



## **DEVELOPMENT OF PLANT-BASED YOGURT WITH PEA PROTEIN ISOLATE AND BIO-CALCIUM FROM NILE TILAPIA BONE**

### **ABSTRACT**

**By:**

**PRATIWI SIWI IKA HAPSARI**  
**21/478735/TP/13196**

Recently, the increasing prevalence of lactose intolerance, dairy allergies, and consumer demand for sustainable diets has led to the development of plant-based yogurt (PBY) as an alternative to dairy products. This study aimed to develop a plant-based yogurt using waxy corn milk and soy milk (2:1), 10% (w/v) sugar and fortified with 5% (w/v) pea protein isolate (PPI) and 1.5% (w/v) bio-calcium derived from Nile tilapia bone. The yogurt was fermented with 2% (w/v) lactic acid bacteria (*L. acidophilus*, *L. bulgaricus*, and *S. thermophilus*) and evaluated for its fermentation performance at 43 °C for 20 hours until it reached pH 4.6, followed by storage stability evaluation over 21-days in 4°C. Nutritional composition was analyzed by determining protein, fat, moisture content, and total soluble solid (°Brix). Probiotic viability was assessed using an in vitro gastrointestinal tract simulation, and consumer acceptability was evaluated by 28 untrained panelists using a 9-point hedonic scale.

The formulation demonstrated good fermentation characteristics, as evidenced by pH reduction, increased titratable acidity, and lactic acid bacteria growth. During refrigerated storage, the yogurt maintained acceptable physicochemical and microbiological properties, although syneresis remained relatively high. The nutritional analysis showed adequate levels of protein, fat, sugar, and moisture, suggesting its potential as a nutritious alternative to dairy yogurt. Probiotic survivability after gastrointestinal simulation reached 5.27 log CFU/mL, equivalent to  $\sim 10^7$  CFU per 100 mL serving, thus meeting the minimum threshold for potential health benefits. However, a notable decline was observed during the stomach phase. Furthermore, sensory evaluation results revealed low acceptability, particularly in taste, texture, and aroma. These findings indicate that the yogurt formulation has potential as a sustainable and functional plant-based product, but further optimization is necessary to improve physical stability and sensory appeal.

**Keyword:** bio-calcium, pea protein isolate, plant-based yogurt, probiotic, soy milk, waxy corn milk.



## **PENGEMBANGAN YOGURT NABATI DENGAN ISOLAT PROTEIN KACANG POLONG DAN BIO-KALSIUM DARI TULANG IKAN NILA**

### **INTISARI**

**Oleh:**

**PRATIWI SIWI IKA HAPSARI**  
**21/478735/TP/13196**

Belakangan ini, meningkatnya kasus intoleransi laktosa, alergi susu, dan permintaan konsumen terhadap pola makan berkelanjutan telah mendorong pengembangan yogurt berbasis nabati. Penelitian ini bertujuan mengembangkan yogurt nabati menggunakan susu jagung ketan dan susu kedelai (2:1), 10% (b/v) gula, serta penambahan dengan 5% (b/v) isolat protein kacang polong (PPI) dan 1,5% (b/v) bio-kalsium yang berasal dari tulang ikan nila. Yogurt difermentasi menggunakan 2 % (b/v) bakteri asam laktat (*L. acidophilus*, *L. bulgaricus*, dan *S. thermophilus*) pada suhu 43 °C selama 20 jam hingga mencapai pH 4,6, kemudian disimpan selama 21 hari pada suhu 4 °C untuk dilakukan evaluasi kestabilan penyimpanan. Komposisi nutrisi dianalisis berdasarkan kadar protein, lemak, kadar air, dan total padatan terlarut (°Brix). Viabilitas probiotik diuji menggunakan simulasi saluran pencernaan secara *in vitro*, dan uji penerimaan konsumen dilakukan oleh 28 panelis tidak terlatih menggunakan skala hedonik 9 poin.

Formulasi menunjukkan karakteristik fermentasi yang baik, ditunjukkan dengan penurunan pH, peningkatan keasaman titrat, dan pertumbuhan bakteri asam laktat. Selama penyimpanan dingin, yogurt mempertahankan sifat fisikokimia dan mikrobiologis yang dapat diterima, meskipun nilai sineresis masih tergolong tinggi. Analisis nutrisi menunjukkan kandungan protein, lemak, gula, dan air yang memadai, sehingga berpotensi sebagai alternatif yogurt berbasis nabati yang bergizi. Viabilitas probiotik setelah simulasi pencernaan mencapai 5,27 log CFU/mL, setara dengan  $\sim 10^7$  CFU per 100 mL penyajian, sehingga memenuhi ambang minimum untuk memberikan manfaat kesehatan. Namun, penurunan jumlah sel signifikan terjadi pada fase lambung. Selain itu, hasil evaluasi sensoris menunjukkan tingkat penerimaan yang rendah, terutama pada atribut rasa, tekstur, dan aroma. Temuan ini menunjukkan bahwa formulasi yogurt memiliki potensi sebagai produk nabati fungsional yang berkelanjutan, namun masih diperlukan optimasi lebih lanjut untuk meningkatkan kestabilan fisik dan daya terima sensorisnya.

Kata kunci: bio-kalsium, isolat protein kacang polong, probiotik, susu jagung ketan, susu kedelai, yogurt nabati