Sacrificial seed’s impact on native seedling establishment in prairie restoration

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Background

Tailgrass prairie used to cover Iowa and much of the Midwest. Now, only 3% of the land it formerly covered still has remnant prairie (Smith 1996). Many prairie restoration efforts are in place, but native prairie seed is very expensive. Two UNI master theses have found there is widespread seed predation in buffer style experiments. The goal of this experiment was to discover if cheap, sacrificial seed would impact native seedling establishment in prairie restoration. Our goal is to find a way to increase seedling establishment so more places can have the opportunity to restore prairies cost-effectively.

Waterman et al. 2015 showed that you could measure seed predation through weedcards and using cages as controls. Riebkes et al. 2016 successfully used sacrificial seed to increase seedling emergence rates on a roadside planting. Animals want to maximize the rate of energy intake by hunting for the highest quality and most abundant food present in their environment. When their food source is low, or another higher quality or more abundant source appears, they will switch to the superior food source.

Methods

Study Site

- Research was conducted in 2020 at Irvine Prairie located at 1173 55th St, Dyers, IA 52224. The 31.2 hectare field is divided into five sections to be planted in consecutive years (Figure 1).
- Native prairie seed was planted on March 31st, 2020 consisting of 75 native prairie species.
- 400 native prairie seed were planted per m², 6.7 kg/ha.
- Six research plots were established measuring 40m by 40 m. They are placed in an array shown in Figure 1.
- Three of the plots were designated control plots and three plots were designated for sacrificial seed.

Sacrificial Seed

- The sacrificial seed mixture consisted of roughly equal proportions of five types of birdseed: Pankum milleum (white millet), Sphingom bilor (sorghum), Helianthus annuus (black oil sunflower), Zea mays (cracked corn), and Guineo aux papamis (papaya flakes).
- The sacrificial seed treatment was applied to three designated plots (plots 2, 3, & 6). We dispersed the bird seed by hand as evenly as possible on April 7th, 2020, and April 9th, 2020.
- Birdseed was spread at 10 times the weight of the native prairie seed, 66.8 kg/ha.

Seed Removal

- To assess predation, we wait for the seedlings to emerge, we monitored the rate of seed removal from a Triats 1 and 2 were calculated uncontrolled because their seedcard cages did not exclude insects. Trial 3 was calculated controlled (with the seedcard cages that excluded all predators). Waterman et al. 2015 showed that you could measure seed predation through weedcards and using cages as controls. Riebkes et al. 2016 successfully used sacrificial seed to increase seedling emergence rates on a roadside planting. Animals want to maximize the rate of energy intake by hunting for the highest quality and most abundant food present in their environment. When their food source is low, or another higher quality or more abundant source appears, they will switch to the superior food source.

Seedling Establishment

- We built a seedcard control cage for each plot that held 8 seedcards. The cages were elevated off the ground, and the metal frame as the border for counting. When comparing the control and sacrificial seed plots, it showed no significant difference. Data is shown as average percentage of seeds removed from seedcards by predators adjusted for the effects of seedling emergence and seed removal rate.

Future Direction

- Future research should look at the impact of different treatments that exclude predators. (only excluding mammals vs excluding everything, etc.)
- The impact of earthworms and fungi would also be beneficial to study.

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Works Cited


Figure 1: Irvine Prairie map, plots in study are boxed 1-6

Figure 2: 60 x 60 cm plot, center 10 x 10 m test section. seedings were counted at one of the surrounding 10 x 10 m sections per week for each. The mean of percent seeds removed from seedcards was calculated for each plot for each trial as well as the standard error. n has been included to show the large differences in the number of cards included at each exposure level.

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