

**PEPTIDA BIOAKTIF HASIL PENCERNAAN *IN VITRO* TEMPE KORO KRATOK MERAH (*Phaseolus lunatus* L.) SEBAGAI INHIBITOR ANGIOTENSIN CONVERTING ENZYME (ACE) DAN PENYERAPANNYA DALAM USUS HALUS TIKUS SPARAGUE DAWLEY**

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**ABSTRAK**

Penyakit kardiovaskuler salah satunya disebabkan oleh hipertensi, yang dapat dikontrol dengan mengonsumsi makanan yang tinggi kandungan peptida inhibitor ACE. Pada proses fermentasi tempe koro kratok terjadi proteolisis yang menghasilkan peptida dan berpotensi sebagai peptida bioaktif. Selama di saluran pencernaan, peptida terdegradasi oleh enzim-enzim pencernaan menjadi peptida yang lebih pendek dan mempunyai kemampuan dalam menghambat aktivitas ACE. Tujuan dari penelitian ini yaitu mempelajari aktivitas penghambatan ACE dari peptida bioaktif tempe koro sebelum dan setelah pencernaan *in vitro*, mengkarakterisasi peptida inhibitor ACE hasil pencernaan *in vitro* tempe koro kratok, dan mengevaluasi penyerapannya pada usus halus tikus *Sparague Dawley*.

Sampel yang digunakan dalam penelitian ini ada 3 yaitu koro kratok rebus (non fermentasi), tempe koro kratok (fermentasi), tempe koro kratok rebus (tempe olahan). Tempe koro kratok difermentasi dengan inokulum komersil 'Raprima' selama 48 jam. Perebusan dilakukan selama 15 menit. Proses pencernaan *in vitro* dilakukan dengan menghidrolisis ekstrak protein dengan enzim pepsin pankreatin secara berurutan selama 240 menit. Perubahan konsentrasi peptida, DH, dan aktivitas penghambatan ACE selama proses pencernaan diamati. Kemudian peptida inhibitor ACE yang dihasilkan dari proses pencernaan *in vitro* dikarakterisasi berat molekulnya menggunakan membran dialisis (1; 3,5; dan 14 kDa). Studi penyerapan peptida inhibitor ACE menggunakan kantong usus terbalik dari tikus *Sparague Dawley* jantan yang berumur 3 bulan dengan berat  $\pm$  250 g.

Hasil penelitian menunjukkan kandungan protein koro kratok sebesar 10,60%. Keberadaan asam amino Arg, Lys, Asp, Glu, Phe, dan Leu cukup banyak ditemukan pada tempe koro kratok. Proses fermentasi dan perebusan dapat meningkatkan pelepasan peptida selama proses pencernaan *in vitro*. Peningkatan aktivitas penghambatan ACE tertinggi pada koro rebus sebesar 23,03%. Walaupun begitu, aktivitas penghambatan yang ditunjukkan oleh tempe koro rebus (90,05%) lebih besar dibandingkan koro rebus (49,42%). Peptida inhibitor ACE dari tempe koro kratok didominasi oleh peptida dengan BM <1 kDa dengan aktivitas penghambatan sebesar 84,34%. Sebagian besar peptida inhibitor ACE terserap di bagian jejunum dan memberikan aktivitas penghambatan ACE sebesar 81,59%.

Kata kunci: tempe, peptida bioaktif, aktivitas penghambatan ACE, pencernaan, absorpsi.

**BIOACTIVE PEPTIDES PRODUCED FROM IN VITRO DIGESTION OF KORO KRATOK (*Phaseolus lunatus* L.) TEMPE AS ANGIOTENSIN CONVERTING ENZYME INHIBITOR AND ITS ABSORPTION IN SPARAGUE DAWLEY SMALL INTESTINE**

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**ABSTRACT**

Cardiovascular disease is caused by hypertension, which can be controlled by consuming foods that are high in ACE inhibitor peptides content. Proteolysis that occurs in the fermentation process produces peptides and has the potential as a bioactive peptide. During in the digestive tract, peptides are degraded by digestive enzymes into shorter peptides and have the ability to inhibit ACE activity. The purpose of this study was to study the ACE inhibition activity of the bioactive peptides of koro tempe before and after *in vitro* digestion, characterize ACE inhibitor peptides produced from *in vitro* digestion of koro kratok tempe, and evaluate its absorption in *Sprague Dawley* small intestine.

The samples used in this study were boiled koro kratok (non-fermented), koro kratok tempe raw (fermented), boiled koro kratok tempe (processed tempe). The koro kratok tempe was fermented by commercial culture 'Raprima' for 48 hours. Boiling was done for 15 minutes. *In vitro* digestion was carried out by hydrolyzing of tempe protein extract with pepsin-pancreatin sequentially for 240 minutes. Changes in peptide content, DH, and ACE inhibition activity during the digestion process were analyzed. Then the ACE inhibitor peptides produced from the digestion process were characterized its molecular weight using dialysis membranes (1; 3.5; and 14 kDa). The absorption study of ACE inhibitory peptides was tested using inverted gut sac of male *Sprague Dawley* rat ( $\pm 250$  g) aged 3 months.

The results showed that the protein content in koro kratok tempe was around 10.60%. Some amino acids such as Arg, Lys, Asp, Glu, Phe, and Leu, were mostly found in koro kratok tempe. The fermentation and cooking process could increase the release of peptides during the gastrointestinal digestion process. The highest increase of ACE inhibition activity in koro kratok non-fermented was 23.03%. Even so, the inhibitory activity by cooking process tempe (i.e. 90.05%) was higher than koro kratok non-fermented (i.e. 49.42%). ACE inhibitor peptides derived from koro kratok tempe were dominated by peptides with BM <1 kDa and could inhibit ACE activity by 84.34%. Most ACE inhibitory peptides derived from koro kratok tempe were absorbed in the jejunum and provided ACE inhibitory activity of 81.59%.

Keyword: tempe, bioactive peptide, ACE inhibitory activity, digestion, absorption.