

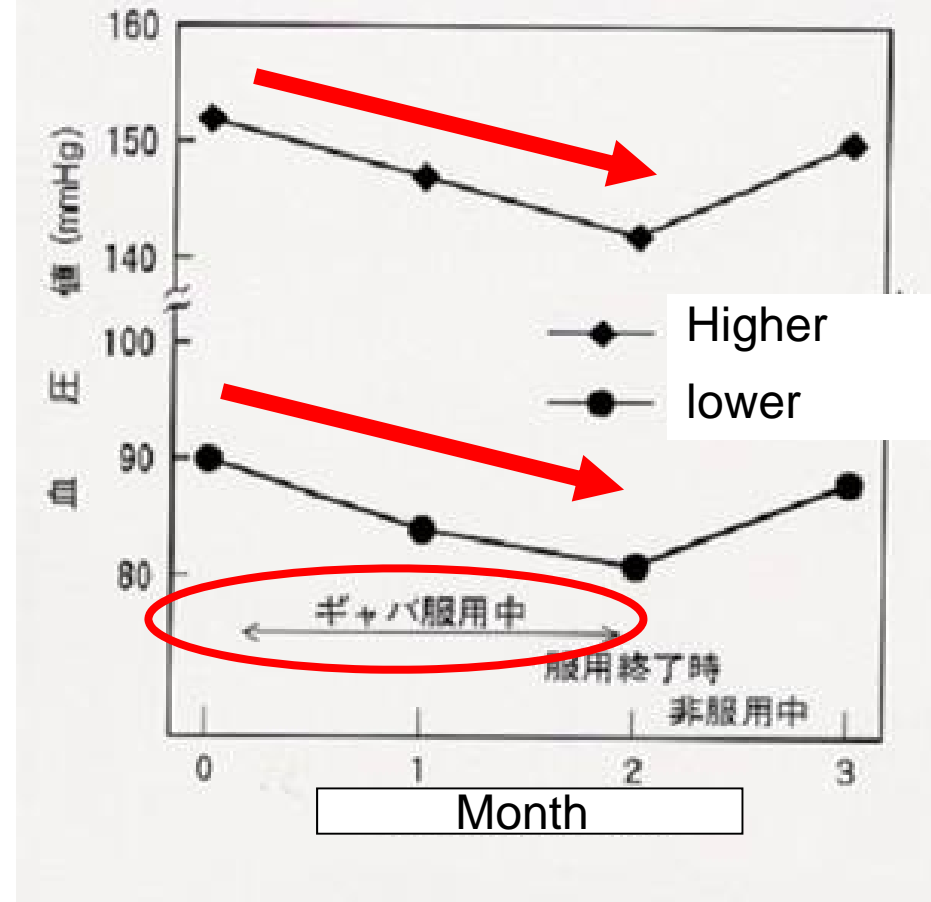
GABA Component Decreased Blood Pressure



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.

Blood pressure





Special Purpose Japanese Rice Variety (Genetic resource)



traits	name of varieties
low amylose	Aya(15%), Yawarakomachi(12%), Milky Queen(10%)
high amylose	Hoshiyutaka(28%), Yumetoiro(28%)
scented	Sari Queen (long grain), Haginokaori, Kitanokaori
pigmented	Asamurasaki (purple, glutinous), Okunomurasaki (p) Beni Roman (red)
protein	LGC-1(low gluteline), Shunyou (low gluteline) LGC-soft (low gluteline, low amylose). LA-1(low allergic protein)
big germ	Haiminori Mebaemochi (glutinous)
big grain	Oochikara (38mg)
small grain	Kanto152(13mg)





Protein Body Change Variety



Proteins in rice endosperm

1. Protein body I

*Prolamine

*Hard to digest

2. Protein body I

*Mainly glutelin

*Easy to Digest





Utilization of Low-Glutelin Mutant



*Reducing 22-23kDa
and 37-39kDa
(**glutelin**) subunits

*Increasing 13kDa
and 16kDa
(**prolamine**) subunits

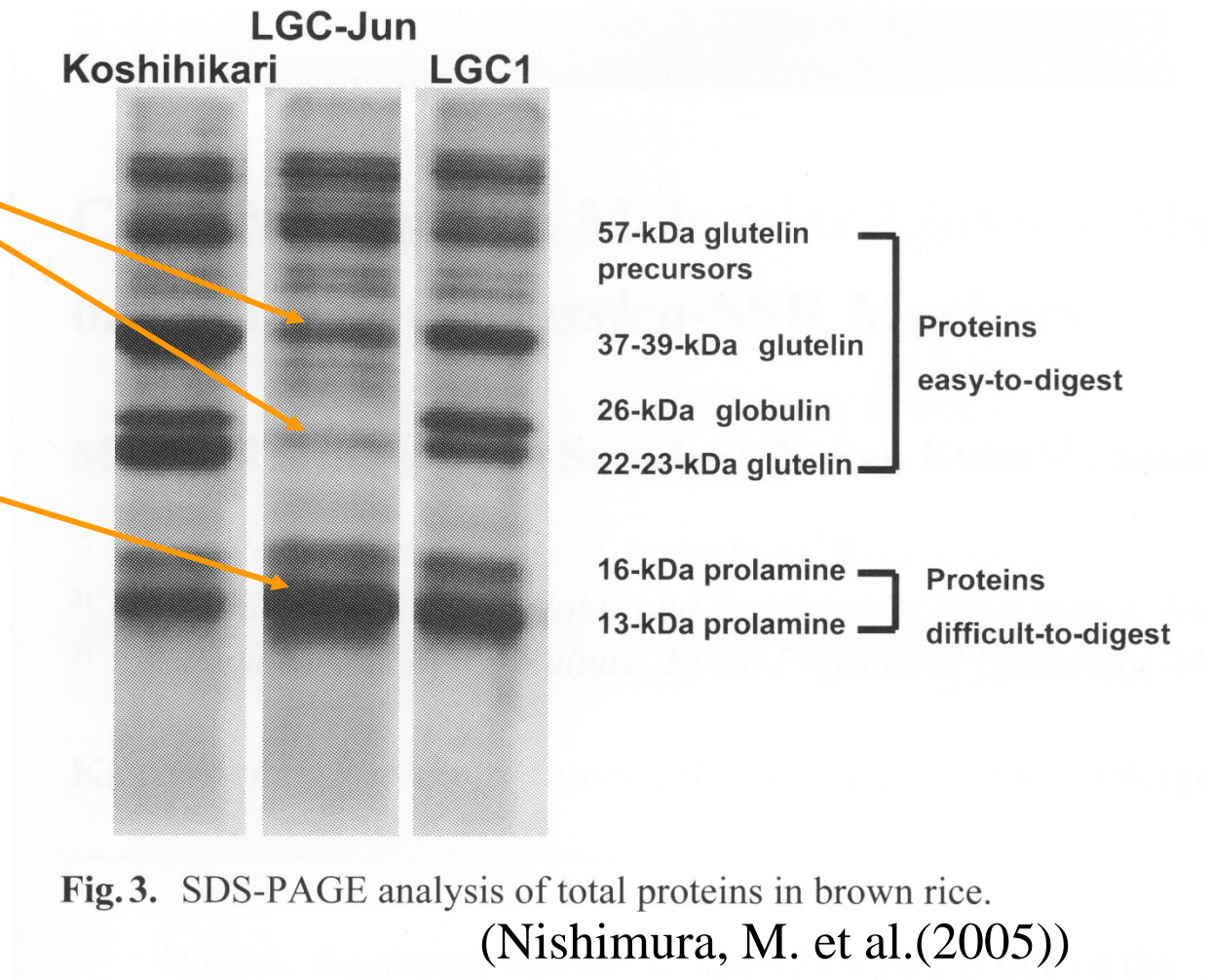


Fig.3. SDS-PAGE analysis of total proteins in brown rice.

(Nishimura, M. et al.(2005))



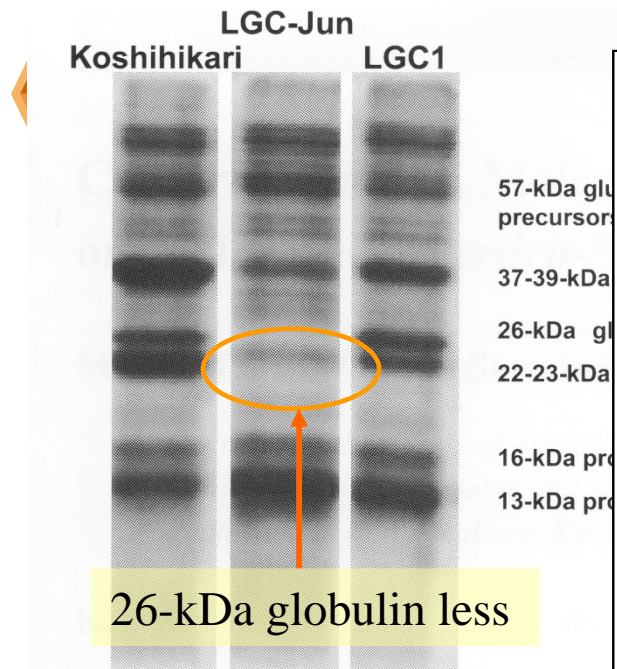
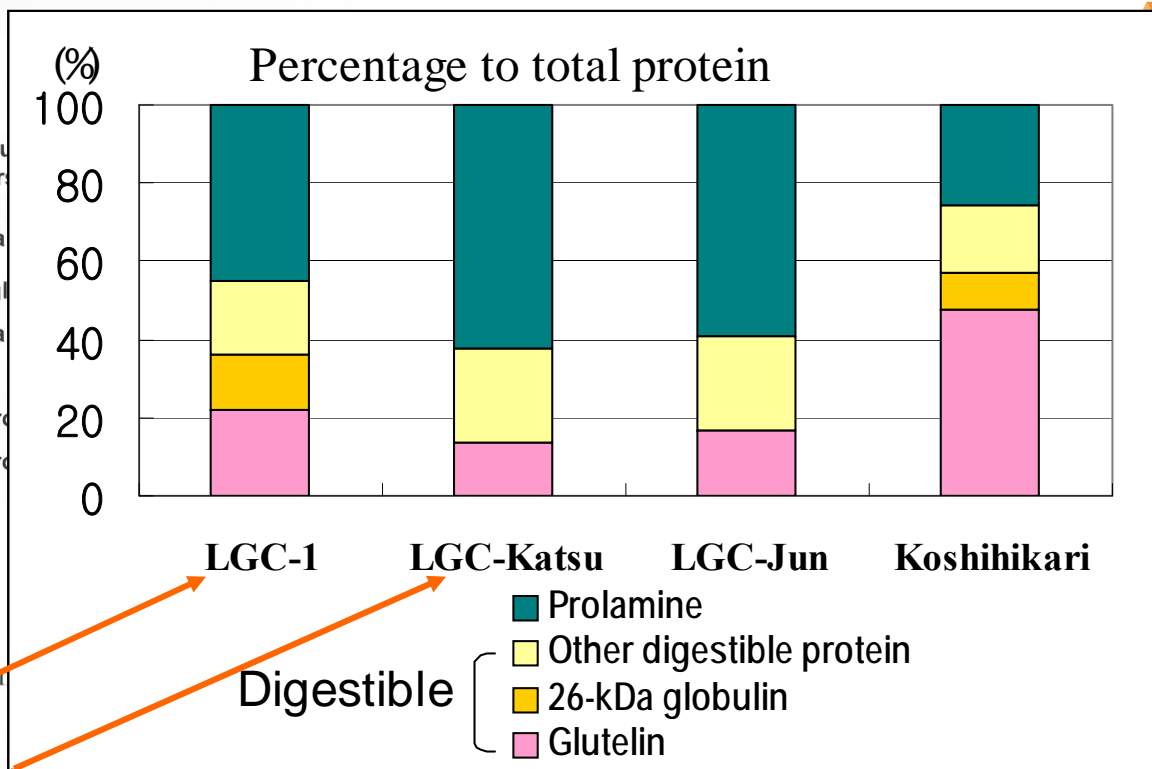


Fig. 3. SDS-PAGE analysis of total protein



*LGC varieties

2/3 of digestible protein content.

(Nishimura, M. et al. (2005))

*LGC+globulin less varieties

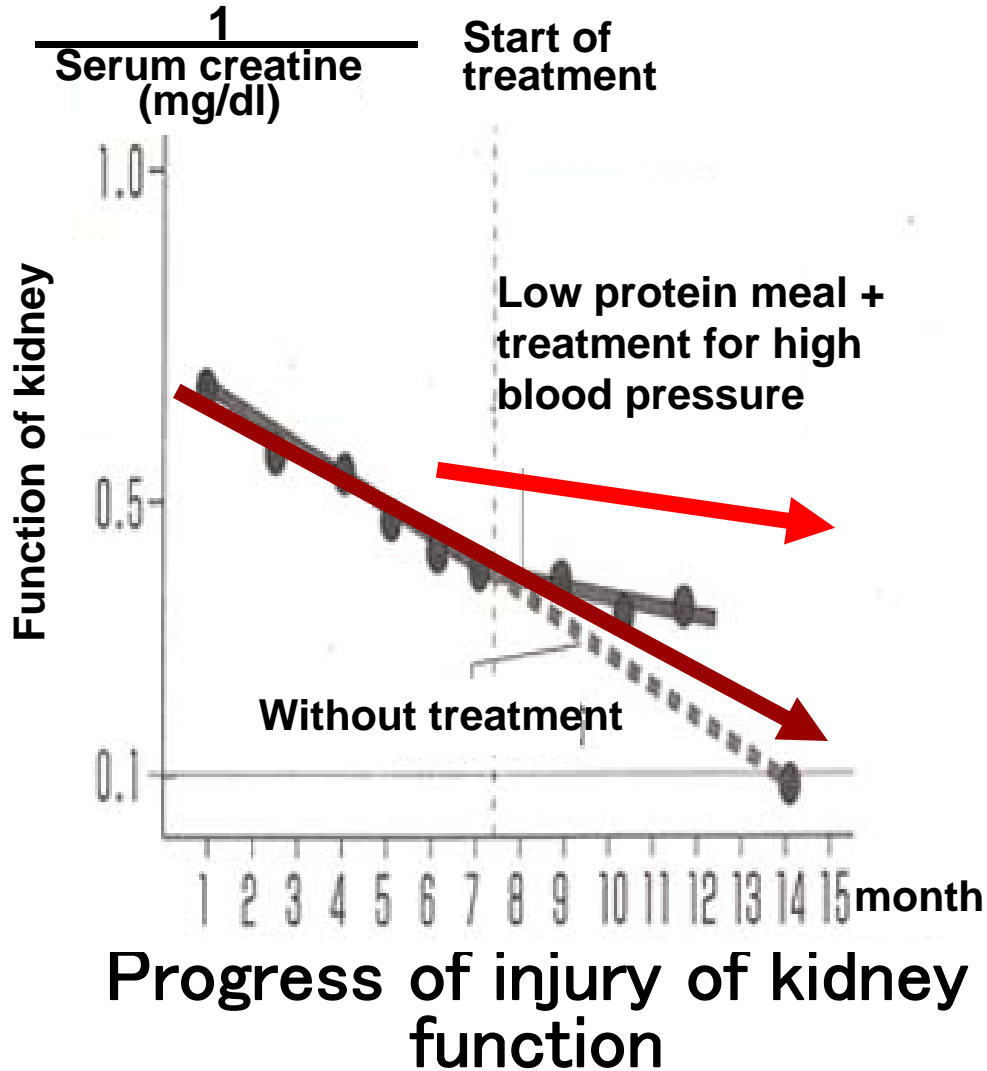
1/2 of digestible protein content.

(compared to normal rice)

(modified)



Effect of Low Glutelin Rice



Change in kidney function after taking LGC-1

	inclination of 1/serum-creatinine before (taking LGC-1) after	
All patient	-3.10 ± 3.62	-1.69 ± 2.95
Much rice taking group	-4.59 ± 4.33	-1.47 ± 3.51*
Less rice taking group	-2.05 ± 2.94	-1.82 ± 2.79

* significant at 5% level



Change and Increase Utilization Rice



- ❖ **1960s-1970s (rice insufficient); Cheap wheat flour**
 - **Wheat flour day; Noodle, bread**
 - **Traditional rice cake, liquor; only special days**

- ❖ **Present time (rice excess); Stimulate rice consump.**
 - **Liquor, cake, cookies, noodle**
 - **Processed boiled rice**
 - **Enriched rice (pregerminated brown rice, ginseng, fungi, mushroom coating)**
 - **Top rice; High quality brand rice**





Rice Cakes & Cookies





Instant Rice





MAS Breeding Programs

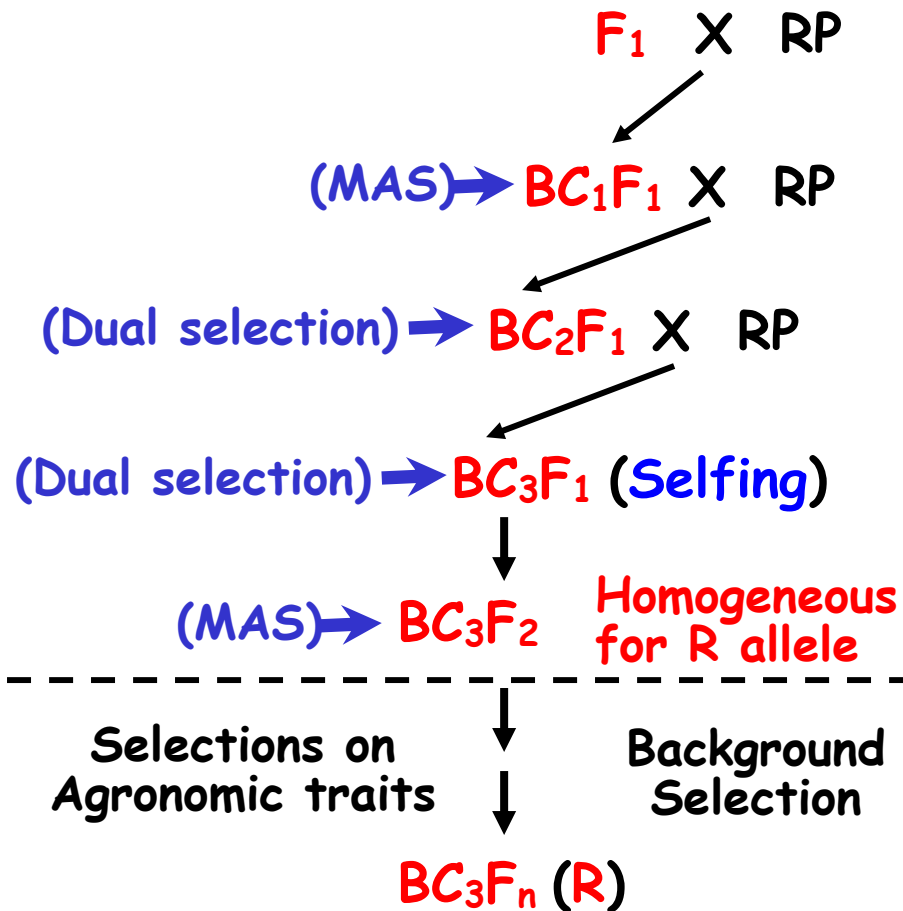


-
- ❖ **Blast (Bl) and bacterial blight (BB) resistance**
 - ❖ **Brown planthopper (BPH) resistance**
 - ❖ **Premium grain quality**
 - ❖ **Wide hybridization**
 - ❖ **Cold tolerance**

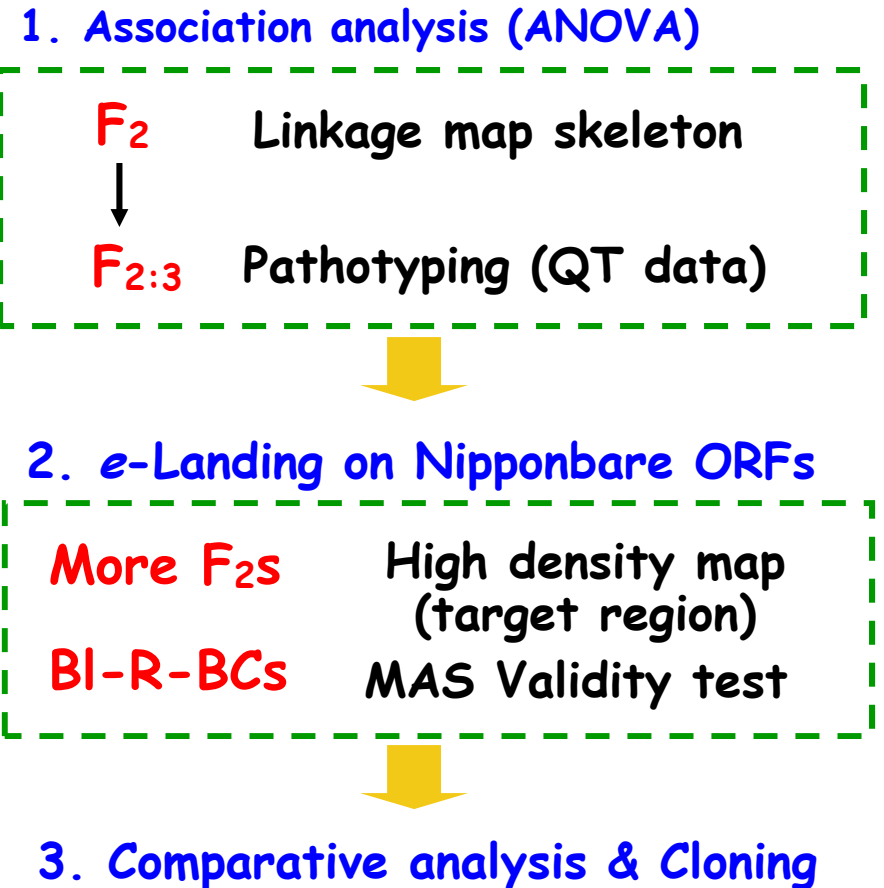


MAS Strategy for Improving Japonica Rice

Improving resistance in Japonica



Fine mapping of new R-genes

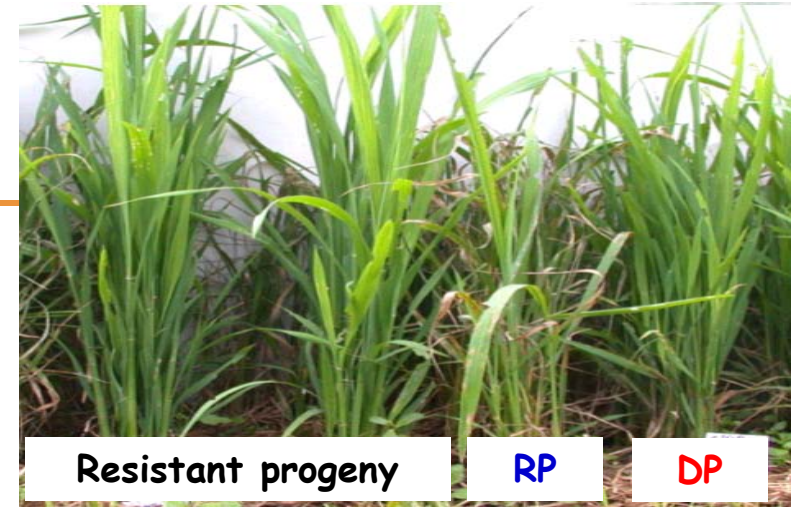


Dual selection \rightarrow selections on marker genotypes as well as agronomic traits

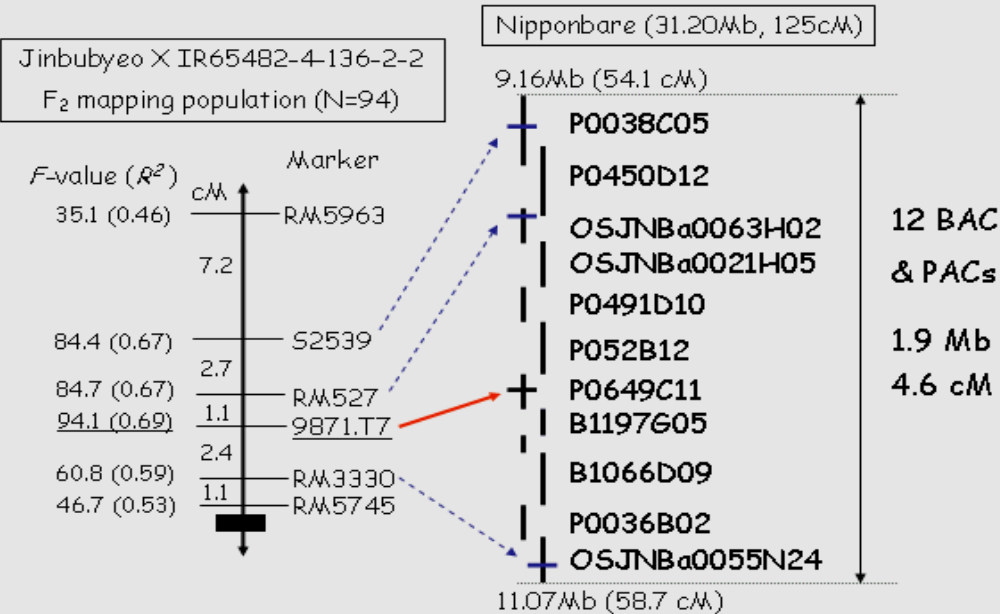
Rice Blast



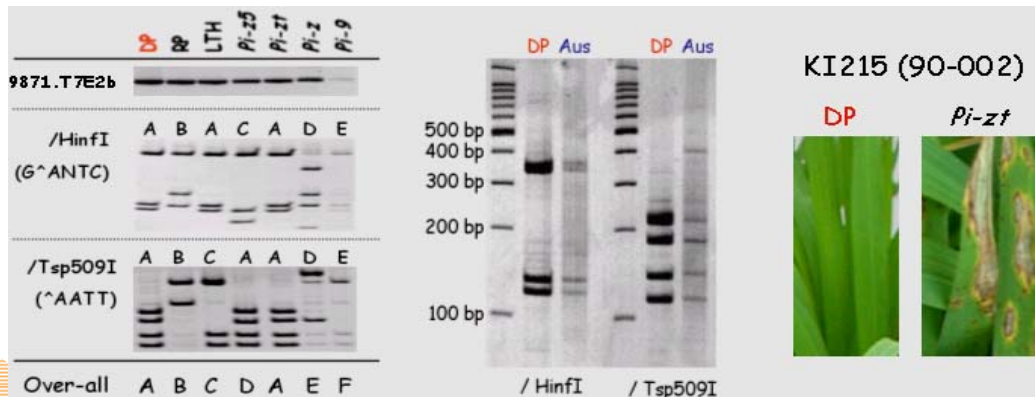
- Mining & Characterization of a novel R-gene
- Tightly linked DNA marker development



Chromosome 6



DNA marker ; 9871.T7E2b



RP = Jinbubyeo

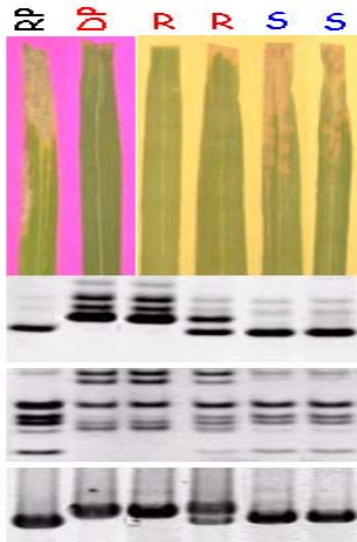
DP = IR65482-4-136-2-2

Bacterial Blight



- Using Known Resistance gene sources
- The most effective R-gene combination

Xa4 + xa5 + Xa21



KX097
Screening Isolate

RP = Mangeumbyeo
DP = IRBB57

MP1 + MP2
(*Xa4*)

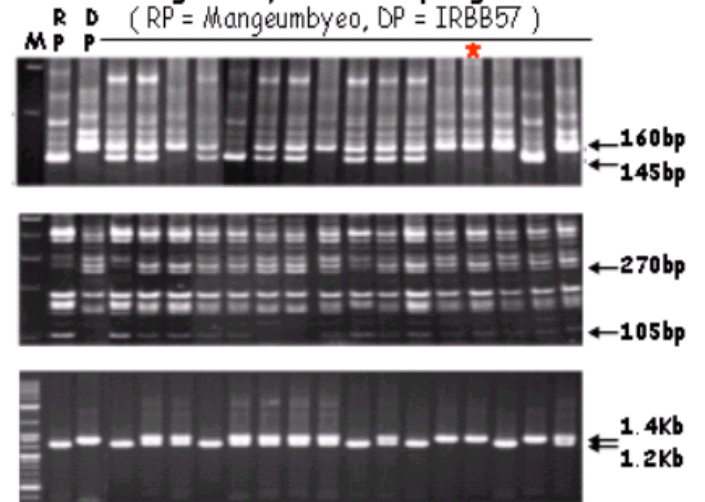
RG556/ *Alu I*
(*xa5*)

U1 + I1
(*Xa21*)

K3a Inoculation on BC₃F₂ Progenies



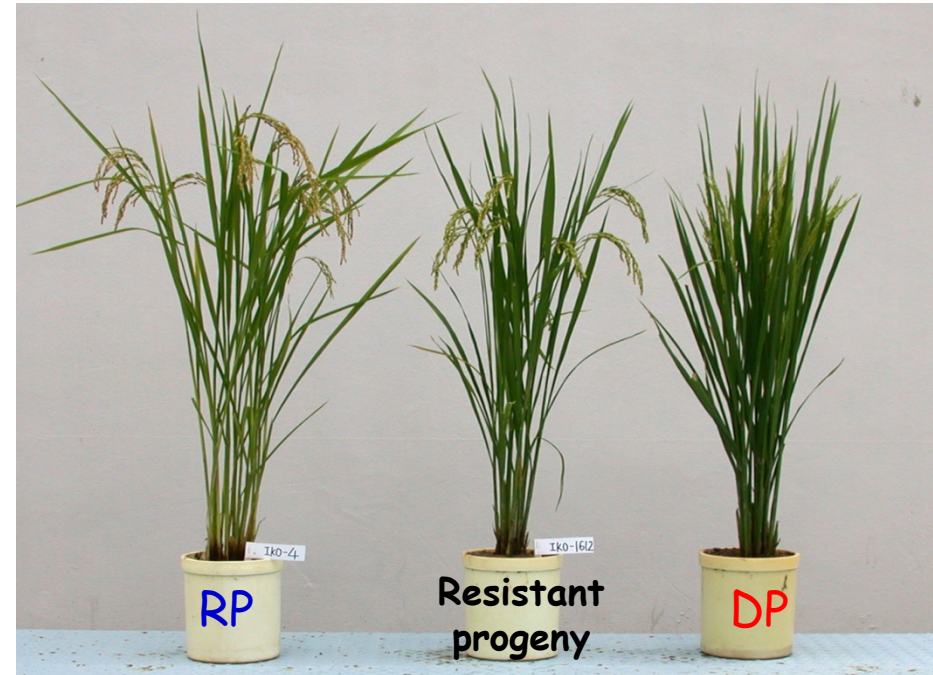
Mangeumbyeo BC₃F₂ progenies



Xa4
(MP1 + MP2)

xa5
(RG556/ *Alu I*)

Xa21
(U1 + I1)



RP = Jinbubyeo

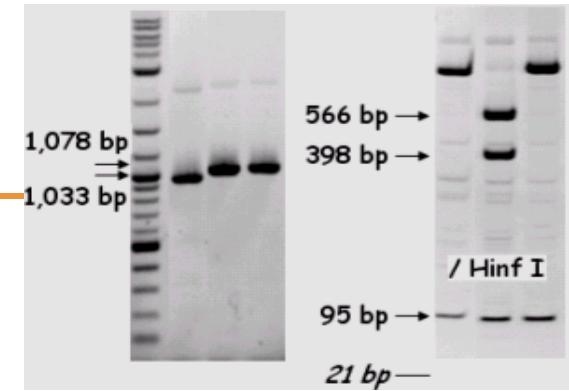
DP = IRBB57

Brown planthopper

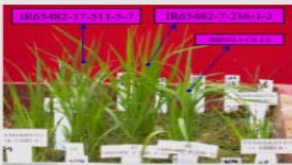


- Mining & Characterization of a novel R-gene
- Tightly linked DNA marker development

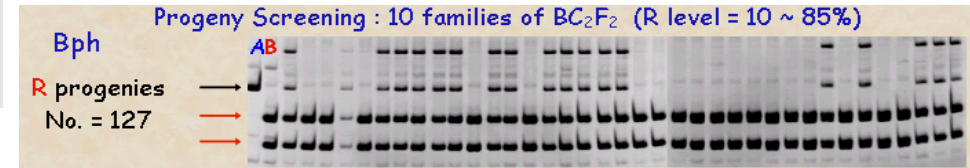
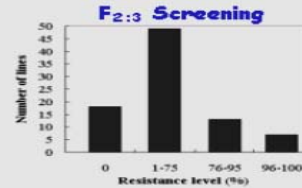
DNA marker
7312.T4A



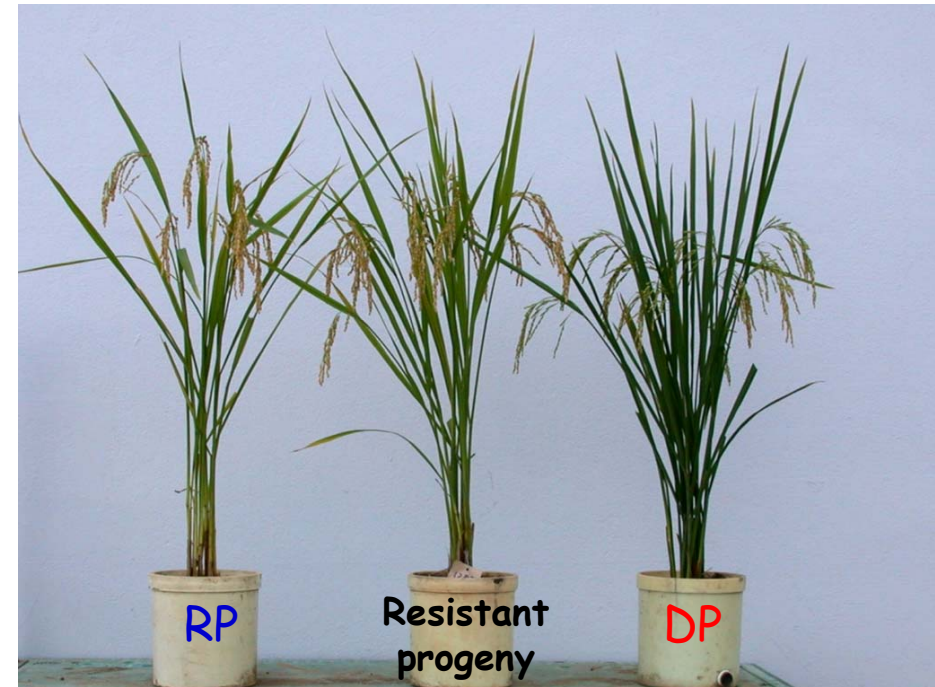
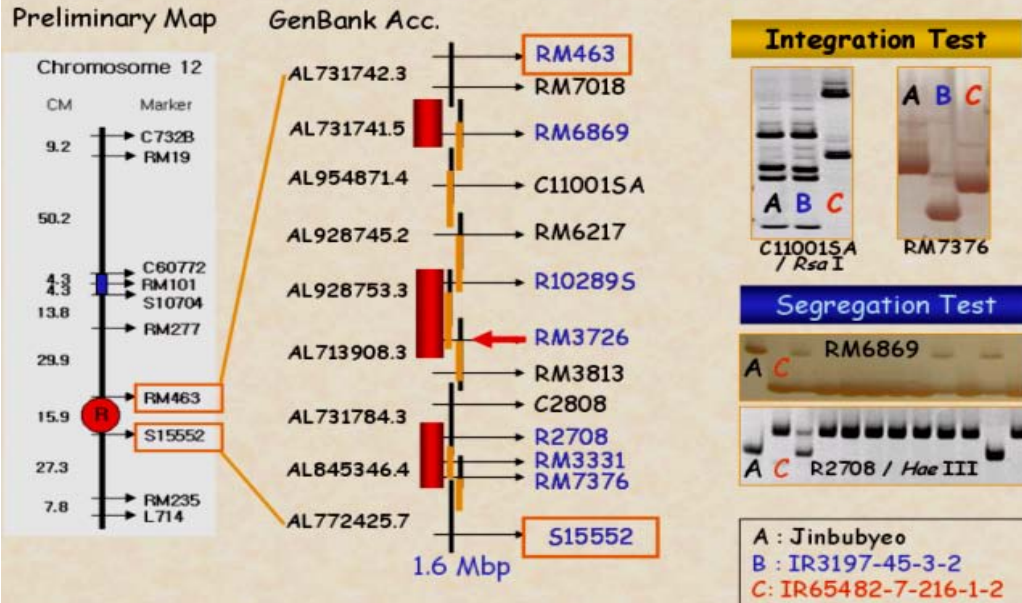
Bph R allele introduction → Jinbubyeo (S) X IR65482-7-216-1-2 (R)



Breeding lines	Score
IR65482-7-216-1-2	1
IR65482-4-136-2-2	1
IR71033-121-15	1
Jinbubyeo	9



Fine Mapping of BPH R Gene (e-Landing)



RP = Jinbubyeo

DP = IR65482-7-216-1-2



Future Strategies for Rice Breeding

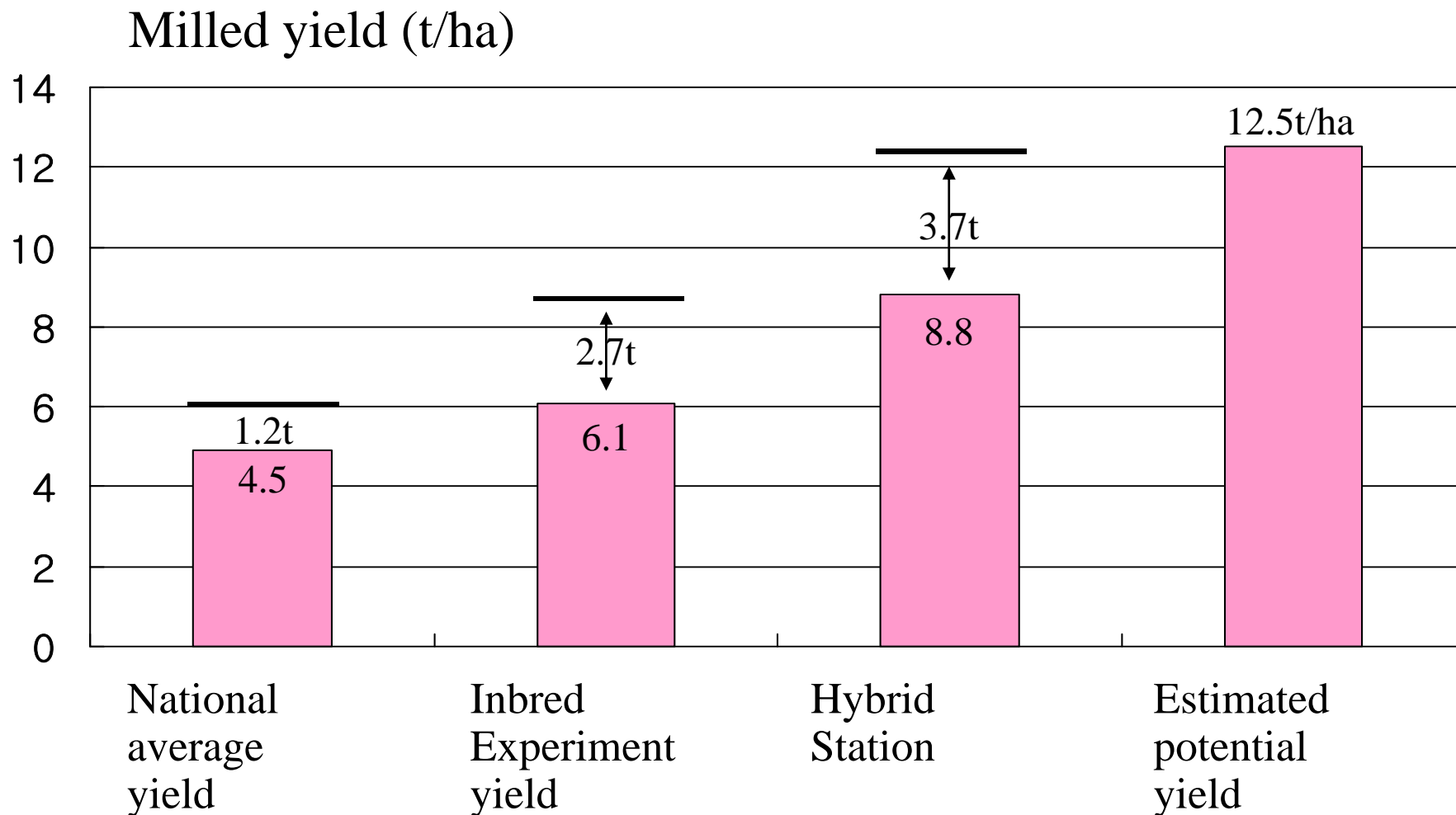


- ❖ **Potential Productivity of Rice**
- ❖ **New Plant Type for Increased Yield Potential**
- ❖ **Developing Hybrid Rice**
- ❖ **Application of Biotechnology**
- ❖ **Wide Hybridization for New Gene**





Potential Productivity of Rice



New Plant Type for Increased Yield Potential

- ❖ **To achieve these goals, a new plant type was conceived with the following attributes.**
 - **Lower tillering capacity (3-4 tillers when direct seed, 8-10 tillers when transplanted)**
 - **No unproductive tillers**
 - **200-250 grains per panicle**
 - **90-100cm tall**
 - **Very sturdy stems**
 - **Dark green thick and erect leaves**
 - **Vigorous root system**
 - **100-130 days growth duration**
 - **Multiple disease and insect resistance**
 - **Acceptable grain quality**





Correlation Coefficient of Yield and Yield Component



❖ In observable yield test of IRRI and Korea's elite lines at YARI in 2005

IRRI	No. of panicles	No. of spikelets per panicle	Grain filling ratio	1,000 grains weight	Milled rice yield
Korea					
No. of panicles	-	0.064	-0.327*	-0.205*	0.186
No. of spikelets per panicle	-0.050	-	-0.271*	0.059	-0.069
Grain filling ratio	0.198	-0.205*	-	0.147	0.816**
1,000 grains weight	-0.087	-0.492**	-0.190	-	0.131
Milled rice yield	0.011	0.615**	0.061	-0.366*	-

*, ** : Significant at 5% and 1% levels, respectively





Path Coefficient of Yield and Yield Component



Charters		No. of panicles	No. of spikelets per panicle	Grain filling ratio	1,000 grains weight
Direction effect	IRRI	0.528	0.170	1.000	0.079
	Korea	0.004	0.650	0.192	-0.009
Indirect effect	IRRI	-0.339	-0.239	-0.206	0.053
	Korea	0.006	-0.035	-0.131	-0.357

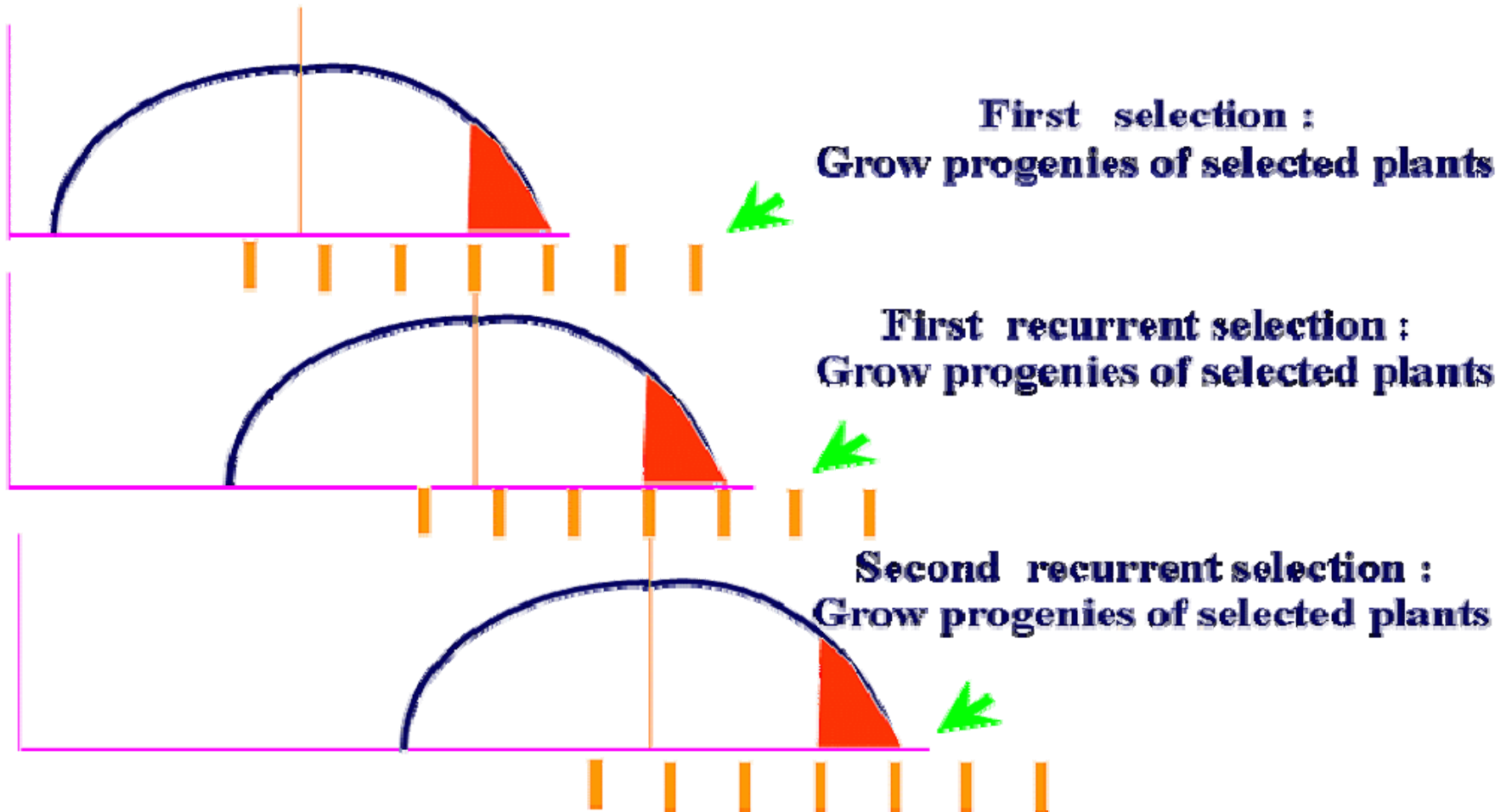




How Can Use QTLs for Breeding ?



Phenotypic-recurrent Selection Effect of QT



What is the QTLs and NON- Allelic Heterosis ?

