Abstract

Sorghum (*Sorghum bicolor* (L.) Moench) presents a suitable source of green fodder in the livestock sector. However, its use as livestock feed is limited by a high concentration of lignocellulose. A study was conducted to evaluate the influence of environment and developmental stage of harvesting on lignin, cellulose, and hemicellulose concentration of selected fodder sorghum cultivars. A field experiment was laid in a randomized complete block design and replicated three times at Egerton University (0°22′S; 35°55′E in Nakuru county), Rongai (0°23′N; 35°51′E in Nakuru county) and Marigat (0°46′N; 35°98′E in Baringo county) in Kenya in the years 2019 and 2020. Twenty different genotypes of sorghum were grown in a randomized complete block design and sampled at the booting and dough stages of development. The samples were analyzed for cellulose, lignin, and hemicellulose content. Plant growth, number of days to 50% heading, and daily average temperatures were recorded. Cellulose, hemicellulose, and lignin content varied among genotypes and across the three environments. The lowest cellulose content was recorded in line E6518 when sampled at the booting stage at Egerton (17.02%) while the highest concentration was recorded in IS11442 (43.87%) from Marigat at the dough stage. Lignin was highest in sorghum grown at Marigat than at Egerton and Rongai while sorghum harvested at dough stage had higher cellulose, hemicellulose, and lignin concentration than at booting stage. Location which distinctively varied on average daily temperature had a significant ($p > 0.05$) effect on the three parameters with sorghum grown at Egerton showing the lowest lignocellulose content followed by Rongai and Marigat, respectively. Lignin was positively correlated with plant height and days to 50% heading. However, regression analysis showed a negative relationship between days to 50% heading and the total sum of temperature. Crop developmental stage, genotype, and environment determine the lignin, cellulose, and hemicellulose concentration in fodder sorghum. The recommendation of suitable sorghum fodder for a region should consider local growing temperature and the developmental stage of harvesting.

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