Original Research Article

Identification of Alien Introgression Lines Resistant to White Backed Planthopper, *Sogatella furcifera* (Horvath) in Rice

ABSTRACT

Introgression lines of wide cross derivatives were screened to identify resistant/tolerant entries for WBPH biotypes under artificial condition. The main objective of this study is to provide breeders with more 'attractive' PGR that are easier to use, i.e. resistance sources in acceptable genetic background; or inbreeding tolerant forms disomic lines for inbred or hybrid rice breeding programme. Forty six pre-breeding lines were evaluated against White Backed Plant Hopper (WBPH) under glasshouse condition over a period of two years (2019 and 2020). Out of these, seven pre-breeding lines are moderately resistant to WBPH having score 5. Three pre-breeding lines are moderately susceptible to WBPH having score 7 and rest thirty four pre-breeding lines are highly susceptible to WBPH with a score of 9.

Keywords: Pre-breeding, screening, *Sogatella furcifera*, resistance, rice

1. INTRODUCTION

Rice is the most important food crop of the Asian countries. Rice crop is prone to various insect pests like plant hoppers, leaf hoppers, stem borer, gall midges [1]. Out of one hundred insect pests, BPH (*N. lugens*) and WBPH (*S. furcifera*) are of most destructive pests and prevalent in India [2]. Lack of donor varieties and landraces tolerant to biotic stress (WBPH) is always a problem and is becoming extremely limited. Therefore additional genetic resources will help to enrich the germplasm for a successful breeding programme. National Rice Research Institute, Cuttack has already begun to use wild species of rice to find out tolerant pre-breeding donors needed to develop high yielding varieties that are resistant to biotic stress (WBPH). However, hybridization between cultivated and wild species belonging to different genome groups is incompatible due to genomic distance. To overcome this problem, embryo rescue has been carried out successfully to achieve the development of introgressive lines or pre-breeding lines. Cultivated rice has evolved from its wild progenitors through a series of introgressive events, natural selection and ultimately breeding. Utilization of wild species is one of the method to introduce additional germplasm into cultivated varieties. White backed planthooper (WBPH), *Sogatella furcifera* (Horvath) is a major pest of rice and cause 30-50% loss in yield. Severe losses were also reported due to transmission of viruses such as rice ragged stunt (RRSV) and rice grassy stunt (RGSV) via WBPH [3,4]. The use of resistant rice varieties is most economical and efficient method for controlling WBPH [5,6], therefore, it is necessary to identify WBPH-resistance donors from diverse sources and incorporate them into rice cultivars by the use of modern biotechnological tools. In a view of widening the genetic base to enable the reliable use of BPH resistance breeding, the screening of introgressive lines have been evaluated against WBPH biotype to identify resistant donors to be used in the rice breeding program.

2. MATERIALS AND METHODS

2.1 Insect rearing

The method described by IRRI [6] has been used to rear the WBPH. The source insects were collected from the field and continuously reared in greenhouse for screening purpose. The insects were reared on 40 to 50 day-old rice plants (susceptible variety TN1) inside a 0.5 × 0.5 × 1.0 m cage. This cage consists of a steel frame covered with a fine mesh wire screen. The cage bottom was open and setting in water. Potted plants were changed as needed. Each cage could accommodate several potted plants that could support 2,000 to 3,000 late-instar WBPH nymphs. The original colony per cage was started by 30 to 40 gravid adults. Eggs of about the same day age were obtained by placing the plants in a cage with gravid adults for two days.

2.2 Screening procedures

The experiment was conducted in net house during wet season 2019 and 2020 at National Rice Research Institute, Cuttack and as described by Heinrichs *et al*. [8]. Forty six pre-breeding lines along with one susceptible check TN1 and one resistant check PTB-33 were screened for WBPH. Pre-germinated seeds of each entry (at least 25 seeds /entry) were sown in 3 cm apart in the wooden box including susceptible check TN-1 and resistance check PTB-33. Twelve days after sowing, the seeds were infested with 3-5 nymph per seedling. After infestation the wooden seed boxes with seedling were covered with cages. The plants were daily observed for WBPH damage. After 20 days of infestation, hopper burn symptoms appeared due to WBPH damage on test lines. When damage rate of 90% was observed in susceptible lines, the test lines were scored on 1-9 scale using SES for rice [9]. Each accession was scored on individual plant basis as 0 (no visible damage), 1 (partial yellow of 1st leaf), 3 (1st and 2nd leaf yellow), 5 (yellow and stunting or half of the plant wilted/dead), 7 (more than half of the plants dead) and 9 (All plants dead).

3. RESULTS AND DISCUSSION

Out of forty-six introgression lines including susceptible check TN1 and resistant check PTB-33, none of the lines were having score 1 and 3. Seven lines were moderately resistant to WBPH having score 5. The resistant lines were EC796762, EC796761, EC796765, EC796764, EC796768, EC796771, EC796772 (Table-1), fig-1 and fig-2. Three lines are moderately susceptible having score 7, thirty four lines were highly susceptible to WBPH having score 9. Timmangouda and Mahaswaran [10] evaluated twenty five rice varieties and reported three varieties resistant. Venkatesh *et al* [11] reported three rive varieties (Panorama, Sambha, Karthik sambha), Ali *et al*., [12] reported 87 genotypes and Bhogadhi *et al*., [13] reported three varieties resistant for WBPH. Score 3 and 5 was reported by 4% each of the accessions; 10% of the accessions reported score 5 and score 7 was reported by 80% of the accessions.

Table 1: Screening of introgression lines against WBPH in control condition

SL No.	Damage score	No. of Genotypes	Genotypes
1	0		
2	1	1	PTB-33 (check)
3	3		
4	5	7	EC796762, EC796761, EC796765, EC796764, EC796768, EC796771, EC796772
5	7	3	EC796765, EC796734, EC796760
6	9	35	EC796778, EC796783, EC796759, EC796753, EC796752, EC796746, EC796749, EC796750, EC796736, EC796737, EC796740, EC796741, EC796742, EC796755, EC796757, EC796758, EC796766, EC796767, EC796770, EC796777,

			EC796743, EC796739, EC796738, EC796756, EC796744, EC796745, EC796751, EC796735, EC796747, EC796769, EC796774, EC796776, EC796779, EC796780, TN-1 (check)
Total		46	

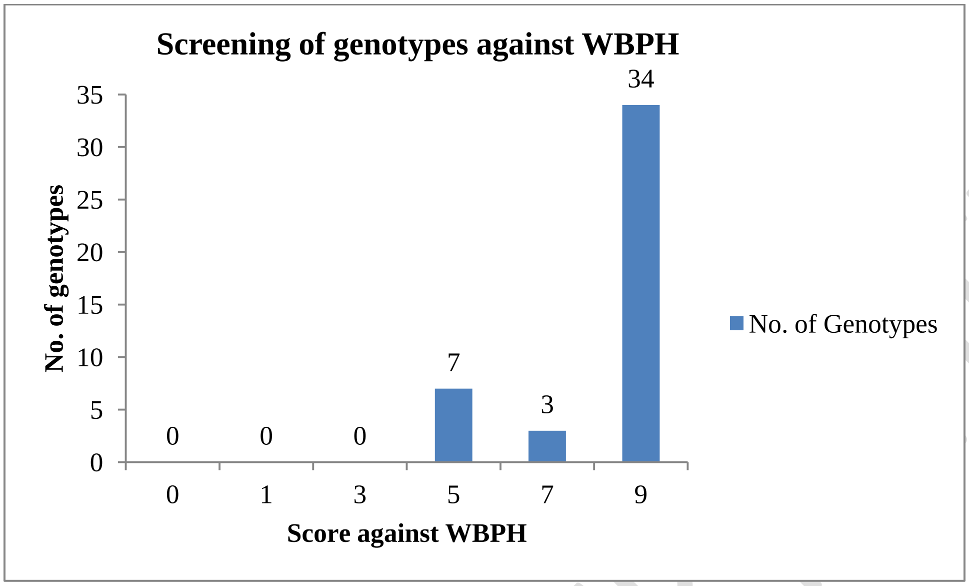

Fig.1: Screening of genotypes against WBPH

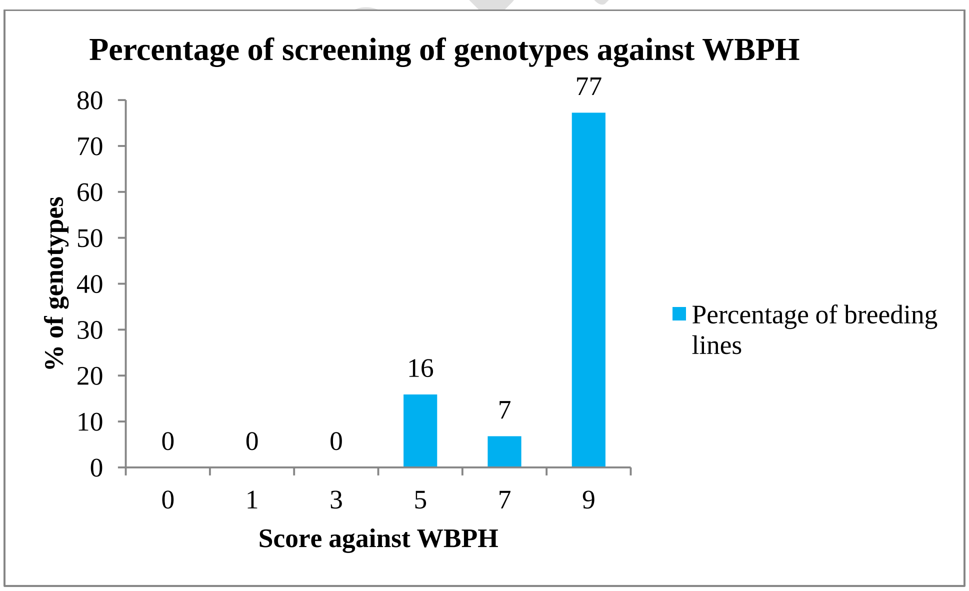

Fig.2: Percentage of screening of genotypes against WBPH

4. CONCLUSION

Results indicate that among forty six introgression lines screened EC796762, EC796761, EC796765, EC796764, EC796768, EC796771, EC796772 were found to be moderately resistant donor against white backed planthopper and those introgression lines could be used in developing resistant varieties against WBPH.

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