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Extreme precipitation increases plant biomass through altering nitrogen acquisition by grasses and soil microorganisms

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Extreme precipitation events resulting from climate change have strong impact on structure and functions of grassland ecosystems. The extreme climate events may shift plant productivity and nutrient acquisition preferences by roots and microorganisms.We conducted an extreme precipitation simulation experiment and used in-situ ^{15}N labeling of the three N forms to investigate N acquisition (N uptake rate, ^{15}N recovery and preference for N form) by the dominant plant species Stipa grandis and soil microorganisms.Increased rain frequency raised the growth and N acquisition of S. grandis, while microbial N uptake remains unaffected. Microorganisms strongly outcompeted S. grandis for total ^{15}N acquisition, however such superiority decreased in higher extreme precipitation frequency. Plant and microorganisms converged their N demands from distinct to similar preferences for N forms with high precipitation frequency. Such chemical niche partitioning by extreme precipitation effectively reduced root and microbial competition for each N form. Overall, important mechanistical insights into chemical niche differentiation by the effects of extreme climate events and their effects on structure, functions and plant-microbial interactions in temperate grasslands were explained.