

# Identification of proteins and bioactivities of okara (*Glycine max*) hydrolysates

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Okara is a by-product of soymilk processing, which contains 20–30% protein that can be enzymatically hydrolyzed to release bioactive peptides. The study characterized okara proteins and assessed the hydrolysates produced by papain, bromelain, and pepsin. Soluble protein isolates (38.76%) were prepared by freeze-drying and isoelectric precipitation. Papain hydrolysates showed the highest soluble protein (49.09%) and yield (91%), exceeding bromelain (40.45%) and pepsin (32.22%). SDS-PAGE confirmed notable changes in protein band patterns after hydrolysis, while LC-MS/MS identified major protein sources as 11S glycinin G1,  $\beta$ -conglycinin  $\beta$  subunit 2, and 11S glycinin G2, with representative sequences such as NLQGENEGEDKGAIIVTVK. BIOPEP-UWM predicted ACE- and DPP-IV-inhibitory peptides. Antioxidant assays showed bromelain hydrolysates had the strongest DPPH scavenging activity (35.15%), while papain hydrolysates had the highest FRAP reducing power (6.80  $\mu\text{M Fe}^{2+}$ ). These results indicate that okara hydrolysates exhibit antioxidant, antihypertensive, and antidiabetic potential, supporting their application in functional foods and sustainable by-product utilization.