

Diversity of Squash Plant Floral Volatiles Mediating Beetle Attraction

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Introduction

Why do beetles like some squash flowers more than others?

Flowers emit volatile organic compounds (VOCs) which are integral for defensive and communicative plant abilities. Certain floral volatiles of squash plants have been known to attract pests like cucumber beetles, while others appear more immune. This study expands on the observation that some squash plants are more infested with pests than others. It aims to decipher which specific floral volatiles are influential in this phenomenon and reveal which squash varieties of *Cucurbita maxima* have higher/lower levels of these important floral volatiles.

Method

- Collect male squash flowers from field before beetles make contact
- Add flowers to volatile collection chambers and attach vacuum and porapak column to collect the VOCs
- After 4 hours, elute the porapak columns with methylene chloride (adjusted to internal standard)
- Examine samples with gas chromatography mass spectrometer (GC-MS)
- Export data, adjust to internal standard, and identify which compounds are present

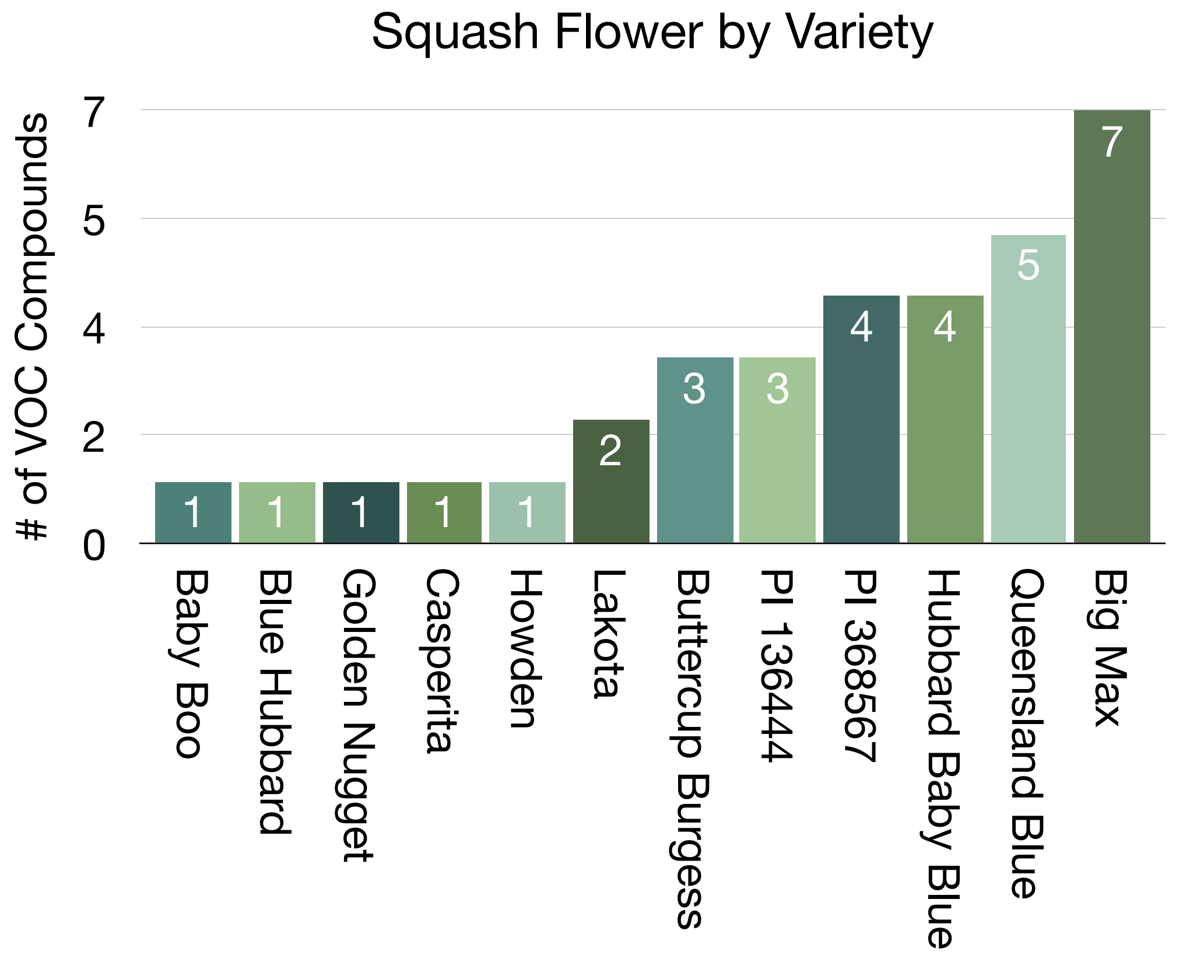
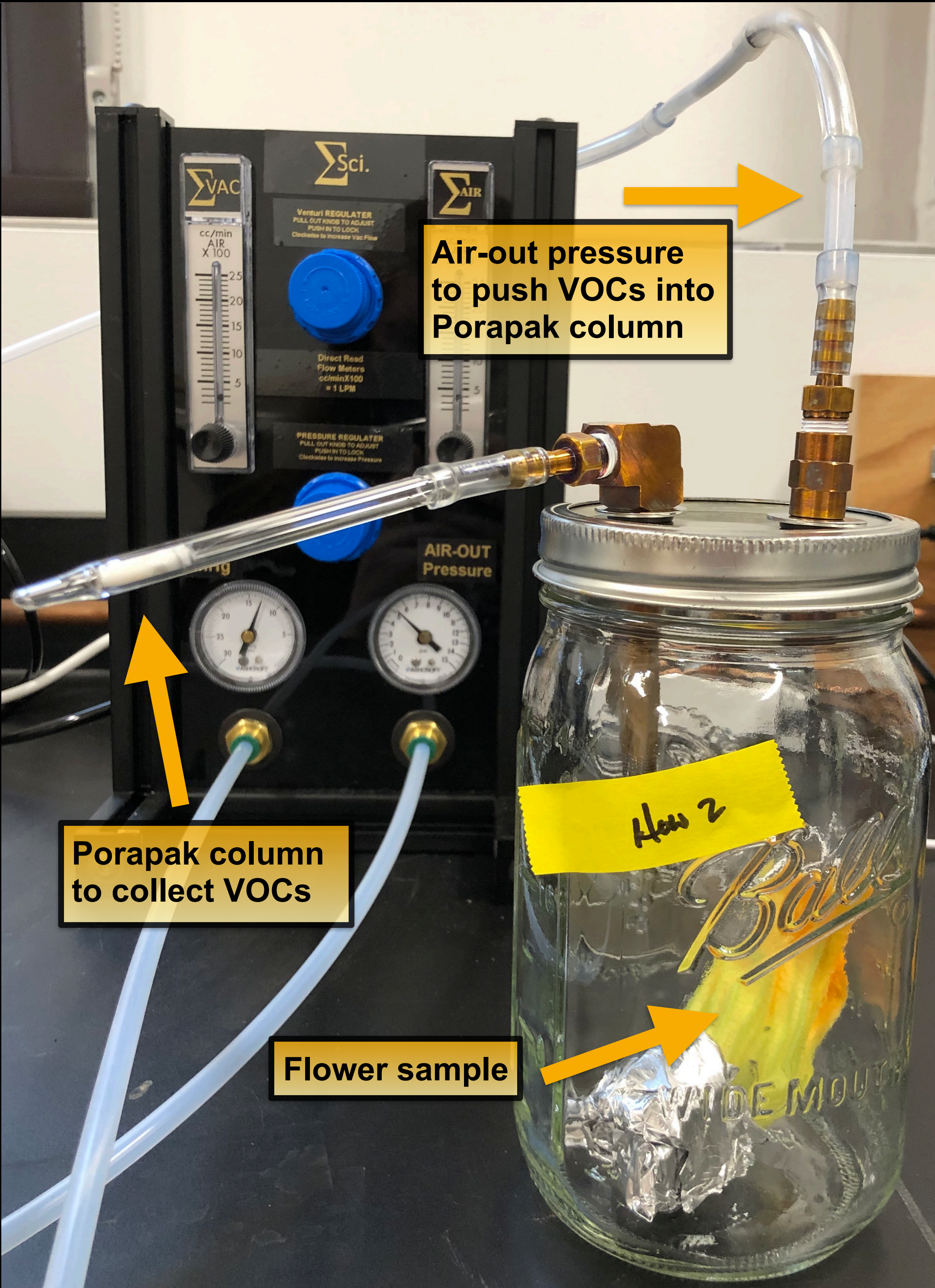


Figure 1. Big Max displayed the most unique VOC emissions of all varieties tested.

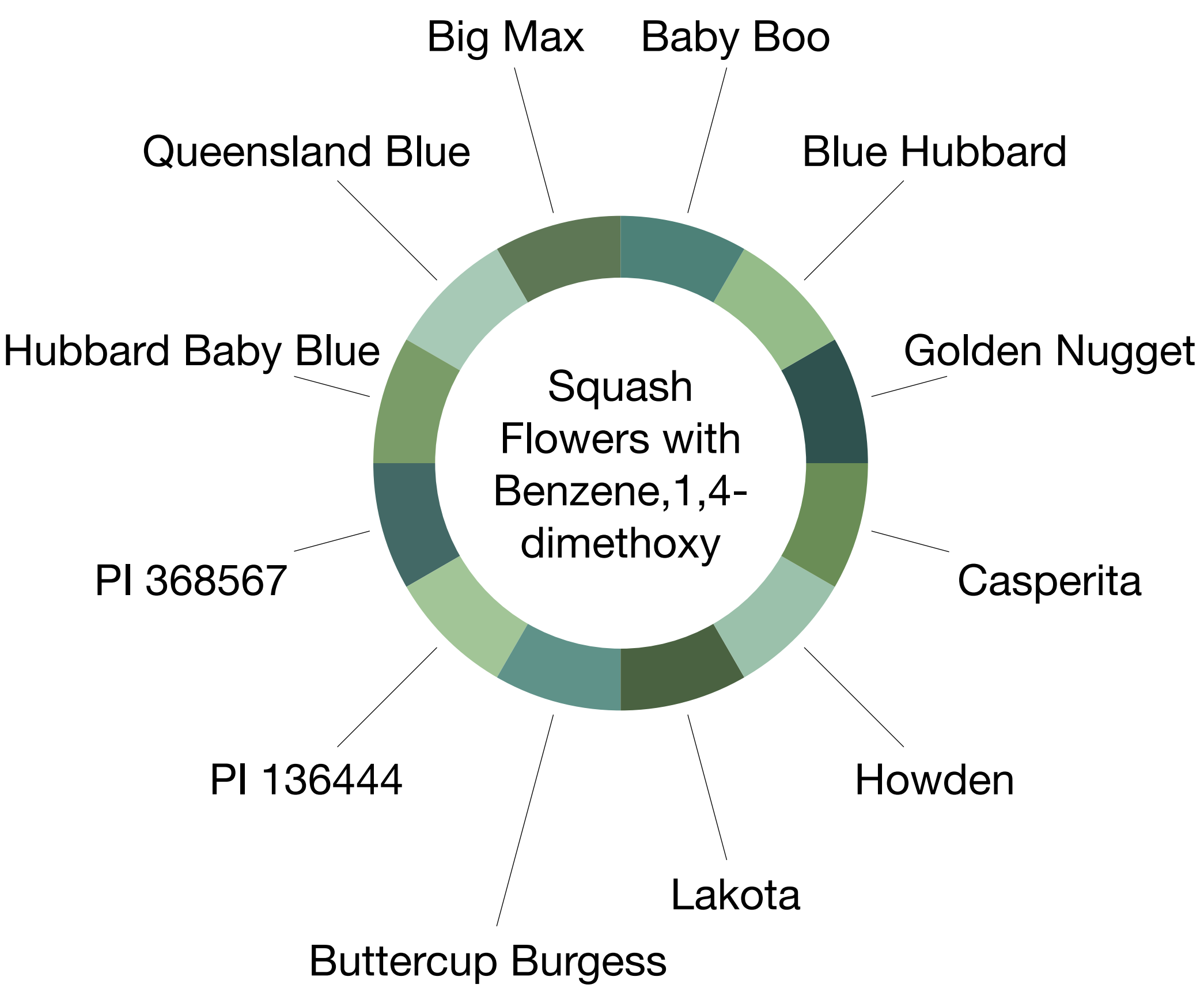


Figure 2. Every squash variety tested displayed the Benzene, 1,4-dimethoxy VOC compound.

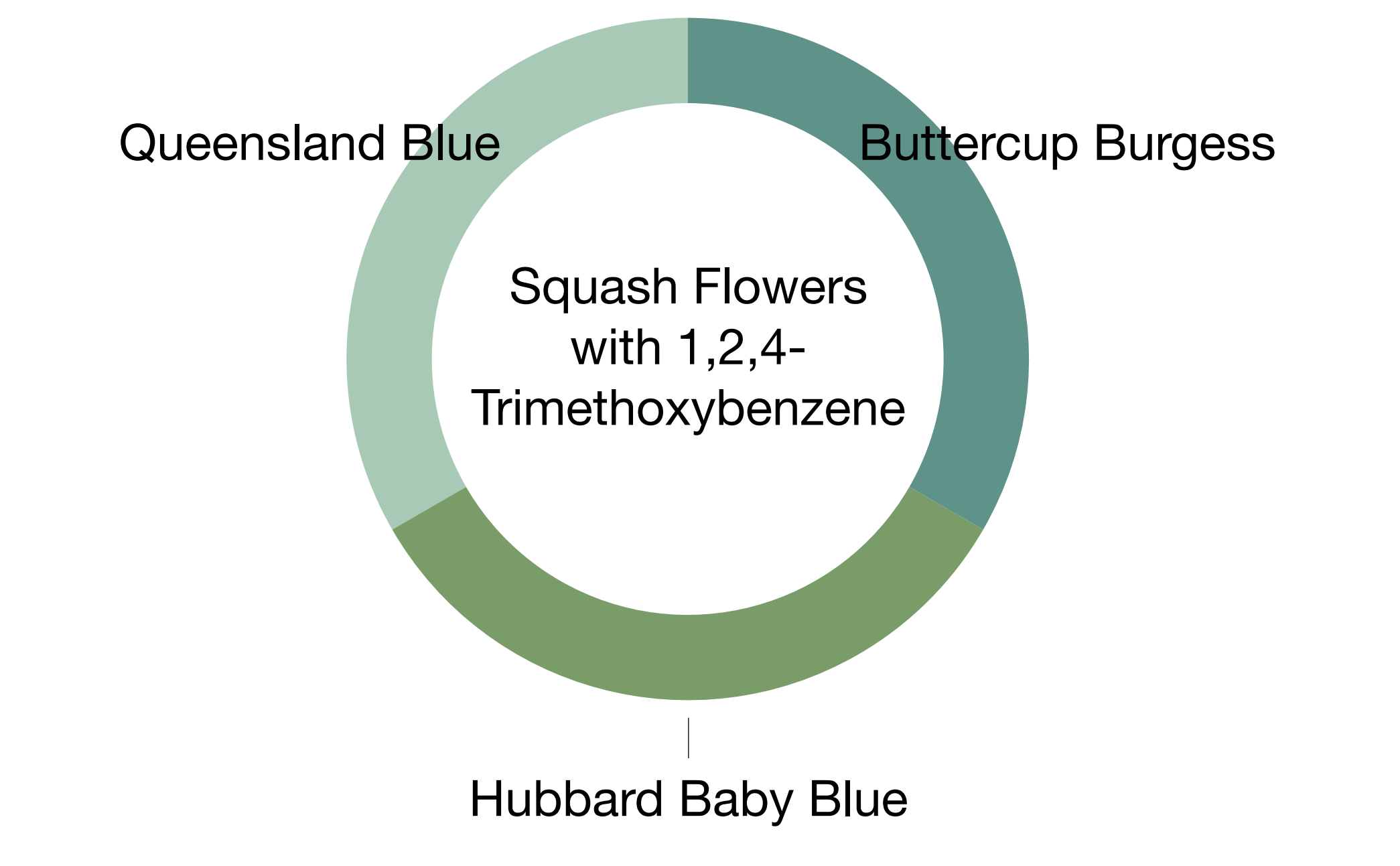


Figure 4. 1,2,4-Trimethoxybenzene appeared in three squash varieties.

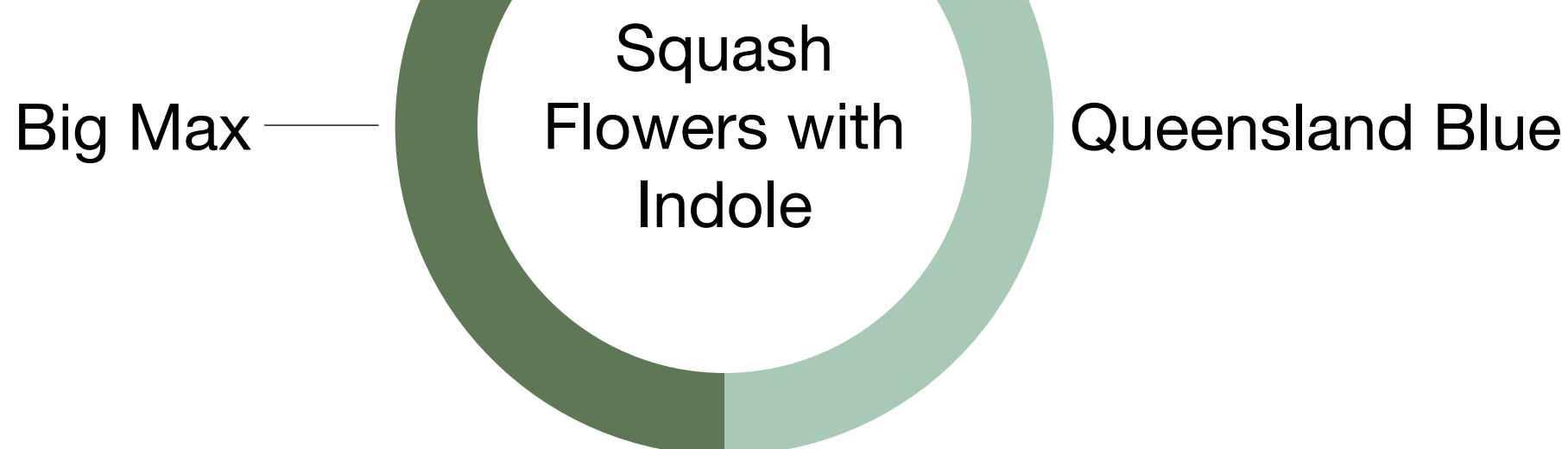


Figure 3. Indole only appeared in two of the twelve squash varieties tested.

Conclusions

Out of the twelve squash varieties tested, Big Max had the most unique VOC compounds. Baby Boo, Blue Hubbard, Golden Nugget, Casperita, and Howden all tied for last place.

Every single flower tested showed evidence of Benzene, 1,4-dimethoxy. On the other hand, VOC compounds like Indole and 1,2,4-Trimethoxybenzene were much more rare with only two and three squash varieties sharing them, respectively.

The VOC peaks, although evident, were lower overall than anticipated and may have been affected due to the time of flower picking (9am). The time between picking and VOC collection may have also played a factor.

Future Work

There are many areas to expand on this experiment. Broadening the project to both male and female flowers or expanding to even more squash plant varieties are both great next steps to build off of the current data. Another great angle would be to redo this experiment in increments of earlier timeframes (8am, 7am, 6am, etc) to gain insight into which VOC compounds may be released at different times and what time of day may have the most prominent VOC emissions.

Other possible factors of VOC levels and pest attraction to consider would be abiotic elements that may affect squash flowers like rain, temperature, and soil.

Acknowledgments

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Spotted cucumber beetle on Howden squash variety