

Emissions of carbonyls in dry herb vaping aerosols

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ABSTRACT

This study investigates aldehyde emissions from dry herb vaporizers, focusing on the potential health risks associated with various herbs.

Carbonyl compounds were measured in aerosol emissions from vaporizers filled with herbs like cannabis, chamomile, thyme, and others, using a peristaltic pump and DNPH/HPLC method. The device operated at 215°C and 225°C, with two puffing regimes (ISO-like and CAN-like).

Results showed that higher temperatures and different vaping methods significantly influenced aldehyde levels, with cannabis emitting the highest.

These findings suggest that vaporization, especially at higher temperatures, may lead to harmful aldehyde emissions, warranting further research into its safety.

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INTRODUCTION

Various manufactures do promote herb vaping. They often market these devices as a safer alternative to traditional smoking, emphasizing benefits like reduced exposure to harmful chemicals and a more controlled consumption experience, but concerns about its safety persist. It's important to critically evaluate these claims and consider scientific research, such as studies on carbonyls emissions, to fully understand the potential health impacts. Carbonyls are compounds emitted from combustion systems (1,2). Tobacco products emits several compounds (3,7)

AIM

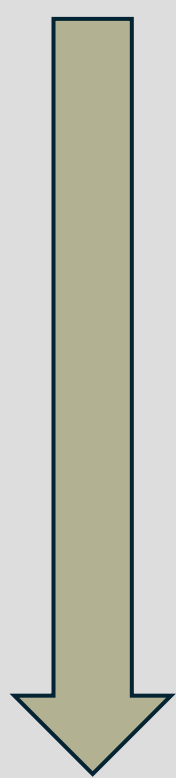
This study aims to measure carbonyls emissions from dry herb vaporizers, focusing on potential health risks.

METHODS AND MATERIALS

Carbonyls were measured in the aerosol emitted from a vaping device filled with dry cannabis, chamomile, thyme, lavender, passiflora, eucalyptus, green tea. The emissions were generated using a peristaltic pump and measured by DNPH/HPLC method. The device was set at 215oC and 225oC and two regimes were applied at each temperature: 35ml per 60s (International Standard Organization, ISO-like) and 55ml per 30s (Health Canada Intense, CAN-like) with a puff duration of 2s.

RESULTS

Herb comparison (in descending order of average carbonyl levels):



- Cannabis: Highest levels in both methods
- Chamomile: Second highest, with an increase at higher temperatures
- Thyme: Third highest, with CAN method showing higher levels
- Lavender: Moderate levels, with ISO method showing slightly higher results
- Passiflora: Shows a difference between ISO and CAN methods, especially at 215°C
- Eucalyptus: Lower levels, with CAN method showing higher results at 225°C
- Green Tea: Lowest levels among all herbs, with no detection (ND) at 215°C in both methods

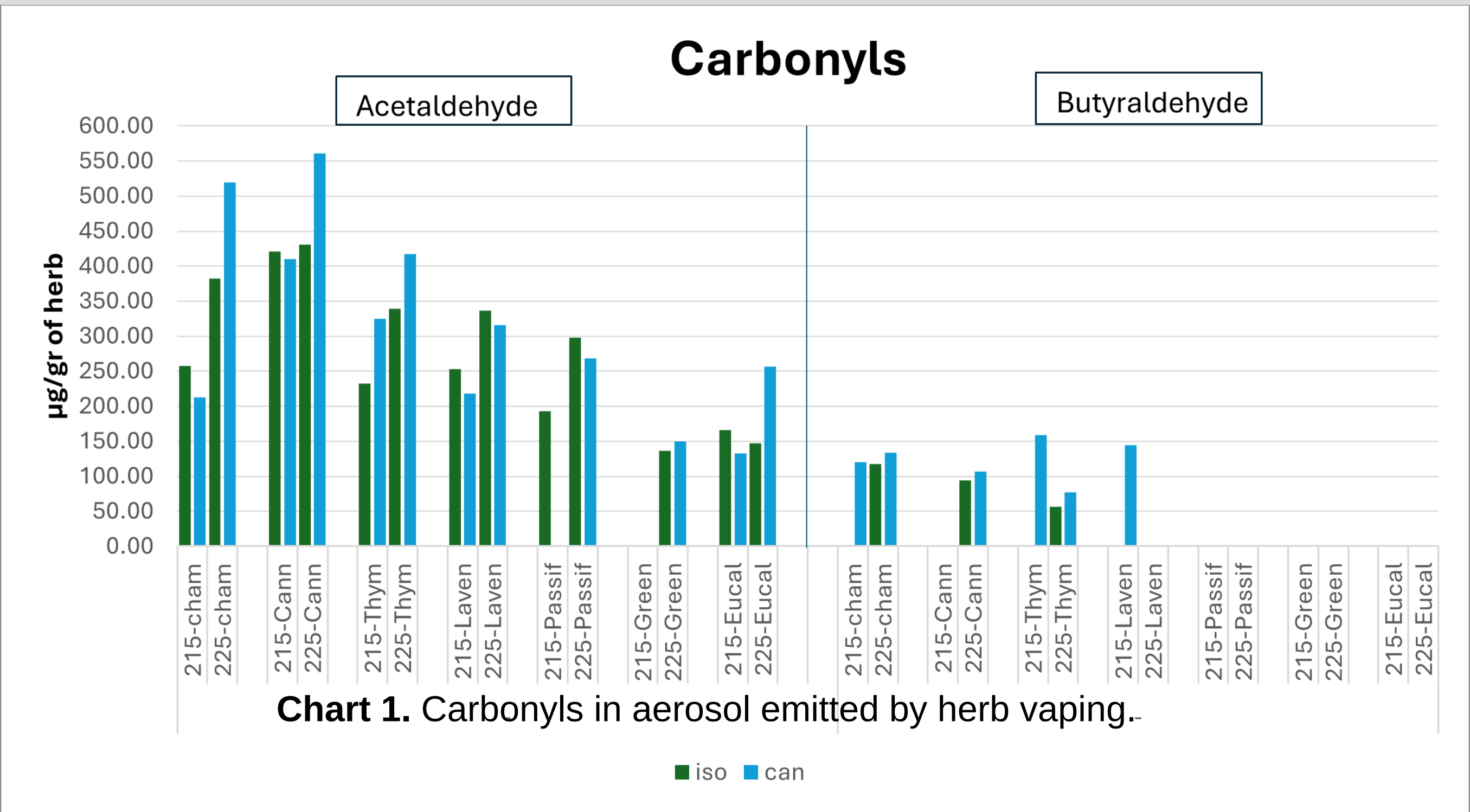


Chart 1. Carbonyls in aerosol emitted by herb vaping.

REFERENCES

1. E Zervas, X Montagne, J Lahaye (2002), Emission of alcohols and carbonyl compounds from a spark ignition engine. Influence of fuel and air/fuel equivalence ratio, Environmental science & technology 36 (11), 2414-2421
2. E Zervas 92005), Formation of oxygenated compounds (aldehydes, alcohols, organic acids) from propane flames, Environmental Engineering Science 22 (5), 651-659
3. Efthimios Zervas, Charikleia Tsipa, Niki Matsouki, Emmanuel Konstantinidis, Zoe Gareiou(2023), Are herb vaporizers a low-risk alternative to tobacco products? Emission of particles from dry chamomile in an herb vaporizer, , Tob. Prev. Cessation, 9(Supplement):A43, DOI: <https://doi.org/10.18332/tpc/162524>
4. N Matsouki, E Konstantinidis, C Tsipa, E Zervas (2021, [Comparison of carbonyls emitted from conventional cigarettes, electronic cigarettes and heated tobacco products](#), IOP Conference Series: Earth and Environmental Science, 899 (1), 012007
5. EN Zervas, NE Matsouki, CF Tsipa, PA Katsaounou (2023), [Particle emissions from heated tobacco products](#), Tob Prev Cessat, 2;10:10.18332/tpc/185870. doi: [10.18332/tpc/185870](https://doi.org/10.18332/tpc/185870)
6. E Zervas, E Litsiou, K Konstantopoulos, S Pouloupoulos, P Katsaounou (2018), [Physical characterization of the aerosol of an electronic cigarette: impact of refill liquids](#), Inhalation Toxicology, 30 (6), 218-223
7. E Zervas, N Matsouki, G Kyriakopoulos, S Pouloupoulos, T Ioannides (2020), [Transfer of metals in the liquids of electronic cigarettes](#), Inhalation Toxicology, 32 (6), 240-248

DISCUSSION

The vaping method (ISO vs CAN) and temperature significantly affect the carbonyl levels, with higher temperatures generally resulting in higher levels. The choice of vaping method seems to impact certain herbs more than others, suggesting that the interaction between the herb, temperature, and vaping method is complex and varies

CONCLUSIONS

The findings underscore the critical role of temperature control and the choice of method in the vaporization of aldehydes. Contrary to popular belief, vaping aldehyde-containing compounds poses significant risks. The detection of harmful aldehydes in aerosol form indicates that combustion processes may occur under certain conditions. These results highlight the need for further research on aldehyde emissions in vaporization products to better understand their potential health implications.