Monarch Caterpillar Dominant Herbivore

In our study, monarchs were typically the first organism visible on milkweed plants. However, predators such as spiders and other herbivores like aphids and leaf miners were also frequently observed. Milkweed plants have a variety of defenses that would impact the preference and performance of these insects (Johnson 2011). Here we show trends in insect abundance on milkweed over time (Fig. 1).



Fig. 1 A: Number of monarch caterpillars and eggs in the field by measurement period. Early trend showed greater caterpillar presence than egg presence which flipped during peak period. A possible explanation is that, during peak, we were measuring at the beginning of the second generation.

B:Total percentages of herbivores counted over measurement periods. Monarchs accounted for 83%, thus early in the growing season, plant damage can be attributed to monarchs.

Measurement Period **C**: Colonization trends of common milkweed from May to July 2021. Spiders establish early and remain consistent in the season while aphids and leaf miners establish later in the season. Monarchs are the dominant herbivores establishing early and having little competition in the early growing season.

Background Information

Monarch populations are decreasing over time (Fig. 2) and Malcolm et al. (2018) has connected 🗄 this decrease to milkweed decline. As monarch caterpillars depend on milkweed as their only food source, researchers are working to restore milkweed to increase monarch populations (Thogmartin et al. 2017).



Fig. 2: The annual record of monarchs in Mexico (Updated December 2020) showing declining monarch populations

Given widespread interest (https://www.fws. in planting milkweed, our goal wasets understand howing vertebratel) herbivores and predators colonize and consume milkweed plants that come from different regions. We conducted a common garden provenance trial measuring plant growth, fitness, and herbivory from May to August on biweekly basis.

Colonization Trends in Common Milkweed, Asclepias Syriaca, in Central Minnesota Kina Msuya, Lauren Sherman, Sam Ronneberg, Siviwe Dlamini, Emily Mohl Department of Biology, St. Olaf College, Northfield, MN, CURI 2021

Spatial, not Geographic Results for Monarchs

Monarch caterpillars are the primary consumer of milkweed and have little competition in the early growing season



Monarch butterflies prefer to oviposit on milkweed plants with more leaves and less damage



Methods and Experiment Design



Plants from 20 locations were plan over 7 plots with each plot. Each plant was marked with a flag with it unique code which contained its plot number, location and genotype



Methods



ants fitness such as stem eight along with observations on herbivory herbivory were collected from each of the plants bi-



The raw data was then processed using R o to analyze for any trends or correlation

Geographic factors from the seed sources were condensed using a principle component analys that was then used to understand if source geography plays a role in herbivore preference







Each caterpillar can consume multiple milkweed seedlings prior to metamorphosis





The data from each plant was recorded and entere into a spreadsheet which was then later double checked for error.

The design of the study was inspired by Woods et al. (2012). A common garden design (planting genotypes from different places in one area) with plants from 20 source populations is replicated across 3 sites. In the St. Olaf Natural lands field, there are 178 plants in each of the 6 plots, one from each genotype and, in plot 7, 192 plants with two from each genotype.

Pl	ot	<u>1:</u> I	Pea	k
1.	2.	3.	4.	5.
14.	15.	16.	17.	18.
27.	28.	29.	30.	31.
40.	41.	42.	43	44.
53.	54.	55.	56.	57.
66.	STIL PUPP	68.	69.	70.
79.	80.	81.	82.	83.
92.	93.	94.	95.	96.
105.	106.		108.	109. M
	STATE OF	Saund S	121.	122.
131.	132.	133.	134.	135
144.	145.	146.	147.	148
157.	158.	159.	160.	161
170.	171.	172.	173.	174

Fig. 3: Plot map of plot one showing damage, egg number, and larvae number per plant. A chi squared test demonstrated that monarch caterpillars and butterflies avoid the most damaged plants for feeding and oviposition.



Application and More Information

In finding that monarchs are the dominant herbivores preferring less damaged plants with greater leaves, we suggest that restoration projects should have an abundance of younger plants to support the monarch population, and when planning seedling locations, consider that monarch larvae seem to feed proximally to oviposition. As these are preliminary findings, they may reveal different conclusions than past studies and require future research to generalize more broadly. Our results are applicable to Minnesota and early growing season.



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Oviposition Preference for More Leaves



Fig. 4: Individual plants with more leaves are more likely to have monarch eggs, especially during later time periods. Except in T1, where plants with more leaves were less likely to have eggs. (Time x Slope Interaction in mixed model: χ^2 (df=3) =9.4677 p=0.02368)

Acknowledgements