

Effects of nutrient additions on plant biomass and diversity of the herbaceous-subshrub layer of a Brazilian savanna (Cerrado)

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Abstract The Brazilian Cerrado is a diversity hotspot due to its high level of endemism and rapid loss of habitats. It is estimated that the number of herbaceous species is four times higher than that of woody species. Increasing levels of nitrogen additions to natural ecosystems have been indicated as a determinant of biodiversity loss. We investigated the effects of nutrient additions on the productivity (aboveground and belowground) and on diversity of the herbaceous-subshrub layer of a Brazilian savanna (cerrado stricto sensu). The experiment was carried out in the IBGE Ecological Reserve, near Brasília, Brazil. Between 1998 and 2006, N, P, N plus P, or Ca were applied to sixteen 225 m² plots, arranged in a completely randomized design. Aboveground biomass was compared 1 year after the first fertilization and 10 years

later. Floristic diversity was significantly different ($P < 0.01$) between the treatments. The highest and lowest species richness were presented in control and NP, respectively. The addition of P alone or in combination with N induced invasion by *Melinis minutiflora* (exotic C₄ grass). The aboveground biomass of this species was higher in NP and P plots. In the N treatment, *Echinolaena inflexa* (native C₃ grass) presented elevated cover and biomass but *M. minutiflora* was absent. The invasion by alien species resulted in negative impacts on native grass species. Besides changes in aboveground biomass, addition of N and P also led, although to a lesser extent, to changes in the root morphology and biomass, but these responses were modulated by seasonal variation in soil moisture. The results suggest that environmental

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