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Short Communication

EVALUATION AND UTILIZATION OF AROMATIC RICE (*Oryza sativa* L.) GERMPLASM FOR AGRONOMIC TRAITS

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The development of semi-dwarf varieties of rice capable of responding to higher doses of fertilizers and irrigation in the sixties, made the vertical choice with respect to consumer quality grades abruptly narrow, thereby shifting the emphasis in food production from quality to quantity. As a result the traditional low yielding but high quality rices started vanishing from the scene. However, the strong liking of the Indian consumers for superfine scented rices together with their increasing demand for export purposes kept the interest in basmati rices alive. Further, lately there has been considerable emphasis on quality improvement of the high yielding rice varieties. The present studies were carried out to assess the genetic potential of some of the exotic and aromatic rices for possible utilization as donors of agronomic traits.

The experimental materials comprised 120 genotypes of aromatic rice collected from diverse geographical sources (Bangladesh-2, China-5, India-3, Indonesia-4, Iran-2, IRRI-14, Myanmar-2, Nepal-1, Pakistan-46, Philippines-8, Thailand-1 and Vietnam-2). Planting was done in a randomized complete block design in two replications during kharif, 1990 at the Crop Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar under irrigated conditions in two row plots of 3 meters length. Row to row distance was kept at 25 cms, while plants in a row were spaced 15 cm apart. One month old seedlings were transplanted in well puddled field @ one seedling/hill. The crop was grown under good management conditions and all the recommended package of practices for basmati group of varieties were followed. Data were recorded on days to 50% flowering, plant height (cm), number of effective tillers/plant, panicle length (cm), number of grains/panicle, spikelet fertility (%), panicle exertion (scored on 1-9 scale), 1000 grain weight (g) and grain yield/plant (g). The standard statistical methods were used to estimate various parameters.

Analysis of variance of means for different characters showed highly significant differences among genotypes. The range of treatment means presented in Table 1 along with the general mean for various characters showed a wide range of variability for days to 50% flowering. The germplasm included a mutant line of Basmati 370 which flowered in 92 days and some photosensitive land races took as long as 157 days to flower. The plant height ranged from 74.4 cm to 176.0 cm and most of the lines were tall as evidenced by the general population mean of 132.7 cm. The dwarf cultures were either very late in flowering (Kalimunchh mutant) or showed very poor panicle exsertion (Balugyun and Macunting) and suffered in grain yield. Dwarf and early cultures possessing basmati grain characteristics did not exist in the germplasm.

The number of effective tillers per plant also showed a wide range of variation in the germplasm screended. However, majority of the cultures screended were low tillering type yet a few moderately high tillering types were available e.g. Basmati 376, (17.0), Mikhudeb (15.0), Sitasail (13.0), Basmati Surkh 81-15 (13.0), Sipala (13.0) which could be exploited in breeding programme aimed at increasing tiller number.

The spikelet fertility in the germplasm ranged from 18.3% to 97.0% with a general mean of 81.0%, while the number of filled grains/panicle ranged from 20.0 to 265.0 (Badshahbhog) with a general mean of 105.2. Delayed flowering exposed the crop to lower atmospheric temperatures and was mainly responsible for reduced fertility of the spikelets. Two lines, namely Khao Dawk Mali and Hawm Mali which showed very poor spikelet fertility (18.3% and 20.3%, respectively) took more than 150 days to flower. Decrease in fertility percentage with increasing length of cooling treatment has been reported by Satake and Koike (1983). However, Badshahbhog was an exception. It flowered in 150 days and possessed maximum number of filled grains (265 grains/panicle) with 76.9% spikelet fertility.

Panicle length in the germplasm ranged from 20.6 cm (Kalimunchh mutant) to 39.4 cm (Basmati 410). There were many genotypes in the germplasm which possessed significantly longer panicles than Basmati 370 and T3 (Table 1). Only a few tall genotypes like Latai, Ramjiwain, Kala Joha and UPRH 22 had short panicles. In general, the short panicles also showed poor panicle

Table 1 : **Range, mean and promising cultures for different agronomic traits in the aromatic rice germplasm.**

Sl.No.	Character	Mean	Range	Promising cultures
1.	Days to 50% flowering	114.9	92.0-157.5	Basmati 208 (95.0), Basmati 334 (95.0), Ayepyaung (95.0), Dwarf Basmati (92.0), Mussatrene (95.0)
2.	Plant height (cm)	132.7	74.4-176.1	Guinata (94.0), Kinandang Pula (97.0), Kalimunch Mutant (80.7), Kunsan-Woo-Shan-Gon (96.5), Balugyun (81.2), Macunting (74.4), Dwarf Basmati (86.0)
3.	Number of tillers/ plant	8.3	3.2-17.5	Basmati 370 (11.0), Sitasail (13.0), Basmati 208 (11.0), Basmati 372(12.0), Basmati 376(17.0), Basmati Surkh 81.15(13.0), Mikhudeb (15.0), Ayepyaung (13.0), Sipala (13.0), New Sabarmati (13.0), Kasturi (11.0), Dwarf Basmati (12.0).
4.	Panicle length (cm)	30.1		Basmati 122(37.2), Basmati 372(36.2), Basmati 410(39.4) Basmati 6113(36.1), Pageleoh (37.2), N 12 (37.2), Type 3 (37.2)
5.	Number of filled grains/panicle	105.2	20.0-265.0	Kinandang Pula (185), Basmati 123 (181), Basmati 376(188), Lakchhmivilas(176), Badshahbhog (265)
6.	Spikelet fertility (%)	81.0	18.3-97.0	Kinandang Pula (95.5), Dinorado (95.4), 6 Palawa Yi-Lu-Hsiang (95.5)
7.	Panicle exsertion score (1-9 scale)	3.7	1.0-8.0	Basmati 370(1), Type 3(1), Sitasail (1), Basmati 123(1), Basmati 138 1),Basmati 372 (1), Basmati 376(1), Basmati 613(1)
8.	1000 grain weight (g)	19.8	8.3-31.6	Kinandang Patong (31.6), Milfor 6-2 (31.6), Tarome (26.5), Cempocelak (26.8), New Sabarmati (26.1), Palwan (28.3), Ku 76-1 (30.1)
9.	Grain yield/ plant (g)	16.8	2.7-59.9	Bindli (30.6), Sitasail (30.6), Basmati 123 (39.5), Basmati 376 (59.9), Yi-Lu-Hsiang(35.5), New Sabarmati (39.5)

exertion. However, some genotypes like Basmati 136, Basmati 6113, Basmati 436 and Basmati 6129 showed poor exsertion inspite of long panicles. Delayed flowering has been reported to be one of the reasons for poor panicle exsertion (Gupta, 1988).

The magnitude of variability was very high in case of grain yield/plant as indicated by the range (2.7-59.9 g). In the germplasm screened, the highest yielding genotype Basmati 376 produced as many as 17.5 productive tillers/plant (population mean 8.3) and longer (35.6 cm) panicles though the 1000 grain weight was at par with Basmati 370. Its spikelet fertility (84.1%) was also better than the spikelet fertility of Basmati 370 (73.5%). The next high yielding genotype Basmati 123 possessed moderate number of tillers/plant (10.5) but had very high (93.6%) spikelet fertility in addition to longer panicles (35.0 cm). Thousand grain weight of this variety was also higher than that of Basmati 370. The importance of the above yield components for increased production has been highlighted by Suyambulingam and Jebarani (1979). However, the main defect of these genotypes was their tallness which made them susceptible to lodging.

The 1000 grain weight ranged from 8.3 g (Rajbhog) to 31.6 g (Kinandang Patong) with a general mean of 19.8 g. Kasturi (21.1 g) and Ratna (20.3 g) were at per in 1000 grain weight but superior to Basmati 370 (18.1 g).

The present results pinpoint definte genotypes for use as donors in various breeding programmes aimed at incorporating single or multiple traits but these do not separate out the genotype x environmental interaction. Therefore, further evaluation of the germplasm at increased number of locations and over different years will be helpful in selecting stable genotypes.

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REFERENCES

Gupta, S. 1988. Screening rice entries for coastal salinity and tidal swamp conditions. IRRN, 13: 16-17

Satake, T. and S. Koike. 1983. Sterility caused by cooling treatment at the flowering stage and organ susceptible to cool temperature. *Japanese J. Crop Sci.* 52: 207-214

Suyambulingam, C. and W. Jebarani. 1979. Path coefficient analysis in short duration tall and dwarf varieties of rice. *Madras Agric. J.* 66: 134-136