

ABSTRAK

Penelitian ini bertujuan untuk mengeksplorasi potensi antioksidan ekstrak buah okra merah (*Abelmoschus esculentus*, Moench), yang selama ini telah banyak dimanfaatkan oleh masyarakat, untuk sayur dan bahan obat tradisional. Sudah banyak dilaporkan bahwa buah okra merah mengandung bahan aktif flavonoid dan *quercetin*, yang merupakan antioksidan untuk mengatasi tingginya radikal bebas, pada penderita diabetes mellitus, sehingga dapat dimanfaatkan untuk perbaikan sensitivitas jaringan terhadap insulin yang menurun pada penderita diabetik.

Penelitian ini diawali dengan membuat ekstrak kasar maupun fraksinasi non polar, semi polar dan polar ekstrak buah okra, selanjutnya dilakukan uji toksisitas *in vitro* ekstrak kasar dan berbagai fraksi ekstrak buah okra merah, untuk mencari IC_{50} ekstrak kasar maupun ketiga fraksinya dengan metode DPPH. Hewan coba yang digunakan adalah mencit jantan strain BALB/C umur 3-4 bulan, dengan berat badan 30-40 g. yang dibagi menjadi 2 kelompok, yaitu kelompok kontrol normal tanpa induksi *streptozotocyn* (KN) dan kelompok mencit diabetik hasil induksi *streptozotocyn* (STZ). Kelompok mencit diabetik dibedakan menjadi 2 sub kelompok yaitu kelompok kontrol diabet (KD), kelompok diabetik- Acarbose (KA) dan kelompok perlakuan dengan ekstrak kasar (EK), ekstrak non polar (NP), ekstrak semi polar (SP) dan ekstrak polar (EP) buah okra. Sebelum dan sesudah injeksi STZ, dilakukan pengukuran terhadap kadar glukosa darah puasa (GDP) dan kolesterol total darah puasa hewan coba. Setelah diperoleh mencit dengan kadar glukosa darah dan kolesterol darah puasa puasa di atas 150 mg/dL, kelompok mencit diabetik selanjutnya diberi perlakuan ekstrak kasar dengan dosis = 100 mg /kg BB, NP = 20,04 mg / kg BB SP3 = 27,38 mg / kg BB dan EP = 54,10 mg/kg BB. Penentuan dosis NP,SP maupun EP dilakukan berdasarkan nilai konversi dari ekstrak kasar buah okra.

Perlakuan ekstrak kasar dan berbagai fraksi ekstrak buah okra merah dilakukan selama 14 hari. Pada hari ke 15 dilakukan pengambilan darah *intracardiac* yang sebelumnya hewan coba dipuasakan selama 6-8 jam. Pengukuran kadar insulin, SOD dan MDA serum, menggunakan alat *spektrofotometer*. Sedangkan pengukuran kadar GDP, dilakukan dengan alat Accu Check. Pengamatan dan pengukuran diameter pulau Langerhans dan jumlah sel β Langerhans kelenjar pankreas, dilakukan dengan pewarnaan *Gomory chrome alum Haematoxylin-phloxylene*. Sedangkan pengamatan dan pengukuran densitas GLUT-4 pada sitoplasma dan membran sel otot lurik dilakukan dengan pembuatan jaringan otot lidah yang diwarnai dengan metode imunohistokimia DAB anti-GLUT-4. Data hasil kadar insulin dianalisis dengan uji t, data dengan

variansi homogen, dianalisis menggunakan analisis varians yang dilanjutkan dengan uji Duncan. Uji statistik dilakukan pada $\alpha = 0.05$.

Hasil uji *Diphenylpicrylhydrazyl* (DPPH) untuk menentukan nilai IC_{50} dalam penelitian ini, didapatkan hasil bahwa IC_{50} ekstrak kasar buah okra merah sebesar = 26,8594 $\mu\text{g}/\text{mL}$, ekstrak non polar = 139,598 $\mu\text{g}/\text{mL}$, ekstrak semi polar = 84,871 $\mu\text{g}/\text{mL}$ dan ekstrak polar = 130,290 $\mu\text{g}/\text{mL}$. Dari hasil penelitian ini dapat disimpulkan bahwa Ekstrak kasar dan berbagai fraksi ekstrak buah okra merah, mampu meningkatkan diameter pulau Langerhans dan meningkatkan jumlah sel β Langerhans kelenjar pankreas mencit yang rusak akibat induksi STZ. Ekstrak kasar dan berbagai fraksi ekstrak buah okra merah mampu menurunkan kadar glukosa darah dan kolesterol total darah mencit diabetik. Ekstrak kasar dan berbagai fraksi ekstrak buah okra merah mampu meningkatkan kadar SOD dan menurunkan kadar malondialdehid (MDA) serum darah mencit diabetik. Ekstrak kasar dan berbagai fraksi ekstrak buah okra merah mampu meningkatkan sensitivitas jaringan terhadap insulin pada mencit diabetik. Ekstrak kasar dan berbagai fraksi ekstrak buah okra merah mampu meningkatkan densitas GLUT-4 pada sitoplasma dan permukaan membran sel otot lurik pada mencit diabetik. Ekstrak kasar dan berbagai fraksi ekstrak buah okra merah mampu meningkatkan sensitivitas jaringan terhadap insulin dengan menurunkan indeks IRhoma pada mencit diabetik.

ABSTRACT

This study aims to explore the antioxidant potency of red okra extract (*Abelmoschus esculentus* (L), Moench), which has been widely used for vegetables and traditional medicinal ingredients by locals. It has been reported that the red okra fruit contains the active ingredient such as flavonoids and quercetin; an antioxidant known to overcome the high free radicals, in people with diabetes mellitus. Therefore, it can also be used to ameliorate tissue sensitivity toward insulin which decreased in diabetic mice.

This study begun with the preparation of okra crude extract and its fractions, which are non-polar, semi polar, and polar. In the first-year research, the 50% lethal dose (LD₅₀) was already determined and antioxidant activity of okra extracts was conducted *in vitro* using DPPH (diphenyl picrylhydrazyl) methods. This study used 35 male mice, 3-4 months old, weighed 30-40 g, distributed to the normal control group and the diabetic group (induced by streptozotocin). Mice were grouped to non-diabetic mice as the normal control group (KN), while STZ-induced diabetic mice were classified into 2 control group; diabetic control group (KD) and diabetic control group inducted with Acarbooses (KA), and lastly, okra extract treatment group. Treatment groups were divided into four subgroups namely: crude extract (EK), non polar extract (NP), semi polar extract (SP) dan polar extract (P). Each group consisted of 5 mice. Before and after STZ injection, the measurement of fasting blood glucose level and total cholesterol was performed. Only mice with 150 mg/dL fasting blood sugar levels was used as diabetic mice on this research. Then, EK group was given crude extract with the dose of 100 mg/kg BW, NP group given the 20,04 mg/kg BW, SP group given the dose of 27,38 mg/kg BW, and P group given the dose of 54,10 mg/kg BW. The estimation of NP, SP, and P dose was based on the conversion result from okra crude extract.

The administration of the extract of red okra were carried out for 14 days . On the 15th day, blood was extracted from mice through intracardiac, after mice was fasting for 6-8 hours. The measurement of insulin, SOD, and MDA serum levels were performed using spectrophotometer. Blood glucose level was measured with Accu Check glucometer. The analysis and measurement of Langerhans islet diameter and the counting of its β cells were performed by Gomory chrome alum Haematoxylin-phloxylene staining process. Meanwhile, the analysis of GLUT-4 density in cytoplasm and strained muscle cell membrane were performed by immunostaining the tongue muscle tissue using DAB anti-GLUT-4. Data with normal distribution, for insulin level, was analyzed with t-test. Data with homogenic variance was analyzed using variance analysis continued with Duncan test. Statistic test was performed at $\alpha = 0,05$.

Diphenylpicrylhydrazyl (DPPH) test was performed to know the IC₅₀ value. The result shows that okra pods extract had crude extract = 26.8594 µg / mL, non-polar extract = 139.598 µg / mL, semi-polar extract = 84.871 µg / mL and polar extract = 130,290 µg / mL. The results of this study it can be concluded that crude extracts and various fractions of red okra pods extract can increase the diameter of the islets of Langerhans and increase the number of β cells of Langerhans islet in diabetic mice. Crude extracts and various fractions of red okra pods extract can reduce blood glucose levels of diabetic mice. Crude extracts and various fractions of red okra pods extract can increase SOD levels and reduce the levels of malondialdehyde (MDA) blood serum of diabetic mice. Crude extracts and various fractions of red okra pods extract can increase tissue sensitivity toward insulin in diabetic mice. Crude extracts and various fractions of red okra pods extract can increase GLUT-4 density in cytoplasm and striated muscle cell surface membrane in diabetic mice. Crude extracts and various fractions of red okra pods extract can also increase tissue sensitivity toward insulin by decreasing the IRhoma index in diabetic mice.