

## Some Nutritional Composition of Barley Flours

by

Hong-Sik Cheigh, Nam-Sook Lee and Tai-Wan Kwon

Korea Institute of Science and Technology, Seoul, Korea

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### 보리가루의 영양성분조성에 관하여(노오트)

최홍식 · 이남숙 · 권태완

한국과학기술연구소

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#### Introduction

Chemical composition of barley was studied comprehensively by several investigators.<sup>(1-14)</sup> However, little information is available for nutrient composition of Korean barley flours after flour-milling.

Previous work<sup>(15)</sup> demonstrated that different varieties of barley made somewhat different milling and rheological properties. In this report, four major barley varieties produced in Korea were analyzed after milling to find contents of vitamins, minerals and amino acids.

#### Materials and Methods

Two varieties of covered barley, Boohung and Suwon #18, were obtained from the National Agricultural Product Inspection Office (Seoul) and two varieties of naked barley, Sedohadaga and Kwangsung, were obtained from a provincial branch of Office of Rural Development (Kwangju). General characteristics of these samples were given previously.<sup>(15)</sup>

The covered barley was tempered prior to milling to 15% moisture and held for 24 hrs at 20°C, and naked barley was tempered to 14% and for 48 hrs at 20°C.<sup>(17)</sup> After tempering, barley samples were fed to the Buhler test mill(MLU-202 type) with the rate of 52g per min., and a total of 2.5kg of barley was

milled for each variety. The flour in each mill stream was collected and used as a flour sample for analyses. Total flour yields were about 70% for naked barley and 61% for covered barley, and results of proximate analyses of barley flours were given previously.<sup>(15)</sup>

Phosphorus was determined by the colorimetric-(Mo) blue method.<sup>(16)</sup> Analyses for other minerals, calcium, iron and potassium, were performed by atomic absorption spectroscopy.<sup>(9)</sup> Analytical determinations were made for vitamin A by the Carr-Price reaction; for vitamin B<sub>1</sub> by the thiochrome method; vitamin B<sub>2</sub> by fluorometric method; for vitamin C by 2,6-dichloroindophenol method and niacin by the Cyanogenbromide method according to AVC., Method of Vitamin Assay.<sup>(18)</sup> Amino acid analyses of acid hydrolyzates were performed with a Beckman Model 116 Amino Acid Autoanalyzer.<sup>(19)</sup> Tryptophan was determined colorimetrically.<sup>(20)</sup>

#### Results and Discussion

Table 1 shows contents of major minerals and vitamins in the flours. Barley flours contained around 0.25% for phosphorous, 0.18—0.27% for potassium, 0.02% for calcium and 0.01—0.03% for iron. Kwangsung among the barley varieties had higher content of calcium while phosphorous, iron and potassium showed lower values. Except for phosphorous,

Table 1. Mineral and vitamin contents for naked and covered barley flours

Component	Naked barley		Covered barley	
	Kwangsung	Sedohadaga	Boohung	Suwon #18
Mineral(%)				
Ca	0.02	0.02	0.01	0.02
P	0.23	0.26	0.27	0.25
Fe	0.01	0.01	0.03	0.03
K	0.19	0.22	0.18	0.27
Vitamin				
A(IU/g)	5	5	5	5
B <sub>1</sub> ( $\mu$ g/g)	5.7	4.6	3.6	5.0
B <sub>2</sub> ( $\mu$ g/g)	1.2	1.2	1.6	0.9
Niacin( $\mu$ g/g)	39	33	33	27
C( $\mu$ g/g)	5	5	5	5

Boohung was lower in calcium, iron and potassium than Suwon #18. This is similar trend to previous report<sup>(6)</sup>.

Barley flours contained little vitamin A (lower than 5 IU/g or negligible) and vitamin C (lower than 5  $\mu$ g/g or negligible). Other vitamins ranged from 3.4 to 5.7  $\mu$ g/g for B<sub>1</sub>, from 0.9 to 1.6  $\mu$ g/g for B<sub>2</sub>, and from 27 to 39  $\mu$ g/g for niacin. Vitamin B<sub>1</sub> for naked barley flour is somewhat higher than for the covered barley flour. Vitamin B<sub>2</sub> showed no substantial

difference between the naked barley flours, but showed a range of 0.9 to 1.6  $\mu$ g/g between the covered barley flours. Niacin for the naked barley flours was a little higher than for the covered barley flours.

Amino acid contents of barley flours are shown in Table 2. There were some differences in amino acid composition between covered and naked barley flour. The contents of amino acids of covered barley flours were slightly higher than naked barley flours except serine and glycine. There were only small differences

Table 2. Amino acid composition of covered and naked barley flours

(g/100g of flour)

Amino acid	Naked barley		Covered barley	
	Kwangsung	Sedohadaga	Boohung	Suwon #18
Lysine	0.31	0.29	0.49	0.41
Histidine	0.22	0.21	0.25	0.20
Arginine	0.43	0.44	0.71	0.47
Tryptophan	0.21	0.19	0.25	0.23
Aspartic acid	0.54	0.52	0.76	0.67
Threonine	0.31	0.26	0.51	0.28
Serine	0.39	0.32	0.26	0.24
Glutamic acid	2.94	2.07	3.85	3.65
Proline	1.30	1.55	1.59	1.50
Glycine	0.37	0.38	0.38	0.34
Alanine	0.36	0.34	0.88	0.48
Methionine	0.13	0.14	0.19	0.18
Valine	0.46	0.43	0.70	0.66
Isoleucine	0.33	0.30	0.47	0.46
Leucine	0.68	0.62	1.00	0.92
Tyrosine	0.31	0.17	0.38	0.35
Phenylalanine	0.55	0.48	0.86	0.74

in amino acid composition between the varieties of naked barley flours (or covered barley flours). Comparing with the FAO amino acid reference pattern<sup>(21)</sup> amino acid score of Boohung in covered barley variety showed 61.7 but others were about 58, and the limiting amino acid was lysine in all flours.

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### 요 약

한국산 쌀보리 2개 품종 및 겉보리 2개 품종을 Bühler test mill에 의하여 제분(제분수율은 쌀보리 약 70%, 겉보리 61%) 한 후 주요 무기질 및 비타민, 아미노산을 분석하여 다음과 같은 결과를 얻었다. 무기질 성분 중 P의 함량(0.19—0.27%)이 높았고 K는 0.18—0.27%, 그리고 미량의 Ca 및 Fe가 함유되고 있었다. 미량인 중 A 및 C는 거의 함유되어 있지 않았고 B<sub>1</sub>, B<sub>2</sub> 및 niacin은 각각 3.6—5.7, 0.9—1.6 및 27—39 $\mu$ g/g의 범위를 보였다. 보리가루류의 아미노산 조성은 품종간에 다소 차이를 보였으며 제한아미노산은 lysine으로서 보리가루 단백질의 amino acid score(FAO 아미노산 표준구성 기준)는 부흥이 61.7, 기타는 모두 58 내외를 보이고 있었다.

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