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Short Communication

Genetics of protein and amylose content in aromatic rice (*Oryza sativa* L.)

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India gets maximum foreign exchange by export of Basmati rice (*Oryza sativa* L.) which have a high premium value in international market. So the situation now calls for diversifying scented rice breeding towards quality for export purposes. The protein and amylose content are the principal compositional indices of cooking quality. The market price and the consumer preference are the important factors which are given weightage during varietal improvement of quality. High protein and intermediate amylose content are preferred by the consumers. Therefore, an attempt have been made to know the gene interaction which controls the protein and amylose content in six aromatic rice varieties.

The experimental material comprised of six populations of aromatic rice i.e. P_1, P_2, F_1, F_2, BC_1 and BC_2 derived from each of four crosses i.e., Basmati bahar × Musk budhi, Basmati bahar × Kalimochi, Kalimochi × Katrani and CRM-8-30 × Gourab were affected at Central Rice Research Institute, Cuttack in *kharif*-2003. All the populations were raised together in a Randomised Block Design with three replications of 30 cm × 10 cm spacing. Each parent and F_1 generations were sown in two rows, back cross generation in four rows and F_2 generation in six rows of 3 meter length. Data on ten competitive plants from the parents and F_1 twenty plants from BC_1 and BC_2 generations and thirty plants from F_2 were used to record the observations.

The crude protein content was estimated by Micro Kjeldahl method [1] and multiplied by 5.95 and amylose content was estimated as per Juliana [2]. The data were first of all subjected to analysis of variance, separate for each cross in each environment. The pooled analysis of variance was done. Mather's [3] scaling test A, B and C was applied to detect the presence of epistasis. At least one of the scale from A, B and C is significant then the data were subjected to estimation of various genetic components as per Hayman [4].

The scaling test indicated the presence of epistasis for both the characters for four crosses except amylose content in Basmati bahar × Kalimochi. Then six parameter model was applied to different crosses. The results are presented in Table 1. The result revealed that both additive (d) and dominance (h) effects were significant for all the crosses except amylose content in Basmati bahar × Musk budhi and CRM-8-30 × Gourab where only additive effect is significant. The relative magnitude of dominant effect (h) was invariably higher than the additive 'd' effect indicating predominance of non-additive gene effect in controlling the character. Earlier Somrith *et al.*, [5] reported the role of non-additive gene effects in controlling the inheritance of amylose content, where as Shenoy *et al.* [6] reported the importance of both additive and non additive gene effects governed the inheritance of this trait. All the epistatic characters like additive × additive (i), additive × dominance (j) and dominance x dominance (l) effects were significant in Basmati bahar × Musk budhi, Basmati bahar × Kalimochi and CRM-8-30 × Gourab for protein content. In most of the crosses for the two characters both additive × additive (i) and dominance × dominance(l) interactions were significant but the latter component predominated indicating major role of non fixable gene action in the expression of the traits. Predominance of non-additive gene effect for protein content was observed by Shenoy [7]. The opposite sign of "h" and "l" indicated the presence of duplicate type of epistasis in most of the crosses which will hinder the process of selection.

The non fixable gene effects like "h", "j", "l" were higher than the fixable "d" and "I" effect in most of the crosses indicating greater role of non additive gene effects in the inheritance of the characters. So recurrent selection like Diallel selective mating or Biparental mating in early segregations might prove to be effective in the improvement of the quality traits. The restricted recurrent selection by the-process of intermating the most

Table 1. Gene estimates of protein and amylose content in aromatic rice

Cross	m	d	h	i	j	l	Epi.
				Protein content			
C_1	10.14±0.40	0.62**±0.02	8.44**±1.10	4.14**±0.41	1.64**±0.32	−4.37**±0.71	D
C_2	11.50±0.35	1.56**±0.06	4.75**±0.88	2.05**±0.32	−0.72**±0.32	−1.90**±0.61	D
C_3	13.20±0.26	−1.45*±0.15	−8.58**±0.62	−3.54**±0.21	−0.18±0.15	4.30*±0.42	D
C_4	11.62±0.24	−1.59*±0.06	−5.80*±0.56	−2.15*±0.24	0.62**±0.16	3.42*±0.36	D
				Amylose content			
C_1	23.65±1.61	0.60*±0.61	3.10±2.30	4.68*±2.10	3.12±1.88	-	-
C_2	24.32±0.51	2.12**±0.53	2.23*±1.02	-	-	-	-
C_3	17.62±1.24	1.86**±0.18	−3.30*±2.40	2.15±1.15	1.86**±0.62	10.15**±2.16	-
C_4	23.85±0.13	−0.28*±0.45	−1.48±1.06	−2.12*±0.95	0.81±0.42	4.32±1.98	D

C_1 = Basmati bahar × Muskbudhi, C_2 = Basmati bahar × Kalimochi, C_3 = Kalimochi × Katrani, C_4 = CRM-8-30 × Gourab. Epi = Epistasis, D = Duplicate

desirable segregants followed by selection might also be useful breeding strategy for the application of both the additive as well as non additive type of gene action.

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