

YIELD AND PHYSICAL CHARACTERISTICS OF AGAR FROM  
*Gracilaria fisheri* AT SETIU, TERENGGANU

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**YIELD AND PHYSICAL CHARACTERISTICS OF AGAR FROM  
*Gracilaria fisheri* AT SETIU, TERENGGANU**

**BY  
FREDOLIN PETER MAJANIL**

**This project report is submitted in partial fulfillment of the  
requirements for the degree of Bachelor of Fisheries Science**

**Faculty of Applied Science and Technology  
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## ABSTRAK

Rawatan alkali biasanya dilakukan dalam industri pengeluaran agar secara komersial daripada spesies *Gracilaria* bagi meningkatkan kualiti agar. Kajian ini adalah untuk mengkaji samada *G. fisheri* yang diambil dari Setiu, Terengganu pada bulan Jun 1997 memerlukan rawatan 5 % NaOH selama 1.5 jam, diikuti oleh rendaman dalam 1.5 % asid H<sub>2</sub>SO<sub>4</sub>. Sekiranya rawatan alkali diperlukan, suhu rawatan alkali yang paling sesuai juga diketahui (suhu rawatan yang diuji: 60, 70, 80 dan 90 °C). penilaian agar yang diekstrak adalah berdasarkan kepada peratus penghasilan agar (%), ketegangan gel serta pembentukan dan pencairan gel. Ciri-ciri ini kemudian dibandingkan dengan agar komersial.

Rawatan alkali adalah diperlukan untuk meningkatkan kualiti agar daripada *G. fisheri*. Penghasilan agar yang paling tinggi adalah tanpa rawatan alkali (32.14 %), tetapi agar yang dihasilkan tidak membentuk gel pada kepekatan piawai 1.5 %. Penghasilan agar dengan rawatan alkali lebih rendah, iaitu pada julat 12.6 – 25.1 %. Penghasilan agar meningkat dengan pertambahan suhu rawatan alkali. Semua agar yang dihasilkan dengan rawatan alkali pada suhu berbeza membentuk gel pada kepekatan piawai 1.5 %. Peningkatan ketegangan gel yang sedikit diperhatikan dengan peningkatan suhu rawatan alkali. Suhu pencairan dan pembentukan gel masing-masing berjulat 36 – 44 °C dan 69 – 81 °C. suhu rawatan alkali 90 °C, menunjukkan ketegangan dan penghasilan agar yang paling tinggi di antara semua suhu yang diuji. Ini menunjukkan bahawa, agar yang dihasilkan daripada *G. fisheri* tanpa rawatan alkali mengandungi kumpulan sulfat yang terikat dengan kuat kepada struktur agar dan memerlukan tenaga yang lebih tinggi untuk menyingkirkan kumpulan sulfat tersebut serta menjadikan ketegangan gel (tanpa rawatan alkali) supaya menjadi lebih tegang.

Penghasilan agar adalah lebih tinggi daripada 8.5 %, yang mana nilai ini adalah nilai minimum untuk spesies *Gracilaria* yang dianggap sebagai sumber agar secara komersial. Suhu pembentukan dan pencairan gel tidak menunjukkan perbezaan yang besar dengan agar komersial yang diuji. Ketegangan gel yang diperolehi daripada sampel *G. fisheri* adalah setara dengan ketegangan gel dari Korea tetapi lebih rendah daripada serbuk agar dari Jepun dan Thailand.

In commercial agar production from *Gracilaria* species, alkali pretreatment is usually done to improve the quality of its agar. This study is to check whether *G. fisheri* from Setiu, Terengganu collected in June 1997 needed alkali pretreatment (5 %) NaOH for 1.5 hour, acid treatment with 1.5 % H<sub>2</sub>SO<sub>4</sub> and if alkali treatment was necessary, determine its most appropriate treatment temperature (temperature tested: 60, 70, 80 and 90 °C). Evaluation of the extracted agars were based on the agar yield (%), gel strength (g cm<sup>-2</sup>) gelling and melting temperatures in comparison with commercial agars.

Alkali treatment was necessary to improve the quality of agar from *G. fisheri*. The yield was higher in native (no alkali treatment, 32.14 %), but this could not form a gel at 1.5 % concentration. Yields for alkali treated agar were lower and ranged from 12.6 to 25.1 %. Yields increased with increase in alkali treatment temperature. All alkali treated agar form gel at 1.5 % concentration and gel strength increased slightly (491 to 498 g cm<sup>-2</sup>) with increasing alkali treatment temperature. Gelling and melting temperatures ranged from 36 to 44 °C and 69 to 81 °C, respectively. The 90 °C alkali treatment temperature which resulted in the highest agar gel strength and yield among the alkali treated agars indicated that the native agar in *G. fisheri* contain sulfate groups that are bound strongly to the agar structure. This needs high energy to remove them and convert the native agar into one with higher gel strength.

All yields were higher than 8.5 % considered as minimum for *Gracilaria* species that can be considered as potential commercial sources of agar. The gelling and melting temperature did not vary much with that of the commercial agars tested. The gel strength of *G. fisheri* samples were comparable to that of agar strips from Korea but lower than the agar powders from Japan and Thailand.

Heavy metal (lead, copper, chromium, nickel and zinc) in the dried seaweeds for agar extraction were also measured. Lead (3.13 ppm) and zinc (103.5 ppm) were above the limits set by the Malaysian Ministry of Health (Lead: 2.0 ppm and zinc: 100 ppm) while copper (1.75 ppm) was lower than the 30 ppm limit. However, international standards for agar set lead limits at 10 ppm.