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Antioxidant, Antidiabetic and antimicrobial activity from the Bark of *Betula alnoides*

Bimal Kumar Ghimire[a], Eun Soo Seong[b], Na Young Kim[c], Ju Sung Kim[b], Kim Myong Jo[b], Chang Yeon Yu[b], Ill Min Chung[a]*

[a]Department of Applied Life Science, Konkuk University, Seoul, 143-701, South Korea
[b]Bioherb Research Institute, Kangwon National University, Chunchon, 200-701, South Korea
[c]Food Service Cuisine, Songho College, Hoingsung 25-704, Korea

Objectives

The present study was undertaken to investigate the antidiabetic, antimicrobial activity and the preliminary antioxidant activity of the extractives of *B. alnoides*. In addition, the content of total polyphenols and total flavonoids in the extracts and fraction was also determined to examine the efficiency of different solvents for the extraction of phenolics. Furthermore, correlation between total phenolic content and biological activities were examined.

Materials and Methods

The radical scavenging activity was measured using the stable radical, 1,1-diphenyl-2-picrylhydrazyl (DPPH). The determination of the reducing power was conducted according to the method outlined by Oyaizu, (1986). The chelation of ferrous ions by the extract was estimated and the absorbance was measured spectrophotometrically at 562 nm. The antimicrobial activity of *B. alnoides* extracts and fractions was tested by Two fold dilution assay and Paper disc diffusion assay. Total phenolic content was measured using the Folin-Ciocalteu assay.

Results

The results showed that 80% methanolic extracts exhibited higher DPPH scavenging activity. In addition, both 80% methanolic extract and EtOAc fraction exhibited more potent reducing activity than BHA and α-tocopherol. Aqueous fraction exhibited higher metal chelating activity (89.00± 1.45 %) than other fractions. 80% methanolic extracts and ethyl acetate fraction showed higher levels of antimicrobial activity than other fractions and inhibited the growth of both gram positive and gram negative bacteria. None of extract and fraction inhibited the growth of yeast strain. Ethyl acetate fraction had the highest phenolic content (217.73 ± 1.02 mg GAE/g). 80% methanolic exract (98.46 ± 2.104%), showed the most powerful α-glucosidase inhibitory effect at concentration of 40 μg/ml. The result suggests that bark extracts of *B. alnoides* could be considered as potential source of natural antioxidant, treating diabetes and pathogenic diseases.

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Corresponding author : 정일민 E-mail : imcim@konkuk.ac.kr Tel : 02-450-3730

Table 1. Total phenolic and total flavonoid content of the extracts from *Betula alnoides*.

Sample	BA-ex *	BA-H*	BA-E*	BA-B*	BA-W*
TPC	178.88 ± 0.15^{g}	10.23 ± 0.819^{a}	217.73 ± 1.02^{h}	177.38 ± 1.02^{g}	129.91 ± 0.63^{f}
TFC	27.28 ± 2.66^{d}	14.49 ± 1.21^{b}	38.42 ± 1.87^{e}	26.67 ± 1.64^{d}	18.91 ± 0.51^{c}

BA, BA-ex ,80% methanolic extract; BA-H, *n*-hexane fraction; BA-E, EtOAC fraction; BA-B, BuOH fraction; BA-W, aqueous fraction.

Table 2. Minimal inhibitory concentration (MIC) of the methanol extracts and sub-fractions

Fraction layer	MIC (μg/ml)						
	Bacterial strain (+)		Bacterial strain (-)			Yeast strain	
	B.s*	S.a*	S.t*	K.p*	E.c*	C.a*	P.j*
MeOH extract	500	250	500	500	1000	<1000	<1000
Hexane layer	<1000	500	500	1000	<1000	<1000	<1000
EtOAc layer	1000	250	500	1000	500	<1000	<1000
BuOH layer	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Water layer	500	250	<1000	500	<1000	<1000	<1000
Tetracycline	8	8	8	8	8	-	-
Ketoconazole	-	-	-	-	-	250	250

*B.s.: *Bacillus subtilis* KCTC 3728, S.a.: *Staphylococus aureus* KCTC 1916, b S.t.: *Salmonella typhimurium* KCTC 1925, *Klebsiella pneumonia* KCTC 2001, E.c.:*Escherichia coli* KCTC 1924, C.a.: *Candida albicans* KCTC 7965, P.j.: *Pichia jadinii* KCTC 7293.

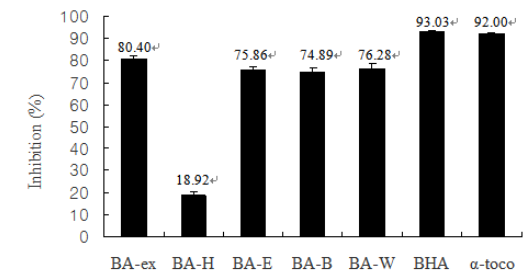

Fig.1. Fig. 1. Free radical scavenging activity.

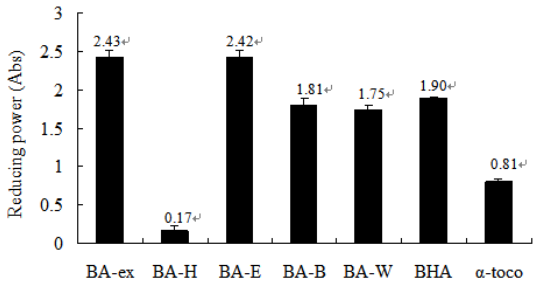

Fig.2. Reducing power.

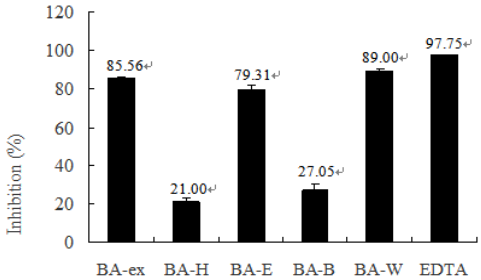

Fig.3. Metal chelating activity.

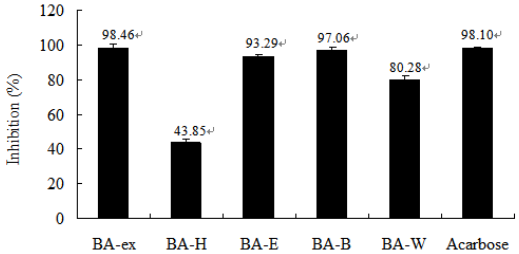

Fig.4. α-glucosidase inhibition.