

Optimization of Available Agar Processing Methodologies of *Gracilaria Verrucosa* in Kinniya

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Introduction

Seaweeds in Sri Lanka are mainly utilized for the production of commercially important products like agar-agar and alginic acid. Agar is commercially produced from *Gracilaria* and *Gelidium* species (Durairatnam, 1962). but the gel strength is very low. This is mainly due to the processing technologies adopted and it is necessary to optimize the processing technologies to produce Agar with higher gel strength. In the present study, attempts were made to produce Agar with higher gel strength and higher yield using the species, *Gracilaria verrucosa*.

Methodology

Raw seaweeds were collected from Kinniya Sea in Trincomalee District and were washed thoroughly to remove unwanted algae. The seaweed is air dried until the moisture content is less than 20% and washed again and sun dried in the open air. Samples were separated into three groups; A,B and C and dried for different time periods such as 2 days, 3 days and 4 days respectively. All foreign materials in dried seaweed were removed.

First, the samples were subjected to alkali treatment by placing 20 g each of seaweeds in three different concentrations of NaOH 4.5%, 5% and 5.5% and boiled at 85 °C for 1.5 hrs. Three replicates of three samples were used for the experiment. The NaOH concentration that gives best yield was selected for further processing. The samples were washed thoroughly with tap water until residues of NaOH is completely removed and were soaked in three different concentrations (0.5%, 1% and 1.5%) of H₂SO₄ acid for 1.5 hrs. Then samples were washed thoroughly in tap water then soaked in fresh water overnight to eliminate the acid completely. Next day the samples were boiled at 85 °C with 1:20 ratio of distilled water stirring slightly.

The gelled seaweeds were kept at 20 °C for 15 hrs and the gel strength was measured. Ten replicates were used for each sample and the force required to break a 1 cm² piece of gel was considered as the gel strength. The solidified agar was cut into strips and kept in the freezer at -35°C for 24 hrs, then allowed to thaw in the room temperature and the gel yield was measured using a balance (Sartorius) with precision of 0.0001 g. Gel yield was taken as a percentage of initial sample (20 g). Finally, 1.5% agar solution was prepared by boiling agar in distilled water for 30 minutes and gel pH was measured using an electronic pH meter.

The data were analyzed using two-way ANOVA incorporated in MINITAB 14 software.

Results and discussion

It was revealed that 5% NaOH solution gives the better yield irrespective of initial drying time ($p < 0.05$) and the samples (A, B and C) were subjected to this concentration prior to processed by acid (Figure 1). The best concentration of H_2SO_4 for soaking is found to be 1% (Figure 2). The pH of agar ranged from 5.60 – 6.50 and gel strength varied from 94 ± 2 gcm^{-2} to 108 ± 2 gcm^{-2} .

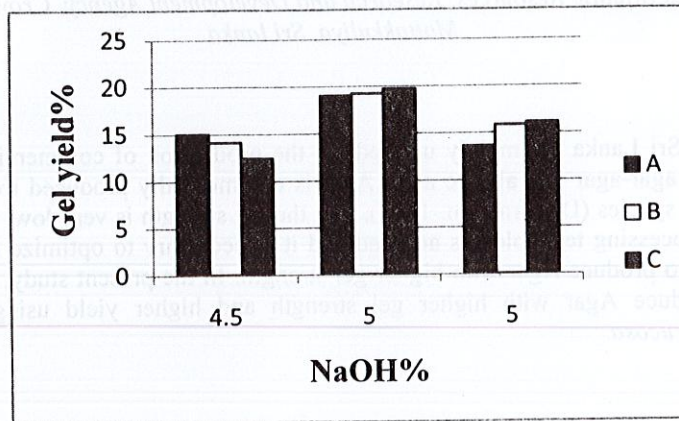


Figure 1: Gel yield obtained using sea weeds dried for A-2 days, B-3 days and C-4 days

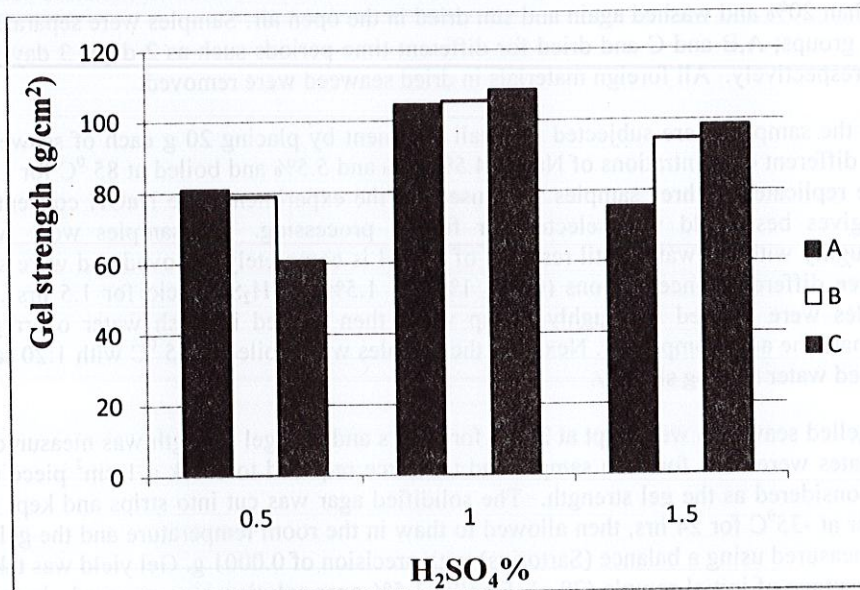


Figure 2: Gel strength (g/cm_2) of agar against concentration of H_2SO_4 .

Highest yield of agar (19.7%) was obtained from the sample C (dried for 4 days) and lowest yield was obtained from sample A dried for 2 days). The yield obtained by the commercial producers usually lie within the range of 10%-25% (Hiroshi Tsukakoshi,

pers.com.) and the findings of this study is comparable with the findings of the commercial producers.

Conclusion

The higher gel strength and a gel yield can be obtain by treating seaweeds with 5% NaOH and 1% H₂SO₄. It is also evident that the drying time has an effect on the strength and yield of the final product. *Gracilaria verrucosa* can be utilized for producing Agar in Sri Lanka.

References

Durairatnam, M. 1962. Some marine algae from Ceylon - 1. *Fisheries Research Station, Ceylon Bulletin* 15: 1-16

person) and the findings of this study is comparable with the findings of the commercial producers.

Conclusion

The higher pH strength and a red yield can be obtained by treating seaweeds with 2% NaOH and 1% H₂O₂. It is also evident that the drying time has an effect on the strength and yield of the final product. Crustacean residues can be utilized for producing Agar in Sri Lanka.

References

Davutyan, M. 1963. Some marine algae from Ceylon - I. Fisheries Research Station, Ceylon Bulletin 15: 1-16.