BIJI DUWET (*Syzygium cumini* L. (Skeel) SEBAGAI SUMBER ANTIOKSIDAN ALAMI DAN POTENSI APLIKASINYA DI BIDANG PANGAN

ABSTRAK

Oksidasi lipid merupakan penyebab utama kerusakan minyak atau makanan berminyak selama proses dan penyimpanan. Sejauh ini kerusakan oksidatif lipid, efektif dihambat dengan penambahan antioksidan sintetik seperti *butylated hydroxyanisole* (BHA) dan *butylated hydroxytoluene* (BHT). Namun demikian penggunaannya masih menimbulkan keraguan akan kesehatan konsumen yang ditimbulkannya. Ekstrak biji duwet memiliki kapasitas antioksidatif yang kuat terhadap penangkapan radikal bebas *2,2 diphenyl-1-picrylhydrazyl* (DPPH), kuat terhadap reduksi radikal ion feri (*ferric ion reducing antioxidant power)*, penangkapan radikal kation *2,2 azinobis 3-ethylbenzothiazoline-6-sulphonate* (ABTS), penangkapan radikal nitroksida (•NO) dan penghambatan peroksidasi lipid pada sistem emulsi asam lemak linoleat.

Tujuan penelitian adalah mengidentifikasi secara taksonomi, sifat kimia dan fisik buah dan biji Duwet (*Syzygium cumini* L. (Skeel), memilih satu diantara tiga pelarut organik (metanol 50%, etanol 50% dan etil asetat 85%) untuk ekstraksi bubuk biji Duwet (BBD) dengan parameter: hasil (*yield*), *phenolic compound*, aktivitas antioksidan ekstrak dengan metode penangkapan radikal bebas DPPH, reduksi ion feri dan penghambatan peroksidasi lipid (*linoleic acid system*), mengidentifikasi dan mengkuantifikasi senyawa fenolik pada ekstrak metanolik biji duwet (EMBD) serta mengetahui pengaruh penambahannya terhadap penghambatan oksidatif pada emulsi minyak ikan Patin (*Pangasius hypothalamus*). Untuk mencapai tujuan tersebut maka dilakukan 3 Tahapan Penelitian. Tahap 1 uji taksonomi sampel dengan metode kunci identifikasi tanaman, ekstraksi bubuk biji duwet dengan 3 pelarut organik secara maserasi pada suhu ruang (25^{o}C), uji aktivitas antioksidan ketiga ekstrak dan pemilihan pelarut. Tahap 2, fraksinasi EMBD dengan metode partisi cair-cair, identifikasi kualitatif dan kuantitatif senyawa fenolik secara KLT dan HPLC. Tahap 3 aplikasi EMBD untuk penghambatan kerusakan oksidatif pada emulsi minyak ikan Patin.

Hasil penelitian menunjukkan bahwa ekstraksi BBD dengan metanol 50% (v/v) paling sesuai, dengan hasil 16,29±0,5%(*db*), fenolik total 45,99±0,25% (g-GAE/100g), 2,28±0,07% (g-QE/100g) dan 26,9±0,07% (g-TAE/100g), aktivitas antioksidan (10-200 ppm) terhadap penangkapan radikal bebas DPPH (*2,2 diphenyl-2-picrylhydrazyl)* 92,87% (200 ppm), aktivitas pereduksi ion feri (50-800 ppm) sebesar OD =3,11±0,01 (600 ppm), penghambatan peroksidasi lipid dalam sistem asam lemak linoleat pada konsentrasi 25-800 ppm (inkubasi 96 jam), 50,13±0,1% (100 ppm). Identifikasi senyawa fenolik ketiga fraksi EMBD dengan KLT menunjukkan bahwa, baik pada fraksi air, etil asetat dan fraksi etil asetat terhidrolisis positif mengandung asam galat (R_f = 0,76), rutin (R_f = 0,47) dan asam tanat (R_f=0,74). Identifikasi kuantitatif

menunjukkan pada fraksi air terdapat senyawa kuersetin (t_R=8,05) dan (+)-katekin (t_R= 2,79) masing-masing sebesar 25 ppm dan 55181 ppm. Pada fraksi etil asetat terdapat senyawa rutin (t_R= 20,84) dan (+)-katekin (t_R= 2,79) sebesar 54,1 ppm dan 258 ppm dan sedangkan pada fraksi etil asetat terhidrolisis ditemukan senyawa rutin sebesar 404 ppm dan (+)-katekin 28692 ppm. Senyawa asam galat tidak ditemukan (*trace*) pada EMBD. Penambahan EMBD (50-800 ppm) pada emulsi minyak ikan Patin mampu menghambat peroksidasi lipid secara siqnifikan (p <0,05) dibanding BHA dan GSE. Nilai PoV dan TBARS pada Kontrol selalu lebih tinggi hingga 144 jam inkubasi. Sampel yang ditambahkan EBMD, BHA dan GSE terbukti efektif menghambat peroksidasi emulsi minyak ikan dibanding Kontrol. Meski demikian hingga pada 144 jam inkubasi, nilai TBARS tidak lebih dari 4,0 µM-MDA/L (dibawah nilai ambang batas keberterimaan produk) sebesar 1,0 mg MDA/kg (1 mg-MDA/kg≈ 13,7055 µM-MDA/kg). Kemampuan EMBD pada penghambatan peroksidasi lipid lebih kuat dibanding GSE, tetapi lebih lemah dibanding BHA. EMBD berpotensi sebagai antioksidan alami untuk penghambatan oksidasi lipid dan pembentukan flavor menyimpang.

Katakunci: biji duwet (*Syzygium cumini* L. (Skeel), antioksidan, TBARS, (+)-katekin

JAVA PLUM (S*yzygium cumini* L. (Skeel) SEED AS SOURCE OF NATURAL ANTIOXIDANT AND ITS POTENTIAL APPLICATION IN FOOD SYSTEM

ABSTRACT

Lipid oxidation is a major causes of quality deterioration of edible oil and food containing oil during processing and storage. Synthetic antioxidants as such *butylated hydroxyanisole* (BHA) and *butylated hydroxytoluene* (BHT) has been used as antioxidant and effective to prevent oxidative deterioration. However consumers have become concerned about possible toxicological effects and often prefer natural antioxidants for food consume as part of healthy diet. Java Plum (*Syzygium cumini* L. (Skeel) seed extract had strongly on radicals scavenging activity of *2,2 diphenyl-1-picrylhydrazyl* (DPPH), reduction Ferric ion (FRAP), kation radical scavenging of *2,2-azinobis 3-ethylbenzothiazoline-6-sulphonate* (ABTS) and inhibition lipid oxidation.

The research purposes is identified in taxonomic, the chemistry and physical fruit and seeds Duwet (*Syzygium cumini* L.(Skeel), choose one of three organic solvents (methanol 50 % , ethanol 50 % and ethyl acetate 85 %) for extraction powder Duwet (bbd) seeds with the parameters: the (yield), phenolic compound , antioxidant activity extract by RSA-DPPH assay, total reduction power by FRAP assay and inhibition lipid peroxidation (linoleic acid system), identification of phenolic compound of extract by HPLC and investigate ability of methanolic 50% extract of Java Plum seed (MEJS) to inhibit lipid deterioration directly in oil-in-water emulsions. To achieve this purpose then done 3 stage research. Stage 1 taxonomic sample assay with the methods key identification plants, extraction powder seeds Duwet with 3 organic solvents in maceration at room temperature (25±2^{o}C), the third antioxidant activity extract and selection solvent. Stage 2 fractionate MEJS with the methods liquid-liquid partition, identification qualitative and quantitative phenolic compound by TLC and HPLC. Stage 3, application MEJS to inhibition oxidative damages in an Stripped catfish oil emulsion.

The results showed that the methanolic 50% (v/v) extraction had highest yield as 16.29% (dry-basis), the phenolic compound of the extract composed by total phenolic 45.99±0,25% (g-GAE/100g), 2.28±0.07% (g-QE/100g) and 26.9±0.07% (g-TAE/100g). Several concentration ranging from 10-200 µg/mL of the MEJS were tested for their antioxidants activity in vitro models. The maximum percentage inhibition of DPPH (*2,2 diphenyl-1-picrylhydrazyl)* was 92.87% (200 µg/mL), ferric ion reduction power OD = 3,11±0,01 (600 µg/mL) and inhibition of lipid oxidation was 50.13% (100 µg/mL) respectively. Determined the phenolic compound of three fraction (*i.e*. aqueous fraction, ethyl acetate and hydrolyzed-ethyl acetate fractions) of MEJS by performing thin layer chromatography (TLC) indicated that all of the fractions contained phenolic substances such as gallic acid (R_f=0.76), flavonoid rutin (R_f= 0.47) and tannic acid (R_f=0.74). The phenolic compound responsible for the

antioxidant activity of the MEJS of sample to quantitative analyses by HPLC-DAD. Results seen the phenolic quercetin (t_R=8.05) dan (+)-catechin (t_R= 2.79) concentration in the aqueous fraction were 25 µg/mL dan 55181 µg/mL respectively. The rutin (t_R=20.84) and (+)-catechin (t_R=2.79) concentration in the ethyl acetate fraction were 54.1 µg/mL and 258 µg/mL respectively. In addition the rutin and (+)-catechin concentration in the hydrolyzed-ethyl acetate fraction were 404 µg/mL and 28692 µg/mL respectively. Meanwhile the gallic acid didn't detect in the sample. This is the first report of the presence of (+)-cathecin in the MEJS.

The MEJS treated samples at level (50-800 µg/mL) incorporated on the fish oil-in-water emulsions were effective in retarding lipid oxidation significantly ($p<0.05$) comparing BHA and GSE. Control samples had the highest peroxide value (PoV) and thiobarbituric acid reactive substances (TBARS) value up to hour 120 and 144 respectively. With the addition of MEJS, BHA and GSE, PoV and TBARS value in the water-in-oil emulsions were retarded effectively, compared to the Control ($p<0.05$). However at all samples, its TBARS value until to the end storage less than 4.0 µM-MDA/L. It means all of the sample had TBARS value still less than 13.7 µM-MDA/kg, as threshold consumer's acceptance. Emulsions treated with BHA exhibited the lowest TBARS values thorough the storage periods and sample with MEJS had TBARS values lower than GSE treated.

Keywords: *Syzygium cumini* L. (Skeel) seed extract, antioxidant, TBARS, (+)-catechin