Race-specific reactions to ten races of *Pyricularia grisea* of near-isogenic lines (NILs) of Chucheongbyeo and Suwon345.

NILs	Mutilines name	Reaction[a] to									
		KJ 101	KJ 203	KJ 301	KI 313	KI 105	KI 315a	KI 409	KI 1113	KI 1117	KI 307
Chucheongbyeo *NILs*											
SR20815-8-1-2	Suwon433-1	S	S	R	R	S	S	R	S	S	S
SR20815-12-2-3	Suwon433-1	R	S	S	S	S	S	R	R	S	R
SR20816-9-2-2	Suwon433-1	S	R	S	S	S	R	R	R	S	R
SR20805-14-3-3	Suwon433-2	R	R	R	S	S	R	R	R	R	R
SR20807-3-3-3	Suwon433-2	S	R	S	R	R	R	R	S	S	S
SR20811-4-2-2	Suwon433-2	S	R	R	R	R	R	R	S	S	S
Chucheongbyeo	Recurrent parent	S	S	S	S	S	R	S	S	S	S
Suwon345 *NILs*											
SR20823-8-1-3	Suwon443-1	R	R	R	R	S	R	R	S	R	S
SR20825-13-1-3	Suwon443-1	R	R	R	S	S	S	R	R	R	R
SR20829-18-1-1	Suwon443-1	S	R	R	S	R	S	R	R	R	R
SR20822-24-1-1	Suwon443-2	R	R	R	S	R	R	R	S	R	S
SR20824-3-1-3	Suwon443-2	R	R	R	S	S	R	R	R	S	R
SR20836-4-1-2	Suwon443-2	R	R	R	R	R	S	R	R	R	R
Suwon345	Recurrent parent	R	R	R	S	R	S	R	R	R	R

[a] R = resistant, S=susceptible

Incidence (%) of leaf and neck blast of multilines grown in blast- favorable paddy field and field without chemical control during '96-'99

Multiliness and recurrent parents	1996 Icheon	1997 Suwon	1998 Icheon	1998 Suwon	1999 Icheon	AV
Leaf blast incidence						
Chucheongbyeo multilines						
Suwon433-1	0.07	1.73	0.28	1.96	0.0	0.81
Suwon433-2	-	0.36	0.12	1.28	0.0	0.44
Chucheongbyeo	25.8	0.92	1.07	1.28	3.19	6.45
Suwon345 multilines						
Suwon443-1	0.01	0.05	0.26	4.60	0.04	0.99
Suwon443-2	-	0.08	0.23	2.18	0.23	0.68
Suwon345	0.45	0.09	0.35	5.10	0.20	1.24

Multiliness and recurrent parents	1998 Icheon	1998 Suwon	1999 Icheon	1999 Suwon	AV
Neck blast incidence					
Chucheongbyeo multilines					
Suwon433-1	0.63	2.45	1.97	0.0	0.3	1.07
Suwon433-2	0.38	0.77	0.96	3.4	0.2	1.14
Chucheongbyeo	2.04	8.18	8.20	38.0	3.9	12.06
Suwon345 multilines						
Suwon443-1	1.97	37.23	1.21	11.3	1.7	10.68
Suwon443-2	3.25	23.81	0.65	17.0	0.8	9.10
Suwon345	4.16	56.46	1.67	43.2	1.8	21.46

Improvement in rice Breeding Technology and system in KOREA(IV)

- **2000s**
  - **Development of high quality appearance and good test rice variety.**
  - **Establishment of analyzing method for value added component and special embryo function.**
  - **Development of second generation “Tongil type” super yielding rice breeding**
  - **Establishment of MAS, QTL, Transformation, etc Bio-Technique breeding system**

Changing Priority of Rice Breeding In KOREA

▶ 1960s-'70s

- ○ High-yielding
- ○ Lodging tolerance
- ○ Heavy fertilization tolerance
- ○ Disease resistance

▶ 1980s-'90s

- ○ High-quality & High-yielding
- ○ Short growth duration
- ○ Direct Seeding adaptability
- ○ Disease & Insect resistance

▶ 2000s

- ○ High-quality : Eating (Ilpumbyeo), Grain Appearance (Chucheongbyeo),
- ○ High-yield : > 5.0 ton/ha of head rice, > 65% of Head rice recovery
- ○ Multiple resistance & Stress tolerance
- ○ Low fertilization adaptability
- ○ Processing & functionality : Complex and diverse endosperm
- ○ Whole crop animal feed etc

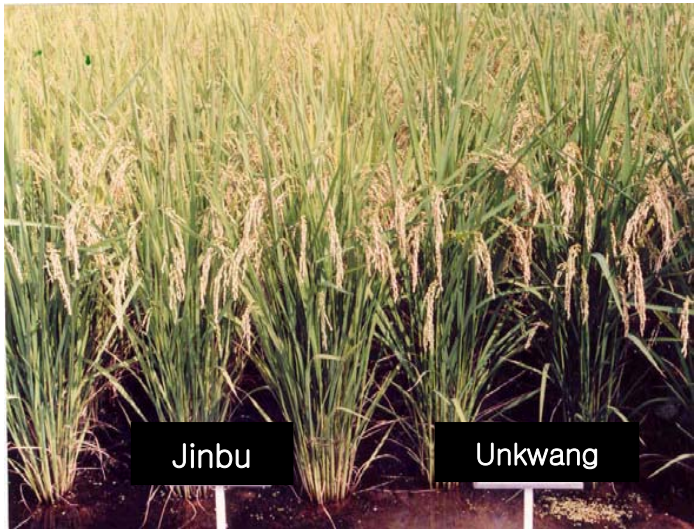
Grain quality of leading japonica cultivars recently developed in Korea

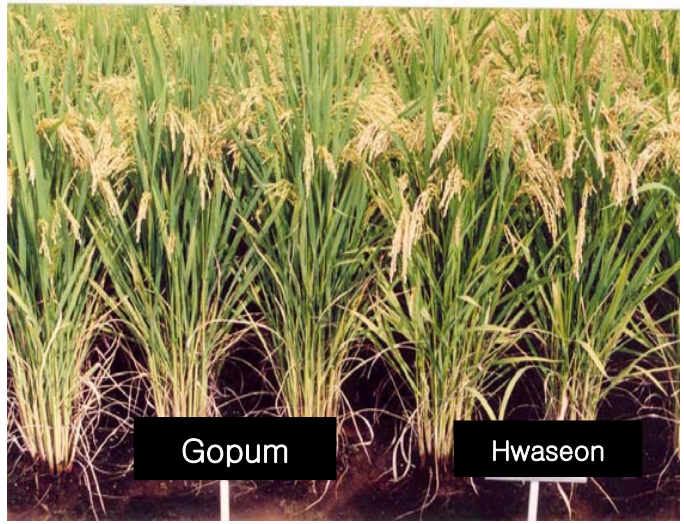
Maturity	Variety	Year deve-loped	Chalkiness (0-9)	Amylose (%)	Milling recovery (%)	1000gr. wt.(g)
Early	Odaebyeo	'82	0/1	19.4	75.5	22.0
	Samcheonbyeo	'95	0/1	17.6	77.2	21.2
	Taebongbyeo	'00	0/0	17.8	75.0	21.8
	Joanbyeo	'03	0/0	18.8	75.2	21.0
	Unkwangbyeo	'04	0/1	19.1	74.8	21.6
Medium	Hwaseongbyeo	'85	0/1	19.6	75.6	22.4
	Geumobyeo 2	'97	0/1	19.2	73.5	21.8
	Surabyeo	'99	0/0	18.3	76.9	20.9
	Sangogbyeo	'03	0/0	18.1	77.2	21.2
	Gopumbyeo	'04	0/0	19.6	74.6	21.0
Medium-late	Chucheongbyeo	'71	0/0	19.9	76.2	20.0
	Ilpumbyeo	'90	0/1	18.9	77.2	21.3
	Hwashinbyeo	'95	0/0	17.7	74.9	22.5
	Saechucheongbyeo	'00	0/0	19.7	76.6	20.5
	Samkwangbyeo	'03	0/0	18.3	76.5	22.2

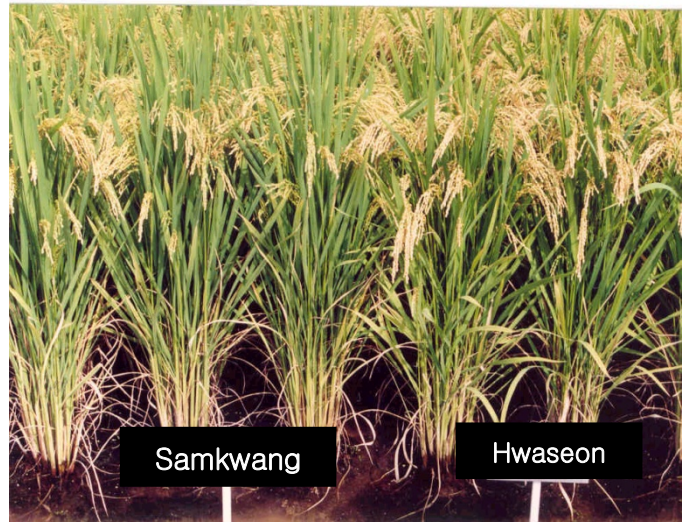
Unkwangbyeo

Gopumbyeo

Samkwangbyeo







What is the High Quality Rice in Korea

- Eating quality
  - stickiness, chewing, scent,
- Appearance
  - color, size, uniformity,
- Nutrient
  - lycine, tryptophan, vitamins
- Safety
  - free residues of agri. Chemicals & heavy metal

Top Rice

Top rice

Head rice; 95% <

Ordinary rice

The Main Factor of High Eating Quality

- Variety
- Weather during ripening stage; diurnal change
- Fertilizers; reduce N fertilizer
- No lodging
- Time of harvest; yellow 80% of spikelets
- Drying; temperature below 35℃
- Storage; grain moisture 16%, temp. below 15℃,
  less than 10 days in summer & 30 days in winter
- Boiling rice; rice/water ratio, temp., pressure
- Temperature of boiled rice

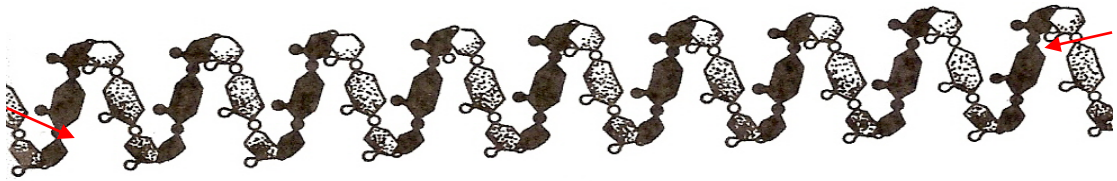
Brand Rice in Korea

Small Package of High Quality Brand Rice

KYEONGI Local Government Certified High Quality Brand Rice in Korea

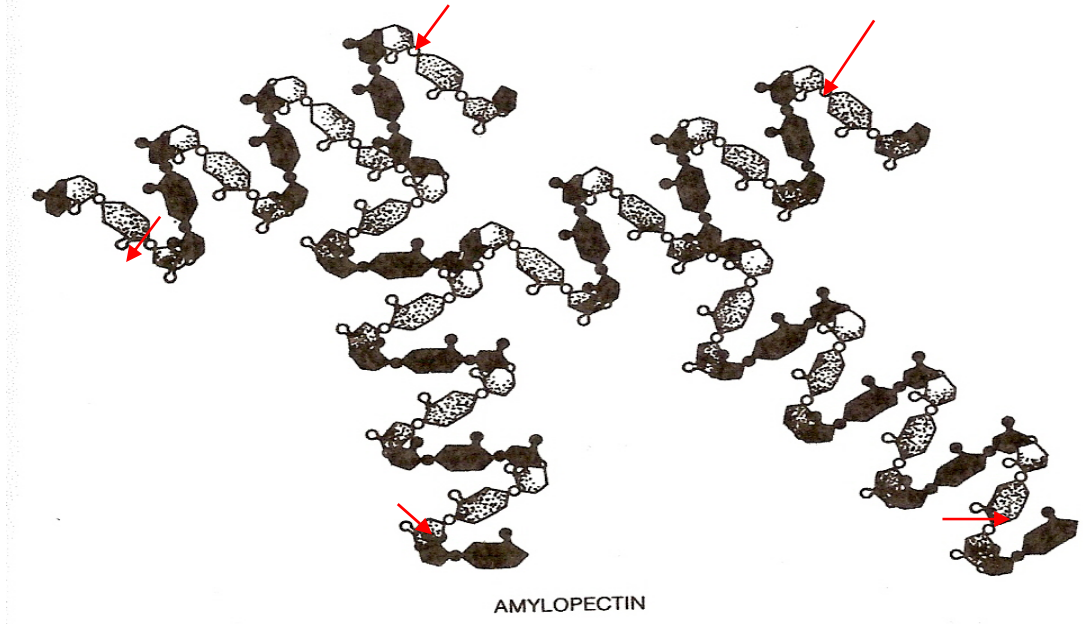
Digestibility of Starch

Enzymes
***a*-Amylase**
ß-Amylase



AMYLOSE

Amylose



AMYLOPECTIN

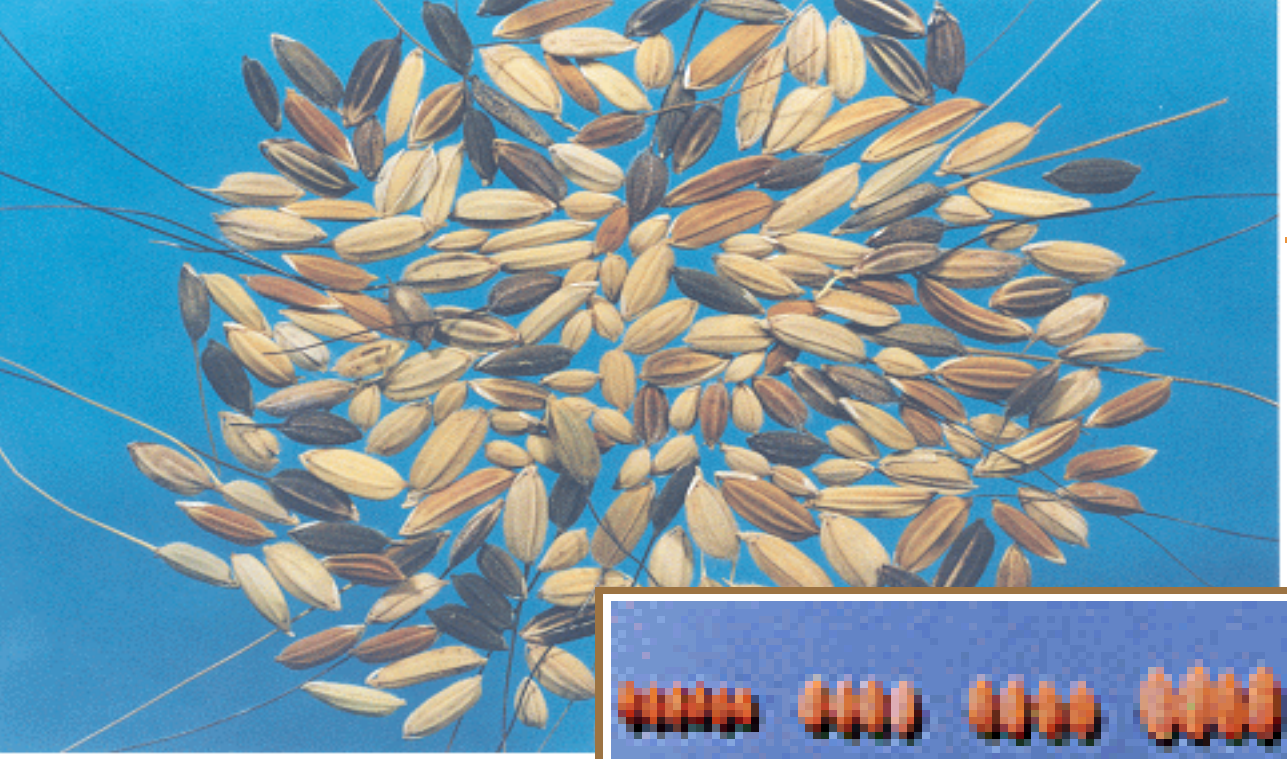
Amylopectin

Various Amylose Content

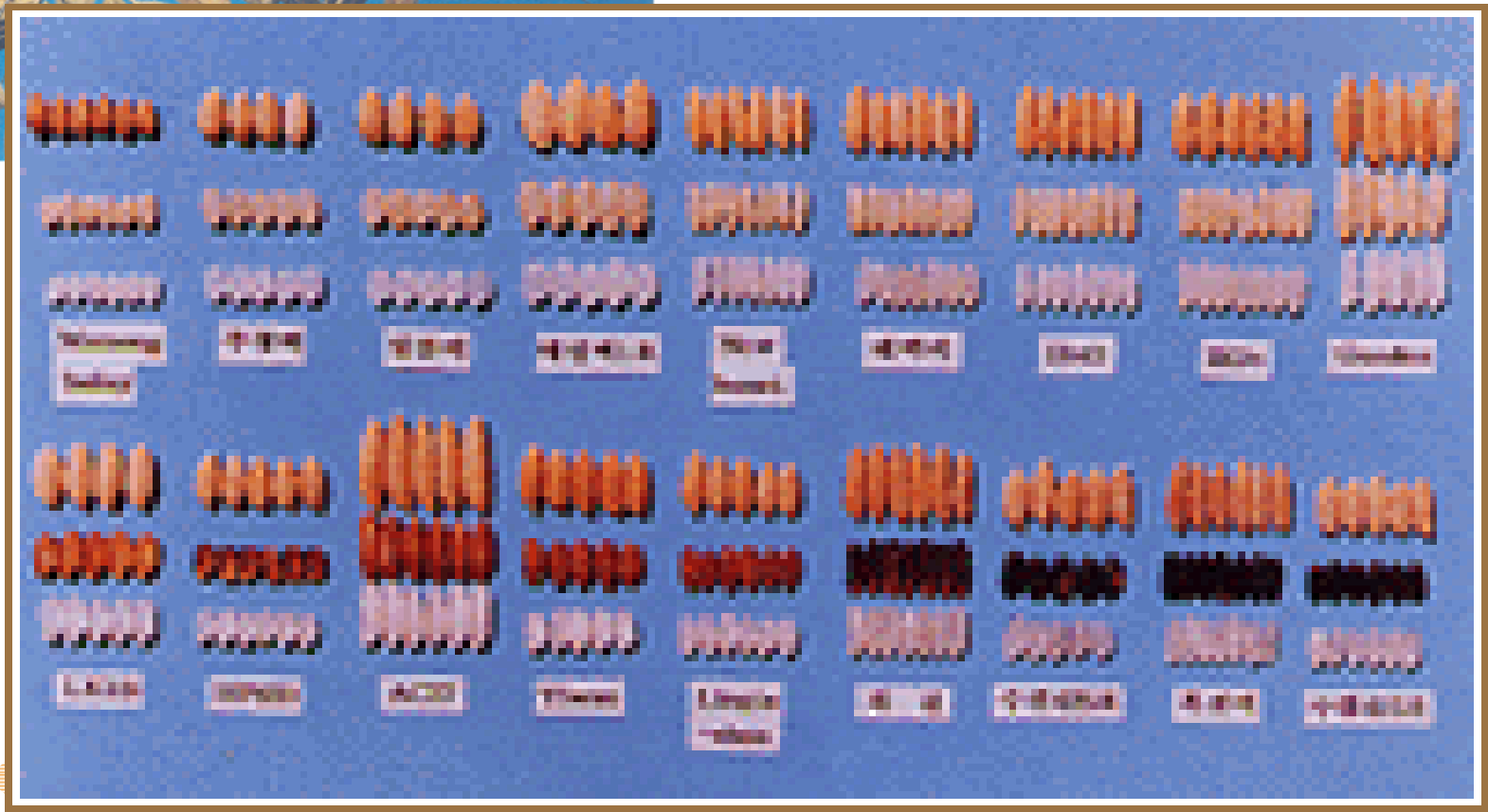
Variety Group	Amylose	Amylopectin	Utilization
Glutinous	0	100	Cake
Nonglutin.	20	80	Boiled
Tongil var.	25	75	Boiled
Bakjinju	9	91	Rice roll
Goami var.	26	74	Noodle

Special Purpose of Rice Varieties

- Boiled rice
  - most varieties
  - colored rice; waxy brown rice
  - scented rice
- Noodle; high amylose
- High cellulose; diabetes, diet
- Rice beer & wine
- Popped rice
- Large embryo; Reduce cholesterols



Different Grain Types



Development of specialty rice cultivars

Variety	Yield (kg/10a)	Major trait / utility
Hyangmibyeo 2	614	Aroma, sweet drink
Heugjinjubyeo	(405)	Black-purple, wine & mixture cooking
Jeogjinjubyeo	(554)	Red-brown, mixture cooking
Seolhyangchalbyeo	523	Japonica, aroma & waxy, sweet drink
Suweon 493	(449)	Black-purple, waxy, mixture cooking
Suweon 501	(464)	Red-brown, mixture cooking
Baekjinjubyeo	518	Semi-waxy, Rice cake, diabetes
Seolgeang	527	Dull, Red rice cozi, wine, sweet drink
Goamy 2	424	High fiber, Healthy diet (diabetes, obesity)
Younganbyeo	545	High lysine, 4.3% lysine, baby food
Suweon 492	425	Giant embryo, Vitamin B, GABA, parboiled rice
Suweon 502	588	Low protein, 5% protein, Kidney disease

( ) : Brown rice yield

Brown rice
Baekjinju(Left),
Ilumbyeo(Right)

Seolgaeng
(Red rice cozi)

Goami 2

Normal embryo(L),
Giant embryo(R)

Colored Rice Breeding

- **Pericarp of brown rice contents coloring matter.**
  - **Anthocyanidin**
  - **Tannin**
- **Aim of breeding**
  - Lodging resistance
  - Yielding ability

[Dark purple rice]

JOSENGHUGCHAL IlPUMBYEO

[Red rice]

JEGJINJU DONGJINBYEO

Why We Breed Colored Rice ?

* Pigments : Antocyanin, polyphenol

  Antioxidant : Remove free radicals

  - 8 times more GABA (neurotransmitter)

GABA Component Decreased Blood Pressure

Brown rice accumulates GABA (gamma - aminolactic acid) after soaking several hours.

By taking of pre-germinated brown rice for two months, the blood pressure decreased significantly and after stopping to take it, the blood pressure became higher.