

ISOLASI DAN IDENTIFIKASI BAKTERI ASAM LAKTAT ASAL *BEE BREAD* LEBAH *Tetragonula laeviceps* SERTA POTENSINYA SEBAGAI STARTER FERMENTASI SUSU KAMBING

INTISARI

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Bee bread merupakan salah satu produk lebah berbentuk padatan hasil fermentasi dari campuran pollen, nektar dan saliva pada sarang lebah. Tujuan penelitian ini adalah mengisolasi dan mengidentifikasi bakteri asam laktat (BAL) asal *bee bread* lebah klanceng *Tetragonula laeviceps* dan mengevaluasi potensinya sebagai starter dalam proses fermentasi susu kambing. BAL diisolasi pada medium MRS agar dengan penambahan *Kanamycin*, dan diinkubasi pada 37°C selama 72 jam. Koloni yang tumbuh kemudian diidentifikasi berdasarkan pendekatan morfologi, biokimia dan molekuler. Identifikasi morfologi dan biokimia berdasarkan pada pewarnaan Gram, motilitas, katalase, dan fermentasi gula. Identifikasi molekuler berdasarkan pada amplifikasi sekuen 16S rRNA. Uji pertumbuhan BAL dievaluasi berdasarkan kecepatan pertumbuhan, kadar biomassa, gula reduksi dan keasaman selama 24 jam. Hasil identifikasi morfologi dan biokimia menghasilkan 6 isolat yang memiliki karakter BAL yang selanjutnya dipilih 4 isolat yaitu LVC, LVE, LVF dan LVG untuk pengujian molekuler. Berdasarkan analisis sekuen 16S rRNA, keempat isolat diklasifikasikan sebagai *Lactocaseibacillus paracasei*. Evaluasi uji pertumbuhan dalam medium basal dengan sumber karbon glukosa dan laktosa menunjukkan bahwa *Lb. paracasei* strain LVC, LVE, LVF dan LVG memiliki kemampuan dalam mendegradasi laktosa dan berpotensi sebagai kandidat starter fermentasi susu serta menghasilkan *Lb. paracasei* strain LVE dan LVF sebagai kandidat terbaik. Karakterisasi dalam uji gula reduksi dan keasaman menunjukkan bahwa *Lb. paracasei* strain LVE dan LVF mampu menurunkan kadar laktosa menjadi 7,484 g/L dan 11,049 g/L, serta menghasilkan kadar asam laktat 6,877% dan 7,241% pada akhir fase logaritmik jam ke-18. Parameter kinetika logistik keempat strain *Lb. paracasei* diukur berdasarkan angka *carrying capacity* (k), yield biomassa terhadap substrat ($Y_{X/S}$) dan yield produk terhadap substrat ($Y_{P/S}$). *Lb. paracasei* LVE menghasilkan $k = 0,202 \text{ jam}^{-1}$, $Y_{X/S} = 0,182 \text{ g/g}$ dan $Y_{P/S} = 0,458 \text{ g/g}$. Sementara itu, *Lb. paracasei* LVF menghasilkan $k = 0,212 \text{ jam}^{-1}$, $Y_{X/S} = 0,253 \text{ g/g}$ dan $Y_{P/S} = 0,847 \text{ g/g}$. Hasil penelitian ini menunjukkan bahwa *Lb. paracasei* strain LVE dan LVF berpotensi dimanfaatkan sebagai starter fermentasi susu kambing. Hasil analisis statistik menunjukkan bahwa kualitas susu kambing fermentasi dengan starter *Lb. paracasei* LVE dan LVF tidak berbeda nyata pada nilai pH, keasaman, viskositas, sineresis, total solid dan *total plate count* (TPC). Kesimpulannya, *Lb. paracasei* LVE dan LVF mampu memecah sumber karbon laktosa pada susu kambing, sehingga berpotensi digunakan sebagai starter untuk fermentasi susu kambing.

Kata kunci: Bakteri asam laktat (BAL), *Lactocaseibacillus paracasei*, kinetika pertumbuhan logistik, starter fermentasi susu.

ISOLATION AND IDENTIFICATION OF LACTIC ACID BACTERIA ORIGINAL
BEE BREAD OF *Tetragonula laeviceps* AND ITS POTENTIAL AS
FERMENTATION STARTER OF GOAT MILK

ABSTRACT

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Bee bread is one of bee product from a mixture of pollen, nectar and saliva fermented in the beehive. The study aimed to isolate and identify lactic acid bacteria (LAB) from bee bread of stingless bee *Tetragonula laeviceps* and evaluate its potential as a starter for goat milk fermentation. LAB was isolated from MRS agar medium with the addition of Kanamycin and incubated at 37°C for 72 hours. The growing colonies were then identified based on morphological, biochemical and molecular approaches. Morphological and biochemical identification based on Gram staining, motility, catalase and sugar fermentation. Molecular identification based on 16S rRNA sequence amplification. LAB growth was evaluated based on growth rate, biomass content, reducing sugar and lactic acid production for 24 hours. The results of morphological and biochemical identification resulted in 6 isolates having LAB characters, which were then selected 4 isolates namely LVC, LVE, LVF and LVG for molecular testing. Based on 16S rRNA sequence analysis, the four isolates were classified as *Lactocaseibacillus paracasei*. Evaluation of growth test in basal medium with glucose and lactose carbon sources showed that *Lb. paracasei* LVC, LVE, LVF and LVG had the ability to degrade lactose and were potential candidates for starter milk fermentation and yields *Lb. paracasei* LVE and LVF as the best candidates. Characterization in reducing sugar test and lactic acid production showed that *Lb. paracasei* LVE and LVF were able to reduce lactose levels to 7.484 g/L and 11.049 g/L, and produced lactic acid about 6.877% and 7.241% at the end of the 18 hours logarithmic phase. The logistic kinetic parameters of the four strains of *Lb. paracasei* were measured based on carrying capacity (k), biomass yield ($Y_{X/S}$) and product yield ($Y_{P/S}$). The *Lb. paracasei* LVE yielded $k = 0.202 \text{ h}^{-1}$, $Y_{X/S} = 0.182 \text{ g/g}$ and $Y_{P/S} = 0.458 \text{ g/g}$. Besides, the *Lb. paracasei* LVF yielded $k = 0.212 \text{ h}^{-1}$, $Y_{X/S} = 0.253 \text{ g/g}$ and $Y_{P/S} = 0.847 \text{ g/g}$. The results of this study indicate that *Lb. paracasei* LVE and LVF have the potential to be used as a starter for goat milk fermentation. The results of statistical analysis showed that the parameters of pH, acidity, viscosity, syneresis, total solid and TPC using *Lb. paracasei* LVE and LVF were not significantly different ($P > 0.05$). This concluded that *Lb. paracasei* LVE and LVF are able to degrade the lactose in goat milk.

Keywords : Lactic acid bacteria (LAB), *Lactocaseibacillus paracasei*, logistic growth kinetics, milk fermentation starter