ABSTRACT

The objectives of the research were to evaluate the effect of invasion treatment and testa (seed coat) color on seed viability, vigor, and vegetative plant growth of bambara groundnut. Two consecutive experiments were conducted in the laboratory and the field at Bogor Agricultural University from March to June 2014. Laboratory experiment was arranged in a factorial completely randomized design while field experiment was factorial completely randomized block design. In both experiments, two factors were tested: testa color and seed invigoration. There were four colors of testa: black, purple, dark brown, and light brown. Seed invigoration consisted of untreated, matricconditioning plus Rhizobium sp., matricconditioning plus fungicide, and matricconditioning plus fungicide and Rhizobium sp. Result of the laboratory experiment showed that matricconditioning plus Rhizobium sp., matricconditioning plus fungicide, matricconditioning plus fungicide and Rhizobium sp. applied on the seeds with all testa colors improved seed viability (percent of germination) and vigor (speed of germination, seedling growth rate). Result of the field experiment showed that matricconditioning plus fungicide and Rhizobium sp. or matricconditioning plus Rhizobium sp. applied on the seeds with black testa improved vegetative growth (plant height, number of leaves) at 9 weeks after planting.

INTRODUCTION

Bambara groundnut has various testa colors such as white, red, purple, brown, and black. Testa color can be used as a cultivar characteristic that affect the plant growth and yield. Indonesian farmers still used the seeds in mixed populations of color and size that affect seed quality and yield.

In order to increase the productivity, high quality seed must be used. Seed invigoration treatment using matricconditioning has proved effective to improve seed quality, plant growth, and yield on vegetable crops (Khan et al. 1992, Ilyas and Saartin 1998, Ilyas 2006). The aims of this research were to evaluate the effect of testa color and invigoration treatment on seed viability, vigor, and vegetative plant growth of bambara groundnut.

MATERIALS AND METHOD

Matricconditioning was conducted using ratio of seeds to carrier (burned rice hull passed through 0.5 mm) to water or Rhizobium and/or fungicide suspension of 5:3:3 (by weight) at 25°C for 3 days.

Matricconditioning plus Rhizobium sp. treatment (I1) was performed by mixing seeds, suspension of Rhizobium inoculant (0.78 g for 130 g seeds), and the carrier. Matricconditioning plus fungicide treatment (I5) was conducted by mixing seeds, suspension of fungicide (0.05% benomyl for 130 g seeds), and the carrier. In matricconditioning plus fungicide and Rhizobium sp. treatment (I3), suspension of Rhizobium was applied before the fungicide.

The four colours of testa:

- Black (T1)
- Purple (T2)
- Dark Brown (T3)
- Light Brown (T4)

RESULT AND DISCUSSION

Table 1. Effect of invasion treatment and testa color on seed viability and vigor parameters of bambara groundnut

<table>
<thead>
<tr>
<th>Invigoration treatment*</th>
<th>Testa color</th>
<th>Germination (%)</th>
<th>Speed of germination (Vul)</th>
<th>Seeding growth rate (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated (I0)</td>
<td>Black (T1)</td>
<td>77.3</td>
<td>6.2</td>
<td>8.7</td>
</tr>
<tr>
<td>Matric + Rhizobium sp. (I1)</td>
<td>Purple (T2)</td>
<td>90.7</td>
<td>13.9</td>
<td>10.0</td>
</tr>
<tr>
<td>Matric + fungicide (I2)</td>
<td>Dark (T3)</td>
<td>98.7</td>
<td>12.4</td>
<td>10.9</td>
</tr>
<tr>
<td>Matric + fungicide and Rhizobium sp. (I3)</td>
<td>Light Brown (T4)</td>
<td>94.7</td>
<td>15.2</td>
<td>11.5</td>
</tr>
</tbody>
</table>

Laboratory experiment

Table 1 indicated that invasion treatment using matricconditioning plus Rhizobium sp. (I1), matricconditioning plus fungicide (I2), and matricconditioning plus fungicide and Rhizobium sp. (I3) applied on the seeds with all testa colors resulted on higher percent of germination, speed of germination and seedling growth rate compared to untreated (I0). These data indicated that invigoration treatments were able to improve seed viability and vigor. Ilyas and Sopian (2013) reported that matricconditioning alone or matricconditioning plus Rhizobium sp. applied on bambara groundnut seeds harvested at 122 or 125 days after planting improved seed viability (percent of germination) and vigor (speed of germination and index of vigor).

Field experiment

Both factors significantly affected vegetative plant growth at 9 weeks after planting. Table 2 indicated that all invigoration treatments applied on the seeds with black testa (T1) provided highest values of plant height compared to the seeds with purple (T2), dark brown (T3), and light brown (T4) testa.

Table 2. Effect of invasion treatment and testa color on vegetative plant growth parameters of bambara groundnut (9 weeks after planting)

<table>
<thead>
<tr>
<th>Invigoration treatment*</th>
<th>Testa color</th>
<th>Plant height (cm)</th>
<th>Number of leaves</th>
<th>Speed index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated (I0)</td>
<td>Black (T1)</td>
<td>22.1</td>
<td>39.4</td>
<td>46.9</td>
</tr>
<tr>
<td>Matric + Rhizobium sp. (I1)</td>
<td>Purple (T2)</td>
<td>24.3</td>
<td>42.7</td>
<td>48.3</td>
</tr>
<tr>
<td>Matric + fungicide (I2)</td>
<td>Dark (T3)</td>
<td>23.3</td>
<td>44.9</td>
<td>52.3</td>
</tr>
<tr>
<td>Matric + fungicide and Rhizobium sp. (I3)</td>
<td>Light Brown (T4)</td>
<td>23.8</td>
<td>47.5</td>
<td>54.4</td>
</tr>
</tbody>
</table>

CONCLUSION

Invigoration treatment using matricconditioning plus Rhizobium sp., matricconditioning plus fungicide, or matricconditioning plus fungicide and Rhizobium sp. applied on bambara groundnut seeds effectively improved seed viability and vigor compared to untreated seeds.

All invigoration treatment applied on the seeds with black testa resulted higher plant height than untreated seeds at 9 weeks after planting. Seeds treated with matricconditioning plus Rhizobium sp., or matricconditioning plus fungicide and Rhizobium sp. applied on the seeds with black testa resulted higher number of leaves compared to matricconditioning plus fungicide and the untreated. It is concluded that matricconditioning plus Rhizobium sp. or matricconditioning plus fungicide and Rhizobium sp. applied on the seeds with black testa improved vegetative growth at 9 weeks after planting.

REFERENCES