

Helianthella quinquernervis Ray Floret Removal: Effect on Insect Visitation Frequency

Amanda Scott

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Dr. George Weiblen

Introduction

Helianthella quinquernervis (Asteraceae), the aspen sunflower, is an herbaceous perennial that attracts many types of insects including many species of bees and ants (Hymenoptera), butterflies and moths (Lepidoptera), beetles (Coleoptera), and flies (Diptera) (Goulson 2003). Insects play very important roles in pollination. According to Inouye and Taylor (1979), there is a mutualistic relationship between ants and *H. quinquernervis* where the ants protect the plant from herbaceous insects and the plants provide nectar, secreted from the bracts, as a food source for the ants. Researchers have also discovered that ants can have a negative effect on plant reproduction by forcing away pollinators with their aggressive behaviors and by consuming the nectar that the plant produces (Wagner 2000). Nectar is a good food source for insects because it provides the sugar and the water that are needed for survival (Goulson 2003). Inouye and Inouye (1980) suggest that there is a correlation between the amount of floral nectar found in a plant and the pollinators that visit the plant. It was shown in a study that visual cues, a conspecific present on a flower, attracted bees to those certain flowers (Kawaguchi 2006). I wanted to see if ray florets were used as a visual cue for insects, so I conducted a study using *H. quinquernervis*, in order to determine whether or not removing ray florets would cause a change in visitation frequency of different species of insects. In a similar study using oxeye daisy (*Leucanthemum vulgare*) the ray florets were removed in order to determine the impact on pollination success. Results showed that removing the ray florets reduced the chance of pollination by 31-35% (Anderson 2008). I hypothesized that insects would choose the flowers for their ray florets and that visitation frequency would be significantly reduced if the ray florets were removed.

Materials and Methods

Three plots of flowering *H. quinquernervis* were randomly chosen from a field site at Rocky Mountain Biological Laboratory in Gothic, Co. The plots were no less than three, and no more than ten meters apart from each other. Each plot contained two plants, one control plant and one experimental plant that had its ray florets removed. The plants were spaced less than one meter apart in each plot. Each plant had three flowering heads and was observed for one hour. Fifteen minute intervals of both plants simultaneously were recorded. Observations were made from 10:30am-11:30am, 1:30pm-2:30pm and from 3:30pm-4:30pm on Saturday, July 18th. Two more observations were made on Sunday, July 19th from 8:30am-9:30am and 5:30pm-6:30pm. Observations were made regarding what type of insects visited the plant during the fifteen minute intervals. The insects that visited *H. quinquernervis* were identified to the family and placed into the general categories of bees, ants, flies, beetles, spiders, or moths. These categories were chosen based on the abundance of these insects at the site. All observations were made from two meters away, on the east side of the plots and no insect repellent was worn.

Results

There are more insect visits to flower heads that have ray florets removed than to flowers with ray florets present (Table 1) 78% of the total ant visits were to flower heads that had ray florets removed (Table 1). Both bees and flies more frequently visited the heads of flowers that had ray florets intact (See Fig. 1) Chi-squared test analysis show that the results for ants ($\chi^2=69.1561$, $df=1$, $p<0.05$) and for flies ($\chi^2=21.7111$, $df=1$, $p<0.05$) were significant, but the removal of ray florets had no impact on bee preference ($\chi^2=3.7692$, $df=1$, ns). The chi-square test was not appropriate for moths, spiders and beetles due to insufficient observation data. When

applying the test to the total number of insect visitors to both plants combined, there is not a significant difference between the two plants ($\chi^2=0.1930, df=1, ns$).

Table 1: Number of visits over 5 hour observation period.

	Bees	Ants	Moths	Flies	Spiders	Beetles	Total
Ray Florets Removed	3	32	0	1	1	0	37
Ray Florets Present	10	9	1	8	0	1	29

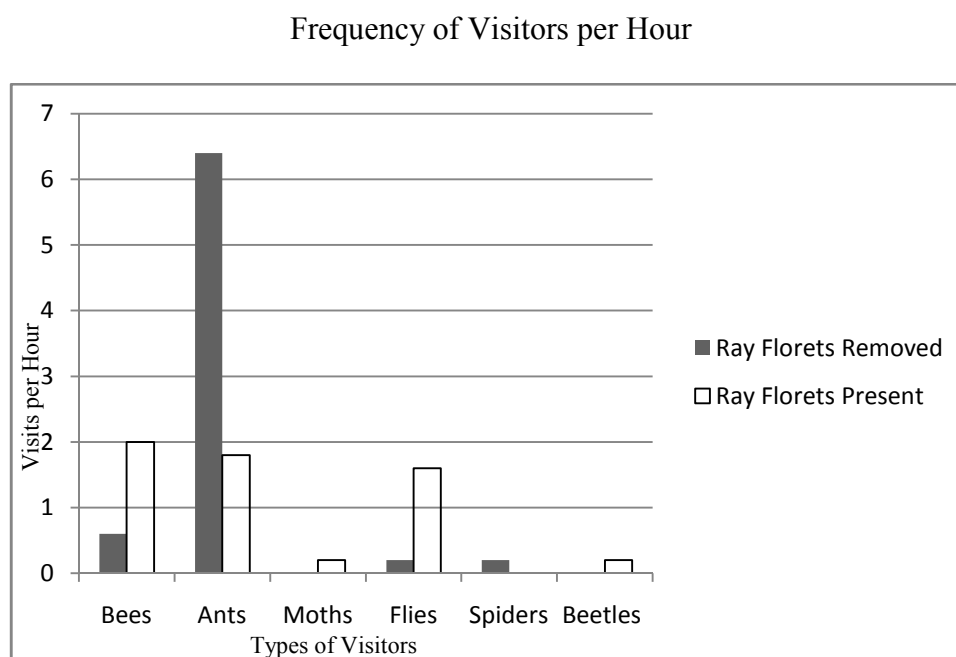


Figure 1: Graph shows the frequency and types of visitors to *Helianthella quinquernervis* heads per hour of observation from both observation days combined.

Discussion

Ants had a higher visitation frequency toward flowers without ray florets (Fig. 1). These results may indicate that the ants have an easy time getting to the head of the flower without the ray florets being present. When present, the ray florets may act as a barrier for the ants. On the other hand, flies have a higher frequency of visitation when the ray flowers are present (Fig.1).

Further research is needed to determine whether the flies were attracted to the color of the ray florets or to a scent that they ray florets were giving off. It was very windy the first day that observations were made, so the environmental factors could have had an effect on the data collected on that day. And because the results were pulled from both days, it could have had an effect on the results presented in table 1 and graph 1. Furthermore, I did not record arrival and exit time of each species. This could have an effect on the data if one insect was present for several minutes, causing other insects to not be present. Because the data shows that the results for the total number of visitors in not significant, my hypothesis is rejected. Removing the ray florets did not seem to have a significant impact on visitation selection of some insects.

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