

INTISARI

Latar Belakang: Homeostasis protein merupakan proses yang diperlukan untuk menjaga stabilitas protein sinaptik yang berperan dalam plastisitas sinaptik dan memori. Dalam otak, proses tersebut dipengaruhi oleh *metabotropic glutamate receptor 5* (mGluR5) yang berperan dalam regulasi sintesis protein sinaptik, termasuk *activity-regulated cytoskeleton-associated protein* (Arc) yang mengatur kekuatan sinaps. Penurunan ekspresi kedua protein tersebut dilaporkan berkontribusi terhadap penurunan fungsi memori pada proses penuaan. Selain faktor molekuler, penurunan fungsi memori juga berkaitan dengan tidak cukupnya asupan protein. Lansia seringkali tidak memenuhi kebutuhan protein harian, sehingga berpotensi memperburuk penurunan fungsi memori.

Tujuan Penelitian: Menganalisis pengaruh pemberian protein nabati terhadap fungsi memori melalui ekspresi mRNA *mGluR5* dan *Arc* dalam *hippocampus* serta fungsi memori spasial menggunakan *Morris Water Maze* (MWM) pada tikus Wistar penuaan awal.

Metode: Sebanyak 20 ekor tikus dibagi ke dalam 4 kelompok: kelompok kontrol (N) dan tiga kelompok intervensi protein nabati dengan dosis 0,315 g/hari (D1), 0,630 g/hari (D2), dan 0,935 g/hari (D3). Uji MWM dilakukan sebelum dan sesudah perlakuan. Setelah 8 minggu perlakuan, tikus diterminasi dan jaringan *hippocampus* dianalisis untuk ekspresi gen menggunakan qPCR.

Hasil Penelitian: Tidak terdapat perubahan bermakna pada fungsi pembelajaran maupun memori spasial antara kelompok intervensi dan kontrol. Ekspresi *mGluR5* tertinggi diamati pada pemberian dosis 1 (D1), sementara ekspresi gen *Arc* tertinggi pada dosis 2 (D2). Hasil tersebut menunjukkan adanya modulasi ekspresi gen terkait fungsi sinaptik, tanpa perubahan perilaku memori yang signifikan.

Kesimpulan: Pemberian protein nabati berpotensi memodulasi ekspresi gen yang berkaitan dengan plastisitas sinaptik pada *hippocampus* tikus penuaan awal, tetapi belum menunjukkan efek signifikan terhadap fungsi memori spasial.

Kata Kunci: Protein Nabati, Penuaan, mGluR5, Arc, Memori Spasial

ABSTRACT

Background: Protein homeostasis determines the stability of synaptic proteins involved in synaptic plasticity and memory. In the brain, this process is influenced by metabotropic glutamate receptor 5 (mGluR5), which plays a role in controlling synaptic protein synthesis, including activity-regulated cytoskeleton-associated protein (Arc), which regulates synaptic strength. Reduced expression of these proteins has been associated with age-related memory decline. In addition, inadequate protein intake in older adults may exacerbate memory function decline.

Objectives: To analyse the effects of plant-based protein supplementation on memory through mRNA expression of mGluR5 and Arc in the hippocampus and spatial memory performance using the Morris Water Maze (MWM) test in early-aging Wistar rats.

Methods: Twenty Wistar rats were divided into four groups: a control group (N) and three intervention groups receiving plant-based protein at doses of 0.315 g/day (D1), 0.630 g/day (D2), and 0.935 g/day (D3). The MWM test was conducted before and after treatment. After 8 weeks, rats were sacrificed and hippocampal tissues were analysed for gene expression using qPCR.

Results: No significant differences were observed in spatial learning or memory performance among groups. The highest mGluR5 expression occurred in the D1 group, while the highest Arc expression was observed in the D2 group. These findings indicate molecular modulation of synaptic-related genes without significant behavioural changes.

Conclusion: Plant-based protein supplementation may modulate synaptic plasticity related gene expression in the hippocampus of early-aging rats but did not significantly affect spatial memory performance.

Keywords: Plant-based protein, Aging, mGluR5, Arc, Spatial memory