



Identification of Agro-Morphological characters in Sheath Blight Tolerant lines of Samba Mahsuri (BPT-5204) Rice variety

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ABSTRACT

Samba mahsuri is a popular rice variety and major food crop for half of the world population. The productivity of rice crop was mainly affected by both biotic and abiotic stresses. Sheath blight was one of most important biotic stress which affected majority of the yield. Sheath blight tolerant population was developed through mutational breeding. The current study was carried out to characterize the sheath blight mutant lines on basis on agro-morphological characterization at ICAR-IIRR. Among sheath tolerant lines, different phenotypic variations were observed like plant height, flag leaf, number of tillers, grain yield per plant and test weight. All the data about variations were recorded at the flowering and ripening stage. 13 sheath blight tolerance mutant lines were selected and compared with wild type for 11 above mentioned agro-morphological traits. We observed significant variations among sheath tolerant lines and wild type.

Keywords: Mutant, Sheath blight tolerant, Samba mahsuri, BPT-5204, Rice, abiotic stress

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INTRODUCTION

Samba Mahsuri (BPT5204) is a medium slender rice variety highly popular among the farmers in South and Eastern India. It is one of the best Rice varieties with good cooking quality. The yield of BPT 5204 is 6-6.5 tons/ha, even though it is showing maximum susceptibility to many biotic stresses and exhibits incomplete panicle emergence, this make it an ideal genotype for identifying mutational changes in traits of agronomic importance. To obtain agronomical important traits mutation breeding plays an important role. Mutagenesis plays key role among these genetic resources, mutant stocks with discrete genetic lesions are essential to determining gene function and dissecting biochemical and metabolic pathways. Chemical mutagenesis has been routinely used to generate genetic variability for breeding research and genetic studies. In rice, there are several advantages of using chemical mutagenesis to produce mutant populations suitable for both forward and reverse genetics. First, mutant populations can be produced using any genotypes. Second, because of the high density of mutations, genome-wide saturation mutagenesis can be achieved using a relatively small mutant population [1, 2]. Third, it provides a large allelic series as a complement to the knockout mutants produced by insertional mutagenesis or transformation methods (over- and under-expression) [3-6]. Morphological variations including grain types, maturity and traits contributing to yield are observed in every generation. In present study, observed the agro-morphological variations in the BPT-5204 sheath blight tolerant mutants which developed through chemical mutagen EMS (Ethyl Methane Sulfonate) [7].

MATERIALS AND METHODS

The present study was carried out in the experimental field of ICAR-Indian Institute of Rice Research, Hyderabad. 13 Sheath blight tolerant mutant line were characterized for 11 different agro-morphological traits. Rice Mutants used in this study are listed in the Table1. Each line of the rice Mutants were sown in the pots, under green house conditions. About 28-30 day old seedlings, were transplanted in 5 lines (each line containing 23 plants) at a spacing of 20 x 15 cm. Agro-Morphological characters were carried out at the 50% flowering stage and Full Ripening stage of the plants. Among the 11 traits on which the data

were recorded were Plant Height (cm), Grain type, Days to 50% flowering, Flag leaf length (cm), Flag leaf width (cm), Number of Reproductive tillers, No. of Panicles per plant, No. of Grains per panicle, Grain Yield per Plant (g), Test weight/1000 grains weight(g).

RESULTS AND DISCUSSION

In this study 13 (M7) Sheath blight tolerant mutant lines of Agro-Morphological characters were carried out at the 50% flowering stage and Full Ripening stage of the plants. Data recorded for following 11 traits (Table1).

Plant Height

Highly significant differences observed for plant height, Among 13 Sheath Blight tolerant mutant lines have shown ranging from Minimum 82 cm (ShB-3) to maximum 153cm (ShB-7) with a mean of 124.5cm, which is higher than wild type (BPT-5204) 87.5cm (Table 1) [10].

Grain Type

Three different grain types were identified among 13 ShB mutant lines. 9 mutant lines showed medium slender (MS), 3 lines showed medium bold (MB) and 1 mutant line showed Medium to long slender (MS-LS) grain type (Table 1).

Days to 50% flowering

Valuable variation was observed among 13 mutants for Days to 50% flowering, minimum 93days (ShB-6) to maximum 116days (ShB-11) with a mean of 106days, which is lower than wild type (BPT-5204) 115days (Table 1).

Flag Leaf Length (cm)

Highly significant differences observed among 13 Sheath Blight Tolerant mutant lines, Flag Leaf Length ranging from Minimum 31.5cm (ShB-4) to maximum 53.5cm (ShB-6) with a mean of 39.9cm, which is higher than wild type (BPT-5204) 31.2cm (Table 1).

Flag Leaf Width (cm)

Highly significant differences observed among 13 Sheath Blight Tolerant mutant lines, it was ranging from Minimum 1.5cm (ShB-2, ShB-4 and ShB-8) to maximum 2.8cm (ShB-10) with a mean of 1.9cm, which is higher than wild type (BPT-5204) 1.3cm (Table 1).



Wild Type
(BPT-5204)
ShB Susceptible

Mutant
(ShB-10)
ShB Tolerant

Mutant
(ShB-5)
ShB Tolerant

Figure-1: Phenotypic variations among Wild type (BPT-5204) and Mutants (ShB-10 and ShB-5) like Plant height, Flag leaf length and width, Number of grains per panicle, Panicle length.

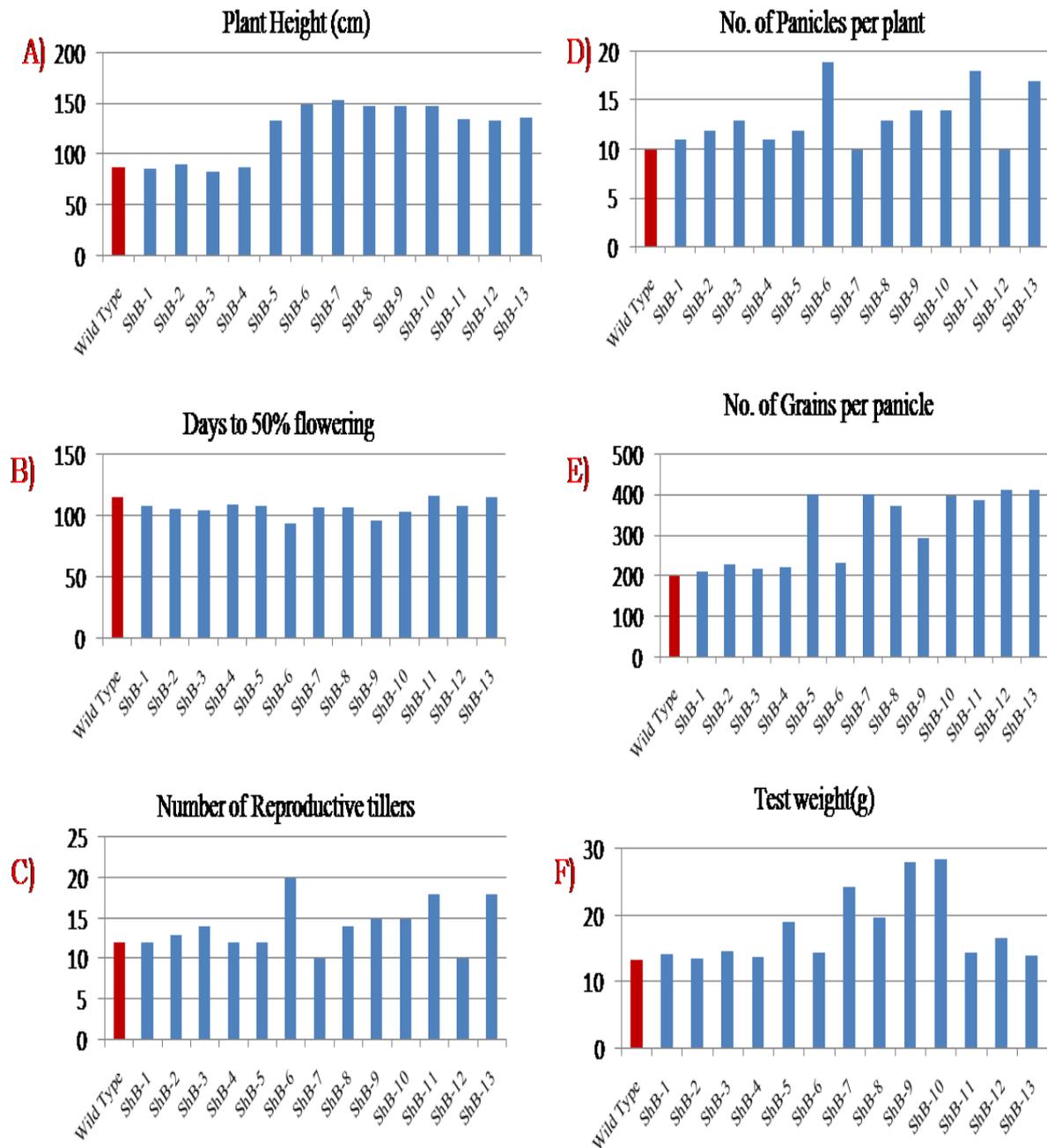


Fig2: Frequency distribution of Agro-Morphological characters between wild type and Sheath Blight Tolerant Mutants in M7- Kharif -2016 (Average of 5 plants) phenotypic values measured for yield and related traits X-axis denotes trait values in their respective units, Y-axis denotes number of plants.

Number of Reproductive tillers

Highly significant differences observed among 13 mutants for Number of Reproductive tillers, it was ranging from Minimum 10 (ShB-7 and ShB-12) to maximum 20 (ShB-6) with a mean of 14.1, wild type (BPT-5204) showed 12 (Table 1).

Number of panicles per plant (no)

Valuable variation was observed for Number of panicles per plant, this trait observed among 13mutants lines observed were minimum 10 (ShB-7 and ShB-12) to maximum 19 (ShB-6) with a mean of 13.4, wild type (BPT-5204) showed 10 (Table 1).

Panicle length (cm)

Highly significant differences measured among 13 mutants for Panicle length Number, ranging from minimum 16.2 cm (ShB-1) to maximum 27.7 cm (ShB-5) with a mean of 22.8cm, which is higher than wild type (BPT-5204) 15.6 cm.

Table-1: Comparison of Agro-Morphological characters between wild type and Sheath Blight Tolerant Mutants in M7-Kh-16 (Average of 5 plants)

Traits/ Characters	Wild Type	Sheath Blight Tolerant Mutants												
	BPT- 5204	ShB-1	ShB-2	ShB-3	ShB-4	ShB-5	ShB-6	ShB-7	ShB-8	ShB-9	ShB-10	ShB-11	ShB-12	ShB-13
Grain type	MS	MS	MS	MS	MS	MS	MS	MS	MS	MB	MB	MS	MS-LS	MB
Plant Height (cm)	87.5	85	89	82	86	133	147.5	153	147	147	147	134	132	135.5
Days to 50% flowering	115	108	105	104	109	107	93	106	106	96	103	116	107	115
Flag leaf length (cm)	31.2	32.5	31.8	32.6	31.5	34.5	53.5	47.5	42.5	47	36.1	40	48.5	40.2
Flag leaf width (cm)	1.3	1.6	1.5	1.8	1.5	2.1	2	1.6	1.5	2.3	2.8	1.9	2	2.15
Number of Reproductive tillers	12	12	13	14	12	12	20	10	14	15	15	18	10	18
No. of Panicles per plant	10	11	12	13	11	12	19	10	13	14	14	18	10	17
Panicle length (cm)	15.6 cm	16.2	18.5	17.5	16.5	27.7	25	26	25	22.5	22.6	24	27	27.5
No. of Grains per panicle	200	210	225	215	218	400	230	400	370	290	395	385	410	410
Grain Yield per Plant (g)	15.6 gm	16.2	17.1	17.5	16.4	23.4	16.6	27.8	18.4	18.4	19.2	24.1	23.02	25
Test weight/1000 grains weight(g)	13.39	14.2	13.6	14.6	13.8	19.09	14.37	24.39	19.77	28.07	28.38	14.38	16.6	14.12

No. of Grains per panicle

Valuable variation was measured among 13 mutants for No. of Grains per panicle, ranging from minimum 210 (ShB-1) to maximum 410 (ShB-12 and ShB-13) with a mean of 319.8, which is higher than wild type (BPT-5204) 200.

Grain Yield per Plant (g)

Highly significant differences was measured among 13 mutants for grain yield per plant, it was ranging from minimum 16.2g (ShB-1) to maximum 27.8g (ShB-7) with a mean of 20.2g, which is higher than wild type (BPT-5204) 15.6g.

Test weight/1000 grains weight (g)

Valuable variation was measured for among 13 mutants for Test weight/1000 grains weight , ranging from minimum 13.6g (ShB-2) to maximum 28.38g (ShB-10) with a mean of 18.1g, which is higher than wild type (BPT-5204) 13.3g.(Table-1) [8-9].

CONCLUSION

In this study, we concluded that the identified sheath blight tolerant mutants showed superior agro-morphological characters when compared with wild type BPT 5204. These phenotypic characters were played key role in crop improvement and same material can use as donor material for breeders to transfer into another genetic background.

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