Presentation abstract

Proso, pearl and finger millet are important food crops (first two more consumed in Asia and finger millet in Africa). However, they are also orphan crops, therefore such crops have not been part of breeding investments, like maize and wheat, for instance. Even though they are orphan crops, the study of these crops can provide us important insights about breeding since these millets can thrive in environments with limited water, where crops like maize, wheat and rice fail to grow successfully. One of the reasons for that is the fact that these orphan crops can grow in environments with limited water resources, where crops such as maize undergo severe yield loss. In addition, because the millets in this study grow where other major food crops are inviable, these millets can be grown in marginal land without the need to use more space. To increase our knowledge about these orphan crops, advances in high-throughput phenotyping can improve breeding decisions, especially with orphan crops neglected by breeding efforts in the past. Because these orphan crops have been neglected for a long time, little efforts in improving breeding decisions can lead to significant yield increase compared to maize. Improvements in high-throughput phenotyping has enabled analyses of several traits using measurements collected in a time series. Such advance is useful for comparing different plants and applying statistical approaches to make such comparisons. Here we employed high-throughput phenotyping throughout the lifecycles of proso, pearl and finger millet. We collected data from RGB, hyperspectral, fluorescence and thermal infrared images. These data collected is being used to quantify plant architectural and water use efficiency differences between accessions and species.

Significance:

According to studies by 2050 we will not have enough food to feed an increasing world population, hence scientists around the world are trying to come up with different approaches to tackle this problem. This problem becomes even worse considering the limited viable land due to salinization and urbanization. Environments with such poor quality are usually unsuited to grow major important food crops such as: maize, wheat and rice. However, some orphan millets, such as proso, pearl and finger millet, can grow in locations where these major food crops can't. Because orphan crops have received very little investment from breeding efforts in the past there is a need for both basic biological research and applied research focused on increasing yield. By using high-throughput phenotyping we can collect data about plant lifecycle, macronutrients concentrations, photosynthetic and water use efficiency rates. These data can guide improved breeding decisions and identify different features that make one crop more efficient than another. As a long-term result of such knowledge is to allow plants to grow in environments with limited water resources and still provide yield to help fight food insecurity and water scarcity worldwide.