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Honey Bee Nutrition Through the Ages

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Introduction

Honey bee nutrition can tell us a lot about the state of the hive. It is known that summer worker bees and winter worker bees have different protein and carbon content (Mattila et al., 2007), but not much research has been done on nutritional content throughout the life history stages of honey bees. I am examining differences in carbon and nitrogen content in the bees for the three different castes at various life stages. The results could allow for more efficient planting of pollinator friendly plants based on the nutritional needs of the colony, or could affect how beekeepers do supplemental feedings when necessary. Data could also inform future experiments on honeybee nutritional ecology.

Figure 1: a) A frame built out with drone comb for varroa mite management. b) Beekeeping with my mentor Beth. c) Frame of capped brood, the oldest babies in the hive.

Materials and Methods

Collection

- Adult bees, pupae, and larvae were collected three times, each 2-3 weeks apart in July-August 2022. Samples were labeled adult (A), pupae (P), or larvae (L) based on life history stage.
- Five samples of each life stage (if available) were collected on each sample date.

Analysis

- After collection, bees were frozen.
- Bees were dried at 113ºF (40ºC) for 24 hours.
- Bees were homogenized and the sample was combusted (Elementar UNICUBE) to collect percent nitrogen and percent carbon.

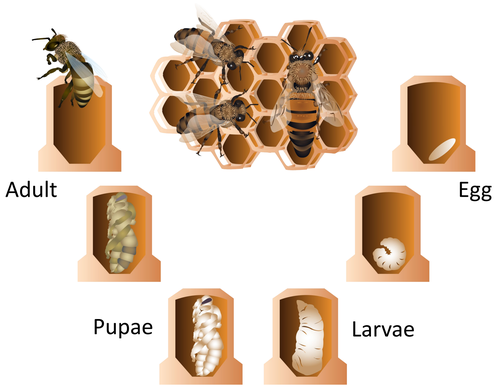


Figure 2: Diagram depicting the honey bee life cycle. Samples for this project were collected during the larvae, pupae, and adult stages.

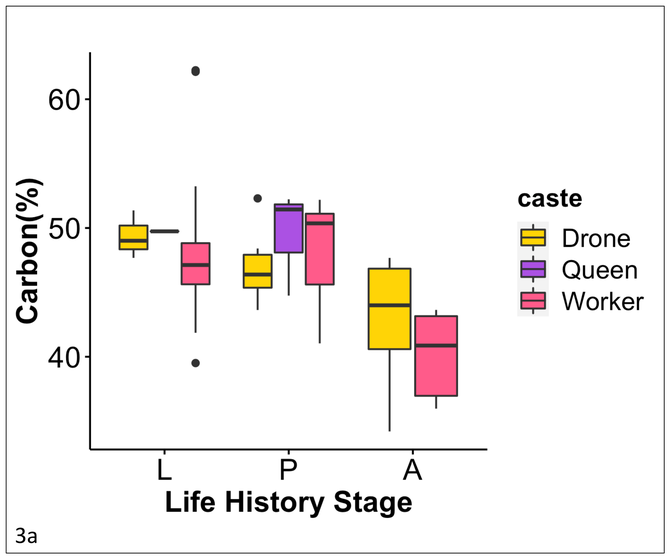
Results

Carbon (Figure 2a)

- There was a significant decrease in carbon content with age (Anova, F=9.83, df=2/47, p=0.0003), but no difference among castes.

Nitrogen (Figure 2b)

- Both age (Anova, F=5.74, df=2/47, p=0.006) and caste (Anova, F=5.10, df=2/47, p=0.01) had significant effects on nitrogen. Adult drones had the highest percent nitrogen content.



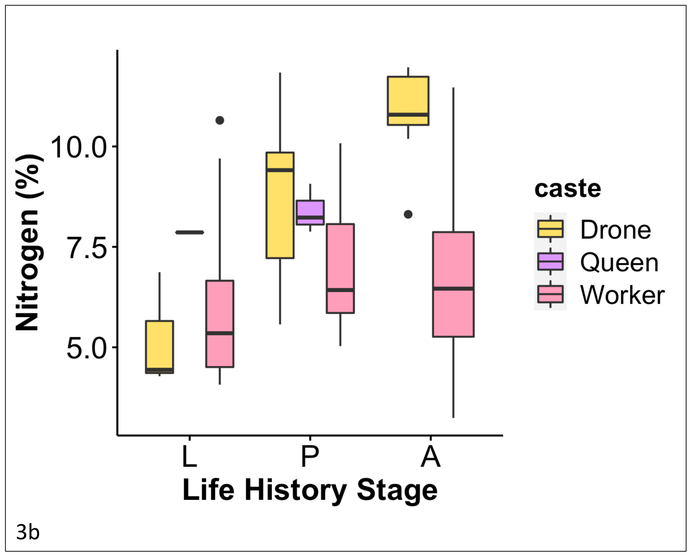


Figure 3: a) Boxplot of percent carbon content for each of the three life history stages. b) Boxplot of percent nitrogen content for each of the three life history stages.

Conclusion

I was most surprised to find the stark positive trend in nitrogen content of drones over their life history stages. Future research could examine the impact that the drone population has on the hive. This could include how using drone brood as management for *Varroa* mites leads to changes in overall nutrition of the hive, as well as the possibility that more pollen foraging is necessary to raise the extra drone brood, and the nutrient expense required.

References

Mattila HR and GW Otis. 2007. Dwindling pollen resources trigger the transition to broodless populations of long-lived Honeybees each autumn. Ecological Entomology. 32:496-505.

Acknowledgements

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