Extent of Genetic Variation in Indigenous Scented Rice Varieties of Assam

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Forty indigenous scented rice varieties of Assam (locally known as *Joha*) including an introduction from Thailand were screened for the extent of genetic variation for yield and yield attributing traits, and for a few biochemical parameters. The results indicated that there was considerable variation among the varieties for all the traits. The estimates of genotypic and phenotypic coefficients of variation were found to be high for grains per panicle, 100-grain weight, flag leaf area, grain yield per plant, effective tillers and biochemical parameters studied.

Key Words: Genetic advance, Genetic variation, Heritability, Scented rice

There is a great diversity of rice germplasm in North Eastern India, particularly in Assam. Among the various classes of rice cultivated in Assam, scented rice locally known as "joha" occupies a premium position in the local market due to its unique aroma. But these varieties are low yielding, photoperiod sensitive and prone to lodging. Considering the socio-economic importance of the crop, there is a need to genetically improve these varieties. The principal chemical of rice is starch followed by protein content. Apart from starch and protein, rice provides other nutrients like sugars, minerals, fats and some B-complex vitamin. Improvement in nutritional quality of the indigenous scented rice varieties should also get due consideration in order to make them more acceptable in national and international markets. The present studies were, therefore, initiated with an objective to know the extent of genetic variation in indigenous scented (joha) rice varieties for yield and yield attributing characters and for a few biochemical parameters.

Materials and Methods

Forty indigenous scented rice varieties were evaluated in a randomized block design with 3 replications during the *Sali* season, 2003. The experiment was conducted in the experimental field of Regional Agricultural Research Station (RARS), Titabor (26°55'N and 90°10'E). Row length was 2 m with a spacing of 20 cm x 15 cm. Fertilizers were applied on the basis of recommendation for indigenous rice (20 kg N, 10 kg P_2O_5 and 10 kg K_2O/ha). In the field experiment, data on individual plant basis were recorded on five randomly sampled plants in each replication leaving the border rows and border plants. Observations were recorded for days to maturity, plant height (cm), number of effective tillers per plant, panicle length (cm), grains per panicle, grain length (cm), grain breadth (cm), L/B ratio, sterility percentage and 100-grain weight (g). For the laboratory experiment, total soluble sugar was estimated by using Anthrone method given by Yem and Willis (1954). Reducing sugar was estimated by the method described by Miller (1959) and non-reducing sugar by subtracting the percentage of reducing sugar from the percentage of total soluble sugar. Starch content was estimated by the method described by Chopra and Konwar (1976). The data were subjected to analyses of variance and the variance components, phenotypic and genotypic coefficients of variation were estimated according to Burton (1952). Heritability and genetic advance were also estimated by the formula given by Johnson *et al.* (1955).

Results and Discussion

In the analysis of variance, existence of significant variation for grain yield per plant and other yield attributing and grain characters was recorded. High estimates of genotypic and phenotypic coefficients of variation (GCV and PCV) were recorded for grains per panicle, 100-grain weight, grain length, grain breadth and days to maturity (Table 1). Direct selection would be effective for these characters in improving grain yield. High estimates (>20%) of GCV and PCV were observed for 100-grain weight, grains per panicle, flag leaf area, grain yield per plant and effective tillers per plant. Out of these characters, relative magnitudes of GCV and PCV estimates indicated relatively higher influence of environment for grain yield per plant and effective tillers per plant. This was also reflected in the estimation of heritability. Plant height, days to maturity and panicle length with less than 10% GCV exhibited lower genetic variation. Rest of the characters exhibited moderate genetic variation (10-20%). High estimates of h^2 and GA for grains per panicle indicated that the character is ideal for selection without progeny testing as it is apparently governed by additive gene. For other characters with high heritability (>80%) corresponding GA estimates

were low indicating influence of non additive genes. For these characters, progeny testing will be required with selection.

The range for different characters are also presented in the Table 1. The plant height was found to be minimum in the varieties Badsabhog (121.7 cm). Effective tillers per plant were found to be maximum in the variety Bogi joha (12.9). Considering the panicle characteristics, panicle length were found to be maximum in the variety Nepali joha (32.93 cm). Grains per panicle were found be highest in Krishna joha (303.33) while sterility percentage was found to be minimum in the variety Tulsi joha (15.63%). The highest performance of grain yield per plant was exhibited by the variety Kon joha-1 (42.71 g) and this higher yield may be due to its better performance for plant height, 100-grain weight, flag leaf breadth, flag leaf area and grain breadth. The variety Nepali joha was found to be a better performer for the traits 100-grain weight, flag leaf length, flag leaf breadth, flag leaf area, grain breadth and L/B ratio. Grains per panicle were found to be maximum in the variety Krishna joha with the longest duration while the shortest duration variety was the Bogi joha with maximum number of effective tillers per plant. Badshabhog was recorded as the tallest among the varieties under study. Highest flag leaf length was exhibited by the variety Govindbhog and L/B ratio was by the variety Koli joha. Cheniguti and Boga Tulsi were two long grained varieties with comparatively higher yield. In the present investigation, analysis of variance was found to have significant variation among the varieties for the various biochemical parameter. Though, estimates of GCV, PCV and h^2_{bs} were found to be high for all the traits but GA (%) was found to be very low except for starch percentage. High heritability, with low genetic advance indicated the involvement of non-additive genes and thus, there will be need for progeny testing for selection to be effective (Table 2). In the present investigation, analysis of variance was found to have significant variation among the varieties for the various biochemical parameters. The range of total soluble sugar was found to be 0.412% to 0.764% while reducing sugar was from 0.121% to 0.264% and non reducing sugar was from 0.256% to 0.628%. Starch percentage was found to be ranging from 65.81% to 81.89%.

Table 1. Estimates of genotypic and phenotypic coefficients of variation (GCV and PCV), heritability (h^2_{bs}), genetic advance (GA) and range for different characters.

Character	GCV	PCV	h^2_{bs}	GA in % of mean	Range
Plant height (cm)	6.85	7.72	78.7	18.61	121.7-166.67
Effective tillers/plant (No)	20.47	27.65	54.8	2.68	4.30-12.90
Days to maturity (days)	3.50	3.74	87.5	10.03	135-157
Flag leaf length (cm)	12.26	15.96	59.0	6.20	24.60-41.33
Flag leaf breadth (cm)	15.16	17.14	78.3	0.32	0.88-1.84
Flag leaf area (cm^2)	24.26	27.78	76.3	16.15	25.55-69.32
Panicle length (cm)	8.63	10.12	72.6	4.11	21.70-32.93
Grains per panicle (No.)	29.53	32.79	81.1	110.22	96.67-303.3
Sterility percentage (%)	11.61	20.14	33.2	3.12	15.63-30.83
100-grain weight (g)	31.36	31.99	96.1	1.05	0.65-2.86
Grain length (cm)	18.07	18.55	94.8	0.27	0.52-1.13
Grain breadth (cm)	15.24	16.25	87.9	0.07	0.19-0.30
L/B ratio	14.44	16.31	78.4	0.83	2.33-4.50
Grain yield per plant (g)	24.26	32.69	55.0	9.64	5.57-42.71

Table 2. Estimates of genotypic and phenotypic efficient of variance (GCV and PCV), heritability, genetic advance (GA)and range for different biochemical parameters

Character	GCV	PCV	h^2_{bs}	GA in % of mean	Range
Total soluble sugar (%)	16.61	16.66	99.4	0.19	0.412 - 0.764
Reducing sugar (%)	14.27	15.66	83.1	0.04	0.121 - 0.264
Non-reducing sugar (%)	22.63	22.81	98.4	0.19	0.256 - 0.628
Starch percentage (%)	4.68	4.69	99.5	7.17	65.81 - 81.89

References

Burton GW (1952) Quantitative inheritance in grasses. *Proc 6th Grassld. Cong.* **1**: 277-281.

Chopra SL and JS Konwar (1976) *Analytical Agricultural Chemistry*. Kalyani Publisher, Ludhiana.

Johnson HW, HF Robinson and RE Comstock (1955) Estimate of genetic and environmental variability in soybean. *Agron J.* **47**: 314-318.

Miller GL (1959) Use of dinitrosalicylic acid reagent for determination of reducing sugar. *Analyt. Chem.* **31**: 426-428.

Yem EW and AJ Willis (1954) The estimation of carbohydrates in plant extracted by anthrone. *Biochem. J.* **57**: 508.