

PeptoGreen

GREEN SOYBEAN PROTEOLYSATE: A NEW SOURCE OF ANTIHYPERTENSIVE PEPTIDES WITH INDUSTRIAL APPLICATIONS



(PI 2013700449)

WHY DO WE NEED THIS INVENTION?

- Hypertension is a major risk factor for mortality, with 932 mil. adults affected around the world, 633 mil. from developing countries. Expected to rise to 1.56 bil. adults in 2025¹.
- Hypertension has been found to be mediated by the renin-angiotensin pathway, involving the angiotensin I-converting enzyme (ACE) which converts angiotensin I into angiotensin II, thereby causing elevated blood pressure.
- Various antihypertensive medications available on the market are targeted towards ACE inhibition. However, these drugs have adverse side effects such as hyperkalemia, headache, dizziness, fatigue, nausea, renal impairment and congenital malformation and stillbirth to pregnant women.
- Therefore, enzyme-generated ACE inhibitory peptides can be incorporated as food ingredients to keep blood pressure within the normal range, in addition to other health benefits as well as a source of amino acids.

WHAT IS THE INVENTION AND HOW IT FULFILLS THE SAID NEED?

- Green soybean seeds are typically eaten as a vegetable yet has limited use otherwise.
- Its high protein content enables us to exploit it by enzymatically hydrolyzing the protein to yield proteolysates with ACE inhibitory property.
- The proteolysate can be incorporated into various types of beverages and food which confers them with the ability to stabilize blood pressure through a normal diet.
- The proteolysate may also confer beneficial functional properties (emulsification, water binding) towards food systems.

BENEFITS

- Easily incorporated into food systems as a source of protein and technological aid.
- Easier digestion of the protein by our gastrointestinal system.
- Contains all the essential amino acids, phytochemicals, vitamins and minerals inherent to soy.
- Exerts antihypertensive effect.
- No adverse side effects.

WHO ARE THE POTENTIAL CONSUMERS?

- General and health-conscious consumers.
- Individuals with potential to develop hypertension.
- Food manufacturers.

Table 1: Peptides derived from green soybean seed proteolysate with their corresponding hydrophobicity and ACE inhibitory capability.

Peptide	Hydrophobicity (%)	ACE inhibitory activity* (%)	IC ₅₀ (mg/mL)
Peptide 1	57	88.21 ± 5.16	0.70 ± 0.16
Peptide 2	33	96.96 ± 2.48	0.41 ± 0.21
Peptide 3	25	92.92 ± 3.37	2.41 ± 0.47
Peptide 4	66	100.70 ± 2.48	1.19 ± 0.42
Peptide 5	33	90.40 ± 1.88	0.45 ± 0.24

Values for ACE inhibitory activity and IC₅₀ are represented by the mean of triplicates ± S.D. IC₅₀ is the concentration of the peptide which inhibits 50% of the enzyme activity.
* Peptide concentration at 10 mM.

¹ Kearney et al., (2005) Global burden of hypertension: analysis of worldwide data. Lancet, 365, 217-223.



Figure 1: A depiction of the flow from seed, to its applications. The raw green soybean seeds were ground to become flour and was defatted. Afterwards, the defatted flour was subjected to enzymatic hydrolysis under specific conditions using a commercial protease to yield proteolysates with strong ACE inhibitory activity. Subsequent purification of the proteolysate identified 5 peptides that was responsible for the strong ACE inhibition.

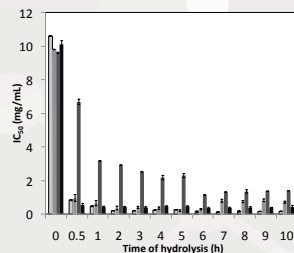


Figure 2: Changes in the IC₅₀ over hydrolysis time of green soybean hydrolysate). □ : Protease A, ■ : Protease B, ▒ : Protease C, ■ : Protease D. Bars represent the standard deviation from triplicate determination.

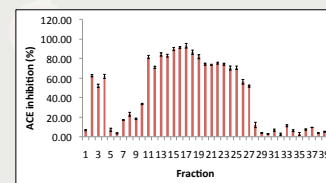
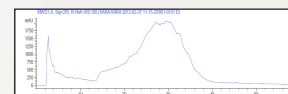


Figure 3: Elution profile of green soybean seed proteolysates via reversed-phase liquid chromatography and its ACE inhibitory activity. The fractions were designated as 1 until 40, and activity is represented by the vertical bars. The values were represented as the mean of triplicates ± S.D.

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