

CHARACTERIZATION OF POLLEN LOADS FROM POLLEN TRAPS PLACED IN HONEY BEE HIVES IN RED CLOVER SEED FIELDS IN THE WILLAMETTE VALLEY

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Introduction

The Willamette Valley in western Oregon is a major producer of red clover (*Trifolium pratense* L.) seed. In the region, red clover blooms over a six week period from early July to mid-August. Typically, growers in the region rent 1-2 honey bees hives per acre to meet pollination requirements for the crop. Research in the past, however, has raised questions about the efficacy of using honey bees as pollinators of red clover due to their tendency to exhibit “nectar robbing” behavior and to their preference for competing blooms near production sites (Bohart 1957; Hawkins 1956, 1960; Free 1965). In addition, the cost of hives has increased in recent years due to reduced availability resulting from diseases and the Colony Collapse Disorder. In 2009 and 2010, we conducted a study to determine the foraging behavior of honey bees in red clover to enable growers to assess their investment in hive rentals, and determine whether to seek an alternative pollinator for production needs.

Methods

Pollen traps were placed on honey bee hives for a 2-day duration, 3 times during early (early July), mid (late July-early August) and late (mid-August) bloom in red clover fields (3 sites in 2009 and 2 sites 2010). Due to trap malfunction, only two pollen samples were collected from one of the 2010 collection

sites. Sub-samples containing 50 pollen loads were randomly selected from each pollen sample. The pollen loads were processed by acetolysis (Erdtman 1943), and pollen grains were identified to plant family using light microscopy.

Results

Analysis of the 700 pollen loads indicated that the majority of pollen collected by honey bees during early and peak bloom in both years, and during late bloom in 2010, was red clover pollen (Figure 1.). However, in 2009, honey bees were foraging elsewhere during late bloom (Figure 1). This may have been a result of a heat wave in August 2009 which drastically impacted clover bloom.

In all, based on the pollen analysis, 9 plant families were visited by honey bees placed in clover fields in 2009 and 2010 (Table 1). On average, honey bees foraged on non-target plant species 38.4% of the time during 2009, and 8.8% of the time during 2010. However, if the late blooming period from 2009 (in which bloom counts were unusually low at field sites) is excluded from the data, then honey bees foraged on non-target plants species on average 7.6% of the times included in the study, which is much more in line with the following year’s data.

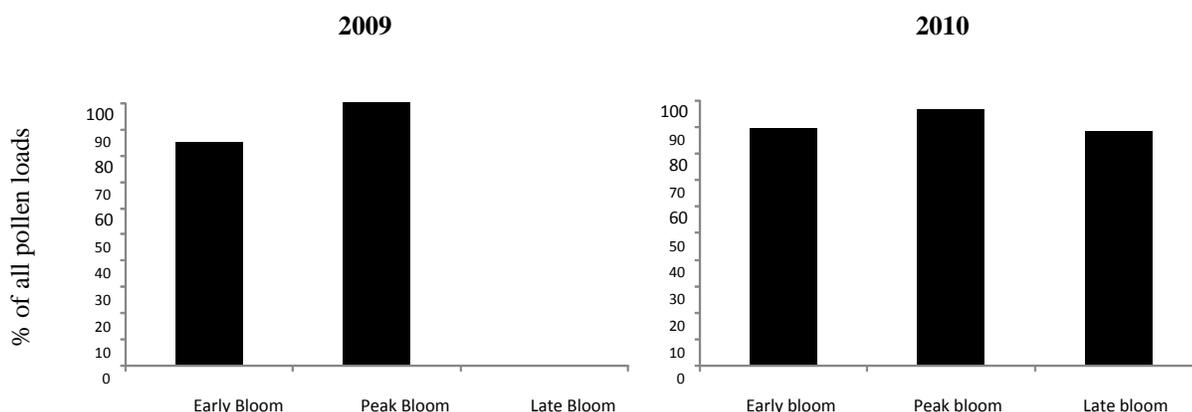


Figure 1. The amount of red clover pollen in loads collected from pollen traps placed in honey bee hives in red clover fields during early, peak and late bloom.

Table 1. The composition of pollen in loads collected from pollen traps placed in honey bee hives in red clover fields during early, peak and late bloom.

Pollen Composition (%)	2009 Bloom			Pollen Composition (%)	2010 Bloom		
	Early	Peak	Late		Early	Peak	Late
Red clover	84.86	100	0	Red clover	89.79	96.8	92
Apiaceae	2.4	0	34.2	Apiaceae	0	0	4
Asteraceae	1.3	0	35.49	Asteraceae	2	2	0
Brassicaceae	0	0	0.66	Brassicaceae	0	0	0
Cucurbaceae	0	0	2.66	Cucurbaceae	0	0	0
Other fabaceae	1.3	0	0	Other fabaceae	6.12	1.2	0
Lamiaceae	0	0	1.36	Lamiaceae	0	0	0
Poaceae	0	0	8.69	Poaceae	0	0	0
Unknown	10.06	0	14.18	Unknown	0	0	0
Rosaceae	0	0	2.72	Rosaceae	4.08	0	4

Discussion

In Western Oregon, during 2009 and 2010, honey bees were found to be excellent foragers in red clover fields, foraging an average of 98.4% of the time during peak bloom on the target crop. In previous studies (Hawkins 1956, 1960), where this was found not to be the case, competing bloom in the vicinity may have impacted foraging behavior on red clover. Thus, in the Willamette Valley, as it has been documented in other regions, honey bees do forage on red clover in seed production fields although prevailing temperatures and presence of competing bloom are factors that may affect their efficacy in this crop. Although honey bees were efficient pollinators in this setting, it is still not known if their placement in field sites is necessary because of high native bee populations previously documented in similar red clover fields in the Willamette Valley (Rao & Stephen 2009, 2010).

References

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