



Identification and marker assisted introgression of blast resistance gene into the parental line of rice hybrid[†]

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Abstract: Rice (*Oryza sativa* L.) is the most widely cultivated and consumed staple food crops for billions of people in the globe. This crop severely affected by fungal disease called blast, caused by a *Magnaporthe oryzae* (synonymous: *Pyricularia oryzae*), is the most dangerous disease and often causes severe reduction of about 80% of rice yield under conducive conditions. One dominant (*Piz*) was introgressed into TNAU CMS 2B through marker assisted breeding. This study identified 22 gene introgressed individuals in first generation of backcross population through foreground selection, indicating these could be promising genetic resources for breeders to use in their breeding programme.

Keywords: molecular markers; gene; rice disease

1. Introduction

Rice is the most important and widely consumed staple food crops worldwide. The rising demand of rice is increasing day by day. To fulfill the future requirement of food grain production, we must produce more than 40% by 2030 [1]. Rice blast is an important fungal disease caused by *Magnaporthe oryzae*, is considered most significant and destructive disease in the world [2,3] and thus led 35–50% yield loss globally [4]. Agriculture sector greatly threatened by climatic shocks, an emerging of new pathotypes of biotic stresses poses serious challenges to scientific community more particularly rice breeders, who like to double the rice production by incorporating diverse resistance genes against both biotic and abiotic stresses [5]. The most effective and efficient way to introgress resistance genes into the desirable genetic background in the breeding programs through marker assisted selection (MAS) [6-11]. The CORH 03 is a popular rice hybrid released by Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India, having the characteristic features of medium duration quality with high yielding potential and, non-sticky and non-aromatic nature. It has occupied large areas under cultivation in rice growing districts in the state, where blast disease is serious concern. The primary goal of the present study was to introgress the *Piz* blast resistance gene into the maintainer line of the popular rice hybrid through MAS.

2. Materials and methods

TNAU CMS 2B is a stable maintainer line of TNAU CMS 2A, which is female parental line of CORH 03 hybrid, were used as a recipient/recurrent parent. The parent Zenith was used as a donor source for one dominant gene (*Piz*) for blast resistance. The hybrid F₁ was developed by crossing between TNAU CMS 2B and Zenith, and the resistance gene carrying individuals in the agronomically superior background were identified by enabling closely linked simple sequence repeats (SSR) marker RM 549. Furthermore, the identified

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Table 2. Single plant yield of gene introgressed progenies of BC₁F₁ cross of TNAU CMS 2B × Zenith.

| Plant No | Single plant yield (SPY, g) |
|----------|-----------------------------|
| 1 | 22.63 |
| 2 | 23.49 |
| 3 | 21.65 |
| 4 | 19.82 |
| 5 | 28.89 |
| 6 | 16.51 |
| 7 | 18.14 |
| 8 | 22.70 |
| 13 | 18.95 |
| 14 | 17.54 |
| 15 | 19.29 |
| 16 | 18.83 |
| 17 | 17.73 |
| 18 | 18.79 |
| 19 | 22.41 |
| 21 | 24.31 |
| 23 | 26.13 |
| 24 | 23.20 |
| 25 | 24.83 |
| 26 | 21.53 |
| 27 | 18.16 |
| 29 | 21.89 |
| 30 | 21.71 |
| 35 | 21.00 |

4. Discussion

Marker assisted foreground selection in the cross TNAU CMS 2B × (TNAU CMS 2B × Zenith) identified 22 individuals had blast resistance gene *Pi_z*. Of these 12 individuals had more than 20g of single plant yield. The plant number 5 was identified as most promising individual could be further advanced to obtain homozygous condition using marker assisted backcross breeding. Several researchers have been also introgressed blast resistance genes into their breeding lines like Jinyou 402 and Jinyou 407, CO 39, and PRR78 (R) [4, 13,14]. Earlier studies have been found blast resistance gene *Pi_z* introgressed lines showed wider spectrum of disease resistance. The gene introgressed individual identified had also found to have increased grain yield which could be utilized as donor parent in future by means of gene introgression with an increased grain yield.

5. Conclusions

The stabilized pyramided lines with high yielding background will be used as genetic stocks for biotic stress resistance breeding program and as improved parental lines in hybrid rice breeding.

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