CHEMICAL AND ANTIOXIDANT POTENTIAL OF COMMERCIAL AND WILD MUSHROOM EXTRACTS AS FEED ADDITIVE FOR ASIAN SEA BASS (*LATES CALCARIFER*) JUVENILES

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ABSTRACT

Extracts of two edible mushrooms, *Pleurotus sajor caju* (commercial) and *Schizophyllum commune* (wild) were used to study the chemical compositions and the potency to use as feed additive on the immune response in Asian seabass, *Lates calcarifer* juveniles. Four types of solvents namely aqueous, ethanol, methanol and acetone were used in mushrooms extraction process to assess total polysaccharide, crude lipid, protein, amino acids, fatty acids, antioxidant activity and antimicrobial activity in mushrooms crude extracts. In feeding trial, one percent of aqueous *P. sajor caju* extract added diet (D1), one percent of aqueous *S. commune* extract added diet (D2) and commercial diet without mushroom extract (D0) were fed to *L. calcarifer* juveniles for 30 days. After 30 days, challenge assay was conducted by injecting each fish intraperitoneally with 10^8cfu/ml of *V. harveyi* bacterium suspension. Immune response was investigated by measuring antibody titre from blood serum and the survival rate (%) was observed for 10 days post-challenge. Total polysaccharide, crude lipid and protein composition were ranged from 2.07% to 22.08%, 0.01% to 0.32%, 5.07% to 17.14% and 13.34% to 25.48%, 0.10% to 0.65%, 6.25% to 10.70% in *P. sajor caju* and *S. commune* crude extract, respectively. *P. sajor caju* contained 19.04% to 20.34% of total AA and S. commune contained 20.29% to 31.62%. Aqueous extract has the highest amount of total EAA (8.95 ± 0.02%) in both mushrooms. DPPH scavenging activity obtained the highest antioxidant activity in 5mg/ml of *S. commune* and *P. sajor caju* extracts. *P. sajor caju* and *S. commune* aqueous extracts at 2mg/ml have shown the highest reducing power capability at 2.69 and 3.35 (700nm), respectively. The lowest EC_{50} (mg/ml) of in-vitro antioxidant assays were obtained in *P. sajor caju* (DPPH=1.47; reducing power=0.09) and *S. commune* (DPPH=1.52; reducing power=0.41) with significance of $p < 0.05$ in aqueous extracts. Minimum inhibition concentration (MIC) values of *V. harveyi*, *V. parahaemolyticus* and *V. anguillarum* were <1.25mg/ml, <1.25mg/ml, 10mg/ml and <1.25mg/ml, 2.5mg/ml, 5mg/ml obtained in *P. sajor caju* and *S. commune* extracts, respectively. Fish fed in D1 and D2 have shown significance difference ($p<0.05$) in antibody titre compared to antibody titre obtained in D0 (control diet). D2 also demonstrated the highest survival of 90%, while fish fed with D1 and D0 recorded 55% and 60% of survival, respectively. The extract of *S. commune* has shown better chemical composition with aqueous extraction process. The highest survival of 90% with the development of antibody titre were also observed in *S. commune* extract inclusion diet. Extract of *S. commune* is the choice of option to boost immune system in Asian seabass juveniles.

ABSTRAK

POTENSI KOMPOSISI KIMIA DAN ANTIOKSIDA DARIPADA EKSTRAK CENDAWAN KOMERSIAL DAN LIAR SEBAGAI MAKANAN TAMBAHAN KEPADA JUVENIL IKAN SIAKAP (LATES CALCARIFER)

Ekstrak daripada dua cendawan yang boleh makan, Pleurotus sajor caju (komersil) dan Schizophyllum commune (liar) telah digunakan untuk mengkaji komposisi kimia dan potensi untuk digunakan sebagai makanan tambahan terhadap tindak balas imun ikan juvenil Siakap, Lates calcarifer. Empat jenis pelarut yang digunakan iaitu akueus, etanol, metanol dan aseton digunakan dalam proses pengekstrakan cendawan untuk menilai jumlah polisakarida, lipid kasar, protein, asid amino, asid lemak, aktiviti antioksida dan aktiviti antimikrob dalam ekstrak cendawan. Dalam percubaan makan, diet tambahan satu peratus ekstrak P. sajor caju (D1), diet tambahan satu peratus ekstrak S. commune (D2) dan diet komersil tanpa ekstrak cendawan (D0) telah diberikan kepada juvenil L. calcarifer selama 30 hari. Selepas 30 hari, eksperimen jangkitan penyakit dilakukan dengan penyuntikan 10^8 cfu/ml bakterium V. harveyi secara intraperitoneal. Tindak balas imun dikaji dengan menyukat penghasilan antibodi dalam serum darah dan peratus ikan hidup direkod selama 10 hari. Jumlah polisakarida, lipid kasar dan komposisi protein berlingkungan dari 2.07% hingga 22.08%, 0.01% to 0.32%,, 5.07% hingga 17.14% dan 13.34% hingga 25.48%, 0.10% to 0.65%, 6.25% hingga 10.70% dalam ekstrak P. Sajor caju dan S. commune, masing-masing. P. sajor caju mengandungi jumlah AA sebanyak 19.04% hingga 20.34% dan S. commune sebanyak 20.29% hingga 31.62%. Ekstrak akueus mendapat jumlah EAA yang tertinggi (8.95 ± 0.02%) daripada kedua-dua cendawan. Asid linoleik merupakan asid lemak tertinggi yang terdapat dalam ekstrak P. sajor caju (35.99% - 85.54%) dan S. commune (35.65% - 73.59%). Aktiviti penyingkiran DPPH tertinggi terdapat pada 5 mg/ml ekstrak S. commune dan P. sajor caju. Ekstrak akueus P. sajor caju dan S. commune pada 2 mg/ml telah menunjukkan penurunan kuasa oksidasi tertinggi iaitu 2.69 and 3.35 (700nm), masing-masing. Dengan perbezaan signifikan $p<0.05$ telah menunjukkan ekstrak akueus mencapai aktiviti in-vitro antioksida EC_{50} (mg/ml) terendah dalam P. sajor caju (DPPH=1.47; kuasa penurunan=0.09) dan S. commune (DPPH=1.52; kuasa penurunan=0.41). Nilai kepekatan perencatan terendah masing-masing V. harveyi, V. parahaemolyticus dan V. anguillarum adalah <1.25mg/ml, <1.25mg/ml, 10mg/ml dan <1.25mg/ml, 2.5mg/ml, 5mg/ml terdapat dalam P. sajor caju dan S. commune. Titer antibodi ikan yang makan diet D1 dan D2 menunjukkan perbezaan signifikan ($P<0.05$) berbanding titer antibodi yang diperolehi D0 (diet kontrol). D2 juga menunjukkan 90% survival, manakala ikan yang diberi makan diet D1 dan diet kontrol merekodkan survival pada 55% dan 60%, masing-masing. Ekstrak S. commune telah menunjukkan komposisi kimia yang lebih baik dengan proses pengekstrakan akueus. Survival tertinggi iaitu 90% selaras dengan penghasilan titer antibody juga diperhatikan dalam diet mengandungi ekstrak S. commune. Ekstrak S. commune adalah pilihan terbaik bagi membina sistem imun juvenil ikan Siakap.