UNGULATE BROWSING AS AN ECOSYSTEM PROCESS: BROWSER-PLANT-SOIL INTERACTIONS IN A SOUTHERN AFRICAN SAVANNA

by

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SUMMARY

Ungulate browsing and its ecological effects at plant, population, community, and ecosystem levels were addressed in a eutrophic southern African savanna. This was to test predictions of prevailing hypotheses, which are based on research in boreal and temperate forests. Changes in plant morpho-functional traits and population structure of a staple palatable species, *Acacia nigrescens* Miller were addressed over a two-year survey among vegetation stands with very different histories of attack from herbivores. Moreover browser-induced effects on functional composition of a woody plant community were addressed along a strong browsing gradient. Nutrient cycling was investigated through measurements of leaf litter decomposition rates, as well as soil and leaf chemistry analyses. Finally, a modelling approach was used to make predictions on plant productivity and changes in soil nutrient availability under ungulate browsing according to opposite plant defensive traits (i.e. tolerance *vs* resistance).

I found evidence that long-term selective browsing may negatively affect soil nutrient pool, at least in the vicinity of palatable woody plants. I proposed this might be due to the drastic reduction of leaf-twig litter mass returned to the soil, which likely decreased decomposer activity and negatively affected N mineralization rates. Hence, the processes responsible for a loss of nutrients in the soil were different from those proposed for northern hemisphere scenarios, which were instead due to decreased litter quality. However, I found evidence of high plant resilience in heavily browsed sites where *Acacia* stands shown (1) higher leaf N during the main growing season, (2) higher N release from leaf litter, (3) high concentrations of nitrate (NO_3) and ammonium (NH_4), and (4) similar, or even faster, litter decomposition rates than in lightly browsed sites. Firstly, this suggests that tree pruning triggers and maintains a fast nutrient cycling within the plant-browser system. The accelerating effect is supported by high mass compensatory growth abilities from highly palatable, fast-growing *Acacia* trees that produce highly decomposable litter. Secondly, browsing may have a long-term decelerating effect on N cycling through quantitative changes in litter production rather than through qualitative changes in litter chemistry. Further studies should better address processes related to soil nutrient cycling to confirm such hypothesis. I discuss how the interactive effects of browsing-grazing-soil fertility may influence nutrient cycling trough different ecological processes.

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