Comparative Analysis of Rose Volatiles in Garden Variety Roses via GC-MS

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Abstract

Roses cultivated for commercial perfume production include only a few varieties bred for that purpose. However, many rose varieties are cultivated and sold for different purposes, including color, scent, cold hardiness, and disease resistance. Individuals interested in making rose-scented perfumes or other products at home are more likely to have access to and use rose varieties available locally, including floral shops and garden varieties. In this study, rose petals of different locally available varieties were analyzed for blossom volatiles using GC-MS with headspace sampling and liquid extraction. Volatile compounds were compared between sampling methods and against those present in commercial rose essential oil.

Introduction

Essential rose oil has become popular due to proposed mental and physical health benefits such as: anxiety, depression, headaches, memory, and more. Do it yourself (DIY) handcrafts have become popularized with the rise of Pinterest and internet blogging. These include things like making perfume and extracting oils which will control the added ingredients or chemical pesticides. Due to the many varieties of roses, the homemade extraction may not be the same as commercial product. In this project, we analyze the scent compositions of different rose varieties available in-home garden and compare them to commercially available rose oil in order to identify and compare the different scent compounds with headspace sampling and liquid extraction.

Experimental

Three varieties of rose blossoms were harvested locally in early October. All of these were highly scented garden varieties: Peace, David Austin, and Fragrant Cloud. In addition, two varieties of rose teas was bought from a local Chinatown Supermarket at the same time. Each of these were stored in a Zip-Lock freezer bag at –30 ◦C until processed. Rose essential oil was purchased from Amazon.

In the liquid extraction process, petals from each variety of roses were processed and analyzed using a method adapted from Krasimir, *et. al.*[1]. Petals were chopped finely and suspended in hexane. The slurries were stirred magnetically for 2 hours and the solutions were then centrifuged. The supernatants were then analyzed by an Agilent 6850 GC attached to an Agilent 5975C MSD with a program running from 40 °C to 270 °C at a rate of 10 C /minute and then held at 270 °C for 20 minutes. The resulting spectra were compared to NIST library. One drop of the rose essential oil was diluted in hexane and analyzed using the same method.

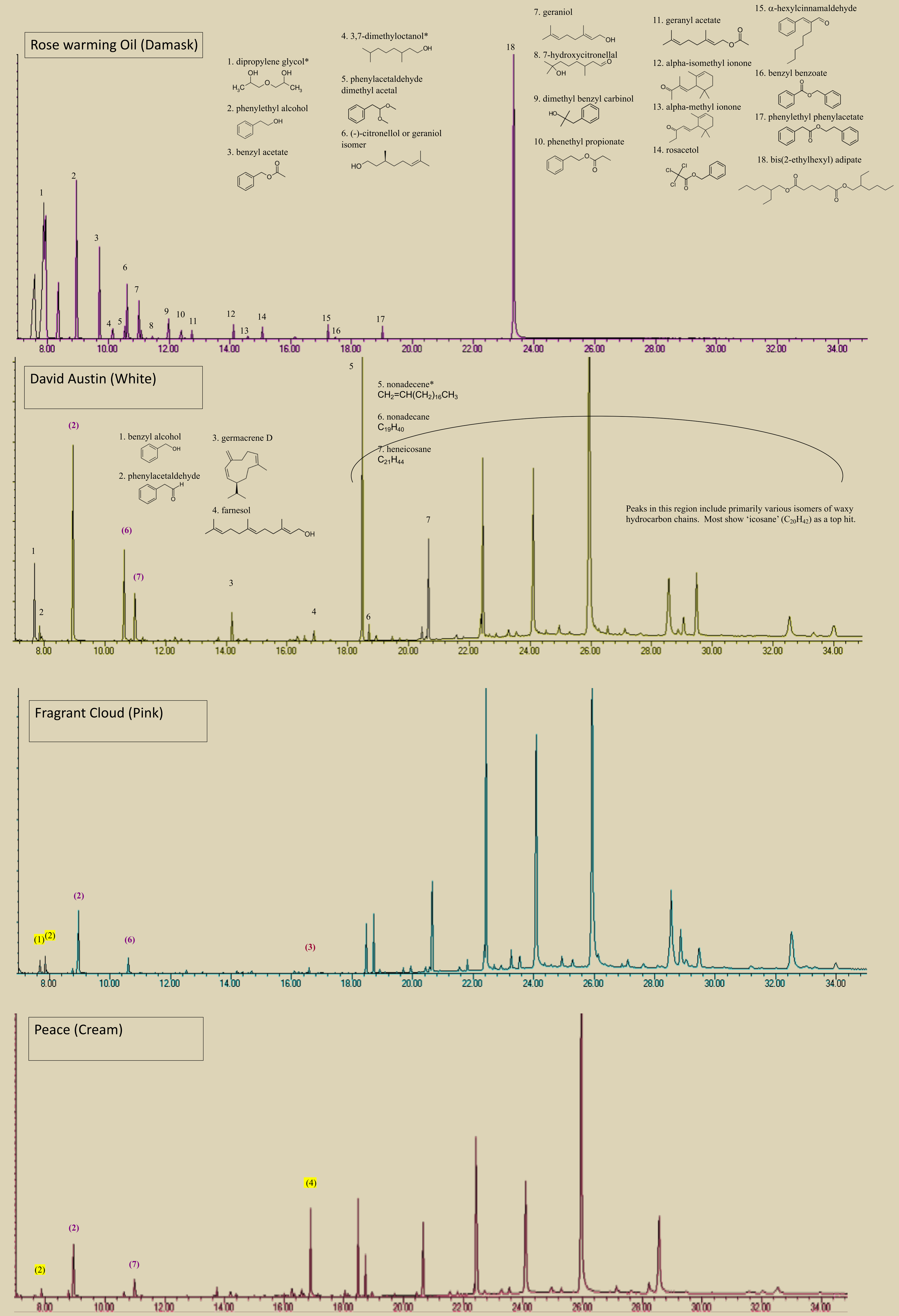
In the headspace process, petals from each variety of roses were placed in headspace vial and tightly sealed. The vial was equilibrated for 7 minutes at 45 °C before injection of the headspace. The GC oven was set at 80 °C for 10 minutes then increased by 2 °C/ minute and then held at 100 °C for 5 minutes. It is then increased by 20 °C/ minute and then held at 200 °C. This method is still in development.

Results

The results reported here are from work performed last year. When we finish headspace method development, we would like to repeat these extraction for the purpose of comparison.

The rose essential oil contained more than a dozen volatiles which were identified as components typical of the damask rose (the cultivar used for commercial rose essential oil production), with two significant exceptions. First, the cluster of peaks from 7.4-8.4 minutes was identified as dipropylene glycol isomers. These were likely intentionally added to the warming oil as a solvent.

Comparison of peaks in each GC-MS graph



Results, continued

Second, the peak at 23.3 minutes was identified as bis(2-ethylhexyl) adipate, a common plasticizer. DIY extraction would likely not include these molecules.

The liquid extraction spectra of the other rose extracts all differed significantly from the spectra of the rose warming oil, but they had many commonalities with each other. Part of these differences can be understood to be arising from the method of isolation, as the rose warming oil is formulated to mimic the hydrodistillate and our results were obtained by solvent extraction. Many of the higher molecular weight molecules showing past the 18-minute mark would be present in much lower concentrations in a hydrodistillate. In this 18-35-minute time frame, all the extracts showed nearly identical qualitative results.

Results from the volatile region showed the David Austin rose was the most similar to the oil. This was expected as the *Rosa Damascena* is a European cultivar, and the Austin roses have a higher percentage of European parentage than the Peace, and Fragrant Cloud roses. These latter are all 'Hybrid Tea' cultivars: crosses of hybrid perpetual European roses and Chinese tea-scented roses. However, they all appear to have maintained a primarily European scent profile which includes 2-phenylethanol and terpene alcohols.

Some compounds of note which were seen in the rose extracts but not the oil include benzyl alcohol and phenylacetaldehyde, which may have been present but masked by the dipropylene glycol in the oil. In addition, farnesol, germacrene D, geranial, and ocimene are all naturally occurring fragrance compounds which were present in some of the locally grown hybrid roses but were not observed in the commercial product.

Results of the headspace are still in progress. We expect to see different results between the commercial oil and the garden variety roses. We hope to see additional fragrance compounds in the headspace method that may have been masked by the solvent in the liquid extraction.

Conclusions

We will extract and analyze the volatile organic compounds present in 3 different locally sourced rose varietals and compared them to a commercially available rose warming oil. We expect the chemical profiles of the roses will be significantly different from the profile of the commercial oil, as they are different varieties. We will additionally perform headspace analysis on the same samples and compare the results with the liquid extraction.

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