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Investigating the Morpho-physiological Characteristics of Sorghum (*Sorghum bicolor* (Moench) Varieties for Adaptability and Productivity in the Agroclimatic Condition of Malaysia

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Sorghum (*Sorghum bicolor* Moench) belongs to the Poaceae family, which is commonly known as the grass family. It plays a significant role in agriculture due to its versatility, drought tolerance, and wide range of uses. Due to genetic diversity, and wide variations of environmental conditions, the yield obtained and nutritional quality from sorghum varieties are inconsistent. However, due to limited knowledge gap of characterizing sorghum varieties (Bahausa, Sambalma, Kaura, Zabuwa, Janjari, and Kabo) according to their response to environmental conditions, this study necessitates examining basic morphology, growth habits, yield components, and nutritional quality of each variety to identify their effective utilization as food and feed. Treatments were laid out in a randomized complete block design replicated three times. Data collected on morphological, physiological, and biochemical compositions were subjected to analysis of variance. The results showed significant ($p<0.05$) effect on the varieties for example, Zabuwa having the highest (8668.88 kg/ha) seed yield and Janjari with the least (1796.3 kg/ha) seed yield was attributed to their plant height and leaf morphology. Similarly, the nutritional quality and quantity of each variety was obtained from the total biomass yield, protein contents, fiber contents and digestibility which were significantly ($p<0.05$) different among the varieties. Kaura variety was evaluated to have the highest leaf number (22), stem girth (23.16 mm), DMY (39200 kg/ha), protein (13.07%) and digestibility compared with Janjari and SAMSORG45. Based on these findings, varieties were classified by use: Sambalma is ideal for forage, Janjari for breweries and starch production, while Kaura, Zabuwa, Bahausa, Kabo, and SAMSORG45 are suitable for forage and seed production. Therefore, this study concluded that the most suitable sorghum varieties for human and animal feed are Zabuwa and Kaura respectively.

Keywords: Adaptability, genetic diversity, nutritional quality and utilization, sorghum, yield