

## ABSTRACT

Sorghum (*Sorghum bicolor* L. Moench) is a staple food and commercial crop for over 95% of the households in the highlands of southwestern Uganda. However, the farmer based selection traits, genetic diversity, heritability and gene action for yield traits have not been identified yet these are critical in breeding improved and farmer adoptable sorghum varieties. The study to assess farmer preferred traits was conducted using a survey involving 163 farmers purposively selected from the target population based on their indigenous knowledge in sorghum growing, during sorghum growing seasons (July – November) of 2013 and 2014. The results revealed culinary traits for making good quality local beverages (29.4%), high yield (28.2%), early maturity (10.4%) and medium height (9.1%) as most farmer preferred selection traits. The results of preferred diversity studies revealed moderate Shannon wiener diversity index ( $H= 2.03$ ) implying that a few traits were preferred by majority of the farmers. Genetic diversity studies involving 47 sorghum landraces collected from the zone were done based on 11 qualitative and 13 quantitative traits. The study was conducted at Kachwekano research farm in Kabale District at an altitude of 2,223 m above sea level, during sorghum growing season of December 2014 to August 2016. The results of coefficient of variation for qualitative traits revealed peduncle shape ( $CV=52.2\%$ ), peduncle exertion ( $CV= 47.2$ ) and Grain Colour ( $CV=46.4$ ) as most varied traits. Exertion length ( $CV=94.8\%$ ), panicle weight ( $CV=34.5\%$ ), grain yield (34. 1), plant height ( $CV= 21.7$ ) and panicle length ( $CV=20$ ) were among quantitative traits that showed highest variability. Days to 50% flowering had the least variability ( $CV=3$ ). The results of genetic diversity revealed low genetic diversity basing on low Shannon wiener trait diversity index values ranging from  $H= 0$  for Leaf midrib colour to  $H=1.4$  panicle shape and compactness. The study on heritability and gene action for yield and yield contributing traits was based on F<sub>2</sub> segregating populations raised from crosses between cultivars of Shokani, Ndatira and Buhuri all of which acted as males to female Kyatanombe. A single Kyatanombe panicle, after hot emasculation of its top three quarters, was sectioned into four approximately equal parts; one section was covered with kaki bag containing Shokani pollen grains, the second with Ndatira pollen grains, and the third with Buhuri pollen grains while the lower quarter that was never emasculated was covered with an empty kaki bag to allow it for self-pollination. All traits revealed variable heritabilities and genetic advances. Some traits for example grain yield and 100 seed weight through all the three crosses revealed additive gene interaction with high heritability and genetic advance values while others such as plant height and days to 50% flowering were under non-additive gene interaction with low values of genetic advance.