국내 찰밀 육성계통의 밀가루 입자 특성

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Flour Particle Characteristics of Korean Waxy Wheat

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Objectives

This study was performed to obtain the basic information to improve the milling performance of waxy wheat by analyzing flour particle characteristics of different sources of waxy wheat.

Materials and Methods

○ List of samples tested

Sample denomination	Variety or pedigree name	Feature	Starch property
Keumkang	Keumkangmil	Hard type of wheat variety	Non-waxy
SW97134	SW97134-B-WF1-12	Descendant of Keumgangmil and Chal #4	Waxy
Olgeuru	Olgeurumil	Soft type of wheat variety	Non-waxy
Suwon 292	Sinmichalmil	Descendant of Olgeurumil and Chal #2	Waxy
Urimil	Urimil	Soft type of wheat variety	Non-waxy
SW97105	SW97105-B-WF14	Descendant of Woorimil and Chal #1	Waxy
Geuru	Geurumil	Semi-hard type of wheat variety	Non-waxy
SW97110	SW97110-B-WF23-13	Descendant of Geurumil and Chal #2	Waxy

○ Wheat flours : Prepared from Buhler Pilot Mill (Buhler, Swiss)

○ Morphology of particles : Measured on the Scanning Electron Microscopy(LEO 440, Germany) with the magnifications of 300X and 1000X

○ Partilce size distribution : Measured in the ethanol solvent by using Particle Size Analyzer (Coulter KS200, U.S.A.)

Results and Discussion

1. From the SEM, it was supposed that larger and more angular-shaped particles be produced when either the relative proportions of matrixes to starch granules were higher or matrixes were well packed with continuity within all gaps between starch granules which were tightly clustered; Whereas smaller and more smooth-shaped particles, when either the proportions of matrixes were lower with discontinuity, or the binding force between starch granules were loosened with low packing densities of granules.

2. From the distributions of flour particle sizes, some differences between soft-type of wheat and others were observed, whereas there were no significant differences between hard and semi-hard types of wheat. Soft-type wheat exhibited bimodal or trimodal granule distributions by showing two or three peaks at 133.7~146.8㎛ (major), 20.70~24.95㎛ (intermediate), and 1.67~2.42㎛ (minor), respectively.

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3. Although the particles size distribution patterns of waxy wheat flours besides SW97105 were very similar with those of their respective maternal parents, their averaged sizes were significantly larger than those of respective maternal parents, which were impling the uneasy milling performances in the waxy wheat

4. Based on volume rates of particle sizes, waxy wheat showed the mean particle sizes at 106.4~128.5㎛ in order of Sinmichal< SW97105< SW97134< SW97110, and non-waxy wheat, at 97.8~117.1㎛ in order of Olgeurumil< Urimil< Geurumil< Keumkangmil.

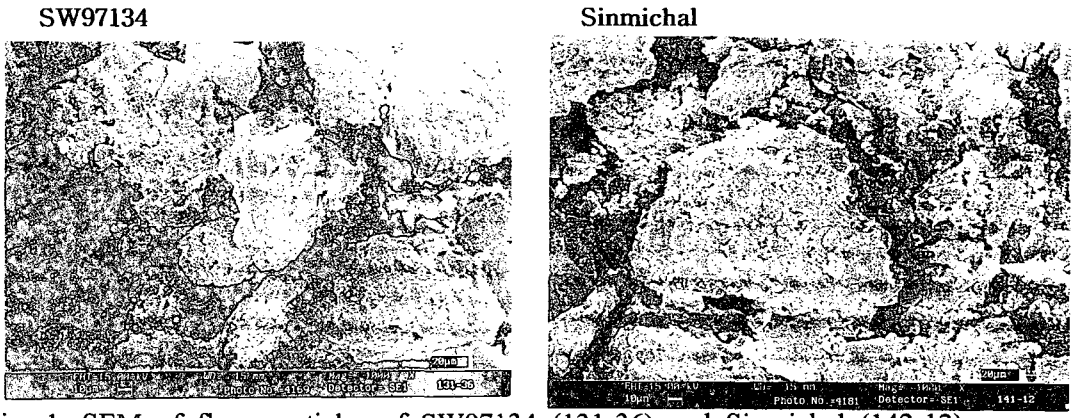

Fig. 1. SEM of flour particles of SW97134 (131-36) and Sinmichal (142-12)

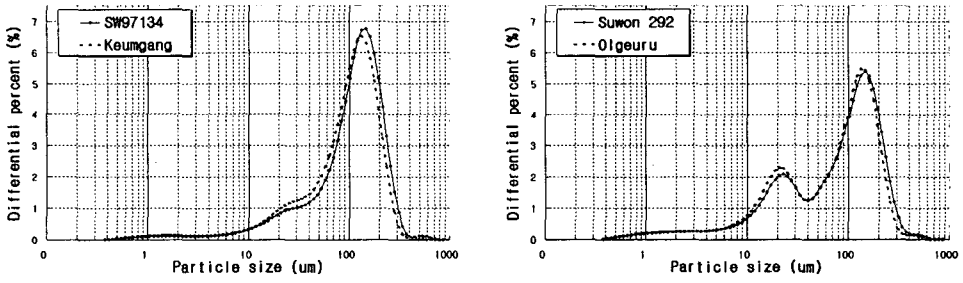

Fig. 2. Relative volume rate distributions depending on sizes of flour particles

Table 1. Mean particle diameters of waxy and non-waxy wheat flour based on volumes, surface areas and numbers

Variety or line	Mean particle diameter(㎛) based on			Specific surface area (㎠/g)	Starch property
	Volume	Surface area	Number		
Keumkangmil	117.1	28.4	0.75	2,115	Non-waxy
SW97134	128.1	31.9	0.76	1,881	Waxy
Olgeurumil	97.8	17.1	0.77	3,518	Non-waxy
Suwon 292	106.4	18.6	0.78	3,223	Waxy
Urimil	98.7	17.6	0.77	3,414	Non-waxy
SW97105	120.1	26.5	0.76	2,267	Waxy
Geurumil	116.3	27.2	0.75	2,207	Non-waxy
SW97110	128.5	32.9	0.75	1,823	Waxy