

# Reduced fitness of *Dalea candida* due to *Uropyxis petalostemonis* rust at different precipitation levels in the Kansas tallgrass prairie

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## Abstract

The effects of water limitations on *Uropyxis petalostemonis* (Farl.) DeT. in Sacc. on *Dalea candida* L. were evaluated in paired irrigation and control transects in the annually burned tallgrass prairie. Consistently higher incidence of *Dalea* rust was observed in the irrigated transects compared to non-irrigated transects. Survival of *D. candida* plants infected in the previous year was reduced, and virtually no flower was produced in the infected stems in either the years.

## Introduction

The frequency and extent of water limitation affects the species composition and productivity at Konza Prairie Biological Station (KPBS) (3). Water limitation also has large effect on disease initiation and development (2). The presence of disease often has negative effect on plant fitness components (1). A common plant at the KPBS is the white prairie clover, *D. candida*, subject to infection by the rust pathogen *U. petalostemonis*. This disease is common within a long-term irrigation study at KPBS and occurs in other areas of KPBS as well. So, irrigation might have influence on this disease incidence. In this poster, we present the results of experiments conducted to determine the effect of water limitations on *Dalea* rust and the effect of this disease on plant survival and fecundity in a natural ecosystem.

## Materials and methods

The experiment was laid out in a split plot design with irrigation and non-irrigation treatments as the main plots and 24 sample areas separated by 1.5 M as sub-plots. We looked for the occurrence of one healthy and one diseased plant per subplot. Data collected in summer 2000 included the occurrence of healthy or diseased plants, number of stems per plant, stem height, presence or absence of flower spike, spike length. Similar data were recorded in 2001 including the plants that had been measured and, marked in 2000.

## Results

Higher incidence of *Dalea* rust was observed in the irrigated transects compared to non-irrigated transects (Fig. 1&2). Similarly the area under disease incidence curves were also higher in the irrigated transects (Fig. 1&2). In 2001, the plots were monitored starting in April, and the first disease initiation was observed on May 17. Disease incidence increased until June 14 and then stabilized in irrigated-I while it was slowly increased until July 12 in non-irrigated-I (Fig. 2). Abundance of *D. candida* was higher in the irrigated transect-I and non-irrigated transect-I compared to the irrigated transect-II and non-irrigated transect-II (Fig. 3). Greater infection levels in 2000 resulted in a lower chance of survival to 2001 (Fig. 4). Rust-infected stems yielded virtually no flower spikes in both years with the exception of a few stems that were infected late and had only a few pustules (Fig. 5).

## Discussion

The aboveground net biomass productivity of forbs was always higher with higher precipitation level in KPBS (Knapp et al. 2001). We found that *Dalea* rust was consistently higher in the irrigated transects, and there was a profound effect on the relative fitness and fecundity of *D. candida* populations in the Konza prairie. These results suggest that current water levels may limit the development of this pathogen and that the benefits for the plant of higher moisture availability might be offset by higher disease incidence.

Disease progress curves, 2000

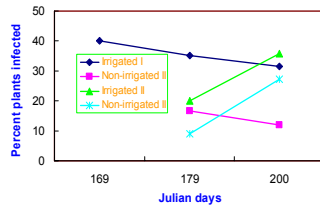


Figure 1

Disease progress curves, 2001

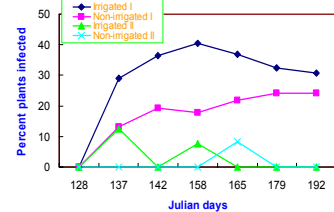


Figure 2

Dalea candida abundance

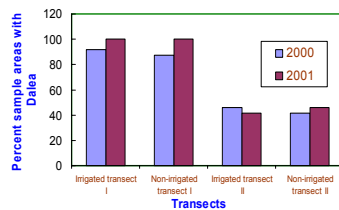


Figure 3

Effect of disease on plant size

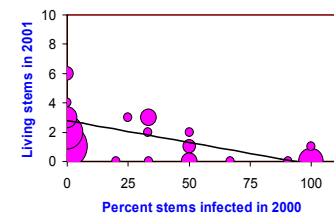


Figure 4



Experimental site, Konza Prairie Biological Station

Effect of disease on flowering

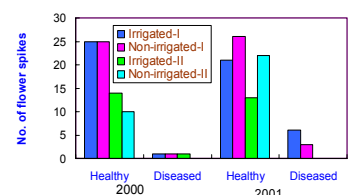


Figure 5

## Acknowledgements

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