VI. Quantitative genetics

32. Isozyme markers for plant height and spikelet fertility in rice

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The F_2 progeny of a Japonica-Indica cross, ES70-6/SS404, was studied for quantitative traits, spikelet fertility and isozyme segregation. Both the parents are African traditional varieties of *O. sativa* from Tanzania and Senegal, respectively.

A total of 321 F_2 plants were surveyed at seven isozyme loci. Plant groups having different alleles at each isozyme locus were compared with one another for plant height and spikelet fertility by the analysis of variance, which was conducted after square root transformation of the data. A significant difference between the plant groups may be considered as showing linkage of the given iso-

Table 1. Test for difference in plant height and spikelet fertility between genotypes for each enzyme locus, in the F_2 of ES70-6 (Japonica)×SS404 (Indica)

Locus[a]	Genotype[b]	No. of plants	Plant height (cm)		Fertility (%)	
			Mean	Dif.	Mean	Dif.
Acp-1	E/E (+9/+9)	36	106.5	**	31.1	ns
	E/S (+9/−4)	149	100.3		27.6	
	S/S (−4/−4)	136	103.9		28.8	
Est-1	E/E	75	106.5	**	22.4	**
	E/S & S/S	246	101.4		30.4	
Cat-1	E/E (2/2)	83	103.3	ns	28.3	ns
	E/S (1/2)	152	103.3		28.2	
	S/S (1/1)	86	101.0		29.2	
Pgd-1	E/E	78	102.8	ns	29.4	ns
	E/S	157	102.9		27.0	
	S/S	86	101.8		30.5	
Pgi-2	E/E (1/1)	36	109.8	**	34.0	**
	E/S (1/2)	173	101.7		24.4	
	S/S (2/2)	112	101.6		31.3	
Sdh-1	E/E	42	101.0	ns	32.7	ns
	E/S	152	103.4		28.9	
	S/S	127	102.0		26.6	

a. Symbols follow those propossed in RGN 3, p. 15-17.
E/E: Homozygote for allele from ES70-6 (Japonica)
S/S: Homozygote for allele from SS404 (Indica)
E/S: Heterozygote
Allele symobls if known are given in parentheses.

** $P<0.01$, ns Not significant.

zyme locus with at least one gene-locus concerned in the studied trait, called quantitative trait locus or QTL (Tanksley et al. 1982).

Three isozyme markers, *Est-1*, *Pgi-2* and *Acp-1*, had effects on plant height (Table 1). Spikelet fertility was associated with *Est-1* and *Pgi-2*. *Pgi-2* and *Acp-1* are independent. *Est-1* is also independent of *Pgi-2* (unpubl. data). Therefore, there can be at least two QTL's for plant height and spikelet fertility.

Thus, *Est-1* and *Pgi-2* are markers for these two characters. This suggests that plant height and spikelet fertility are, in part, controlled by linked genes or by pleiotropic effects of the same genes. Relationships of plant height with pollen and/or spikelet fertility were reported by Oka (1978). Our result supports this observation and provides an explanation of the genetic basis. As the Indica and Japonica varieties differ in morpho-physiological, enzymatic and other traits, these traits are expected to be interrelated in hybrids.

Analysis of quantitave traits by marker loci was successfully made in tomato (Tanksley et al. 1982; Weller et al. 1988) and in maize (Edwards et al. 1987). In rice, such studies may provide a new insight on varietal differentiation.

In our data, it is worth noting that in *Acp-1*, *Pgi*-2 and *Sdh-1*, homozygotes for the allele from the Japonica parent were much fewer than those for the allele from the Indica parent.

References

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33. A rice line with very large grain obtained by pyramiding genic effects

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Line SLG12 with an extraordinarily large size of grains was obtained from a series of crosses of lines selected for larger grain size. Its grain length and width reached 12.8 mm and 4.9 mm, respectively, and its single grain weight was 77.9 mg (Table 1). It could be the largest of the world, as the world collection of 14,128