Will *Neotyphodium* infection influence tall fescue response to predicted climate change?

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Abstract:

Climate change may alter abiotic and biotic factors influencing plant growth which could potentially affect plant-microbial interactions. To assess this possibility, we investigated the response of tall fescue, *Lolium arundinaceum*, with (E+) and without (E-) the wild-type fungal endophyte, *Neotyphodium coenophialum*, growing in a mixed species hayfield community in central Kentucky (USA), to elevated temperature (+3°C) and altered precipitation (+30% of the long-term mean annual). A randomized complete block design was employed, with 5 plots each of the following 4 treatments: Control, + Heat (+H), + Heat + Precipitation (+HP), + Precipitation (+P). Individual tall fescue tillers were measured weekly for growth and destructively harvested three times in 2009 during simulated hay mowing events. Tillers were analyzed for tissue chemistry (% hemicellulose, cellulose, lignin, carbon, and nitrogen) for each harvest date and E+ tillers were analyzed for alkaloid content at the final harvest.

The climate change treatments affected tall fescue growth differently depending on the season. For example, during the June-July period, tall fescue growth was dramatically reduced under the +H treatment, but this same treatment stimulated growth in the fall, producing the most tall fescue growth for the growing season. Tall fescue tissue chemistry varied across the growing season and interacted with both endophyte status and the climate treatments to produce complex effects on these parameters. Loline alkaloid concentrations increased under the +H and +HP treatments in the September E+ plant material, however ergot alkaloids were not different across the climate treatments. These results suggest that predicted increases in temperature and precipitation in this region of the United States will lead to greater spring and fall tall fescue growth, but reduced mid-summer growth, and subtle, but also seasonally complex changes in tissue chemistry.