Sorghum inbreds combining high yield and grain mold resistance ready for deployment to seed system in Senegal

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Introduction

In Senegal, during these past ten years, important attempts in the improvement of short and medium duration high yielding sorghum have been made leading to the release of several varieties. However, combining resistance to grain mold with high grain yield in tannin-free white-grained photo-insensitive sorghum remain one of the major challenges of the sorghum breeding program. In this study, 25 Mini-NAM inbred lines having grain mold resistant QTL were evaluated in multi-location environments across the country. The objective was to identify inbred lines that combined higher yield and resistant to grain mold.

Materials and Methods

Vegetative material

The 25 Mini-NAM lines used in this study belong to the cross between Nganda, susceptible and Sureño resistant to grain mold (Fig.1).

Figure 1: Panicles of susceptible parent Nganda and resistant parent Sureño

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sites of experimentation and PVS

The inbred lines were evaluated in station at Bambey, Rooff, Darou, Sinthiou Maleme and Seta (Fig. 2) under natural field infestation by grain mold during 2019, 2020 and 2021, rainy seasons. The experimental design was 7×4 Alpha lattice with three replications. A participatory varietal selection has been held at Rooff, Sinthiou Maleme, and Seta in 2021.

Figure 2: Sites of experimentation and climatic conditions

Statistical analysis

Data were first subjected to individual analysis of variance, and then combined for multi-environment analysis using R software (version 3.4.1). PVS data were coded and analyzed using the Statistical Package for Social Scientist (SPSS) version 19. The biplot was made using the MiniTab Statistical Software version 17.

Key Results

Performance per se of Genotypes

- Figure 4 indicated that the inbred lines E400, E270-1, E300-1, E26, E319, E269, E300-2, E270-2, E270-3 are as high yielding as the check Nganda with grain yield ranging from (2000 to 2500 Kg/ha). (Fig 6).

Figure 4: Performance of inbred lines for grain yield

- Of the 25 inbred lines evaluated, 20 are as resistant to grain mold as the resistant check Sureño.
- Among these, E300-2, E269, and E319 scored lower than the resistant check Sureño (Figure 05).
- The 20 best resistant lines for grain mold will be further considered for GGE Biplot analysis in order to identify their performance and stability for grain yield.

Figure 5: Performance inbred lines for resistance to grain mold

Best lines combining high yield and resistance to grain mold

- Inbred lines combining high yield and resistance to grain mold are E400, E300-1, E26, E319, E269, E300-2, and E270-2 (Fig 6).

Figure 6: Performance of Mini-NAM inbred lines for high yield and resistance to grain mold

Participatory varietal selection (PVS)

Participatory varietal selection involving 45 farmers (26 women and 19 men) was organised in Rooff, Seta and Sinthiou Maleme. PVS results indicated that farmers best preferred inbred lines are E319, E269, E300-2, E300-1, and E400. Farmers criteria prior to adoption are:

Men: high grain yield, short maturity cycle, grain quality, and forage yield;
Women: whitish grain, suitability for local dishes, big and open panicles.

Table 1: Ranking of the inbred lines according to farmers own criteria

<table>
<thead>
<tr>
<th>LINE</th>
<th>SINTHIOU</th>
<th>SEFA</th>
<th>ROFF</th>
<th>RANK</th>
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<td>1.2</td>
<td>1.5</td>
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</tr>
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<td>E-269</td>
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<td>2</td>
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<td>Sureño</td>
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<td>2.5</td>
<td>9</td>
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</tbody>
</table>

Conclusion

Based on agronomic performance and PVS, the five inbred lines ISRA-S-692-400, ISRA-S-692-300-1, ISRA-S-692-269, ISRA-S-692-300-2, and ISRA-S-692-319 have been selected. These inbred lines will be tested for grain suitability for local food and the best three will be registered and push to the seed system before the end of 2023.

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