

Effect of defoliation on grass growth. A quantitative review.

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Abstract

The diversity of responses of individual grasses to defoliation created a controversy about 15 years ago, which still needs clarification. We quantitatively assessed the evidence of defoliation effects on individual grass growth, addressing two main questions: 1) what is the average and variability of the effect of defoliation on plant growth? and 2) what are the associated conditions accounting for the diversity of effects? Regarding the first question, the results showed a negative overall effect of defoliation on plant growth and substantial variability in the defoliation responses of different plant components. There was an intermediate negative effect on total production (which included clipped-off biomass), a large negative effect on final live biomass at harvest, and a minimal effect on root biomass. Regarding the second question (conditions accounting for the diversity of effects), defoliation intensity had no effect on the response to defoliation, but both time for recovery from the last defoliation and the period of time between defoliation events significantly decreased the negative effect of defoliation. Nitrogen availability also altered the effect of defoliation, as plants grown at highest nitrogen levels were more negatively affected by clipping than plants with no supplementary addition of nitrogen. These results indicate that the magnitude of defoliation response by an individual plant differs among plant compartments and this response is modulated by other factors, such as time for recovery after defoliation, and nutrient availability. In general, the effect of defoliation on individual plant production was more negative than reported effects of grazing on ecosystem primary production.