

Evaluation of minerals, trace elements, and antinutritional factors in selected legume fodder species (Fabaceae) with the potential to improve cattle nutrition and gastrointestinal health

Abstract:

The study aimed to investigate the nutritional composition, trace elements and anti-nutritional factors of fodder species belonging to the family Fabaceae potentially used as an alternative feed for cattle. The proximate composition, particularly dry matter, moisture, fats, crude proteins (CP), carbohydrates, crude fibre (CF), and neutral detergent fiber (NDF), were analysed, thereby, nonfibre carbohydrate (NFC) and gross energy (GE) were calculated. Thirty-three trace elements were determined from chemically digested dried plant material using ICP-MS (Inductively Coupled Plasma Mass Spectrometry) and ICP-OES (ICP-Optical Emission Spectrophotometry). The tannin levels, a known antinutritional factor, were estimated using Folin–Ciocalteu method. The methods were validated by the relative standard deviation (RSD) values and acceptable recovery percentage, linearity, limit of quantification (LoQ), and limit of detection (LoD). The proximate composition analysis estimated levels of dry matter (> 90 %), ash (3.77–26.98 %), crude proteins (8.22–22.19 %), carbohydrates (54.00–86.79 %), crude fibre (10.54–40.10 %), NDF (22.26–59.20 %) and GE (< 100 Kcal kg⁻¹ DM) in leguminous species. Essential elements were detected in recommended levels including Zn (21.20–50.30 mg/kg), Co (0.06–0.045 mg kg), Cr (0.5–5.08 mg kg⁻¹), Mn (9.02–197 mg kg⁻¹), Mg (0.10–0.52 mg kg⁻¹), Fe (42.40–812 mg kg⁻¹) and Na (72.00–1721 mg kg⁻¹). The concentration of toxic elements was below critical levels and tannin occurred at a safe level (< 50 mgTAE kg⁻¹) for ruminant consumption. Therefore, the selected fodder can effectively contribute to cattle dietary requirements for smallscale farmers in Onderstepoort, Gauteng Province, South Africa.