

**PENGEMBANGAN PROTOTIPE *VEGAN ANALOGUE SPREAD CHEESE*  
MENGGUNAKAN PROTEIN *Spirulina platensis* DAN SODIUM ALGINAT  
DENGAN METODE EMULSI GELASI**

**INTISARI**

Oleh :

**MUHAMMAD RIFQI MUSYAFFA**

**21/474986/TP/13114**

*Spirulina platensis* sebagai alga tinggi protein tidak hanya sebatas sebagai fortifikan gizi tetapi bisa digunakan untuk substitusi protein pada pangan analog *vegan*. Pada penelitian ini spirulina digunakan untuk membuat prototipe *Vegan Analogue Spread Cheese (VASC)* menggunakan variasi konsentrasi sodium alginat dengan metode emulsi gel yang dievaluasi karakteristik fisik dan kimianya. Variasi konsentrasi alginat yang digunakan yaitu, 0.80%, 1.00%, 1.20%, dan 1,40%. VASC dengan kadar sodium alginat yang berbeda menunjukkan tekstur, viskoelastisitas, mikrostruktur, Aw, daya oles, pH, kadar air, kadar protein, kadar karbohidrat, total kalori, dan aktivitas antioksidan yang berbeda secara signifikan ( $p < 0.05$ ), tetapi tidak untuk warna, kadar abu, kadar lemak, dan angka peroksida. *Spirulina platensis Biomass (SPB)* memiliki nilai *Emulsion Activity Index (EAI)* sebesar  $17.97 \pm 1.97 \text{ m}^2/\text{g}$  dan *Emulsion Stability Index (ESI)* sebesar  $35.63 \pm 7.78$  menit dengan kadar proteinnya mencapai  $70.53 \pm 1.79\%$ . Peningkatan konsentrasi sodium alginat menyebabkan kenaikan signifikan *hardness* dan *adhesiveness*, tetapi menurunkan *cohesiveness*, *resilience*, *gumminess*, dan *springiness*. Semua sampel memiliki sifat *shear thinning* ( $G' > G''$ ) dengan peningkatan konsentrasi sodium alginat yang meningkatkan nilai  $G'$ ,  $G''$ , dan viskositas. Pengamatan mikrostruktur menunjukkan distribusi globula minyak yang kurang seragam seiring bertambahnya sodium alginat. Sampel memiliki nilai Aw dan daya oles yang semakin menurun seiring meningkatnya kadar sodium alginat, tetapi tidak berdampak pada perbedaan warnanya. Peningkatan konsentrasi sodium alginat cenderung menurunkan kadar airnya hingga  $55.76 \pm 0.86\%$  dan kadar proteinnya hingga  $11.31 \pm 0.37\%$ db. Sementara, kadar karbohidrat mengalami peningkatan karena penambahan konsentrasi sodium alginat hingga  $9.46 \pm 1.79\%$ db. Kadar lemak dan kadar abu tidak terpengaruh dengan konsentrasi sodium alginat. Total kalori cenderung meningkat seiring bertambahnya konsentrasi sodium alginat. Lalu, meningkatnya konsentrasi sodium alginat membuat aktivitas antioksidan semakin menurun dengan nilai terbesar  $34.06 \pm 1.76\%$ RSA, tetapi angka peroksidanya tidak ada perbedaan. Secara keseluruhan, hasil penelitian menunjukkan SPB dengan stabilizer sodium alginat berpotensi dan berpengaruh terhadap pengembangan model VASC lewat metode emulsi gelasi.

Kata kunci: keju oles, sodium alginat, *Spirulina platensis*, emulsi gelasi, vegan analog

**DEVELOPMENT OF VEGAN ANALOGUE SPREAD CHEESE  
PROTOTYPE USING *Spirulina platensis* PROTEIN AND SODIUM  
ALGINATE WITH EMULSION GELATION METHOD**

**ABSTRACT**

By :

**MUHAMMAD RIFQI MUSYAFFA**

**21/474986/TP/13114**

*Spirulina platensis*, as a high-protein alga, is not only limited to being a nutritional fortificant but can also be used as a protein substitute in vegan analogue foods. In this study, *Spirulina* was used to develop a Vegan Analogue Spread Cheese (VASC) prototype using various concentrations of sodium alginate through the emulsion gel method, and its physical and chemical characteristics were evaluated. The variations in alginate concentrations used were 0.80%, 1.00%, 1.20%, and 1.40%. VASC with different sodium alginate levels showed significantly different texture, viscoelasticity, microstructure, water activity ( $A_w$ ), spreadability, pH, moisture content, protein content, carbohydrate content, total calories, and antioxidant activity ( $p < 0.05$ ), but not for color, ash content, fat content, and peroxide value. *Spirulina platensis* biomass (SPB) had an Emulsion Activity Index (EAI) of  $17.97 \pm 1.97$  m<sup>2</sup>/g and an Emulsion Stability Index (ESI) of  $35.63 \pm 7.78$  minutes, with its protein content reaching  $70.53 \pm 1.79\%$ . Increasing the sodium alginate concentration significantly increased hardness and adhesiveness, but decreased cohesiveness, resilience, gumminess, and springiness. All samples showed shear-thinning behavior ( $G' > G''$ ) with higher sodium alginate concentrations increasing  $G'$ ,  $G''$ , and viscosity. Microstructure observations showed less uniform oil globule distribution as sodium alginate increased. The samples showed decreasing  $A_w$  and spreadability values as sodium alginate content increased, but there was no impact on color differences. Increasing sodium alginate concentrations tended to reduce moisture content to  $55.76 \pm 0.86\%$  and protein content to  $11.31 \pm 0.37\%$  db. Meanwhile, carbohydrate content increased due to the addition of sodium alginate up to  $9.46 \pm 1.79\%$  db. Fat and ash contents were not affected by sodium alginate concentration. Total calories tended to increase with increasing sodium alginate concentration. Furthermore, the increase in sodium alginate concentration led to decreased antioxidant activity, with the highest value being  $34.06 \pm 1.76\%$  RSA, while the peroxide value did not show any difference. Overall, the research results show that SPB with sodium alginate as a stabilizer has potential and influence in the development of the VASC model through the emulsion gelation method.

Keyword: spread cheese, *Spirulina platensis*, sodium alginate, emulsion gelation, vegan analogue