

## Angiotensin-I Converting Enzyme (ACE) Inhibitory Activity of ACE Inhibitory Peptides Produced during Fermentation of Pigeon Pea (*Cajanus cajan*) Tempe

### ABSTRACT

*The increase in the prevalence of hypertension encourages the importance of treating hypertension through inhibition of Angiotensin Converting Enzyme (ACE) which plays an important role in regulating blood pressure. The ACE activity can be inhibited by ACE inhibitor peptides which can be obtained from fermented products such as tempeh which currently uses non-soybean as raw materials, such as pigeon pea. The high protein content and hydrophobic also negatively charged amino acid composition of pigeon pea has the potential as sources of ACE inhibitor peptides. This research aims to study the effect of fermentation time on ACE inhibitory activity during fermentation of pigeon pea tempe and to determine the molecular weight of peptides which contribute to ACE inhibitory activity. This research used a completely randomized design with fermentation time as one primary factor. Pigeon pea were inoculated with Raprima starter and fermented for 0, 12, 24, 36, 48, 72 and 96 h. Peptides extract from the highest ACE inhibitory activity of pigeon pea tempe were then fractionated using dialysis membranes to determine the molecular weight of the peptides. The results showed that proteolytic activity, degree of hydrolysis and peptides content increased with fermentation time. Fermentation increased the ACE inhibitory activity of pigeon pea tempe compared to raw and unfermented pigeon pea. The ACE inhibitory activity reached the maximum after 48 h of fermentation at 76,14% (IC<sub>50</sub> 10,37 mg/g) and then decreased until the end of fermentation. Pigeon pea tempe (fermented for 48 h) has proteolytic activity of  $0,0405 \pm 0,0015$  U / mL, degree of hydrolysis of  $18,89 \pm 0,041\%$  and peptides content of  $2,43 \pm 0,144$  mg/100 g. Peptide fraction of pigeon pea tempe (fermented for 48 h) with molecular weight of <1 kDa has the highest ACE inhibitory activity, which is equal to 87,98%. Based on these results, it can be concluded that the proper time for pigeon pea tempe fermentation which has the highest ACE inhibitory activity is 48 h and peptide fraction of <1 kDa was the most contributing to ACE inhibitory activity of pigeon pea tempe.*

**Keywords :** hypertension, ACE inhibitory peptide, pigeon pea, tempe.

**Aktivitas Penghambatan *Angiotensin Converting Enzyme* (ACE) dari Peptida Inhibitor ACE yang Dihasilkan Selama Fermentasi Tempe Gude (*Cajanus Cajan*)**

**INTISARI**

Terjadinya peningkatan prevalensi hipertensi mendorong pentingnya penanganan hipertensi salah satunya melalui penghambatan aktivitas *Angiotensin Converting Enzyme* (ACE) yang berperan dalam pengaturan tekanan darah. Aktivitas ACE dapat dihambat oleh peptida inhibitor ACE yang dapat diperoleh dari produk fermentasi seperti tempe yang saat ini memanfaatkan bahan baku non-kedelai salah satunya kacang gude. Kandungan protein tinggi dan komposisi asam amino hidrofobik serta bermuatan negatif pada kacang gude sesuai dengan prekursor peptida inhibitor ACE sehingga berpotensi sebagai sumber peptida inhibitor ACE. Penelitian ini bertujuan untuk mempelajari pengaruh lama fermentasi terhadap aktivitas penghambatan ACE selama fermentasi tempe gude serta mengetahui berat molekul peptida yang berperan terhadap aktivitas penghambatan ACE pada tempe gude. Penelitian ini menggunakan Rancangan Acak Lengkap satu faktor, yaitu lama fermentasi (0, 12, 24, 36, 48, 72, dan 96 jam) dengan menggunakan ragi *Raprima*. Ekstrak peptida tempe gude dengan aktivitas penghambatan ACE tertinggi selanjutnya difraksinasi menggunakan membran dialisis untuk mengetahui berat molekul peptida yang berpengaruh terhadap aktivitas penghambatan ACE. Hasil penelitian menunjukkan bahwa aktivitas proteolitik, derajat hidrolisis dan konsentrasi peptida meningkat seiring lama fermentasi. Fermentasi menyebabkan peningkatan aktivitas penghambatan ACE dibandingkan kacang gude mentah dan kacang gude tanpa fermentasi. Aktivitas penghambatan ACE mencapai maksimum pada fermentasi jam ke-48, yaitu sebesar 76,14% ( $IC_{50}$  10,37 mg/g) kemudian menurun sampai akhir fermentasi. Tempe gude (48 jam) memiliki aktivitas proteolitik sebesar  $0,0405 \pm 0,0015$  U/ML, derajat hidrolisis  $18,89 \pm 0,041\%$  dan konsentrasi peptida  $2,43 \pm 0,144$  mg/100 g. Fraksi peptida tempe gude (48 jam) dengan berat molekul  $<1$  kDa memiliki aktivitas penghambatan ACE paling tinggi (87,98%). Lama fermentasi yang menghasilkan tempe gude dengan aktivitas penghambatan ACE tertinggi adalah selama 48 jam dan fraksi peptida yang paling berpengaruh terhadap aktivitas penghambatan ACE adalah fraksi peptida  $<1$  kDa.

**Kata kunci:** hipertensi, peptida inhibitor ACE, gude, tempe.