

Background/Objective

- Root exudation is a key process for plant nutrient acquisition, but the controls on root exudation and its relationship to soil carbon (C) and nitrogen (N) processes in agroecosystems is unclear.
- This work probes the relationship between root exudation, environmental characteristics and root traits for biomass sorghum, miscanthus, switchgrass, maize, and soybean.

Approach

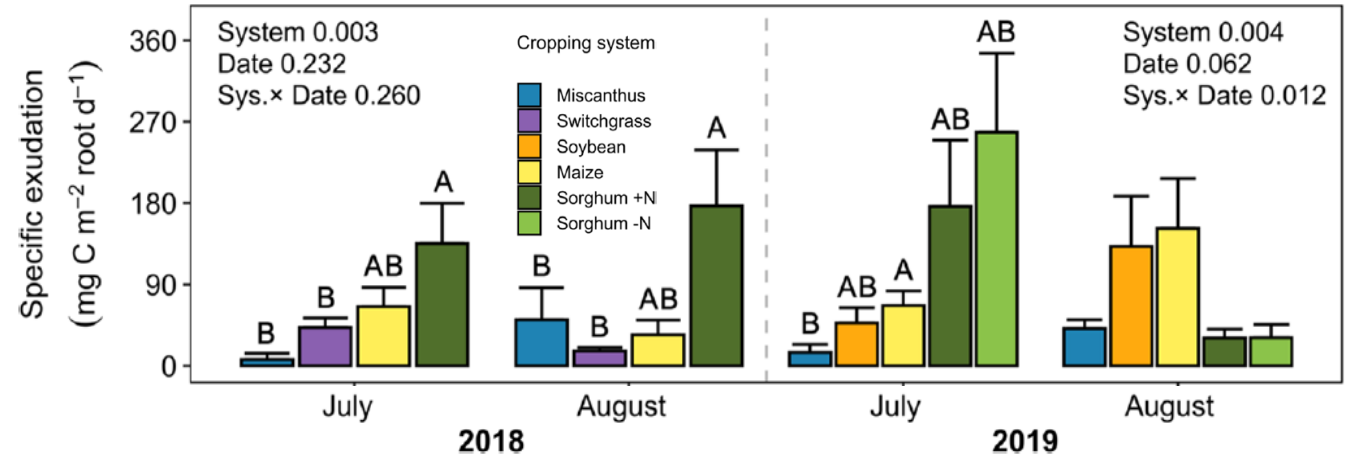
Root exudation and root morphology were measured in situ in Urbana, IL, during two growing seasons with contrasting precipitation regimes. N fertilization was varied in sorghum for one year. Root samples were collected from soil cores down to 30 cm. Soil samples taken to 10 cm were assayed for enzyme activity and microbial biomass.

Results

Specific root exudation was negatively related to root diameter and was generally higher in annuals than perennials. Sorghum N fertilization did not affect root exudation rates, and soil moisture did not impact annual root exudation rate among maize, sorghum, and miscanthus. Specific root exudation was negatively related to bulk soil C- and N-degrading soil enzyme activities.

Significance/Impacts

Intrinsic plant characteristics appeared more important than environmental variables in controlling *in situ* root exudation rates. Relationships between root diameter, root exudation, and soil C and N processes link root traits to soil function and demonstrate potential tradeoffs among plant nutrient acquisition strategies in agroecosystems.



Specific root exudation. Error bars show one standard error. P-values for the effect of cropping system, date, and their interaction are shown.