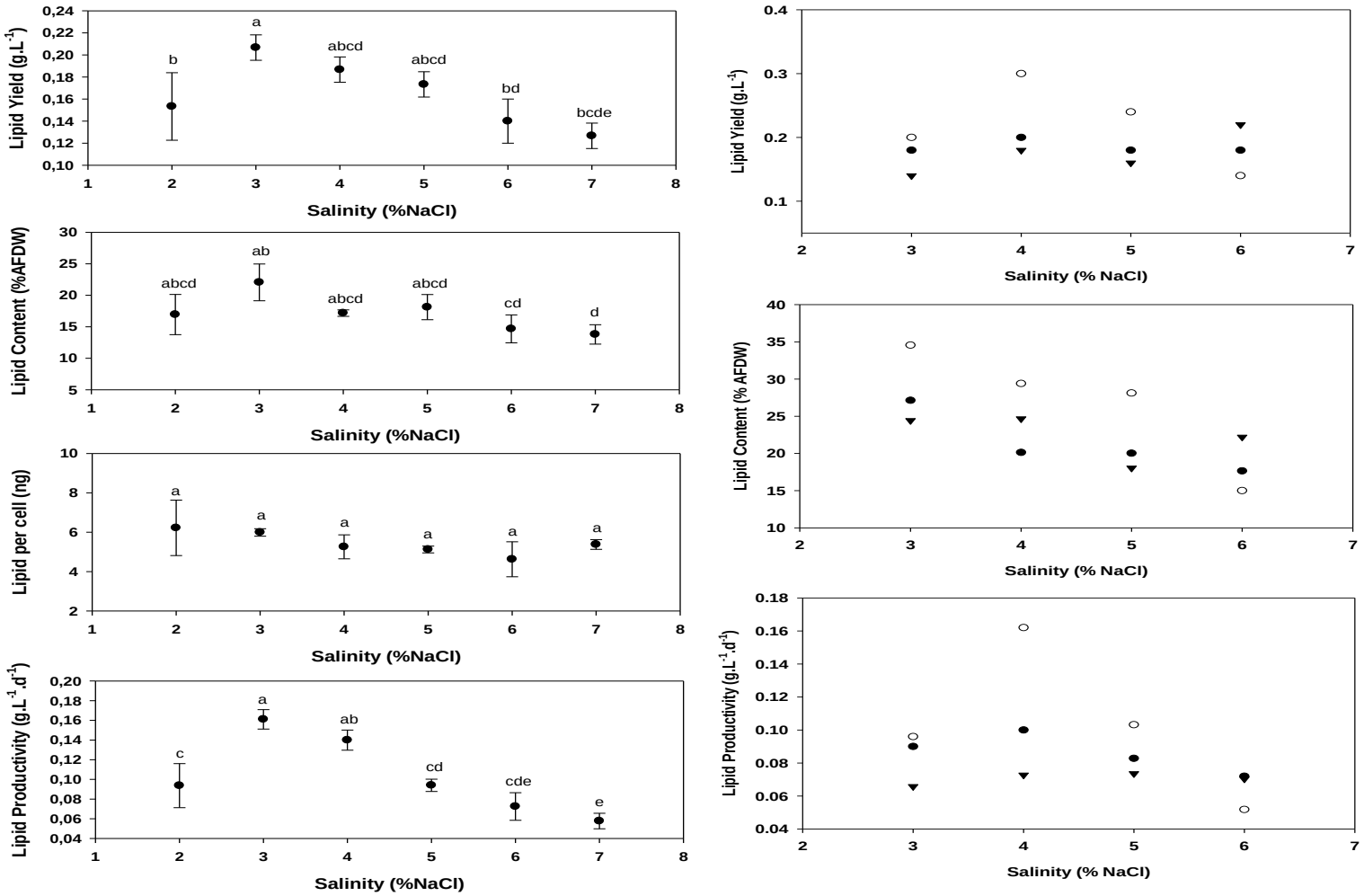
Growth, Lipid Productivity and Fatty Acids Composition of *Nannochloropsis* sp.UHO 003 and *Skeletonema* sp.UHO29 at increasing salinity



Gambar 3. Growth curve of *Nannochloropsis* sp.UHO3 (left) and *Skeletonema* sp.UHO29 (right)



Gambar 4. Specific growth rate (d^{-1}) of the *Nannochloropsis* sp.UHO 003 (left) *Skeletonema* sp.UHO29

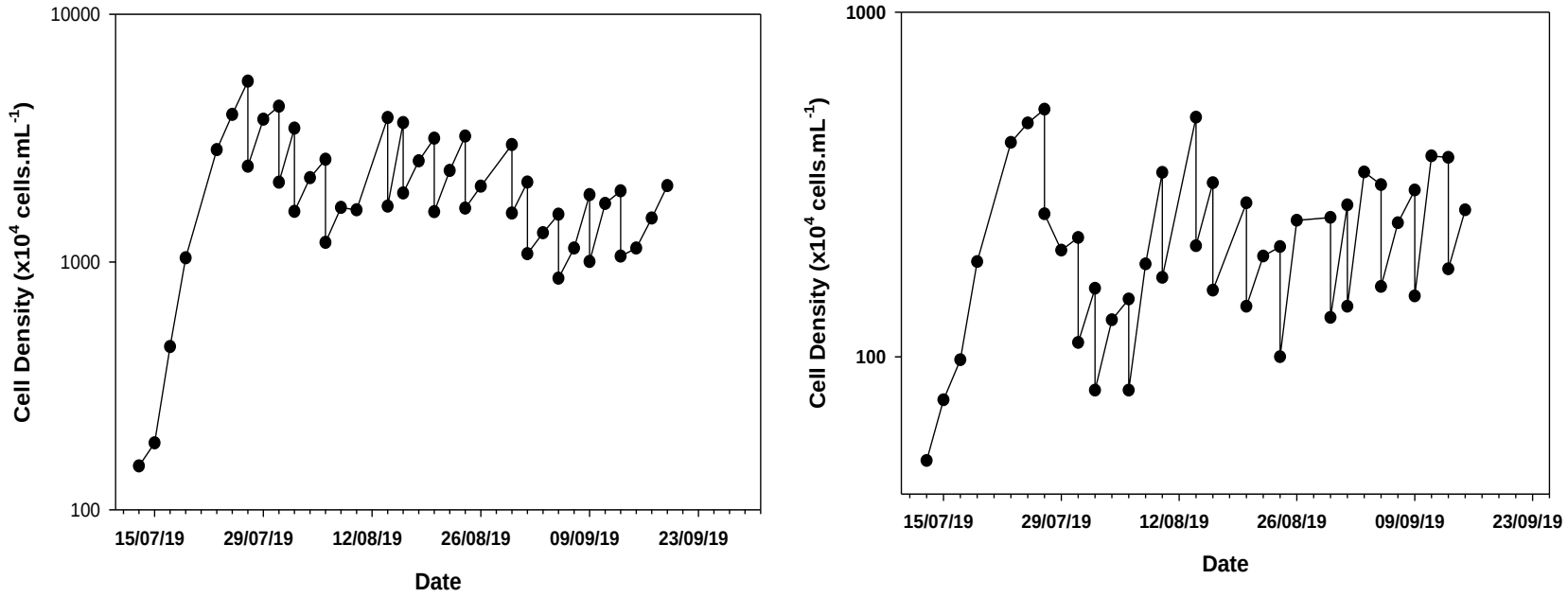


Gambar 5. Lipid yield (g.L^{-1}) , lipid content (%AFDW) and lipid productivity (g.L^{-1}.d^{-1}) of *Nannochloropsis* sp.UHO 003 and *Skeletonema* sp.UHO29

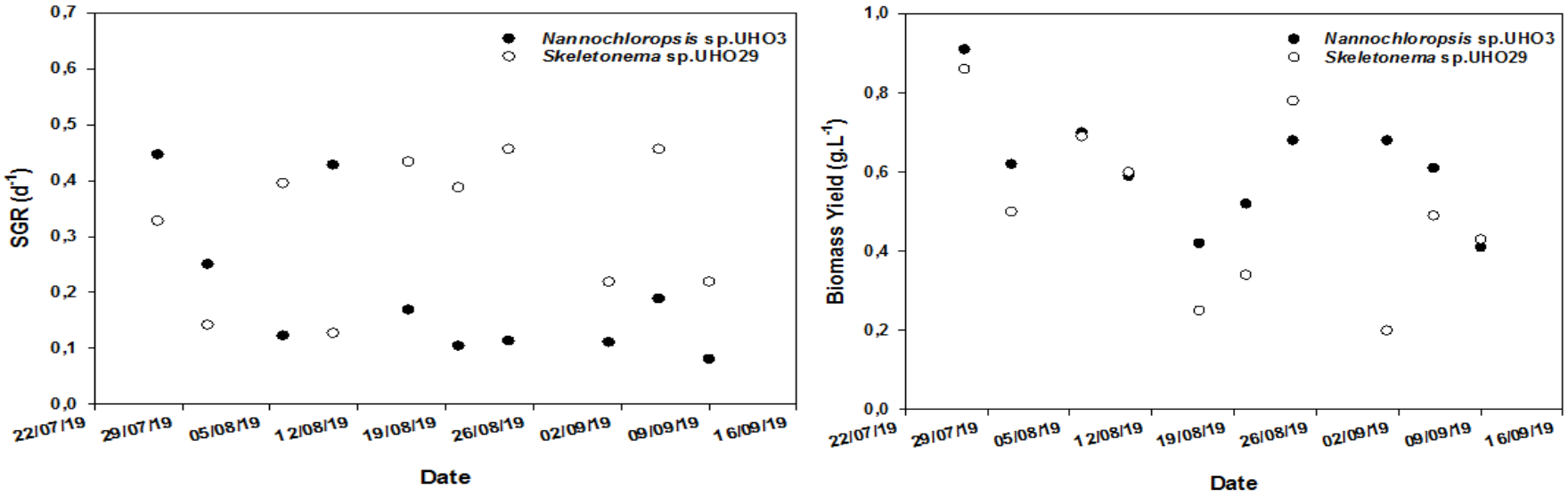
- Predominant fatty acids of both microalgal species :
  - Methyl Palmitate (C16:0)
  - Methyl Stearate (C18:0)
  - Methyl Oleate (C18:1)
  - Methyl Linoleate (C18:2)

Kultur Massar pada Kolam Raceway di outdoor

Gambar 6. Mass Cultivation of *Nannochloropsis* sp.UHO3 dan *Skeletonema* sp.UHO29 in outdoor raceway ponds

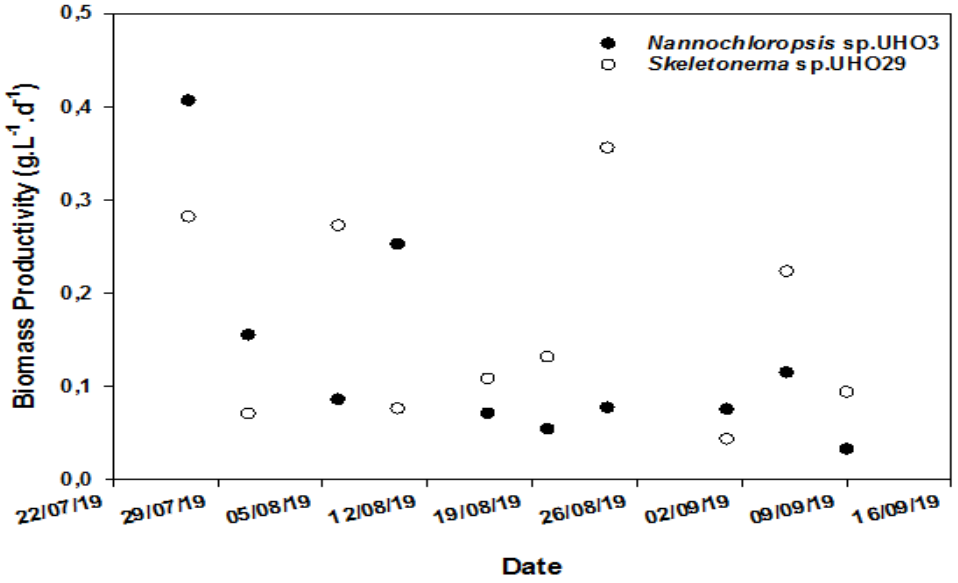


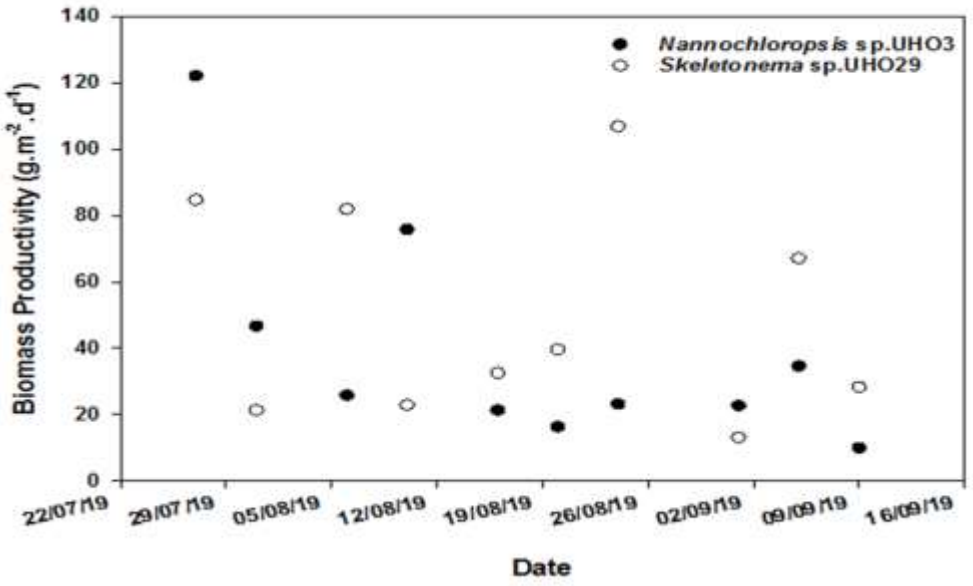
Gambar 7. Growth curve of *Nannochloropsis* sp.UHO3 (left) dan *Skeletonema* sp.UHO29 (right) in outdoor raceway ponds



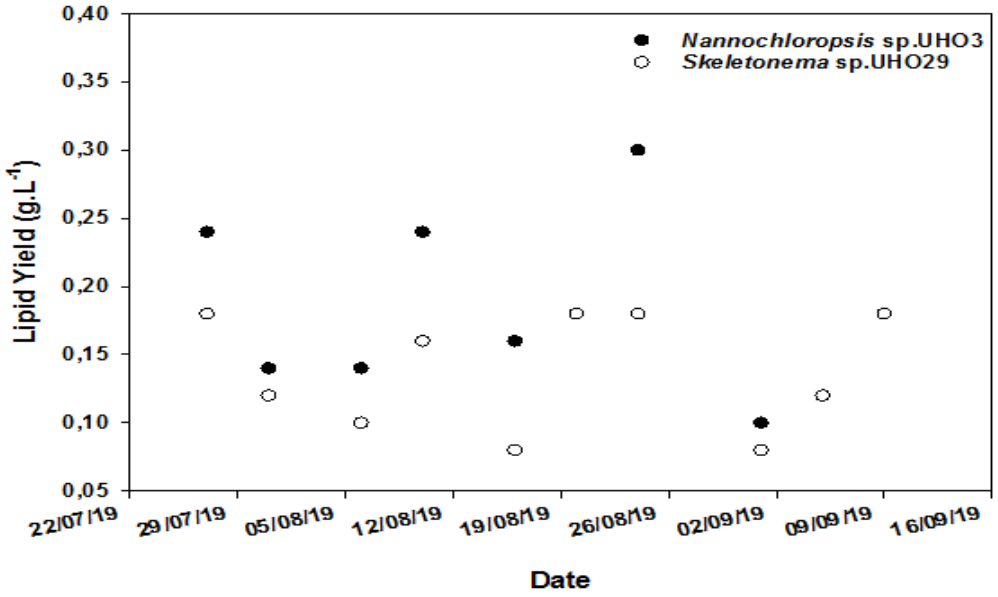
Gambar 8. SGR (d^{-1}) and biomass yield ($g.L^{-1}$) of *Nannochloropsis* sp.UHO3 and *Skeletonema* sp.UHO29 in outdoor raceway ponds

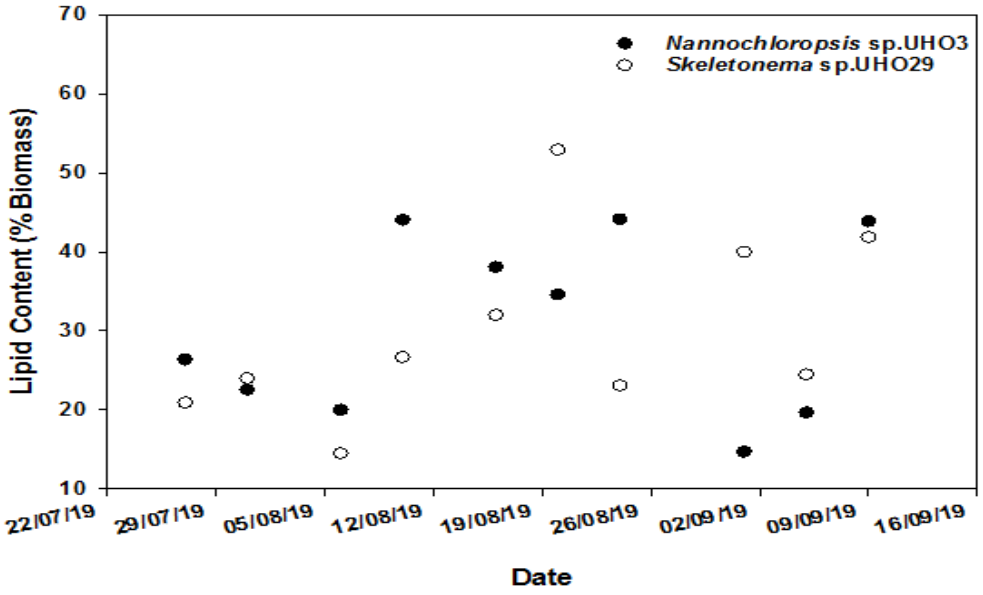
Gambar 9. Biomass productivity per volume ($g.L^{-1}d^{-1}$) and per area ($g.m^{-2}d^{-1}$) of *Nannochloropsis* sp.UHO3 and *Skeletonema* sp.UHO29 in outdoor raceway ponds



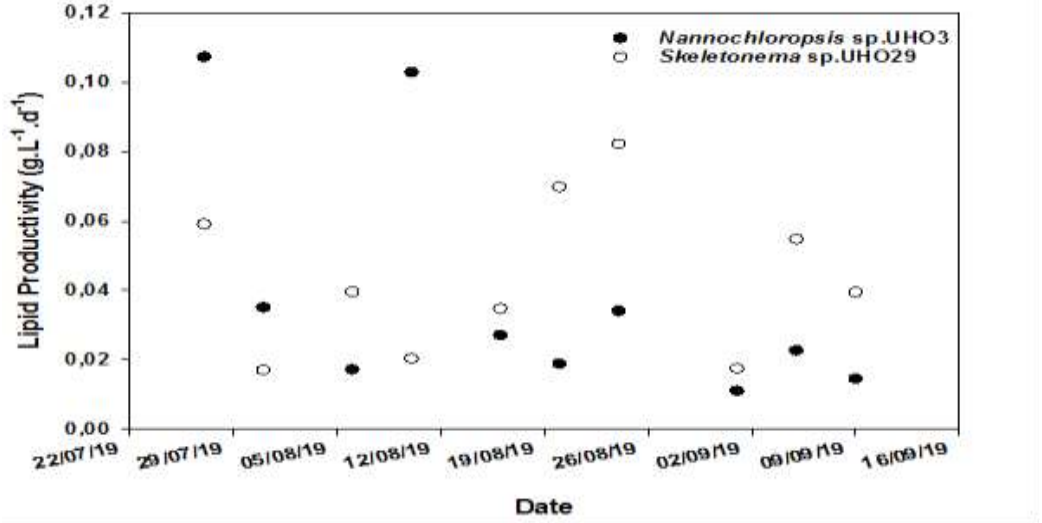


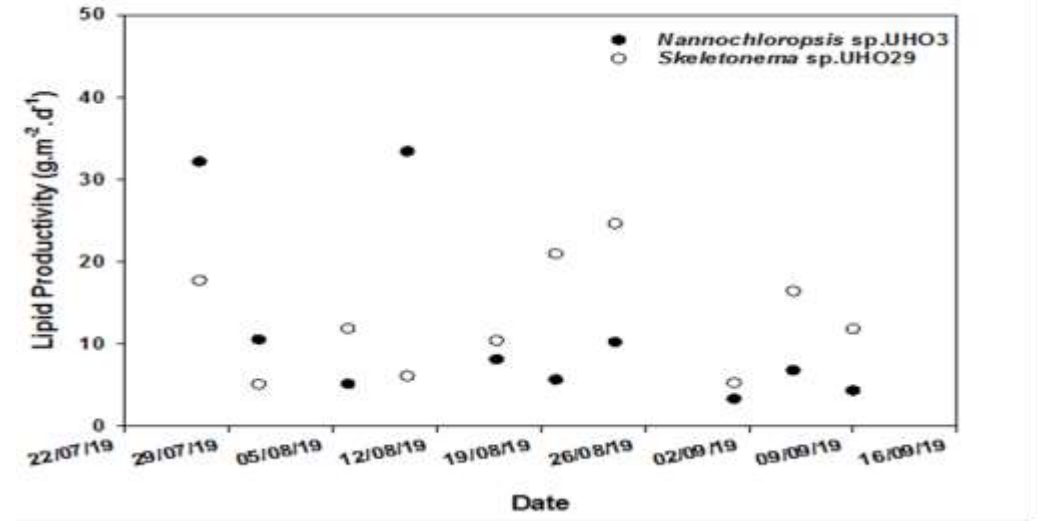
Gambar 10. Lipid yield (g.L^{-1}) and lipid content (% AFDW) of *Nannochloropsis* sp.UHO3 and *Skeletonema* sp.UHO29 in outdoor raceway ponds





Gambar 11. Lipid productivity per volume ($g.L^{-1}d^{-1}$) and per area ($g.m^{-2}d^{-1}$) of *Nannochloropsis* sp.UHO3 and *Skeletonema* sp.UHO29 in outdoor raceway ponds





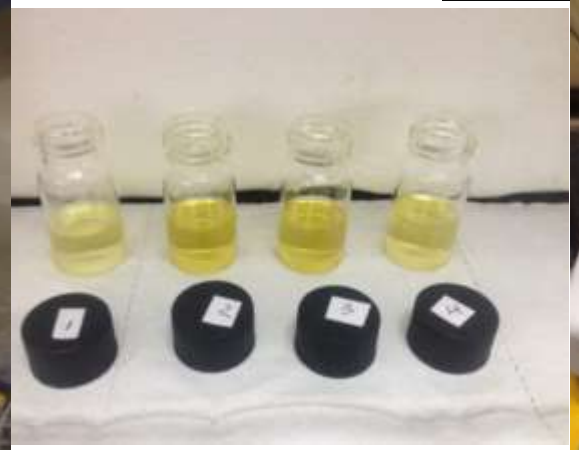
Kesimpulan dan Rekomendasi

Mikroalgae *Nannochloropsis* sp.UHO3 and *Skeletonema* sp.UHO029 sangat potensil untuk dikembangkan sebagai bahan baku biodiesesl karena memiliki laju pertumbuhan yang tinggi, toleran terhadap kisaran salinitas yang luas, memiliki kandungan lipid yang tinggi serta tumbuh dengan baik pada kolam racway di outdoor.










Thank You