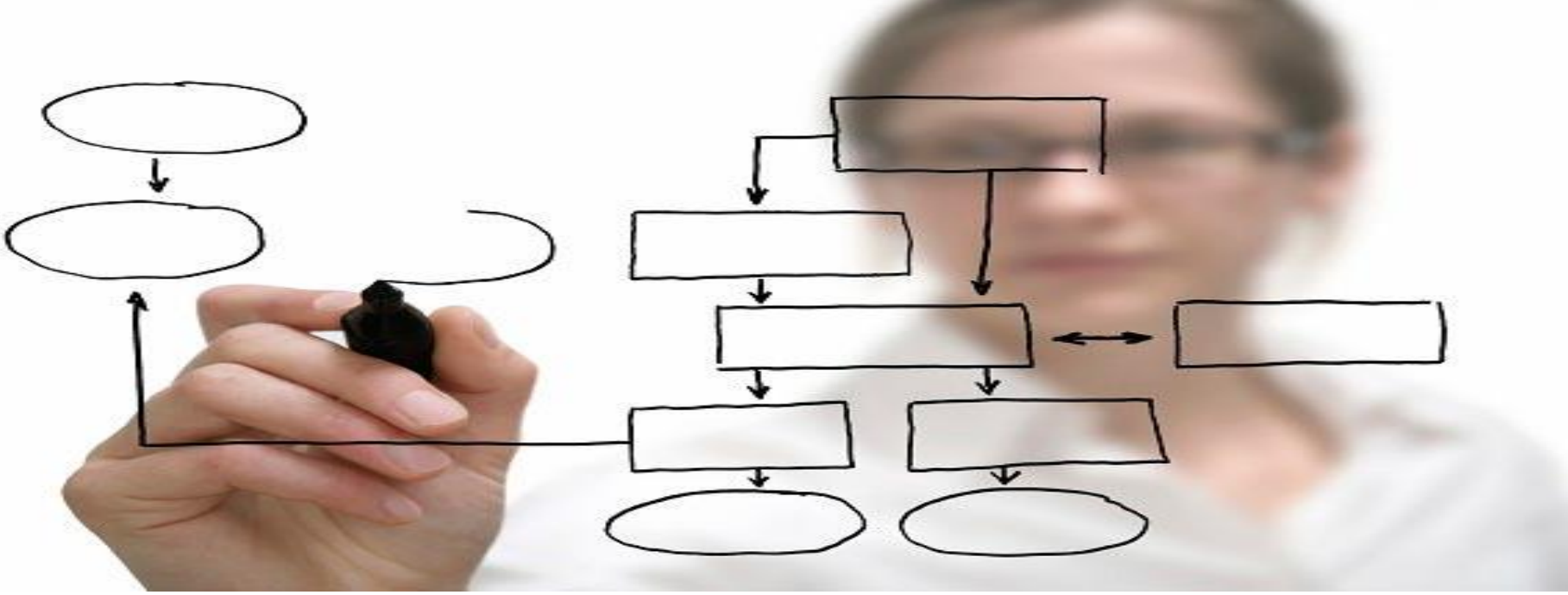
Menyusun Metode Praktik, Hasil Pembahasan, Simpulan & Saran, Serta Ringkasan Pada Karya Ilmiah

Tulisan ilmiah merupakan tulisan yang didasari hasil pengamatan, peninjauan, penelitian dalam bidang tertentu, disusun menurut metode tertentu, dengan sistematika penulisan yang bersantun bahasa dan isinya dapat dipertanggung jawabkan keilmiahannya

Tujuan karya tulis ilmiah adalah melaporkan hasil kegiatan/penelitian ilmiah secara sistematis, jelas, padat dan benar



Langkah-langkah metode ilmiah

- *Mencari, merumuskan dan mengidentifikasi masalah*
- *Menyusun kerangka pemikiran (Logical construct)*
- *Merumuskan hipotesis*
- *Menguji hipotesis secara empirik*
- *Menarik kesimpulan*

Metode praktik dalam suatu tulisan ilmiah

- Objek dan subjek penelitian
- Metode penelitian
- Populasi dan sampel
- Teknik dan alat pengumpulan data
- Teknik analisis data

Contoh :

Johns, 1994), and *Nannochloropsis* species (Hu and Gao, 2003), have been reported to accumulate amounts of lipid in cells under various culture conditions. However, there are few studies on the effects of carbon resources, especially, the effects of carbon sources on the biomass production and lipid component of algae under mixotrophic cultivation (Andrade and Costa, 2007; Bouarab et al., 2004). Therefore, marine microalgae in seawater around Taiwan that exhibit high lipid productivity were isolated in this study to observe the effects of carbon and nitrogen sources on the growth and lipid productivity of the isolated microalgae under mixotrophic conditions.

2. Methods

2.1. Collection of samples, establishment and identification of algal strains

The microalgae samples were collected from seawater around Taiwan, stored in sterile centrifugal tubes, and sent to the laboratory within 3 d for algal cell isolation. Walne medium plates were prepared using full-strength seawater, containing 18 g/L of agar and 1 g/L of glucose. After inoculation, the plates were cultured at 30 °C for 2–7 d. Single colonies composed of spherical cells atypical of either yeast, fungi, or bacteria were extracted and carefully transferred to a new plate.

After becoming established, these algal strains were identified according to their 18S rRNA gene sequences, as well as some morphological characteristics. For morphological observation, cells from each strain were observed using a light microscope (ESPA, Taiwan).

For obtaining the DNA sequences of the 18S rRNA gene from one strain, a single colony of the strain grown on an agar plate was carefully transferred to a 50-mL tube containing 1 g/L of glucose and 10 mL of a Walne liquid medium prepared using seawater. The culture was then cultivated at 30 °C for 1 wk with continuous aeration (10% CO_2, 0.5 vvm). The algal cells were collected using centrifugation (5000 rpm × 5 min), rinsed with 5 mL of deionized water, and lyophilized prior to performing DNA sequencing.

The amplified 18S rRNA gene in the genomic DNA of algal cells was obtained and sent to Mission Biotech (Taipei, Taiwan) for DNA sequencing. The resulting 18S rRNA gene sequences were aligned and compared to the nucleotide sequences of known microorganisms in the GenBank database of the National Center for Biotechnology Information by using a Basic Local Alignment Search Tool (BLAST). The samples were also analyzed using MEGA 4.1 software (Tamura et al., 2007) and by employing the multiple alignment program CLUSTAL W to construct a neighbor-jointing (NJ) tree. The bootstrap values were obtained from 1000 replications of NJ analyses (Burja et al., 2006).

source in photoautotrophic cultivation, while organic carbon (sucrose) was used in heterotrophic cultivation. Mixotrophic cultivation, which means the microalgae could undergo photosynthesis and simultaneously use both organic (fructose, glucose, glycerol, sucrose, and xylose) and inorganic carbon (CO_2) as carbon sources, was also investigated in this study. The effects of these cultivation conditions on microalgae growth and lipid production were investigated.

2.3. Analytical method

Biomass was determined by measuring the OD of each sample at 680 nm (OD_{680}). The dry cell weights of the diluted samples were then detected and measured for plotting the standard curve. The amounts of total sugar were estimated by the phenol–sulfuric acid assay method of Dubois et al. (1956) using fructose, glucose, sucrose, and xylose standard calibration curves, respectively (Dubois et al., 1956). The glycerol concentration was determined using high-performance liquid chromatography (HPLC; Young Lin Acme 9000 HPLC).

2.4. Total lipid extraction

The total lipid content (dry weight) was measured by employing a modified version of the method used by Bligh and Dyer (1959) (Bligh and Dyer, 1959). After the cultivation was complete, the culture medium was centrifuged at 9000 rpm and 4 °C for 2 min; the cell pellets were then collected for freeze drying. The samples were pulverized after drying by using a homogenizer, and were extracted using a chloroform–methanol mixture (1:2 v/v). Approximately 15 mL of solvents was used for 50 mg of dried samples in each extraction step. After the samples were mixed using a vortex mixer for 1 min, they were ultrasonicated for 3 h and centrifuged at 3000 rpm for 10 min. The solid phases were separated carefully using Whatman No. 1 filter paper, and the solids were washed using 5 mL of chloroform. After this process, 9 mL of sterilized water was added to a solvent phase, and the solvent was mixed using a vortex mixer. The solvent phase was centrifuged at 3000 rpm for 10 min, and the chloroform layer was collected. The weight of the lipids was measured after removing the solvent by using a nitrogen blowing concentrator; the lipid content was then calculated.

2.5. Fatty methyl esters and fatty acid analysis

To observe the saponification/esterification reactions, each of the samples were mixed with 2 mL of NaOH–methanol solution and disrupted using a sonicator, heated in a 100 °C water bath for 10 min, and cooled to room temperature. The samples were

Hasil dan pembahasan dalam suatu tulisan ilmiah

Hasil

- Deskripsi subjek penelitian
- Deskripsi objek penelitian
- Analisis data dan pengujian hipotesis

Pembahasan

- Validitas
- Signifikansi temuan
- Kaitan dgn penelitian sebelumnya

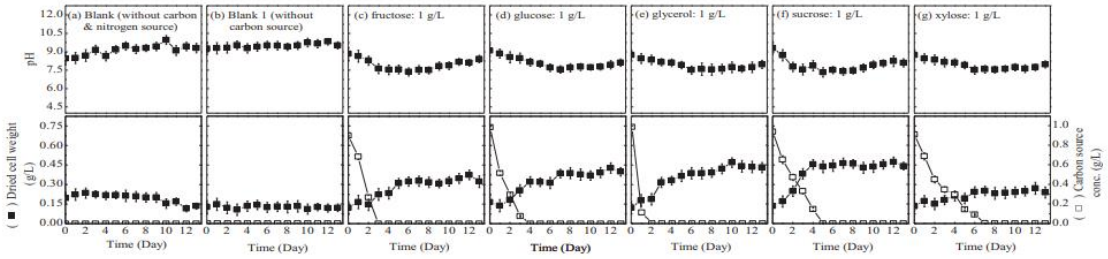


Fig. 2. The time courses of dried cell weight and sugar consumption of isolated *Chlorella* sp. Y8-1 microalgae at various carbon sources. Culture condition: light/dark cycle: 24 0; light source: fluorescent; light intensity: 4300 lux; nitrogen sources: urea 0.5 g/L; various carbon sources; aeration: 10% CO_2; $n = 3$. *Note:* (a) and (b): autotrophi cultivation; (c)–(g): mixotrophic cultivation.

Table 1
Lipid and biomass production of different microalgae under photoautotrophic, heterotrophic and mixotrophic culture conditions, respectively.

Microalgae	Autotrophic		Heterotrophic		Mixotrophic		Refs.
	Lipid content (%)	Biomass (g/L)	Lipid content (%)	Biomass (g/L)	Lipid content (%)	Biomass (g/L)	
Marine							
Chlorella sp. Y8-1	16.5	0.22	5.9	0.17	35.5	0.45	This study
Chlorella sp.	30.0	0.38	21.0	0.48	25.5	1.45	Cheirsilp and Torpee (2012)
Chlorella vulgaris	–	–	2.0	3.00	0.8	4.00	EL-Sheekh et al. (2012)
Chlorella sorokiniana	19.0	–	–	–	33.0	–	Ngangkham et al. (2012)
Nannochloropsis sp.	28.0	0.37	20.0	0.38	27.5	1.20	Cheirsilp and Torpee (2012)
Freshwater							
Chlorella sp.	13.5	0.60	13.0	0.75	15.0	1.40	Cheirsilp and Torpee (2012)
Chlorella vulgaris ESP-31	20.0	0.8	16.0	0.2	53.0	3.0	Yeh and Chang (2012)

Note: Values were not showed from the results of studies and labeled as "–" in the table.

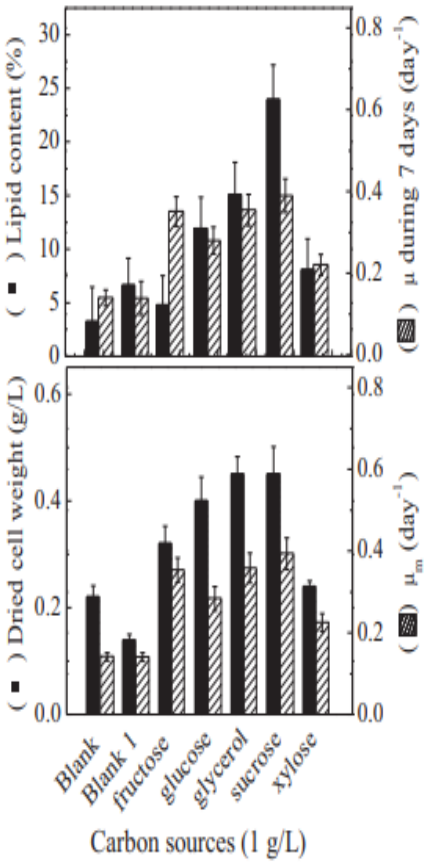


Fig. 3. Lipid content and growth of *Chlorella* sp. Y8-1 after 14 day culture at various carbon sources (1 g/L). Culture conditions: light/dark cycle: 24/0; light source: fluorescent; light intensity: 4300 lux; nitrogen sources: urea 0.5 g/L; aeration: 10% CO_2; $n = 3$. *Note:* Blank: without organic carbon and nitrogen sources (autotrophic cultivation). Blank 1: without organic carbon sources (autotrophic cultivation). Others: mixotrophic cultivation.

Kesimpulan : Pernyataan singkat, jelas, dan sistematis dari keseluruhan hasil analisis, pembahasan, dan pengujian hipotesis dalam sebuah penelitian

Metode Penulisan Kesimpulan

- ***Metode Generalisasi***

mengulas secara keseluruhan masalahnya terlebih dahulu, baru kemudian menjadikannya fokus penelitian

- ***Metode Analogi***

memberikan pandangan atau menyampaikan pokok atau gagasan penelitian menjadi lebih mudah dan sederhana

- ***Metode Korelasi***

mengulas semua topik pembahasan dan mencari fokus dan mencari hubungan sebab akibat yang terjadi dalam sebuah penelitian

Cara membuat kesimpulan karya ilmiah

- Membaca ulang karya tulis
- Menentukan kalimat utama
- Menemukan ide pokok bahasan
- Menyusun ide pokok dan informasi penting kalimat penjelas
- Merangkai kesimpulan paragraf menjadi teks bacaan

Compared to photoautotrophic and heterotrophic cultures, an abundance of lipids were accumulated when *Chlorella* sp. Y8-1 was cultivated under mixotrophic conditions, suggesting that it has great potential for renewable biodiesel feedstock applications. Mixotrophic *Chlorella* sp. Y8-1 showed higher lipid content (35.5 ± 4.2%) and higher lipid productivity (0.01 g/L/d) than *Chlorella* sp. Y8-1 cultivated under autotrophic and heterotrophic conditions. Additionally, under mixotrophic conditions, the microalgae accumulates lipids up to 35.5 ± 4.2% of dry cell weight, with palmitic acid (16:0) and stearic acid (C18:0) representing the most abundant fatty acid components. Mixotrophic cultivation is much easier to alter conditions to improve the yield of biomass and lipid of microalgal production. Therefore, further study on the influence of environmental factors would facilitate the improvement of algal lipid production.

Saran : usul atau pendapat dari seorang peneliti yang berkaitan dengan pemecahan rumusan masalah yang menjadi objek penelitian ataupun kemungkinan penelitian lanjutan.

Saran mengacu pada :

- Referensi ke masalah penelitian / tujuan laporan
- Keputusan tentang alternatif terbaik dari yang dievaluasi dalam laporan yang ditawarkan
- Saran perlu digarisbawahi untuk menekankan bahwa itu adalah rekomendasi.
- Bahasa singkat, berorientasi pada tindakan yang digunakan dalam kalimat juga menekankan hal ini.

Ringkasan

Menyajikan suatu karangan yang panjang dalam bentuk yang singkat.

Dalam ringkasan keindahan gaya bahasa, ilustrasi, serta penjelasan-penjelasan yang terperinci dihilangkan

Unsur ringkasan

- Latar belakang secara singkat
- Tujuan
- Metodologi
- Hasil dan pembahasan
- Kesimpulan dan saran

Cara membuat ringkasan

- Membaca teks
- Menentukan dan mencatat gagasan
- Membuat reproduksi
- Ketentuan tambahan
    1. dipergunakan kalimat tunggal
    2. gagasan yang sentral
    3. hal yang dianggap penting
    4. semua keterangan/ kata sifat dibuang
    5. pertahankan susunan gagasan asli
    6. ditulis dengan sudut pandang orang ketiga
    7. berapa panjangn ringkasan final