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Introduction
Combining resistance to drought with high grain yield is of major interest for farmers in Senegal where sorghum is mainly cultivated during the rainy season. However, breeding for drought resistance is difficult because of most of the known donor parents are exotic, non-adapted to growing environments and have poor grain quality that are not suitable for food. In this study, Genome-wide association studies were used to identify quantitative trait loci associated with sorghum drought resistance in the national sorghum collection of Senegal.

Materials and Methods

Plant materials
The genetic material was consisted of 337 cultivars from the Senegalese sorghum sorghum collection along with three checks (Tx7000, B35 and Nigeria). These sorghum cultivars were evaluated for pre-flowering water stress during the 2018 and 2020 off-seasons under well-watered (WW) and water-limited (WL) field plot.

Sites of experimentation
Field experiments were conducted during the 2018 and 2020 off-seasons at the Bamby Research Station, Senegal (14.42 N, 16.28 W) located in the sudano-Sahelian zone (Figure 02). The soil texture was predominantly sandy (88.1-91.7%) with low clay (2.6-5.8%), silt (4.0-6.8%), and organic matter content.

Figure 1: Experimental field plots at Bamby in 2018 showing: A= Well-watered field plot; B= Water limited field plot.

Figure 2: Map showing the CNRA Bamby experimental site.

Materials and Methods

GWAS results revealed a total of 36 QTL associated with flowering time, panicle weight, seed weight and grain yield for 2018, 2020 trials and based on phenotype BLUP across years.

GWAS for Combined data
GWAS analysis using BLUP method revealed 9 QTL (Figure 04) among with:
- 06 were associated with Time to flowering, and
- 03 to grain weight.

GWAS for 2018 trial
Ten (10) were identified with the 2018 trial (Figure 03) among with:
- 04 were associated to time to flowering,
- 02 to panicle weight,
- 02 to grain weight, and
- 02 to grain yield.

GWAS for 2020 trial
Twenty-six identified with the 2018 trial (Figure 03) among with:
- 05 were associated to time to flowering,
- 04 to panicle weight,
- 10 to grain weight, and
- 07 to grain yield (07).

GWAS for 2020 trial
Twenty-six identified with the 2018 trial (Figure 03) among with:
- 05 were associated to time to flowering,
- 04 to panicle weight,
- 10 to grain weight, and
- 07 to grain yield (07).

GWAS analysis using BLUP method revealed 9 QTL (Figure 04) among with:
- 06 were associated with Time to flowering, and
- 03 to grain weight.

GWAS for 2020 trial
Twenty-six identified with the 2018 trial (Figure 03) among with:
- 05 were associated to time to flowering,
- 04 to panicle weight,
- 10 to grain weight, and
- 07 to grain yield (07).

Conclusion
This study, demonstrate the potential value of using locally adapted sorghum cultivars that are resistant to drought as donor parents for the improvement of elite sorghum varieties in Senegal.

Acknowledgment: This study is made possible through funding by the Feed the Future Innovation Lab for Collaborative Research on Sorghum and Millet through grants from American People provided to the United States Agency for International Development (USAID) under cooperative agreement number AID-OAA-A-13-00047. The contents are the sole responsibility of the authors and do not necessarily reflect the views of USAID or the US Government.