INTISARI

Dalam peningkatan kesehatan kolon, banyak studi yang telah dilakukan untuk menginvestigasi bahan fungsional untuk kesehatan pencernaan dan pencegahan penyakit kronis. Khususnya, dietary fibre telah dilaporkan mempunyai manfaat pada kesehatan kolon. Dietary fiber di kategorikan sesuai dengan karakteristiknya yang berhubungan dengan komponen prebiotic.

Porang (*Amorphophallus oncophyllus*) adalah sebuah tanaman di Indonesia dan umbinya yang mengandung dalam glucomannan (PGM). Adapun alternatif untuk menghasilkan prebiotik oligosakarida dari polisakarida yang dikontrol oleh pendekatan hidrolisis enzimatis. Studi ini bertujuan untuk memproduksi porang oligo-glucomannan (POG) dengan menggunakan optimal kondisi hidrolisis enzimatis. Kondisi optimal dipilih berdasarkan tingginya oligosakarida yang dihasilkan dan cepatnya waktu inkubasi. POG yang dihasilkan dievaluasi aktivitas prebiotiknya dalam fermentasi *in vitro fecal batch culture* menggunakan feses manusia sebagai sumber mikrobiota. Bakteri feses dan short-chain fatty acid (SCFA) diuji menggunakan fluorescence in situ hybridization (FISH) dan GC.

Komposisi kimia tepung PGM (g/100 g) adalah kadar air (7.82), kadar abu (0.61), kada lemak (2.33), kadar protein (0.31), dan karbohidrat (88.6). Kondisi optimum untuk produksi POG menggunakan β-mannanase telah dipelajari.

Kondisi hidrolisis optimal adalah 37 ^{o}C, pH 5.5, rasio enzim per substrat (E/S) 1:1,000 atau 0.1% (w/w), dan waktu hidrolisis 4 jam. POG mengandung terutama oligosakarida (99.45%) dan dalam jumlah sedikit monosakarida (0.17%) dan polisakarida (0.39%) yang dianalisis menggunakan *high-performance size exclusion-chromatography* (HPSEC). Komposisi monosakarida dalam POG adalah manosa dan glukosa. Derajat polimerisasi (DP) dari POG berkisar 3-4.

Hasil menunjukkkan bahwa POG meningkatkan signifikan (p<0.05) pertumbuhan bakteri baik, terutama terutama bifidobakteria dan menurunkan signifikan (p<0.05) jumlah bacteriodes. Sementara itu, konjac oligo-glucomannan (KOG) menunjukkan menurunkan signifikan (p<0.05) pada clostridia. Pengaruh *bidogenic* POG dapat diamati setelah 12 h fermentasi hingga 48 jam. Itu menunjukkan bahwa POG mempunyai indeks prebiotik yang tinggi 10.29, diikuti oleh KOG 8.53, dan PGM 4.25. POG mempunyai pengaruh *butyrogenic* dan mudah difermentasi daripada KOG yang ditunjukkan dengan produksi butirat yang dihasilkan pada awal fermentasi berkisar 12 jam. Pengaruh butirat pada POG dibandingkan dengan produk yang serupa dengan KOG dan substrat alaminya (PGM).

Hasil ini menunjukkan bahwa POG mempunyai pengaruh *bifidogenic*, butyrogenic, dan fermentasi dibandingkan dengan produk yang serupa. Oleh karena itu POG merupakan sumber terbaru sebagai prebiotik degan potensi untuk dapat diaplikasikan pada nutraceutikan dan makannan fungsional.

Kata kunci : Porang glucomannan, Porang Oligo-glucomannan, Prebiotic, Short Chain Fatty Acid, *Bifidogenicity*, dan *Butyrogenicity*.

ABSTRACT

As interest increases for colonic health, various studies have been conducted to investigate functional ingredients for host health and the prevention of chronic disease. In particular dietary fibre has been reported to have beneficial effects on colonic health. More recently, dietary fibre has been categorized based on its characteristics correlations with prebiotic properties.

Porang (*Amorphophallus oncophyllus*) is a plant in Indonesia and its tuber rich in glucomannan called porang glucomannan (PGM). An alternative way to obtain prebiotic oligosaccharides from polysaccharides was by controlled enzymatic hydrolysis approach. This study aimed to produce porang oligo-glucomannan (POG) under optimal conditions by enzymatic hydrolysis. Optimal conditions were chosen based on the produced the higher of oligosaccharides yield and a short period of incubation. Then, the obtained POG was evaluated on its prebiotic activity in faecal batch culture fermentation. The prebiotic activity of POG was evaluated by *in vitro* faecal batch culture fermentation using fresh human faeces as a source of gut microbiota. Faecal bacteria and short-chain fatty acids (SCFA) were quantified by fluorescence *in situ* by hybridization (FISH) and GC, respectively.

The chemical compositions (g/100 g) of PGM flour were moisture 7.82, ash 0.61, lipid 2.33, protein 0.31, carbohydrate 88.6. The optimum conditions for the production of POG using β-mannanase were studied. The optimal hydrolysis conditions were 37 ^{o}C, pH 5.5 enzyme per substrate ratio (E/S) of 1:1,000 or 0.1% (w/w), and hydrolysis time of 4 h. The POG contained mainly oligosaccharides (99.45%) and minor amounts of monosaccharide (0.17%) and polysaccharide (0.39%) determined by high-performance size exclusion-chromatography (HPSEC). The monosaccharide compositions in POG were mannose and glucose. The degree of polymerization (DP) of POG was mainly in ranged of 3-4.

The result showed that POG significantly promoted (p<0.05) on the growth of beneficial bacteria, especially on bifidobacteria population and reduced significantly (p<0.05) the number of bacteroides. Meanwhile, konjac oligo-glucomannan (KOG) showed a significant reduction of clostridia. The bifidogenic effect of POG was observed after 12 h until throughout fecal fermentation (48 h). It was demonstrated that POG had the highest prebiotic index 10.29, followed by KOG (8.53) and PGM (4.25). POG had higher butyrogenic effect and fermentability than KOG since it showed butyric acid production in the early fecal fermentation period of 12 h. The butyrogenic effect of POG was comparable to KOG and higher than KGM about two folds.

These results indicated POG had the bifidogenic effect, butyrogenic effect, and fermentability compare to a similar product of KOG and its native substrate (PGM). Therefore, POG is a new source of prebiotic ingredient with potential applications in nutraceutical and functional food.

Keywords : Porang glucomannan, Porang Oligo-glucomannan, Prebiotic, Short Chain Fatty Acid, Bifidogenicity, and Butyrogenicity