

2021 Lily Beetle Research Update  
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Lily Beetle Larvae Collections:

All lilies on the campus were surveyed for larvae beginning in June and ending in September or 2021. One hundred seventy-two (172) lily beetle larvae, substantially up from 5 in 2020 and comparable to 128 in 2019, were collected from the lily plots in 2021. The larvae were fed on excised lily leaves and allowed to pupate in plastic containers filled with vermiculite wetted with tap water. Nineteen (19) adult lily beetles emerged from the pupae, an emergence rate of 11%. No pupal cells with un-emerged (= parasitised) lily beetles resulted from the rearing attempt.

We adjusted two variables this year in the rearing conditions, soil depth and soil moisture content. We maintained a higher moisture content this year to determine if moisture was a limiting factor in previous rearing attempts. We also doubled the depth of the soil in the rearing containers. In previous years all of the lily beetle larvae pupated directly on the plastic at the bottom of the container. We wanted to determine whether soil depth was also a limiting factor in parasitoid success. No surviving pupae were detected. This may be a result of declining parasitism rates (see larval dissection rates below) or that the altered conditions were even less conducive to parasitoid success. The moisture content this year was likely too high as we maintained the soil at field capacity, a condition not normally encountered in Alberta soils.

The rearing conditions will be adjusted to reduce the moisture content to approximate field conditions. We will also have containers with varying depths to determine if soil depth is a factor.

Lily Beetle Parasitism:

Eighty-three (83) larvae ranging from first to fourth-instar were collected from the lily plots on the Olds College campus. These larvae were preserved in 95% ethanol for dissection in the laboratory. Larval parasitism rates were 22.9%, a significant decline from prior years (Table 1). The average number of parasitoid larvae per parasitised lily beetle was 5.05. This low number may be an artefact resulting from a predominance of early instars being collected. *Tetrastichus setifer* prefers to parasitise later instars (unpubl. res.). Overall, lily beetle abundance has rebounded from 2020 and it may be that the two consecutive cold periods (-20°C for > 1 week) over the two previous winters have had a negative impact on the ability of the parasitoid to overwinter. However low the parasitism rate was for 2021, *T. setifer* was able to successfully overwinter. It remains to be seen whether the summer drought

conditions and a possible return to severely low temperatures this winter will cause a further decline in the population density of the parasitoid.

Table 1. Parasitism rates of *Lilioceris lili* by *Tetrastichus setifer* at Olds College

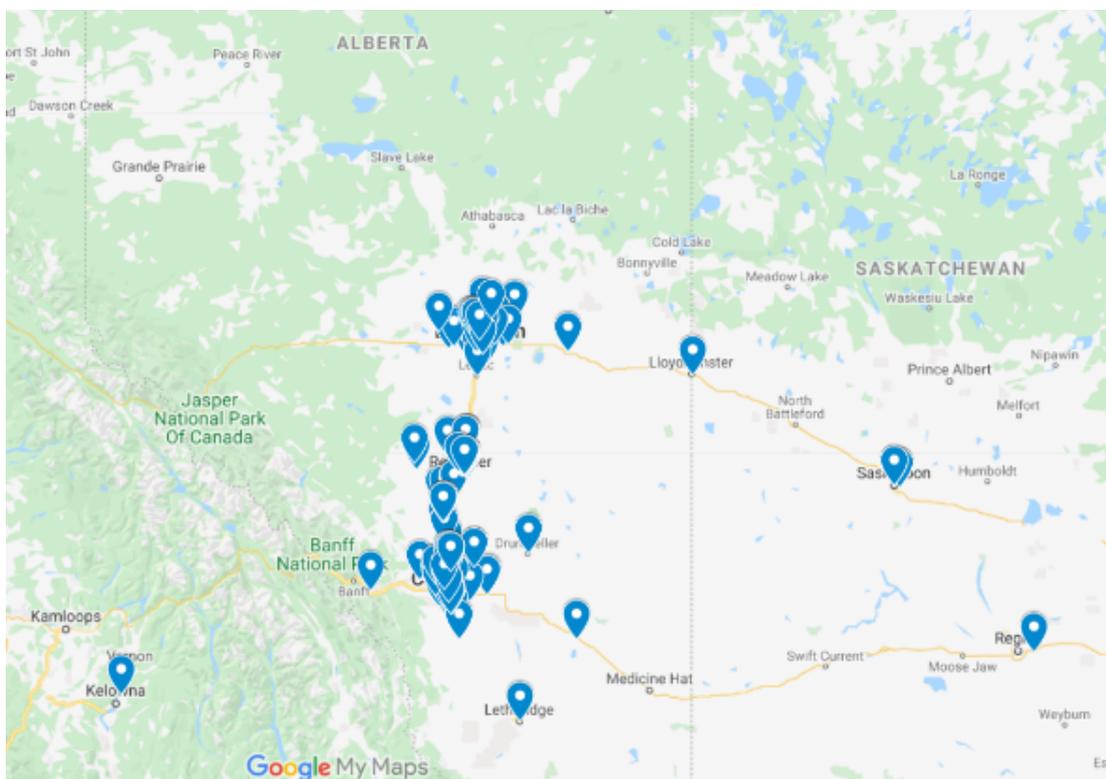
Year	Parasitism Rate
2017	75
2018	50
2019	95
2021	23

The staff at the Reader Rock Garden in Calgary did not participate in the program this year. Their assistance will be solicited in 2022.

Lily Beetle Distribution:

The provincial distribution of the lily beetle in Alberta arising from reports to Olds College between 2006 and 2021 are presented in fig. 1.

Figure 1. Distribution of Lily Beetle in Alberta as determined by public reporting



### Training:

A summer student was employed to collect lily beetle larvae, rear the larvae through to adult, and enter all records of lily beetle occurrence in Alberta into the Alberta database managed by Dr. Ken Fry and into the national database managed by Dr. Naomi Cappucino.

### Extension:

As is the case in all previous years, several (57 in 2021) emails were responded to regarding reports of the lily beetle, requests for information or management and enquiries about the parasitoid.

The results of the field season and the status of the Lily beetle in Alberta was included in the Alberta Pest Report to the Annual Western Forum on Pest Management.

### Conclusions:

The lily beetle population in the Olds College lily plots and the Botanic Garden has dropped from a peak in 2017 with population densities being approximately equal in 2018 and 2019 and a drastic drop in 2020 with a rebound in 2021. Long-term population densities as affected by the parasitoid and weather conditions will need to be monitored over several more years to determine whether the parasitoid has achieved a lasting suppressive force on the lily beetle and can survive the variable weather conditions in southern Alberta.