In-vitro digestibility and methane gas emission of indigenous and introduced grasses in the rangeland ecosystems of south eastern Kenya

Annastacia Nduku Maweu[1,2] · **Bockline Omedo Bebe**[1] · **Simon Gichuru Kuria**[2] · **Olivier Basole Kashongwe**[1,3]

Received: 18 March 2022 / Accepted: 3 December 2023 / Published online: 21 December 2023

Abstract

Various grass species with high biomass yield and low moisture demand have been introduced in the rangelands of Kenya to realize increased ruminant productivity that could not be achieved with the low quality of the indigenous grasses. However, this intervention ignores the different methane emission of the indigenous and introduced grasses, a necessary consideration for realizing increased productivity while minimizing greenhouse gas emissions. This study determined *in-vitro* digestibility and methane emission of three indigenous grasses: *Eragrostis superba (E. superba)*, *Cenchrus ciliaris (C. ciliaris)*, *Enteropogon macrostachyus (E. macrostachyus)* and two introduced grasses (two varieties of *Chloris gayana*; Boma rhodes and Extozi rhodes. Samples of these five grasses (whole plant above ground) were collected from established pasture plots in South Eastern rangelands of Kenya. The grass samples were collected at bloom stage using one-meter square quadrats for proximate analysis and determination of neutral detergent fiber (NDF), acid detergent lignin (ADL) and acid detergent fiber (ADF) using AOAC (1990) methods. On average, relative to the indigenous grasses, the introduced grasses were higher in crude protein (74.05 g Kg-1 dry matter (DM) vs. 52.11 g Kg-1 DM), organic matter digestibility 62.7% vs 53.6%) and in NDF (712.7 g Kg-1 DM vs. 708.0 g Kg-1 DM), metabolizable energy (16.35 vs 12.90 MJ/kg DM), methane emission (25.61 ml vs 15.93 ml) but with lower in-*vitro*-dry matter digestibility 54.24% vs 58.12%. Methane production positively correlated with crude protein, NDF, metabolizable energy, ADF and *in-vitro* organic matter digestibility. Hence, utilizing the introduced grasses to boost cattle production would achieve increased productivity but a point of concern are the higher methane emissions, not to mention the ecosystem change caused by the introduction of new species, which should affect the sustainability of the rangeland ecosystem.

Keywords Rangelands grasses · Methane emission · *In-vitro* dry digestibility · Chemical composition · Sustainability

Introduction