

Observations of Sugar Preferences Between *Solenopsis Invicta* Buren, 1972, *Camponotus consobrinus* (Erichson, 1842), and *Nylanderia fulva* Mayr 1862 (Hymenoptera: Formicidae)

Djeneba Diakite, Taylor Miller, Lincoln Jin, Hadley McKnight and Breanne Duprie

Texas A&M University

Editor: Maximillian Hart

Abstract: *Solenopsis invicta* Buren, 1972, *Camponotus consobrinus* (Erichson, 1842), and *Nylanderia fulva* Mayr, 1862 are three ant species under the family Formicidae in the order Hymenoptera. Ants are known for their strong evolutionary success, for which carbohydrates take a big role in. For this reason, ants can be a big household pest; claiming sources of food where they can find it. Specimens were collected around the Texas A&M campus, kept alive and housed in an ant farm and their preferences in different sugar types were recorded. Results showed that *Camponotus consobrinus* preferred cane sugar, *Nylanderia fulva* preferred all three sugars almost equally, and *Solenopsis invicta* preferred brown sugar. Ants' sugar preferences differed among different species; one of the species appeared to like all types of sugar presented to them. Our study provides further analysis of ants' attraction to divergent sugar varieties based on their species.

Keywords: Sugar preference, *Solenopsis invicta*, *Nylanderia fulva*, *Camponotus consobrinus*.

Ants are a part of the order Hymenoptera (family Formicidae) and are known to have very strong olfactory abilities that can be used for both communication and finding food (Steck, 2012). Ants are commonly omnivorous and will eat everything. In this study, we are focused on the ants' attraction to different types of sweeteners. A source of carbohydrates benefits a colony greatly, even boosting the immunity of the whole colony to certain diseases (Kay, 2014). The ants that we are focusing on in this study are *Solenopsis invicta* Buren, 1972, *Camponotus consobrinus* (Erichson, 1842), and *Nylanderia fulva* *Nylanderia fulva* Mayr

1862. The species *Solenopsis invicta* (*S. invicta*), also known as the red imported ant, were accidentally brought into the United States and ever since their introduction they caused many problems that go as far as the economic and environmental level (Ascunce, 2011). The species *Camponotus consobrinus* (*C. consobrinus*) is known as the banded sugar ant and is known to be a nuisance as they have a very strong liking for sweets and are capable of entering buildings, which could be particularly bad as they are possible vectors for certain stomach illnesses (Ogba, 2017). The species *Nylanderia fulva* (*N. fulva*), known as the crazy ant, was found

only in Southern America but has moved into the lower United States becoming a common pest to many homeowners (Wang, 2016). Our kitchens are where a lot of that sugary stuff is located that the ant is attracted to. This in return leads them to the insides of people's homes to find more food (Steck, 2012). Ants are drawn to places that can provide food sources for them and once they find it, they are either going to keep coming back or stay put there. The sweeteners that we will be looking into are cane sugar, Stevia, and brown sugar. Cane sugar (refined sucrose product), Brown Sugar (unrefined sucrose product, contains some molasses), Stevia (non-carbohydrate sweetener). This raises the question if ants have a preference towards certain foods and more specifically towards certain sugars in our homes. By researching this question, people can then take stronger preventative measures for those food or sugar preferences if they keep in their homes. From previous research it can be seen that certain species have a preference for the sugars within certain flowers and favoring them more, creating a mutual relationship between the ant and the flower by being food for the ant and protection for the plant (Kaspari, 2019). Therefore, the purpose of this experiment is to find out if different species have a sugar preference by using Cane Sugar, Brown Sugar, and Stevia.

Materials and Methods

This study was performed by collecting three species of ants *S. invicta*, *C. consobrinus*, and *N. fulva* from the Texas A&M campus. Once collected, the ants stayed in a container respective to their species. In order to test for the ants' preference, three types of sugars

were used. These were cane sugar, Stevia, and brown sugar. The observation was done by taking three plastic bottle caps and labeling them based on the sugar that will be placed in it. Each bottle cap was filled with 1 teaspoon of the sugar and placed them 3 cm apart within a secured container. Once situated correctly each species was given a turn and data was collected based on which sugar they went towards first. After all 20 ants were counted they were returned to their designated container, and the sugar was reset for the next species. Once all the data was gathered from each species, the numbers were moved to a Microsoft Excel sheet to analyze for any trends in preference of sugar between the species.

Results

From the data seen in **Table 1**, the species *S. invicta* had 5 visits to the Cane Sugar, 7 visited the Stevia, and 8 went to the brown sugar. The *C. consobrinus* had 10 visits to the cane sugar and 5 visited the Stevia and brown sugar. The species *N. fulva* had 7 visits to the cane sugar, 6 visited the Stevia, and 7 visited the brown sugar. Based on **Chart 1**, one can indicate that the *Solenopsis Invicta* was more prone to eat the brown sugar first rather than the other sugars. This is different than both *C. consobrinus* and *N. fulva* because *C. consobrinus* tended to go towards the cane sugar first tending to not choose the other two options and *N. fulva* did not have a preference towards any of the sugars with their first choices being recorded as even between the sugars.

	Cane Sugar	Stevia	Brown Sugar
<i>Solenopsis invicta</i>	5	7	8
<i>Camponotus consobrinus</i>	10	5	5
<i>Nylanderia fulva</i>	7	6	7

Table 1: The Number of Ants that Visited a Certain Sugar First

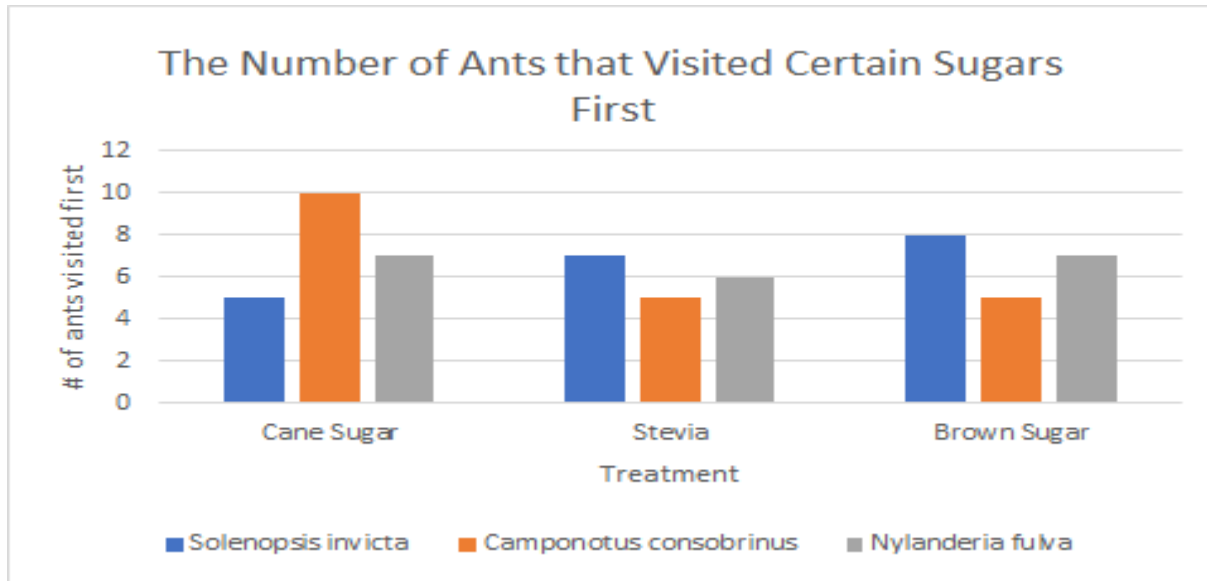


Chart 1: The Number of Ants that Visited a Certain Sugar First

Discussion

Overall, only two of the ant species, *C. consobrinus* and *S. invicta* seemed to have some sort of preference towards the sugars, but the species *N. fulva* showed no real favor towards any of the sugars being almost even in their option. For the first choice of sugars, *C. consobrinus* tended to choose the cane sugar first before the other two sugars and the *S. invicta* leaned more towards the brown sugar than the other two sugars. The tendency seen in *S. invicta* is not as obvious as the *C.*

consobrinus, but the favor towards brown sugar is greater than the other two options. As mentioned earlier, ants are already attracted to sugar and tend to go to places within the house that have food and sugar like the kitchen. A way that this experiment could be taken further is if a larger population of ants were tested for each sugar. Another interesting pathway for this would be to test more non-carbohydrate sweeteners in order to better understand the methods that ants use to search for food.

References Cited

- Ascunce, M. S., Yang, C.-C., Oakey, J., Calcaterra, L., Wu, W.-J., Shih, C.-J., ... Shoemaker, D. (2011).** Global Invasion History of the Fire Ant *Solenopsis invicta*. *Science*, *331*(6020), 1066–1068. doi: 10.1126/science.1198734
- Hooper, L. M., & Rust, M. K. (1997).** Food Preference and Patterns of Foraging Activity of the Southern Fire Ant (Hymenoptera: Formicidae). *Ann. Entomol. Soc. Am.*, *90*(2), 246–253. doi: 10.1093/aesa/90.2.24
- Kaspari, M., Welti, E. A. R., & Beurs, K. M. (2019).** The nutritional geography of ants: Gradients of sodium and sugar limitation across North American grasslands. *J. Anim. Ecol.* *89*(2), 276–284. doi: 10.1111/1365-2656.13120
- Kay, A. D., Bruning, A. J., Alst, A. van, Abrahamson, T. T., Hughes, W. O. H., & Kaspari, M. (2014).** A carbohydrate-rich diet increases social immunity in ants. *Proc. R. Soc. B.* *281*(1778). doi: <https://doi.org/10.1098/rspb.2013.2374>
- Ogba, O. M., Akpan, A. A., Olorode, O. A., & Bassey, I. B. O. (2017).** The Public Health Importance of the Association between *Comptonotus Consobrinus* and Potential Bacterial Pathogens in Human Dwellings. *J. microbiol. exp.*, *5*(7). doi: 10.15406/jmen.2017.05.00175
- Nyamukondiwa, C., & Addison, P. (2014).** Food preference and foraging activity of ants: recommendations for field applications of low-toxicity baits. *J. Insect Sci.*, *14*, 48. <https://doi.org/10.1093/jis/14.1.48>
- Steck, K. (2012).** Just follow your nose: homing by olfactory cues in ants. *Curr. Opin. Neurobiol.*, *22*(2), 231–235. doi: 10.1016/j.conb.2011.10.011
- Wang, Z., Moshman, L., Kraus, E., Wilson, B., Acharya, N., & Diaz, R. (2016).** A Review of the Tawny Crazy Ant, *Nylanderia fulva*, an Emergent Ant Invader in the Southern United States: Is Biological Control a Feasible Management Option? *Insects*, *7*(4), 77. doi:10.3390/insects7040077