

GROWTH RATE AND CARRAGEENAN PROPERTIES OF THREE
VARIETIES OF *Kappaphycus alvarezii* (RHODOPHYTA)
FARMED IN TANGAL, SEMPORNA, SABAH

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VARIETIES OF *Kappaphycus alvarezii* (RHODOPHYTA) FARMED IN
TANGAL, SEMPORNA, SABAH**

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**Research Report submitted in partial fulfillment of
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**DEPARTMENT OF MARINE SCIENCE
FACULTY OF MARITIME STUDIES AND MARINE SCIENCE
UNIVERSITI MALAYSIA TERENGGANU**

**DECLARATION AND VERIFICATION REPORT
FINAL YEAR RESEARCH PROJECT**

It is hereby declared and verified that this research report entitled:
Growth Rate and Carrageenan Properties of Three Varieties of *Kappaphycus alvarezii*
(RHODOPHYTA) Farmed in Tangel, Semporna, Sabah.
by Melissa Mangalis, Matric No. UK18176 have been examined and all errors
identified have been corrected. This report is submitted to the Department of Marine
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LIST OF ABBREVIATIONS

°C	-	degree celsius
AG	-	Anhydro-galactose
CaCl ₂	-	calcium chloride
cP	-	centipoises
cm ²	-	centimeter square
cm ⁻¹	-	per centimeter
d ⁻¹	-	per day
g	-	gram
κ	-	kappa
KCl	-	potassium chloride
KOH	-	potassium hydroxide
ln	-	natural logarithm
MT	-	metric ton
M	-	Mol
m	-	meter
ml	-	millilitre
mm	-	millimetre
mmol	-	millimole
nm	-	nanometre
p	-	probability
ppm	-	part per million
rpm	-	rotation per minute
w/w	-	weight over weight

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ABSTRACT

Relative growth rate, semi-refined carrageenan yields, gel strength, viscosity, gelling temperature, melting temperature and IR spectra of gel were investigated in three varieties of *K. alvarezii* (*K. alvarezii* var. 'tambalang', *K. alvarezii* var. 'babaei', *K. alvarezii* var. 'aring-aring') farmed at Tangal, Semporna, Sabah for 35 days cultivation using the long-line culture method in a sandy seafloor area and coral seafloor area. These three varieties of *K. alvarezii* produce κ -carrageenan which has the greatest market demand now days. Study showed higher growth rates were achieved by *K. alvarezii* var. 'aring-aring' (4.49-5.18% day⁻¹) than *K. alvarezii* var. 'tambalang' (3.47-3.68 % day⁻¹) and *K. alvarezii* var. 'babaei' (3.96-4.06% day⁻¹). The *K. alvarezii* var. 'tambalang' and *K. alvarezii* var. 'babaei' exhibited lower growth rates, but produced higher semi-refined carrageenan yields and greater gel strength than *K. alvarezii* var. 'aring-aring'. All varieties showed negative correlation between growth rate and semi-refined carrageenan yields and same goes for gel strength. In alkaline treatment, the optimum temperature was 70-80 °C which give the optimum results for gel strength and viscosity. This study showed that, *K. alvarezii* var. 'tambalang' and *K. alvarezii* var. 'babaei' are among the best varieties recommended for further farming in terms of higher carrageenan yields and better gel strength compared to *K. alvarezii* var. 'aring-aring'.

Kadar Pertumbuhan dan Sifat Karagenan dalam Tiga Jenis *Kappaphycus alvarezii* (Rhodophyta) Dikultur di Perairan Tangel, Semporna, Sabah.

ABSTRAK

Kadar pertumbuhan relatif, menghasilkan karagenan semi-halus, kekuatan gel, kelikatan gel, kadar suhu membentuk gel, kadar suhu lebur atau mencair dan spektrum IR gel dikaji dalam tiga jenis *K. alvarezii* iaitu *K. alvarezii* var. 'tambalang', *K. alvarezii* var. 'babaiei', *K. alvarezii* var. 'aring-aring' yang dikultur di perairan Tangel, Semporna, Sabah selama 35 hari dengan menggunakan kaedah 'long-line' di kawasan dasar berpasir dan berbatu karang. Ketiga-tiga variasi *K. alvarezii* ini menghasilkan κ -karagenan yang mempunyai permintaan pasaran yang tinggi pada masa kini. *K. alvarezii* menjadi salah satu penanaman yang komersil di Semporna, Sabah. Kajian menunjukkan kadar pertumbuhan yang tinggi dicapai oleh *K. alvarezii* var. 'aring-aring' (4.49-5.18% sehari) daripada *K. alvarezii* var. 'tambalang' (3.47-3.68% sehari) dan *K. alvarezii* var. 'babaiei' (3.96-4.06% sehari). *K. alvarezii* var. 'tambalang' dan *K. alvarezii* var. 'babaiei' menunjukkan kadar pertumbuhan yang lebih rendah, akan tetapi menghasilkan karagenan semi-halus yang lebih tinggi dan kekuatan gel yang lebih kuat berbanding *K. alvarezii* var. 'aring-aring'. Semua variasi menunjukkan korelasi yang negatif antara kadar pertumbuhan dengan hasil karagenan semi-halus dan antara kadar pertumbuhan dengan kekuatan gel. Suhu yang disyorkan semasa proses pengekstrakan karagenan ialah pada suhu 70-80 °C, iaitu suhu ini memberikan hasil yang optimum bagi kekuatan gel dan kelikatan gel. Kajian ini menunjukkan bahawa, *K. alvarezii* var. 'tambalang', *K. alvarezii* var. 'babaiei' merupakan variasi spesis *K. alvarezii* yang terbaik yang boleh disyorkan untuk penanaman kerana kelebihan yang mempunyai hasil karagenan yang lebih banyak serta kekuatan gel yang lebih baik berbanding *K. alvarezii* var. 'aring-aring'.