

**THE EFFECT OF DELAYED POST-HARVEST DRYING  
ON THE YIELD AND PHYSICAL QUALITY OF AGAR  
FROM *Gracilaria changii***

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AND PHYSICAL QUALITY OF AGAR FROM *Gracilaria changii***

**BY**

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## ABSTRACT

The effect of delayed post-harvest drying on the yield and physical quality (gel strength, gelling and melting temperatures) of agar from *Gracilaria changii* was studied. With delayed drying, the seaweeds became discoloured and softening of the thallus started from the tips. The changes in the thallus were more clear on day 6 with some thalli completely softening and becoming yellow together with the release of foul smell and sticky liquid. By day 9, 90% of the samples had softened and turned white. The most obvious changes were in the loss of pigments, loss of water and development of foul smell. Even if the thallus had become soft, it was still not broken down into small pieces but still retained their shape and structure. Fresh weight, dry weight of seaweed and water content of the thallus also decreased. However, clean anhydrous weight (%CAW) did not change significantly ( $R^2 = 0.2712$ ). Besides this, agar yield obtained also did not change significantly ( $R^2 = 0.2746$ ) and it was almost always about 8% except on day 2 (6.384%), day 5 (7.562%) and day 7 (7.519%). All the samples were still considered as a potential commercial sources of agar.

The gel strength of agar obtained in this experiment decreased in two phases. The first phase (0-4 days) showed a stronger significant decrease ( $R^2 = 0.922$ ) compared to second phase (5-10 days) which showed less significant change ( $R^2 = 0.785$ ). In the second phase, the gel strength was reduced by 10 g/cm<sup>2</sup> compared to 90 g/cm<sup>2</sup> in the first phase. The highest gel strength obtained was 480g/cm<sup>2</sup> and the lowest was 377g/cm<sup>2</sup>. Although gel strength of agar (>370g/cm<sup>2</sup>) decreased during the experiment, it still can be used as first grade agar based on the Japanese Standard

Specification for processed agar wherein the gel strength of first grade agar is  $\geq 350\text{g/cm}^2$ .

The agar melting and gelling temperatures were not effected by the delayed drying period. The melting and gelling temperatures obtained were  $84\text{-}85^{\circ}\text{C}$  and  $34\text{-}36^{\circ}\text{C}$ , respectively.

Results show that there was insignificant decay of the seaweeds up to 10 days of delayed post-harvest drying. However, the best agar sources was still the control sample (day 0, drying as soon as harvested) based on the gel strengths ( $481.48\text{ g/cm}^2$ ) and agar yield (10.11 %) obtained.

## ABSTRAK

Kajian kesan pengeringan lambat selepas penuaian ke atas hasil dan fizikal kualiti (kekuatan agar, suhu pencairan dan pembentukan agar) agar *Gracilaria changii* telah dilakukan dengan tempoh pengeringan lambat selama 10 hari. Bahagian hujung talus didapati mula-mula sekali mengalami perlembutan talus dan perlunturan warna semasa pengeringan lambat dilaksanakan. Perubahan ini menjadi lebih ketara pada hari ke-6 dengan sebahagian thalli sempurna berubah lembut dan warna terluntur ke warna kuning disertai penghasilan bau busuk dan cecair yang melekit dari rumpai yang sedang menjalani kajian perlambatan pengeringan. Hampir 90% daripada sampel menjadi lembut dan warna terluntur ke putih pada hari ke-9. Pada keseluruhannya, perubahan yang ketara dalam kajian ini adalah kehilangan pigment dan kandungan air dalam talus serta perkembangan bau busuk dalam rumpai laut. Talus tidak hancur atas perubahan fizikal di atas malahan bentuk dan struktur asalnya masih dikekalkan. Berat basah dan berat kering rumpai laut serta kandungan air dalam talus didapati menurun semasa kajian. Walaubagaimanapun, berat kering bersih rumpai laut tidak mengalami perubahan yang nyata ( $R^2 = 0.2712$ ). Selain itu, agar yang dihasilkan juga tidak menunjukkan perubahan yang nyata ( $R^2 = 0.2746$ ). Kebanyakan nilai hasil agar yang diperolehi adalah hampir 8 % kecuali hari yang ke-2 (6.384 %), hari ke-5 (7.562 %) dan hari ke-7 (7.519 %). Semua sampel masih dipertimbangkan sebagai sumber agar komersial yang berpotensi.

Penurunan kekuatan agar yang diperolehi dalam kajian ini boleh dihuraikan dalam dua fasa. Fasa pertama (hari ke 0 - 4) menunjukkan perubahan nyata

yang lebih kuat ( $R^2 = 0.922$ ) jika berbanding dengan fasa kedua (hari ke-5 - 10) dimana ia menunjukkan perubahan nyata yang kurang kuat ( $R^2 = 0.785$ ). Dalam fasa kedua, kekuatan agar hanya menurun sebanyak  $10\text{g/cm}^2$  berbanding dengan  $90\text{g/cm}^2$  dalam fasa pertama. Kekuatan agar tertinggi yang diperolehi adalah  $480\text{g/cm}^2$  manakala yang terendah adalah  $377\text{g/cm}^2$ . Walaupun kekuatan agar ( $>370\text{g/cm}^2$ ) dikesan menurun dalam kajian ini tetapi ia masih boleh dianggap sebagai agar gred satu merujuk kepada Piawai Jepun khas untuk memproses agar dimana kekuatan agar di bawah kategori gred satu mesti  $\geq 350\text{g/cm}^2$ .

Suhu pencairan dan pembentukan agar tidak dipengaruhi oleh tempoh perlambatan pengering. Ini adalah kerana kedua-dua suhu yang diperolehi adalah stabil dan berada dalam lingkungan  $84\text{-}85^\circ\text{C}$  dan  $34\text{-}36^\circ\text{C}$  masing-masing.

Keputusan menunjukkan pereputan rumpai laut adalah tidak nyata dalam tempoh 10 hari pengeringan lambat. Walaubagaimanapun, ia boleh disimpulkan bahawa sampel yang terbaik adalah sampel kawalan (Hari ke-0, dikeringkan dengan segera selepas menuai) berasas kepada kekuatan agar ( $481.48\text{g/cm}^2$ ) dan hasil agar ( $10.11\%$ ) yang diperolehi.