Efek dan Mekanisme Neuroproteksi Ekstrak Daun dan Minyak Biji Moringa oleifera Pada Mencit Model Stres Kronik = Neuroprotective Effect and The Mechanism of Leaf Extract or Seed Oil of Moringa oleifera in Chronic Stress Mice

Emni Purwoningsih, author

Abstrak

Latar belakang: Moringa oleifera (MO) secara luas telah dimanfaatkan oleh masyarakat Indonesia sebagai bahan makanan dan juga obat tradisional. M. oleifera telah terbukti memiliki berbagai efek farmakologi diantaranya efek neuroprotektif. Tujuan penelitian ini untuk menganalisis efek neuroprotektif dan mekanisme dasar dari ekstrak etanol 70% daun (MOE) dan minyak biji M. oleifera (MOO) pada mencit yang mengalami depresi, kecemasan dan fungsi kognitif akibat induksi stres kronik.
Metode: Dalam penelitian ini kami menguji analisis fitokimia MOE dengan LC-MS dan MOO dengan GC-MS. Dua puluh empat mencit jantan dengan berat badan 25-30 g, dibagi secara acak menjadi 6 kelompok yaitu kelompok normal (mencit normal diberi 0,5% CMC), WIRS (mencit stres dengan induksi WIRS+CMC 0,5%), kelompok WIRS+MOE400 (mencit stres+ MOE 400 mg/kg BB), WIRS+MOE800 (mencit stres + MOE 800 mg/kg BB), WIRS+MOO1 (mencit stress + MOO 1 ml/kg BB), dan WIRS+MOO2 (mencit stress + MOO 2 ml/kg BB). Pemberian MOE dan MOO diberikan secara oral selama 23 hari. Induksi WIRS dilakukan pada hari 1 sampai 15 selama 2 jam, dan hari ke 16 dilakukan selama 6 jam. Selanjutnya dilakukan uji perilaku dengan open field test untuk prilaku kecemasan, forced swim test untuk perilaku depresif, dan uji memori dengan Y-maze test dan novel objective recognition test. Pada hari ke-24 mencit dikorbankan dan diambil darah serta jaringan otak untuk dianalisis lebih lanjut.
Hasil: MOE mengandung 5,8% (b/b) total fenol dan 2,70% (b/b) total flavonoid, sedangkan MOO mengandung 0,04% (b/b) total fenol, tetapi flavonoid tidak terdeteksi. GC-MS menghasilkan MOO yang mengandung senyawa asam lemak, sterol, vitamin E dan senyawa aromatik, sedangkan MOE didominasi oleh senyawa flavonoid, asam lemak dan alkaloid juga ditemukan. Pemberian MOE 400 mg/kg BB dan MOO 2 mL/kg BB, kadar protein dan ekspresi BDNF meningkatkan signifikan ($p<0,050$) dibanding kelompok WIRS, selanjutnya MOE 800 mg/kg BB dan MOO 1 dan 2 mL/kg BB aktivitas asetilkolinesterase (AChE) menurun signifikan ($p<0,05$) dibandingkan kelompok WIRS. MOE 400 dan 800 mg/kg BB dan MOO 1 mL/kg BB, tingkat depresi dan kecemasan menurun signifikan serta memori meningkat signifikan dibandingkan kelompok WIRS. Sedangkan MOO 2 mL/kg BB tingkat kecemasan tidak berbeda dari kelompok WIRS.
Kesimpulan: MOE dan MOO memiliki efek neuroprotektif dengan memperbaiki fungsi kognitif dan menurunkan tingkat depresi dan kecemasan melalui mekanisme penghambatan aktivitas AChE dan meningkatkan kadar protein dan ekspresi mRNA BDNF.
.....Background: Moringa oleifera (MO) has been widely used by Indonesian people as a functional food and as traditional medicine. M. oleifera has been shown to have various pharmacological effects including neuroprotective effects. The aim of this study was to analyze the neuroprotective effects and the basic mechanisms of 70% ethanol extract (MOE) and seed oil of M. oleifera (MOO) in mice depression-like behavior, anxiety-like behavior, and cognitive decline due to chronic stress induction.

Methods: In this study we examine the phytochemical analyze of MOE by LC-MS and MOO by GC-MS. Twenty-four male mice with a body weight of 25-30 g, were randomly divided into 6 groups. Normal group (normal mice given 0.5% CMC), WIRS (stressed mice with induced water immersion restraint stress/WIRS+CMC 0.5%) group, WIRS+MOE400 (stressed mice+ MOE 400 mg/kg BW) group, WIRS+MOE800 (stress mice + MOE 800 mg/kg BW) group, and WIRS+MOO1 (stress mice + MOO 1 ml/kg BW) group, and WIRS+MOO2 (stress mice + MOO 2 ml/kg BW) group. The MOE and MOO were orally administration for 23 days. MOE and MOO were administered orally for 23 days. WIRS induction was performed for 2 hours on days 1 to 15, and for 6 hours on day 16. The open field test for anxious behavior, the forced swim test for depressive behavior, and a memory test using the Y-maze test and the novel objective recognition test were then performed sequentially on days 17-23. On day 24th the mice were sacrificed and the blood as well as the brain tissue were collected for further analyze.
Results: MOE contained 5.8% (w/w) of total phenols and 2.70% (w/w) of total flavonoids, while MOO contained 0.04% (w/w) of total phenols, but no flavonoids were detected. GC-MS produced MOO which contained fatty acid compounds, sterols, vitamin E and aromatic compounds, while MOE which was dominated by flavonoids, fatty acids, and alkaloids, were also found. Giving MOE 400 mg/kg BW and MOO 2 mL/kg BW, protein levels and expression of BDNF increased significantly ($p<0.050$) compared to the WIRS group, then MOE 800 mg/kg BW and MOO 1 and 2 mL/kg BW acetylcholinesterase activity (AChE) decreased significantly ($p<0.05$) compared to the WIRS group. MOE 400 and 800 mg/kg BW and MOO 1 mL/kg BW, the levels of depression and anxiety decreased significantly, and memory increased significantly compared to the WIRS group. Whereas MOO 2 mL/kg BW the anxiety level was not different from the WIRS group.
Conclusion: MOE and MOO have neuroprotective effects by improving cognitive function and reducing levels of depression and anxiety through mechanisms of inhibiting acetylcholinesterase activity and increasing protein levels and BDNF mRNA expression.