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Abstract

Our grand challenge addresses the decline in *Apis mellifera* populations and proposes a solution for preserving this species of pollinator by providing them with a more nutritious diet. As a team, we have conducted research to identify four plants that show potential for providing bees with novel health benefits. The four plants we chose to research and experiment with were sunflowers, lavenders, almond trees and sainfoin. We also established a new concept called “plant pairings” which we hope to contribute to farmers, beekeepers and scientists alike in identifying ways to improve bee health and provide a greater variety of plants in which bees can derive nutrients from.

Introduction

- The decline in pollinator populations has not only negatively impacted the human economy and access to sustenance, but has also led to severe repercussions on environmental biodiversity and plant diversity
- The western honey bee (*Apis mellifera*), which has been identified as the world’s most frequent pollinator, has experienced a massive plunge in population size (Morawetz, 2019). In less than a century, their population has been reduced by nearly 50% and continues to drop to this day (Morawetz, 2019).
- The *A. mellifera* species provide pollination services to a great distribution of flora all across the world, so preserving their colonies is crucial
 - Increasing habitat loss/degradation, pathogens, pesticides and climate change, prevents pop. restoration (Paudel et al., 2015).
- **Our goal:** To increase biodiversity of the environment through the identification and experimentation of 4 plant species that hold ideal nutrient and dietary requirements lacking from the current diet. Factors that were studied include nutritional content, survivability, accessibility, and anti-parasitic characteristics

Citations

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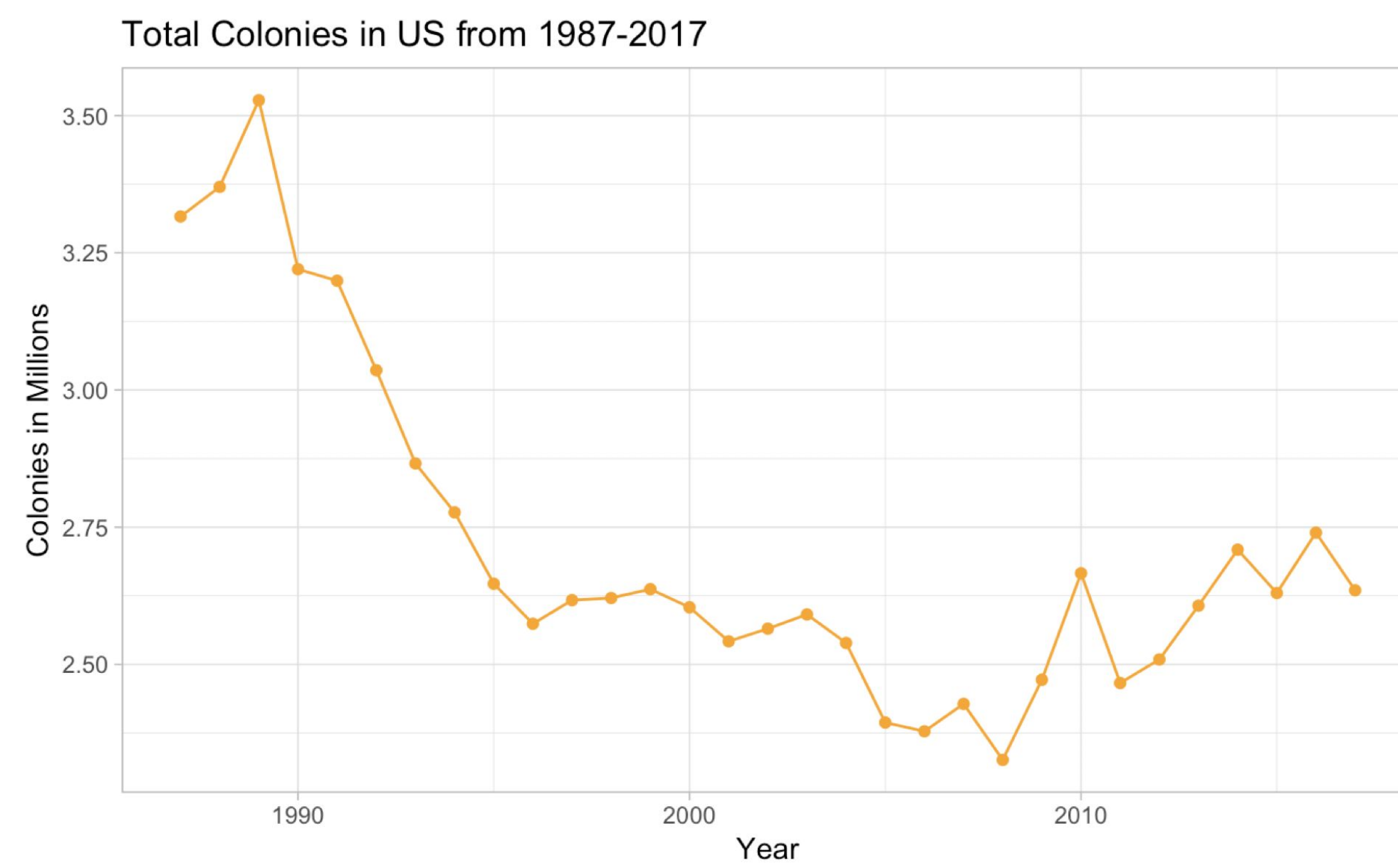


Figure 1: total number of Bee Colonies in US 1987-2017

Methods

- Conducted general literature research and identified any plants with novel health benefits for bees ⇒ out of these, select which survive best in SC climate ⇒ determine what makes each plant most attractive to bees (nutrition wise, the colors and scents etc.) as well as what makes plant most attractive to farmers in SC (survivability, how easy it is to maintain, etc)
- From this array, select 3-5 (we chose 4) plants that we found most novel and relevant to our grand challenge.
- Conduct further scientific research on each plant to determine how exactly they benefit bees; interview with a beekeeping expert
- Attempt to access all four experimental plants by arranging meetings/emailing with farmers and botanists
 - Experiment due to impact of COVID-19: we instead made any observations we could with plants readily available to us in the Southern CA region - lavender was the only plant we could observe due to COVID-19 restrictions.

Results

Date	Time	Temperature (°C)	Interactions (# of bees)	Lavender type
4/12/2021	1:00-2:30pm	28.9	28	French
4/18/2021	1:00-2:30pm	21.7	54	French
4/20/2021	8:00-9:30am	21.7	42	French
4/25/2021	1:00-2:30pm	30.6	21	English
4/28-2021	9:00-10:30am	20.0	32	English

Table 1: Recorded bee interactions with lavender over time and temperature

Results (cont.)



Figure 2: Germination & planting of sunflower seeds

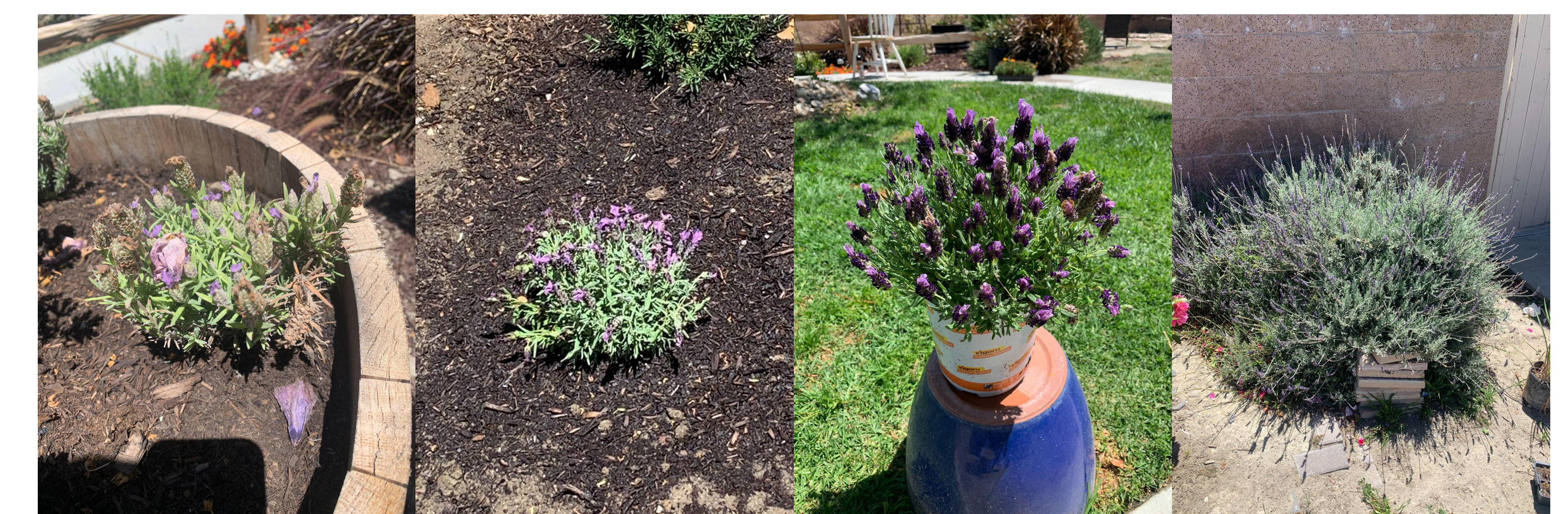


Figure 3: Observation of bee visits to lavender

Conclusion

Although we did not obtain data from each plant listed in our experimental procedure we wanted to test due to the COVID-19 pandemic, our literature research over the course of a year and a half has provided us with enough evidence to confidently procure an outline of an experiment that could provide significant results. As was stated in numerous recent studies, bee populations are declining due to various reasons; however, based on our research, the most imperative was unhealthy bee diets. By creating an experiment in which we can observe which plant species is most desired by bees (thus the most nutritious), we could be one step closer in increasing diet nutrition of pollinators.

Future Experiments

Looking towards the future we would love to conduct the experimental phase of our project. Due to COVID-19 we were not able to get the materials in order to feasibly and reliably test the selected plants

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