Abstract

Water hyacinth (*Eichhornia crassipes*), an invasive water weed with a large biomass, poses serious socioeconomic and environmental challenges in fresh water bodies. Efforts to control and remove water hyacinth (WH) can be complemented by biogas production, which, however, requires knowledge of its chemical and nutritional composition. Moreover, co-digestion with other substrates may compensate for possible limitations of its largely lignocellulosic biomass. This study carried out proximate, crude fiber, elemental and biochemical analysis of WH and a co-substrate, ruminal slaughterhouse waste (RSW). The WH had significant concentrations of cellulose, hemicellulose and carbohydrates of 331,200, 231,800 and 447,800 mg/L, respectively, and lesser concentration of lignin of 99,400 g/L that is desirable in biomass for biogas production. Concentrations of C, N, P and K in WH were 15,480, 1654, 51 and 137 mg/L compared to 26,220, 1390, 34 and 7475, respectively, for RSW, which indicated potential for biogas generation. The potassium concentration for WH of 137 mg/L was below the optimum range of 200–400 mg/L while that for RSW of 7476 mg/L was in the inhibitory range. Both biomass exhibited phosphorous deficiency at C/P of 310 and 656 for WH and RSW, respectively, against optimum ratio of 100 and 150 for hydrolysis and acidogenesis stages and methanogenesis stage, respectively. The C/N for WH of 9.4 was at the lower limit for optimal biogas production of 8 mg/L that demarcates potential ammonia toxicity while that for RSW of 18.8 was near the upper limit of 20 mg/L for nitrogen deficiency. Co-digesting the two substrates has the potential for balancing potassium concentrations and the C/N ratios. Trial co-digestion of WH with RSW improved WH gas production demonstrating complementary effect of the two substrates. However, commercialization of the co-digestion would need to establish the optimal mix proportions and methanogenic microbial communities involved in the digestion process.