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


Plant Pathology Department, Kansas State University, Manhasset; Department of Ecology and Evolutionary Biology, University of Kansas, Lawrence, and Division of Biology, Kansas State University

Abstract

The effects of water limitations on Uropyxis petalostemonis (Farl.) Deit. in Sci: 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. The area under disease incidence curves was also higher in the irrigated transects (Fig. 1). 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 pathogen 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.

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 pathogen 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.

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 paired within each main plot. The experiment was repeated in 2000 including 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 May 8, 2000 in the irrigated transects. This disease incidence increased until June 14 and then stabilised 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 II compared to the irrigated transect II and non-irrigated transect I (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.

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Reference

