

行政院原子能委員會
委託研究計畫研究報告

培植海洋大型綠藻石蓴做為生質能之材料
Cultivation algae as the algal materials for biomass
energy production

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中文摘要

提高自產能源之數量以減低對進口能源之依賴，是我國能源政策之既定目標。本研究以台灣海域常年可見之潮間帶大型綠藻「石蓴」為研究材料，在實驗室進行人工附苗、另在溫室進行培育、最後在戶外長期培養，探討以人工大量培養石蓴之方式及其最大生物量，做為評估石蓴做為生質能材料之可行性。本研究是利用野外採集之石蓴藻體，經刺激誘發其釋放游動之生殖細胞，並使其附著於綿繩上，以達到高密度之培養。隨後將附著有石蓴幼苗之綿繩置於岸邊養殖池培養，進行為期 10 個月之戶外長期培養及觀察。發現石蓴生殖細胞附著於綿繩上第 90 天後，石蓴藻體生長之長度均可超過 10 cm，此時亦隨之進行藻體的採收。本實驗期間，平均 1 週每公尺棉繩可獲得石蓴的最高乾重為 3.1 g，推估 1 m²的自然海域養殖面積，其最高 1 週生物量為 0.02 kg 乾重、約 0.27 kg 濕重的石蓴。

此外，石蓴幼苗在溫室內培育的時間長短，對於戶外培養時藻體的生長速度，並沒有直接的影響。颱風來襲時，可將石蓴苗置於溫室或陸上池以渡過危機。以台灣東北部海域而言，「月平均溫度」29.5°C 以上、長期低「日照時數」、過強的「自然光度」、或「最大風速」高於 10.8 m · s⁻¹，相當於「大浪」以上的海象，可能不適合石蓴的生長。而「降水日數」與「降水量」對石蓴生長的影響則不明顯。

Abstract

For reducing the reliance on the imported foreign fossil fuel and increasing self-producing energy are the main goals of Taiwan's energy policy. This study cultivated the marine green macroalga, *Ulva fasciata*, as bio-materials for energy production. *U. fasciata* usually found on the rock shores of Taiwan, is a universal seaweed. The algae were initially collected from the wild field, and then were stimulated to release zooids for the seedling cultivation. Those zooids soon developed to form seedlings at indoor culture tanks. Subsequently, the cotton ropes with the seedlings that developed from the zooids were transferred to seashore culture pond during 10 months of cultivation. When at the 90th day of culture, the average length of algal thalli reached more than 10 cm which is the harvesting length. The maximum average algal biomass was $3.1 \text{ g} \cdot \text{m}^{-1} \cdot \text{week}^{-1}$ of dry weight. Therefore, estimating the maximum algal biomass of 1 m^2 of pond area was $0.02 \text{ kg} \cdot \text{m}^{-2} \cdot \text{week}^{-1}$ of dry weight, was equal to $0.27 \text{ kg} \cdot \text{m}^{-2} \cdot \text{week}^{-1}$ of raw weight.

In addition, the cultivation periods of *U. fasciata* seedlings at the greenhouse had no directly affect to the growth rate of seedlings while they were cultured in seashore culture pond. When the typhoons attacked Taiwan, the cotton ropes with the seedlings were transferred from

seashore to the greenhouse or/ and culturing tanks to avoid disaster. In the Northeast coastal area of Taiwan, when the average monthly temperature was higher than 29.5°C, short sunshine hours were too long, natural light intensities was excessively strong, or forcefully wind speed was more than 10.8 m · s⁻¹, quite as larger waves of marine weather, were not suitable for the culture of *U. fasciata* seedlings. Other possible weather factors such as the total days and the amount of rainfall are without relationships to the growth of *U. fasciata* .