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Determination of Curcuminoid Contents in Foods using HPLC

Dept. of Herbal Medicine Resource, Kangwon National University
Lee-Seul Song, Su-Jin Lee, Young-Hak Kim, Kwang-Hee Yoon, Gi-Ppeum Kim, Min-Ji Kim, Soon-Wook Hong, Young-Sun Hwang, and Myoung-Gun Choung*

HPLC를 이용한 식품 중 curcuminoid 함량 분석

강원대학교 : 송이슬, 이수진, 김영학, 윤광희, 김기쁨, 김민지, 홍순욱, 황영선, 정명근*

Objectives

This present study deals with determination of curcuminoids, which are potential sources of a natural food colorant, present in commercially available food items in Korean markets. Herein, we isolated three curcuminoids from the roots of *Curcuma longa* by silica gel column chromatography and their structures were identified through spectroscopic methods. Additionally, we were determined to the curcuminoid contents of a number of food items using HPLC analysis in order to get the first overview of application situation in Korea commercial foods.

Materials and Methods

○ Materials

Food list including 54 items of 16 food types were obtained from local markets in Korea. Organic solvents and chemicals used for this study were purchased from J. T. Baker and Sigma Aldrich Co.

○ Methods

- Instrumentation :NMR(Bruker AM 500), EIMS(JEOL JMS-700), HPLC(Agilent 1200)
- Extraction : The roots *C. longa* and food materials were extracted with methanol.
- Isolation : The extracts was fractionated by silica gel open column chromatography.

Results

Three principles, curcumin(1), demethoxycurcumin(2) and bisdemethoxycurcumin(3) were isolated from *Curcuma longa* roots. Moreover, their contents were investigated in 54 items of 16 food types by HPLC-DAD at 420 nm. The recovery rates showed remarkable differences, and ham of solid state exhibited the highest rate (98.9%), while beverage of liquid state was the lowest (0.34%). Among food items, curcumin detected the predominant content and curry showed the highest curcuminoid in the range of 37.24 ~ 617.98 ㎍/g. Interestingly, curry powder was the highest content, followed by compressed curry, and retorted curry. The remaining food items, only mustard, candy, and pickle exhibited curcuminoids. This study provides that analysis of curcuminoids may be a potential tool for the quality control of manufactured foods.

주저자 연락처 (Corresponding author): 정명근 E-mail: cmg7004@kangwon.ac.kr, Tel: 033-540-3321

Table 1 . Determination of three curcuminoid contents of various commercial food items in Korean markets.

Food items	Curcuminoid content[a] (μg/g)			
	Curcumin(1)	Demethoxycurcumin(2)	Bisdemethoxycurcumin(3)	Total
Curry 1 (Korea, powder, brand A[C])	201.42 ± 6.92	80.45 ± 2.53	70.21 ± 2.52	352.08 ± 6.59
Curry 2 (Korea, powder, brand O)	205.30 ± 3.85	77.92 ± 4.03	75.85 ± 3.35	359.06 ± 2.36
Curry 3 (Korea, powder, brand X)	354.48 ± 16.47	145.96 ± 11.85	117.54 ± 4.35	617.98 ± 32.50
Curry 4 (Korea, powder, brand R)	290.92 ± 3.08	121.15 ± 2.66	115.72 ± 3.20	527.80 ± 5.31
Retorted curry 1 (Korea, powder, brand AA)	22.44 ± 0.60	11.13 ± 0.45	10.80 ± 0.96	44.36 ± 1.97
Retorted curry 2 (Korea, powder, brand H)	18.14 ± 0.39	9.58 ± 0.16	9.51 ± 0.26	37.24 ± 0.29
Compressed curry (Korea, powder, brand G)	122.62 ± 2.38	53.85 ± 0.75	48.77 ± 1.38	225.24 ± 4.47
Candy 1 (Korea, lump, brand A)	ND[b]	ND	ND	ND
Candy 2 (Korea, lump, brand E)	7.18 ± 0.22	5.57 ± 0.12	5.93 ± 0.12	18.68 ± 0.23
Candy 3 (Korea, lump, brand F)	7.90 ± 0.22	5.97 ± 0.12	6.22 ± 0.15	20.09 ± 0.48
Cheese 1 (Korea, parings, brand DD)	ND	ND	ND	ND
Cheese 2 (Korea, parings, brand JJ)	ND	ND	ND	ND
Cheese 3 (Korea, parings, brand F)	ND	ND	ND	ND
Snack 1 (Korea, piece, brand H)	ND	ND	ND	ND
Snack 2 (Korea, piece, brand B)	ND	ND	ND	ND
Snack 3 (Korea, piece, brand R)	ND	ND	ND	ND
Cornflake 1 (Korea, piece, brand H)	ND	ND	ND	ND
Cornflake 2 (Korea, piece, brand B)	ND	ND	ND	ND
Cornflake 3 (Korea, piece, brand R)	ND	ND	ND	ND
Green tea 1 (Korea, powder, brand JJ)	ND	ND	ND	ND
Green tea 2 (Korea, powder, brand R)	ND	ND	ND	ND
Green tea 3 (Korea, tea bag, brand S)	ND	ND	ND	ND
Green tea 3 (Korea, tea bag, brand DW)	ND	ND	ND	ND
Mustard 1 (Korea, canned, brand F)	8.34 ± 0.27	5.96 ± 0.16	7.66 ± 0.52	21.96 ± 0.46
Mustard 2 (Korea, canned, brand DD)	9.54 ± 0.18	6.17 ± 0.29	6.68 ± 0.02	22.40 ± 0.25
Mustard 3 (Korea, canned, brand X)	10.13 ± 0.63	6.98 ± 0.27	8.65 ± 0.34	25.76 ± 0.57
Mustard 4 (Korea, canned, brand Z)	22.33 ± 0.39	12.24 ±0.36	16.21 ± 0.23	50.78 ± 0.51
Mustard 5 (Korea, canned, brand DD)	81.56 ± 1.80	32.74 ± 0.41	41.55 ± 0.74	155.94 ± 2.18
Mustard 6 (Korea, canned, brand O)	44.55 ± 5.53	23.14 ± 1.47	33.03 ± 0.71	100.71 ± 7.70
Mustard 7 (Korea, canned, brand HH)	84.48 ± 1.81	34.79 ± 0.69	36.37 ± 1.12	155.64 ± 3.57
Mustard 8 (Korea, canned, brand K)	21.15 ± 1.19	10.35 ± 0.33	11.39 ± 0.11	42.89 ± 1.34
Pickle 1 (Korea, canned, brand Z)	4.58 ± 0.00	4.12 ± 0.00	4.41 ± 0.00	13.12 ± 0.01
Pickle 2 (Korea, canned, brand KK)	ND	ND	ND	ND
Wheat flour (Korea, powder, brand JJ)	ND	ND	ND	ND
Butter (Korea, lump, brand DD)	ND	ND	ND	ND
Ham (Korea, lump, brand DW)	ND	ND	ND	ND
Sauce (Korea, canned, brand CC)	ND	ND	ND	ND
Gochujang (Korea, canned, brand U)	ND	ND	ND	ND
Red pepper (Korea, powder, brand V)	ND	ND	ND	ND
Wasabi (Korea, canned, brand A)	ND	ND	ND	ND

[a] All values are presented as the mean ± SD of triplicate determinations. [b] ND = not detected. [c] Brand = manufacturing company.

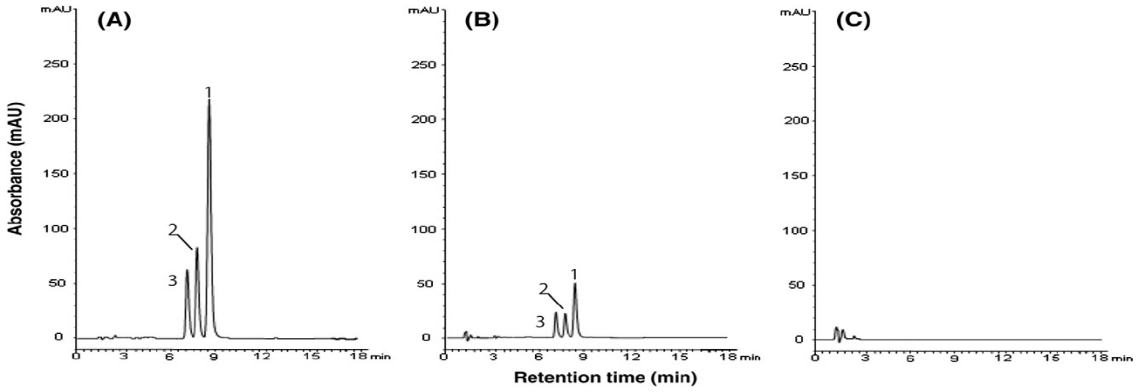

Fig. 1. HPLC chromatograms of curcuminoids in commercial foods. (A) Curry (B) Mustard (C) Gochujang.