**Summary Statement**

Our study investigates the genetic architecture underlying panicle traits in switchgrass (*Panicum virgatum*), evaluates the sensitivity of QTL effects across environments, and explores the potential environmental factors contributing to G x E interactions across 10 field sites in the US. Our results suggest that panicle trait variation in switchgrass is due to a combination of QTL and the environment, with QTL displaying different effects across geographic regions. Moreover, patterns of QTL overlap support a pleiotropic model of panicle development and evolution.