

# Production and nitrogen responses of the African dwarf shrub *Indigofera spinosa* to defoliation and water limitation

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## Abstract:

The dwarf shrub *Indigofera spinosa* Forsk. (Papilionacea), a native forage species of arid Northwest Kenya, was propagated from seed, grown in a controlled environment, and subjected to three treatments of defoliation and watering frequencies in a factorial experimental design. Biomass production and nitrogen accumulation in tissue components were measured to determine defoliation responses in a water-limited environment. We hypothesized that plants would maintain biomass and nitrogen flows despite removal of aboveground meristems and tissues by defoliation. Principal experimental results included a slight reduction (11%;  $P=0.08$ ) of total biomass production by clipping ca. 1/3 or 2/3 of new leaves and stems and all apical meristems every month. Total aboveground production was not affected by clipping, while final root biomass was reduced 17% by the 2/3 clipping. The least water stressed plants were affected most negatively by defoliation, and the unclipped plants responded more negatively to greater water limitation. Plants achieved partial biomass compensation through alterations in shoot activity and continued allocation of photosynthate to roots. A smaller fraction of leaf production was directed to litter in clipped plants although clipping only removed the youngest tissues, suggesting that clipping increased leaf longevity. In turn, each leaf probably contributed a greater total quantity of photosynthate. Photosynthetic rates were also likely to have been increased by clipping water-stressed plants. In contrast to biomass, plants overcompensated for nitrogen lost to defoliation. Total nitrogen uptake by individual plants was stimulated by defoliation, as there was more total nitrogen in leaves and stems. Increased nitrogen uptake was achieved by clipping stimulation of total uptake per unit of root rather than of total root mass. Oecologia Oecologia Look Inside Share Share this content on Facebook Share this content on Twitter Share this content on LinkedIn Other actions Export citations Register for Journal Updates About This Journal Reprints and Permissions