DETERMINATION OF OPTIMUM ROW RATIO FOR LOCALLY BRED LONG GRAIN AROMATIC HYBRID RICE SEED PRODUCTION

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ABSTRACT
Twelve treatments were observed to find out the optimum row ratio of A: R lines for better hybrid seed production. R lines were planted on three seeding dates. Highest seed yield of 1.16 t/ha was observed in treatment No. 7 where two restorer lines with twelve cytoplasmic male sterile (cms) lines, followed by treatment No.6 (two restorer lines with ten cms lines). This treatment produced 1.09 t/ha of seed yield. Treatment No.11 (three restorer lines with 10 cms lines) and treatment No.12 (three restorer lines with 12 cms lines) also produced more than 1.0 t/ha seed yield. Lowest seed yields of 0.39 t/ha and 0.40 t/ha were observed in treatment No.3 (two restorer lines with 4 cms lines) and treatment No.10 (three restorer lines with 10 cms lines), respectively. Low seed yields (t/ha) may be attributed to poor flowering synchronization of restorer and cms lines. Therefore, better flowering synchronization of restorer and cms lines and highest number of productive tillers / m² may produce more than 3.0 t/ha seed yield. Supplementary pollination was done twice daily at peak anthesis with a rope. Row ratios of two restorer lines with ten cms lines, two restorer lines with twelve cms lines, three restorer lines with ten cms lines and three restorer lines with twelve cms lines were observed to be the best to achieve higher hybrid seed yield.

KEYWORDS: hybrid rice, row ratio, anthesis, seed yield, restorer lines, cms lines

INTRODUCTION
In Pakistan, the yield level of semi dwarf and tall rice varieties has plateau (3.3 t/ha) and more and more rice has to be produced in lesser land and with lesser inputs. Hybrid rice technology has already shown 20-25% higher yield potential over inbreds (Yuan, 1994, Virmani, 2006, Viraktamath, 2006 and Sabir et al. 2007).

In China, hybrid rice technology has been adopted for more than two decades on a very large scale (18 million hectare). Nearly 70% of rice production in China today comes from hybrid rice cultivation (Yuan, 1994). Many IRRI hybrids have been evaluated for yield and related traits including cooking quality tests (Akhter et al, 2007). For locally bred long grain aromatic hybrid, seed production technology is to be developed. Establishing the optimum row ratio of restorer and CMS line was the primary objective of the study (Shengqui, 1986).

MATERIAL AND METHODS
Basmati 385 and IR 58025A genotypes were used as restorer (R) and cytoplasmic male sterile (A) parents. Restorer was seeded 3 times with intervals of three days between seeding. CMS (A) line was seeded 21 days after second seeding of restorer during kharif, 2006. Accordingly, these parents were transplanted in the field on their scheduled / repeated dates. These parents were replicated thrice using Randomized Complete Block Design. The considered twelve row ratio treatments were as follows:
S. No. | Treatments | Field layout |
---|---|---|
1. | 1 : 1 | One Restorer + One CMS line |
2. | 2 : 2 | Two Restorer + Two CMS lines |
3. | 2 : 4 | Two Restorer + Four CMS lines |
4. | 2 : 6 | Two Restorer + Six CMS lines |
5. | 2 : 8 | Two Restorer + Eight CMS lines |
6. | 2 : 10 | Two Restorer + Ten CMS lines |
7. | 2 : 12 | Two Restorer + Twelve CMS lines |
8. | 3 : 3 | Three Restorer + Three CMS lines |
9. | 3 : 6 | Three Restorer + Six CMS lines |
10. | 3 : 8 | Three Restorer + Eight CMS lines |
11. | 3 : 10 | Three Restorer + Ten CMS lines |
12. | 3 : 12 | Three Restorer + Twelve CMS lines |

Row length / treatment / replication was 15 meter. Plant to plant distance was 15 cm in all the three seeding of restorers. However, A line seeding distance was spaced at 30 x 15 cm. NPK was applied @ 133-85-62 kg/ha. Standard agronomic and plant protection measures were adopted. A space isolation of 50 m was provided for seed production plot to avoid the foreign pollen interception. To ensure purity of hybrid seed, roughing was done during different growth stages. At booting stage with the help of a sharp sickle, ½ or 2/3 of the A line’s flag leaf was removed from just above the flag leaf joint with the tiller. Two applications of GA3 spray were made @ 3 g/1000 m2, the first when 15-20 % of the tillers started heading and the second 2 days after first spray. A ULV/Knapsack sprayer was used for this purpose. A rope was used at the time of flowering for supplementary pollination. This operation was done 3-4 times daily at peak anthesis for a period of ten days (Virmani et al. 1997). Restorer parent was harvested first. A line seed was harvested and threshed separately. The seed was weighed, tabulated and analyzed according to Steel and Torrie 1997.

RESULTS AND DISCUSSIONS

Seed yields (t/ha) of locally developed long grain aromatic rice hybrid across twelve row ratio treatments for restorer and cytoplasmic male sterile (cms) lines are presented in Table1. Significant differences among restorer: cms treatments are evident in table 1. Although, seed yields (t/ha) presented in table 1 are not much higher, however, highest seed yield of 1.16 t/ha was observed in treatment No. 7 i.e, two restorer lines with twelve cms lines, followed by treatment No.6 i.e, two restorer lines with ten cms lines. This treatment produced 1.09 t/ha of seed yield. It is also evident from Table 1 that treatment No.11 (three restorer lines with 10 CMS lines) and treatment No.12 (three restorer lines with 12 CMS lines) also produced more than 1.0 t/ha seed yield. Lowest seed yields of 0.39 t/ha and 0.40 t/ha were observed in treatment No.3 (two restorer lines with 4 CMS lines) and treatment No.10 (three restorer lines with 10 CMS lines), respectively. Low seed yields (t/a) ma be attributed to poor flowering synchronization of restorer and CMS lines. It was clearly demonstrated that better flowering synchronization of restorer and CMS lines and highest number of productive tillers / m² may produce more than 3.0 t/ha seed yield.

CONCLUSION

Row ratios of two restorer lines with ten cms lines, two restorer lines with twelve cms lines, three restorer lines with ten cms lines and three restorer lines with twelve cms lines produced more than one ton seed yield per hectare. These row ratios may be helpful in achieving higher hybrid seed production in future.
Table-1: Seed yield (t/ha) of locally bred long grain aromatic rice hybrid across twelve row ratio treatments.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Row Ratios (R:A)</th>
<th>Seed Yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>One Restorer : One CMS line</td>
<td>0.91E</td>
</tr>
<tr>
<td>T2</td>
<td>Two Restorer : Two CMS lines</td>
<td>0.54J</td>
</tr>
<tr>
<td>T3</td>
<td>Two Restorer : Four CMS lines</td>
<td>0.40K</td>
</tr>
<tr>
<td>T4</td>
<td>Two Restorer : Six CMS lines</td>
<td>0.87F</td>
</tr>
<tr>
<td>T5</td>
<td>Two Restorer : Eight CMS lines</td>
<td>0.69H</td>
</tr>
<tr>
<td>T6</td>
<td>Two Restorer : Ten CMS lines</td>
<td>1.09B</td>
</tr>
<tr>
<td>T7</td>
<td>Two Restorer : Twelve CMS lines</td>
<td>1.16A</td>
</tr>
<tr>
<td>T8</td>
<td>Three Restorer: Three CMS lines</td>
<td>0.80G</td>
</tr>
<tr>
<td>T9</td>
<td>Three Restorer : Six CMS lines</td>
<td>0.56I</td>
</tr>
<tr>
<td>T10</td>
<td>Three Restorer : Eight CMS lines</td>
<td>0.39K</td>
</tr>
<tr>
<td>T11</td>
<td>Three Restorer : Ten CMS lines</td>
<td>1.02D</td>
</tr>
<tr>
<td>T12</td>
<td>Three Restorer : Twelve CMS lines</td>
<td>1.04C</td>
</tr>
</tbody>
</table>

Means followed by similar letters do not differ significantly from each other according to DMR Test.

Fig.1: Replicated layout of hybrid seed production.
Fig. 2: Seed parent having different growth duration as pollen parent
REFERENCES


