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Research article

The antioxidant, α-glucosidase inhibitory, antifungal, anti-inflammatory and xanthine oxidase inhibitory activity of extraction from Cordyceps spp. isolated in Vietnam

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ABSTRACT

The medicinal fungus Cordyceps is well-known as a potent source of metabolites and bioactivities and is indicated as long-traditional medicine in Asian countries. As many Cordyceps species isolated in Vietnam have been reported, our previous publications indicated them as promising potentials. This study has provided more scientific evidence of their bioactivities including antioxidant, α-glucosidase inhibitory, antifungal, anti-inflammatory and xanthine oxidase (XO) inhibitory activity.

As results, all screened Cordyceps strains possess antioxidant activity. The EtOAc extracts exhibited higher $ABTS^{\cdot+}$ radical-scavenging activity than other extracts. The high $ABTS^{\cdot+}$ radical-scavenging activity includes EtOAc-DL0038B, EtOAc-DL0075, and EtOAc-DL0004 with IC_{50} values = 840.57 ± 1.33, 806.45 ± 15.85 and 672.04 ± 6.00 μg/ml, respectively. Among extracts, only PS extracts exhibited α-glucosidase inhibitory activity. The IC_{50} value for α-glucosidase inhibitory activity of PS-DL0038B, PS-DL0038A, and PS-DL0069 were 7,676.95 ± 181.05, 7,594.52 ± 251.21, and 5,080.28 ± 291.66 μg/ml, respectively. The 500 μg of PE-DL0067 inhibited C. albicans with a 13 mm-inhibitory zone. Significantly, EtOH and PE extracts from Cordyceps exhibited significant anti-inflammatory activity. Regardingly, DL0077 showed the most potent anti-inflammatory activity, the IC_{50} values of EtOH-DL0077, EtOAc-DL0077, and PE-DL0077 were 38.74 ±1.3, 24.50 ± 2.9, and 23.70 ± 1.6 μg/ml, respectively. In the case of XO inhibitory activity, the IC_{50} values of PS-DL0050, BuOH-DL0050, BuOH-DL0038B, PE-DL0038B, and PS-DL0077 were 305.44 ± 0.91, 271.26 ± 4.24, 267.90 ± 1.92, 189.48 ± 0.50, and 140.01 ± 6.89 μg/ml, respectively. The results exhibited bioactivities in Cordyceps isolated in Vietnam as promising bioactive resources.

Key words: α-glucosidase inhibitory activity, anti-inflammation, antifungal activity, antioxidant activity, Cordyceps, XO inhibitory activity

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INTRODUCTION

The endoparasite Cordyceps is a group of caterpillar fungi. They can feed on insects, response to their host-defense system and coordinate the host-life cycle coefficients for survival and reproduction [1]. The special mechanism for biosynthesis of valuable metabolites and bioactivities has dedicated Cordyceps as a long tradition of medicinal remedy and new source of drug research and development as well [1,2]. Their nutrient includes proteins, fatty acids, amino acids, volatile oils, carotenoids, phenolic compounds, flavonoids, minerals (Fe, Ca, Mg, Ni, Sr, Na, Ti, Pi, Se, Mn, Zn, Al, Si, K, Cr, Ga, V and Zr), vitamins (B1, B2, B12, E and K), and carbohydrates (monosaccharides, oligosaccharides, polysaccharides, sterols, nucleosides, etc.) [3]. Approximate 131 metabolites have been investigated in mycelium, fruiting bodies and fungal complexes of various Cordyceps in the recent years [1]. As regards, they have been considered for anti-diabetic, anti-hyperlipidemia, antifungal, anti-inflammatory, immunomodulatory, antioxidant, anti-aging, anticancer, antiviral, hepatoprotective, hypo-sexuality, cardiovascular diseases, antimalarial, anti-osteoporotic, anti-arthritic, and cosmeceutical activity [1–3]. In addition, C. sinensis, namely Dongchong Xiacao, is famous for a long history of traditional use to replenish the kidney, soothe the lung, treat chronic coughs, or restore health after illnesses [4–6].

According to recent scientific reports, there have been a numerous Cordyceps species containing potential biocompounds and bioactivities besides the famous Ophiocordyceps sinensis [1,7]. A numerous Cordyceps sp. have been isolated in Viet Nam [8,9 10]. Our previous publications revealed their extracts and biocompounds as promising sources of metabolites and bioactivities such as antioxidant, antimicrobial, anti-inflammatory, XO inhibitory, and α-glucosidase inhibitory potentials [8–13]. Therefore, the present study

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has been continuously investigated potential bioactivities of cultured Cordyceps sp. isolated in Langbiang highland, Vietnam. The aim of research outlines bioactivities of Cordyceps in Vietnam.

MATERIALS AND METHODS

Materials

Ten cultured Cordyceps biomass of strain DL0004, DL0006, DL0015, DL0038A, DL0038B, DL0050, DL0067, DL0069, DL0075, and DL0077 were from Nguyen Long Joint Stock Company, Lam Dong Province.

Candida albicans, Microsporum gypseum, Trichophyton rubrum, Trichophyton mentagrophytes, Aspergilus niger, Aspergilus fumigatus, Penicillium sp., and Fusarium sp. used in antifungal assay were obtained from Department of Microbiology and Parasitology, Faculty of Pharmacy, University of Medicine and Pharmacy HCMC, Vietnam.

METHODS

Preparation of Cordyceps extracts

The cultured Cordyceps sp. were dried and extracted in 96% ethanol (EtOH). Then, petroleum ether (PE), ethyl acetate (EtOAc), n-buthanol (BuOH) and water (W) fractions were obtained in ascending sequence of polarity by liquid-liquid extraction of EtOH extract. Polysaccharide (PS) from residues was extracted by hot water extraction [11,14].

The $ABTS^{\cdot+}$ radical-scavenging assay

The measurement of $ABTS^{\cdot+}$ (2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)) radical scavenging activity was performed using a previously published protocol [14,15]. A solution of 7 mM $ABTS^{\cdot+}$ with 2.45 mM potassium persulphate was mixed. The reaction mixture was at room temperature for 12-16 h in the dark before using. The $ABTS^{\cdot+}$ solution was diluted using phosphate buffer to adjust its absorbance to within 0.70 $\pm$ 0.02 at 734 nm. Then, 3 ml of $ABTS^{\cdot+}$ solution were mixed with 100 μl of samples (at concentration of 1,000 – 5,000 μg/ml). Vitamin C was considered as a positive control. Finally, the absorbance was measured at 734 nm after reaction at room temperature for 30 minutes. The free radicals scavenging activity was calculated by the following equation: Inhibition (%) = [1 – (A_{sample} /$A_{control}$)] x 100%. Each experiment was carried out in triplicates. The half-maximal inhibitory concentration (IC_{50} value) was calculated from the plotted graph at various concentrations of samples.

The α-glucosidase inhibitory assay

Assay for α-glucosidase inhibition was performed using a previously published protocol [14]. The assay was conducted by adding 50 μl of extracts (at concentration of 2,000 – 10,000 μg/ml) into 40 μl of α-glucosidase solution (0.2 unit/ml, in 100 mM phosphate buffer pH 6.8). After preincubating at room temperature for 20 min, 40 μl of 3mM pNPG (p-nitrophenyl α-D-glucopyranoside) were added to the mixture to initiate enzymatic reaction. The reaction mixture was incubated at room temperature for 30 min, and the reaction was stopped by addition of 130 μl of 0.2 M Na_2CO_3. Acarbose was used as a positive control. The α-glucosidase inhibitory activity was determined by measuring the p-nitrophenol released from pNPG at 405 nm. The % inhibition was calculated using the following equation: Inhibition (%) = [1 – (A_{sample} /$A_{control}$)] x 100%. The IC_{50} value was calculated from the plotted graph at various concentrations of samples.

The antifungal assay

The antifungal activity was screened by disc diffusion method [14]. Muller Hinton Agar (for C. albicans) and Sabouraud dextrose (for other fungi) were used. As testing, 50 μl of extract solutions (10 mg/ml) were laid on the inoculated media. Fluconazole (25 μg/disc) and terbinafine (30 μg/disc) (Merck, Germany) were considered as a positive control for C. albicans and other fungi, respectively. The 5% DMSO (dimethyl sulfoxide) was used as negative control. Each sample was repeated in triplicate.

The anti-inflammatory assay

The anti-inflammatory assay was performed using a previously published protocol [9]. The diclofenac was used as positive control. A solution including 2 ml of 0.025 M acetate buffer (pH 5.5), 1 ml of 0.16% bovine serum albumin, 1 ml of extract (at 93.75; 187.5; 375; 750; and 1,500 μg/ml) was incubated at 37 °C for 30 min, then 67 °C for 3 min. Finally, the absorbance was measured at 660 nm. The % inhibition was calculated using the following equation: Inhibition (%) = [1 – (A_{sample} /$A_{control}$)] x 100%. The IC_{50} value was calculated from the plotted graph at various concentrations of samples.

The xanthine oxidase (XO) inhibitory assay

The XO - inhibitory assay was performed using a previously published protocol [6,13]. A mixture of 250 μl of extract (at concentration of 50 – 300 μg/ml), 450 μl of 50 mM phosphate buffer (pH=7.5), and 25 μl of 0.05 UI XO was incubated at room temperature for 15 min. Then, 25 μl of 150 μM xanthine was added and incubated at room temperature for 30 min. 125 μl of 1 N HCl was added to terminate the reaction. Finally,

the absorbance was measured at 290 nm. The % inhibition was calculated using the following equation: Inhibition (%) = [1 – (A_{sample} /$A_{control}$)] x 100%. The IC_{50} value was calculated from the plotted graph at various concentrations of samples.

RESULTS

The $ABTS^{\cdot+}$ radical-scavenging activity

This study has provided evidence contributing their antioxidant potential. Regarding to table 1, all of screened Cordyceps strains possess $ABTS^{\cdot+}$ radical-scavenging activity. The EtOAc extracts exhibited higher activity than others. The high $ABTS^{\cdot+}$ radical-scavenging activity includes EtOAc-DL0004, EtOAc-DL0038B, and EtOAc-DL0075 with IC_{50} values = 672.04 ± 6.00, 840.57 ± 1.33, and 806.45 ± 15.85 μg/ml, respectively. In addition, other significant IC_{50} values were 709.22 ± 20.30 (BuOH-DL0050) and 766.87 ±15.25 (PS-DL0067) μg/ml.

The α-glucosidase inhibitory activity

Among extracts, the IC_{50} values of PS-DL0038A, PS-DL0038B, and PS-DL0069 were 7,594.52 ± 251.21, 7,676.95 ± 181.05, and 5,080.28 ± 291.66, respectively. The IC_{50} value of positive control, acarbose, was 3,579.12 ± 281.01 μg/ml.

The antifungal activity

Among Cordyceps, the PE-DL0067 inhibited C.albicans with a 13 mm-inhibitory zones. Besides, the result did not show antifungal activity on other tested fungi.

The anti- inflammatory activity

Regarding to table 2, the EtOH and PE extracts exhibited higher anti-inflammatory property. In the case of EtOH extracts, the EtOH-DL0038A, EtOH-DL0038B and EtOH-DL0077 exhibited with IC_{50} values = 49.0 ± 0.4, 79.4 ± 4.0, and 38.74 ±1.3 μg/ml, respectively. In the case of PE extracts, the PE-DL0015, PE-DL0038A, PE-DL0038B, PE-DL0077 exhibited significant anti-inflammatory activity as well with IC_{50} values = 90.8 ± 1.2, 25.6 ± 1.2, 52.7 ± 0.2, and 23.7 ± 1.6 μg/ml, respectively. Among screen strains, DL0077 showed the most potent anti-inflammatory activity, the IC_{50} values of EtOH-DL0077, PE-DL0077, and EtOAc-DL0077 were 38.74 ±1.3, 23.7 ± 1.6, and 24.5 ± 2.9 μg/ml, respectively. The IC_{50} value of positive control, diclofenac, was 55.0 ± 6.5 μg/ml.

The XO inhibitory activity

Regarding to table 3, the PE-DL0038B, BuOH-DL0038B, BuOH-DL0050, and PS-DL0050 and PS-DL0077 exhibited significant XO inhibitory activity. The IC_{50} value of PE-DL0038B was 189.48 ± 0.50 μg/ml. The IC_{50} values of BuOH-DL0038B and BuOH-DL0050 were 267.90 ± 1.92 and 271.26 ± 4.24 μg/ml, respectively. The IC_{50} values of PS-DL0050 and PS-DL0077 were 305.44 ± 0.91 and 140.01 ± 6.89 μg/ml, respectively. The IC_{50} value of positive control, allopurinol, was 134.60 ± 0.23 μg/ml.

DISCUSSION

Our results showed scientific evidences of antioxidant, α-glucosidase inhibitory, antifungal, anti-inflammatory and XO-inhibitory activities in Cordyceps strains isolated in Vietnam. The results and our previous publications [8,12,15] have indicated Vietnam-isolated Cordyceps as a valuable source of bioactive compounds. Regarding results, many PS extracts exhibited potential $ABTS^{\cdot+}$ radical-scavenging, α-glucosidase inhibitory and XO inhibitory activities, but no antifungal and anti-inflammatory activities. However, many PE extracts exhibited antifungal, anti-inflammatory and XO inhibitory activities, but no $ABTS^{\cdot+}$ radical-scavenging and α-glucosidase inhibitory activities.

Regarding to $ABTS^{\cdot+}$ radical-scavenging activity, all of screened Cordyceps strains possessed the ability indicating their strong antioxidant property. In addition, extracts from these strains showed high 1,1-diphenyl-2-picrylhydrazyl (DPPH) and hydroxyl radical-scavenging activity as well [8,9,11,15]. The result was similar to those DPPH radical-scavenging activity [11] showing antioxidant potential of EtOAc extracts. Besides, other publications have determined Cordyceps as a promising antioxidant agent [1,7,11,15]. Eiamthaworn et al. (2022) revealed antioxidant activity of C. militaris associating with flavonoid content (9.50 mg GAE/g extract and 10.59 mg QAE/g extract) [16]. As a research of Thi et al. (2022), a Vietnam-grown Ophiocordyceps sobolifera containing 18.08 ± 0.52 mg GAE/g dry weight of phenolic compound and 10.48 ± 0.02 mg QUE/g dry weight of flavonoid compounds was indicated as DPPH radical scavenging potential [17]. Nguyen et al. (2021) revealed exopolysaccharides form O. sinensis as $ABTS^{\cdot+}$ and hydroxyl radical scavenging potentials supporting a significant hepatoprotective effect against hepatotoxicity induced by CCl_4 in rats [4].

In the study, the PS-DL0038A, PS-DL0038B, and PS-DL0069 exhibited α-glucosidase inhibitory activity. Lingran Wu et al. (2020) also indicated polysaccharides from C. militaris as α-glucosidase inhibitory compounds [18]. Polysaccharides from the genus Cordyceps were indicated as a promising α-glucosidase inhibitory agent [4]. Besides, Xue Han et al. (2023) isolated and identified a new thiazole alkaloid with α-glucosidase inhibitory activity and anti-diabetes potential from Chinese Cordyceps, named

Table 1: The IC_{50} values of Cordyceps extracts for $ABTS^{\cdot+}$ radical-scavenging activity

Strain	IC_{50} values (μg/ml)					
	EtOH	PE	EtOAc	BuOH	Water	PS
DL0004	3,401.36 ± 54.18	-	672.04 ± 6.00	1,779.36 ± 18.77	-	2,136.75 ± 18.50
DL0006	3,821.40 ± 50.18	-	3,663.75 ± 21.86	-	-	-
DL0015	-	-	3,747.26 ± 47.11	4,027.95 ± 30.97	-	3,399.89 ± 21.80
DL0038A	-	-	2,464.05 ± 9.43	2,123.12 ± 22.50	-	1,677.96 ± 4.85
DL0038B	3,923.08 ± 41.76	-	840.57 ± 1.33	1,150.80 ± 4.94	2,635.83 ± 16.50	1,219.99 ± 3.59
DL0050	4,545.45 ±315.17	-	1,865.67 ± 95.03	709.22 ± 20.30	4,545.45 ±198.04	2,604.17 ± 19.77
DL0067	3,333.33 ± 51.32	-	1,404.49 ± 46.19	1,510.57 ±13.69	4,450.78 ± 39.16	766.87 ±15.25
DL0069	-	-	3,364.28 ± 27.95	2,026.54 ± 16.34	4,287.85 ± 52.89	1,783.87 ± 19.91
DL0075	2,500.00 ± 116.48	-	806.45 ± 15.85	1,602.56 ± 54.68	3,225.81 ± 63.72	-
DL0077	-	-	2,631.58 ± 85.72	-	-	2,040.82 ±106.45
Vitamin C	61.20 ± 0.51					

"-": IC_{50} values (μg/ml) > 5,000 μg/ml

Table 2: The IC_{50} values for anti-inflammatory activity

Strain	IC_{50} values (μg/ml)					
	EtOH	PE	EtOAc	BuOH	Water	PS
DL0004	353.0 ± 7.2	276.7 ± 6.0	-	-	-	-
DL0006	261.2 ± 3.2	353.0 ± 7.2	-	-	-	-
DL0015	129.2 ± 2.1	90.8 ± 1.2	-	99.0 ± 2.0	-	-
DL0038A	49.0 ± 0.4	25.6 ± 1.2	-	178.8 ± 6.9	-	-
DL0038B	79.4 ± 4.0	52.7 ± 0.2	262.5 ± 6.3	-	-	-
DL0050	199.1 ± 3.3	188.9 ± 2,9	-	-	-	-
DL0067	241.2 ± 1.2	102.8 ± 1.3	-	-	-	-
DL0069	264.8 ± 1.3	153.7 ± 6.5	-	53.1 ± 2.9	-	-
DL0075	126.3 ± 6,4	222.5 ± 1.5	-	-	-	-
DL0077	38.74 ±1.3	23.7 ± 1.6	24.5 ± 2.9	-	-	-
Diclofenac	55.0 ± 6.5					

"-": IC_{50}values (μg/ml) > 500

Table 3: The IC_{50} values for XO inhibitory activity

Strain	IC_{50} values (μg/ml)					
	EtOH	PE	EtOAc	BuOH	Water	PS
DL0004	-	-	-	-	-	-
DL0006	-	-	-	-	-	-
DL0015	-	-	-	-	-	-
DL0038A	-	-	-	-	-	-
DL0038B	-	189.48 ± 0.50	-	267.90 ± 1.92	-	-
DL0050	-	-	-	271.26 ± 4.24	-	305.44 ± 0.91
DL0067	-	-	-	-	-	-
DL0069	-	-	-	-	-	-
DL0075	-	-	-	-	-	-
DL0077	-	-	-	-	-	140.01 ± 6.89
Allopurinol	134.60 ± 0.23					

"-" : no activity

cordythiazole A [19]. A research of Kim et al. (2017) investigated a strong α-glucosidase inhibitory activity from C. militaris. A water extract from C. militaris induced the uptake of glucose into HepG2 cells and metabolism of the absorbed glucose as a potential use in diabetes prevention and treatment [20].

The PE-DL0067 inhibited C. albican with a 13 mm-inhibitory zone in this study. Our previous study showed that PE-DL0067 had a 10 mm-inhibitory zone against Bacilus subtilis [12] proving it as an antimicrobial candidate. Park et al. (2009) indicated a protein from C. militaris with a molecular mass of 12 kDa and a pI of 5.1 as an inhibitory agent of Fusarium oxysporum [21]. Regarding to Wong et al. (2011), cordymin from C. militaris, with a molecular mass of 10,906 Da and an N-terminal amino acid sequence, inhibited the growth of Bipolaris maydis, Mycosphaerella arachidicola, Rhizoctonia solani and C. albicans with an IC_{50} of 50 μM, 10 μM, 80 μM, and 0.75 mM, respectively [22].

The EtOH and PE exhibited higher anti-inflammatory activity while PS showed negative results. Regarding to the result, Cordyceps owns the significant anti-inflammatory activity and is an excellent alternative source. Smiderle et al. (2014) indicated that anti-inflammatory activity of Cordyceps was contributed by β-(1→3)-D-glucan, a linear chain composed of β-D-Glcp (1→3)-linked. The compound could stimulate the expression of IL-1β, TNF-α, and COX-2 by THP-1 macrophages, inhibit the pro-inflammatory gene expression, inhibit the inflammatory phase of formalin-induced nociceptive response, and reduce the migration of total leukocytes but not the neutrophils [23]. Chiu et al. (2016) indicated that cordycerebroside A, an anti-inflammatory cerebroside, along with soyacerebroside I and glucocerebroside in C. militaris could inhibit the accumulation of pro-inflammatory iNOS protein and reduce the expression of COX-2 protein in LPS-stimulated RAW264.7 macrophages [24]. Park et al. (2015) indicated anti-inflammatory activity of Cordyceps as production and expression of NO, iNOS, and pro-inflammatory cytokines in macrophages via inhibition of NF-κB and AP-1, which may play an important role in inflammation [25].

Our results exhibited XO inhibitory activity of screened Cordyceps strains. Some previous studies investigated XO inhibitory activity as well as hyperuricemic treatment as a potential of Cordyceps as well [6,13,26,27]. Our previous researches on O. sinensis investigated promising results in hyperuricemia inhibition [6,13]. Besides, Yong et al. (2016) indicated that C. militaris owned hypouricemic actions and effects without negative impacts on liver, renal and spleen functions [26]. The EtOAc extracts in our result did not show XO inhibitory activity, while those from C. militaris in Quy et al. (2019) showed the high activity [27].

CONCLUSION

Findings of this study highlighted potentials of Vietnam-isolated Cordyceps strains as antioxidant, α-glucosidase inhibitory, antifungal, anti-inflammatory and XO-inhibitory agents. Based

on these results, Cordyceps strains isolated in Vietnam have been considered as promising bioactive resources. Future investigation should be focused on their biological activities in vivo. Moreover, there need to be further studies on relationships between bioactivities and metabolites.

LIST OF ABBREVIATIONS

ABTS: 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)
AP-1: Activator Protein 1
BuOH: n-buthanol
CCl_4: carbon tetrachloride
COX-2: Cyclooxygenase-2
DMSO: dimethyl sulfoxide
DPPH: 1,1-diphenyl-2-picrylhydrazyl
EtOAc: ethyl acetate
EtOH: ethanol
GAE/g extract: Gallic Acid Equivalents per gram of extract
IC_{50} value: half-maximal inhibitory concentration
IL-1β: interleukin-1β
iNOS: Inducible Nitric Oxide Synthase
NF-κB: Nuclear Factor kappa-light-chain-enhancer of activated B cells
NO: Nitric Oxide
PE: petroleum ether
pI: isoelectric point
pNPG: p-nitrophenyl α-D-glucopyranoside
PS: polysaccharide
QAE/g extract: Quercetin Acid Equivalent per gram of extract
THP-1: Tohoku Hospital Pediatrics-1
TNF-α: Tumor Necrosis Factor-α
W: water
XO: xanthine oxidase

COMPETING INTERESTS

The authors declare that they have no competing interests.

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AUTHOR CONTRIBUTION

Thu Huynh contributed to performing tests, methodology, formal analysis and investigation, visualization and writing the original draft. Minh-Hiep Dinh contributed to conceptualization, methodology, investigation, funding acquisition, review and editing. All authors were involved in revising the manuscript.

REFERENCES

1. Qu SL, Li SS, Li D, Zhao PJ. Metabolites and their bioactivities from the genus Cordyceps. Microorganisms. 2022;10:1489–1489.
2. Zhou X, Gong Z, Su Y, Lin J, Tang K. Cordyceps fungi: natural products, pharmacological functions and developmental products. Journal of Pharmacy and Pharmacology. 2009;61(3):279–91.
3. Ashraf SA, Elkhalifa A, Siddiqui AJ, Patel M, Awadelkareem AM, Snoussi M. Cordycepin for health and wellbeing: A potent bioactive metabolite of an entomopathogenic Cordyceps medicinal fungus and its nutraceutical and therapeutic potential. Molecules. 2020;25(12).
4. Vinh Q, N, Tuoi T, V, Trang M, T, et al. Antioxidant activity and hepatoprotective effect of exopolysaccharides from cultivated Ophiocordyceps sinensis against CCl4-induced liver damages. Nat Prod Commun. 2021;16(2).
5. Trang M, T, Phuong TX, N, Lai T, N, et al. Preparation of a sulfated exopolysaccharide (S-EPS) from Ophiocordyceps sinensis fungus and its antioxidant effects. Science and Technology Development Journal: Natural Sciences. 2018;2.
6. Thư H, Lan NTK, Đinh Minh Hiệp. Khảo sát khả năng ức chế xanthine oxidase và hạ uric acid máu chuột của cao cồn chiết xuất từ Ophiocordyceps sinensis. Tạp chí Công nghệ Sinh học. 2017;15:151–158.
7. Jędrejko KJ, Lazur J, Muszyńska B. Cordyceps militaris: An overview of its chemical constituents in relation to biological activity. 2021;10:2634–2634.
8. Thu CDN, H, Minh-Hiep, D. Screening for some biological activities of cultured Cordyceps neovolkiana. Science and Technology Development Journal. 2017;20(K3):106–118.
9. Kỷ LTKLK, Cương. Văn Thị Xuân Thương, Đinh Minh Hiệp, Ngô Đại Hùng. Hoạt tính kháng oxy hóa và kháng viêm in vitro của cao chiết nấm Cordyceps takaomontana DL0038A phân lập tại Việt Nam. Tạp chí Khoa học - Đại học. Thủ Dầu Một. 2021;2(51):3–13.
10. Thư H, Đại Nghiệp N, Đinh Minh Võ Thị Xuyến, Hiệp. Nghiên cứu tiềm năng của Cordyceps sp. trong việc bảo vệ tế bào HepG2 chống lại tác nhân oxy hóa . Tạp chí Khoa học và Công nghệ Việt Nam. 2013;51:339–382.
11. Thư H, Đại Nghiệp N, Đinh Minh Võ Thị Xuyến, Hiệp. Trương Bình Nguyên. Nghiên cứu khả năng kháng oxy hóa của cao chiết từ một số chủng nấm Cordyceps sp. phân lập tại Việt Nam. Tạp chí Công nghệ Sinh học Việt Nam. 2012;10(4A):1041–1047.
12. Thanh-Vy HT, Thu H, Minh-Hiep D, Binh-Nguyen T. Screening for the antibacterial activity of cultured Cordyceps spp. Journal of Science and Technology. 2014;52(5B):552–560.
13. Tung A, Thu V, H, Hieu T, N, Cam NH, et al. Nghiên cứu hoạt tính ức chế xanthine oxidase của một số cao chiết từ nấm dược liệu. VNU Journal of Science: Natural Sciences and Technology. 2017;33(2S):192–200.
14. Huynh T, Nguyen-Thi TH, Nguyen-Thi NA, Mai XD, Tran MT, Le NQ. Antioxidant, α-glucosidase inhibitory and antifungal activities of extracts from lichens collected in Viet Nam. Journal of Science and Technology. 2016;54(4A):156–63.
15. Phuong-Tham HT, Thi-Tuoi, Thu V, Minh-Trang H, T, Lt TH, et al. Comparison of radicals scavenging activity of exopolysaccharides from cultured Cordyceps spp. isolated in Vietnam. Journal of Science and Technology. 2016;54(4A):148–55.
16. Eiamthaworn K, Kaewkod T, Bovonsombut S, Tragoolpua Y. Efficacy of Cordyceps militaris extracts against some skin pathogenic bacteria and antioxidant activity. Journal of Fungi. 2022;8(4):327–327.
17. Thi TT, Van, Khoa T, Van, Son LL, Minh TT, et al. Phenolic content and antioxidant activity of Ophiocordyceps sobolifera extract for renal injury prevention. Process Biochemistry. 2022;121:322–331.

18. Wu L, Sun H, Hao Y, Zheng X, Song Q, Dai S. Chemical structure and inhibition on α-glucosidase of the polysaccharides from Cordyceps militaris with different developmental stages. Int J Biol Macromol. 2020;148:722–758.
19. Han X, Liu LH, Fang XY, Jiang ST, Zhao H, Qian ZM. Cordythiazole A, the first member of thiazole alkaloids from Chinese Cordyceps, with α-glucosidase inhibitory activity. J Nat Med. 2023;77(4):986–91.
20. Kim DJ, Kang YH, Kim KK, Kim TW, Park JB, Choe M. Increased glucose metabolism and alpha-glucosidase inhibition in Cordyceps militaris water extract-treated HepG2 cells. Nutr Res Pract. 2017;11(3):180–180.
21. Park BT, Na KH, Jung EC, Park JW, Kim HH. Antifungal and anticancer activities of a protein from the mushroom Cordyceps militaris. The Korean Journal of Physiology and Pharmacology. 2009;13(1):49–49.
22. Wong JH, Ng TB, Wang H, Sze S, Zhang KY, Li Q. Cordymin, an antifungal peptide from the medicinal fungus Cordyceps militaris. Phytomedicine. 2011;18(5):387–92.
23. Smiderle FR, Baggio CH, Borato DG, Santana-Filho AP, Sassaki GL, Iacomini M. Anti-inflammatory properties of the medicinal mushroom Cordyceps militaris might be related to its linear (1→3)-β-D-glucan. PLoS One. 2014;9(10):110266–110266.
24. Chiu CP, Liu SC, Tang CH, Chan Y, El-Shazly M, Lee CL. Anti-inflammatory cerebrosides from cultivated Cordyceps militaris. J Agric Food Chem. 2016;64(7):1540–1548.
25. Park SY, Jung SJ, Ha KC, Sin HS, Jang SH, Chae HJ. Anti-inflammatory effects of Cordyceps mycelium (Paecilomyces hepiali, CBG-CS-2) in Raw264.7 murine macrophages. . Orient Pharm Exp Med. 2015;15:7–12.
26. Yong T, Zhang M, Chen D, Shuai O, Chen S, Su J. Actions of water extract from Cordyceps militaris in hyperuricemic mice induced by potassium oxonate combined with hypoxanthine. J Ethnopharmacol. 2016;194:403–414.
27. Quy TN, Xuan TD. Xanthine oxidase inhibitory potential, antioxidant and antibacterial activities of Cordyceps militaris (L.) link fruiting body. . Medicines. 2019;6:20–20.

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TIỀM NĂNG HOẠT TÍNH SINH HỌC CỦA CÁC CHỦNG NẤM CORDYCEPS NUÔI CẤY PHÂN LẬP TẠI VIỆT NAM

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TÓM TẮT

Mở đầu: Các loài nấm Cordyceps được ghi nhận có nhiều hoạt tính sinh học tiềm năng. Nghiên cứu này nhằm đánh giá một số hoạt tính sinh học của các chủng Cordyceps nuôi cấy được phân lập tại Việt Nam.

Phương pháp: Sinh khối của 10 chủng Cordyceps nuôi cấy (DL0004, DL0006, DL0015, DL0038A, DL0038B, DL0050, DL0067, DL0069, DL0075 và DL0077) được chiết bằng ethanol 96% và phân đoạn bằng ether dầu hỏa, ethyl acetate, n-butanol và nước; đồng thời thu nhận phân đoạn polysaccharide. Hoạt tính chống oxy hóa được đánh giá bằng phép thử bắt gốc tự do ABTS● +; hoạt tính ức chế α-glucosidase, kháng nấm, kháng viêm và ức chế xanthine oxidase (XO) được khảo sát bằng các phương pháp in vitro tương ứng.

Kết quả: Tất cả các chủng được khảo sát đều có khả năng bắt gốc tự do ABTS● +, trong đó các phân đoạn ethyl acetate của DL0004, DL0038B và DL0075 thể hiện hoạt tính nổi bật, với giá trị IC50 lần lượt là 672,04 ± 6,00; 840,57 ± 1,33; và 806,45 ± 15,85 μg/mL. Các phân đoạn polysaccharide của DL0038A, DL0038B và DL0069 có hoạt tính ức chế α-glucosidase, với IC50 lần lượt là 7.594,52 ± 251,21; 7.676,95 ± 181,05; và 5.080,28 ± 291,66 μg/mL. Phân đoạn ether dầu hỏa của DL0067 ức chế Candida albicans với đường kính vòng vô khuẩn 13 mm. Hoạt tính kháng viêm mạnh nhất được ghi nhận ở chủng DL0077, với IC50 của các phân đoạn ethanol, ether dầu hỏa và ethyl acetate lần lượt là 38,74 ± 1,30; 23,70 ± 1,60; và 24,50 ± 2,90 μg/mL. Hoạt tính ức chế XO đáng chú ý được quan sát ở các phân đoạn ether dầu hỏa của DL0038B, n-butanol của DL0038B và DL0050, cùng các phân đoạn polysaccharide của DL0050 và DL0077; trong đó polysaccharide của DL0077 có IC50 là 140,01 ± 6,89 μg/mL.

Kết luận: Các chủng Cordyceps nuôi cấy phân lập tại Việt Nam là nguồn tài nguyên sinh học có tiềm năng về hoạt tính chống oxy hóa, ức chế α-glucosidase, kháng nấm, kháng viêm và ức chế xanthine oxidase. Cần tiếp tục nghiên cứu in vivo và làm rõ mối liên hệ giữa thành phần chất chuyển hóa với các hoạt tính sinh học của các chủng nấm này.

Từ khoá: Cordyceps, hoạt tính sinh học, chống oxy hóa, kháng viêm, xanthine oxidase, α-glucosidase

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