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Effect of tannin on the fibrolytic potential of domestic, wild and consortia from browsed herbivores microbial ecosystems

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Trees and shrubs are important sources of forage (protein supplement when both quality and quantity of pastures are limited) for animals particularly during the long dry seasons of West Africa or winter in Southern Africa. However, their consumption is restricted by the presence, variation and complexity of phenolic compounds called tannin. Therefore, browsing different microbial ecosystems in search of potential microbes that have evolved in their ability to digest fiber and tannin tolerance can be important to improve browse digestion by domestic browsers. This study monitored the effect of tannin on the fibrolytic potential of microbial ecosystems from domestic goat, wild giraffe, kudu, impala and consortia [A1 (giraffe+kudu, 1:1), A2 (giraffe+impala, 1:1), A3 (kudu+impala, 1:1), and A4 (giraffe+kudu+impala, 1:1:1)]. Fresh fecal samples were collected and 50g was mixed with homogenization buffer (50 ml) for crude protein extraction. Crude protein enzyme extracts (CPZ) were precipitated with 60% ammonium sulfate and assayed for exocellulase, endocellulase and hemicellulase by incubating with crystalline cellulose, carboxymethyl cellulose and xylan at 38 °C with optimum pH of 5.5 to 6.5 for 1, 2 and 48 hours, respectively. Each reaction mixture contained 100 µL of 10% tannin acid while the control had no tannin. Enzyme specific activities were defined as µg of reducing sugar/mg CPZ. In vitro fermentation study was done by transferring 33 mL of fresh fecal inoculum into 67 mL of salivary buffer containing 1 g *Acacia sieberiana* and 10% tannin (substrate 6.2% was made up to 10% by adding 50 µL containing 3.8 mg tannic acid) before incubating for 72 hours at 38 °C. The control incubations had no tannic acid. Apparent degradability (APD), true degradability (TD), neutral detergent fiber degradability (NDFdeg), acid detergent fiber degradability (ADFdeg), hemicelullase degradability (HEMdeg), microbial yield (MY), metabolizable energy (ME) and total gas emitted (GAS) were measured. Endocellulase and hemicellulase activity were generally higher ($P<0.05$) when incubated with tannin than no tannin with the highest activity observed in impala. Exocellulase activity increased ($P<0.05$) in all systems when incubated with tannin but for goat that decreased. Impala and A1, showed the highest ($P<0.05$) exocellulase activity. Apparent degradability, TD, NDFdeg and ADFdeg varied ($P<0.05$) between microbial ecosystems incubated with tannin and no tannin as well as among the tannin treatment groups. True degradability increased ($P<0.05$) in all systems when incubated with tannin than no tannin. Impala and A1 showed the highest TD, NDFdeg and ADFdeg. Apart from goat and A2, HEMdeg tended to increase upon incubation with tannin. Metabolizable energy decreased with tannin incubation. The highest decreased in GAS was observed in goat followed by A1, A4 and A3. However, GAS increase in impala, kudu and giraffe. The results from this study demonstrated that wild herbivores especially IM and A1 consortia possess a higher fibrolytic potential under high tannin concentrations. It was also noticed that tannin plays a major role in reducing enteric GAS production especially in microbial consortia which is a major environmental concerned for global warming. Therefore, investigating these microbial ecosystems effect on domestic goat both in vitro and in vivo may improve browse utilization and decrease enteric gas production.

Biography

Msimango Nokwethemba Nqobile Philile is currently a PhD student in the Department of Agriculture at the University of Zululand, South Africa. Her research focuses on improving forage utilization in ruminants with potential fibrolytic microbes from wild herbivores for better animal productivity.

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