

## Abstract

Air pollution from volatile organic compounds (VOCs) affects health and the environment, with plant-emitted VOCs acting as precursors to secondary aerosols and ozone. This study examines their role by analyzing air samples from rice fields in Khon Kaen (2023) using TDU-GC-MS across summer, rainy, and winter seasons. Results showed OVOCs were most abundant (39%), followed by alkanes (37%), aromatics (18%), alkenes (5%), and haloalkanes (1%). Phenol had the highest Ozone Formation Potential (OFP) in summer, while isoprene dominated in the rainy and winter seasons. Phenol also exhibited the highest Secondary Organic Aerosol Potential (SOAP) across all seasons, followed by benzene, isoprene, and toluene. Seasonal variations in VOC emissions are closely linked to environmental factors like temperature, humidity, and sunlight.

## Calculation

### Ozone Formation Potential (OFP)

The VOC concentration is calculated and used to assess its ozone formation potential through photochemical reactions under optimal conditions.

$$OFP_{i,j} = E_{i,j} \times MIR_{i,j}$$

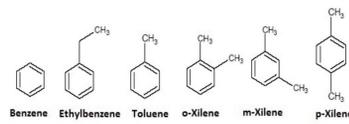
### Secondary Organic Aerosol Potential (SOAP)

The VOC concentration is calculated to assess its secondary aerosol formation potential, helping estimate secondary particle levels that contribute to SOA.

$$SOAP_{i,j} = E_{i,j} \times Y_{SOA,j}$$

### Calculation and analysis of the BTEX Index

The measurement and assessment of total volatile organic compounds (VOCs), including benzene, toluene, ethylbenzene, and xylene (BTEX), which are aromatic hydrocarbons primarily emitted from human activities and industrial processes.



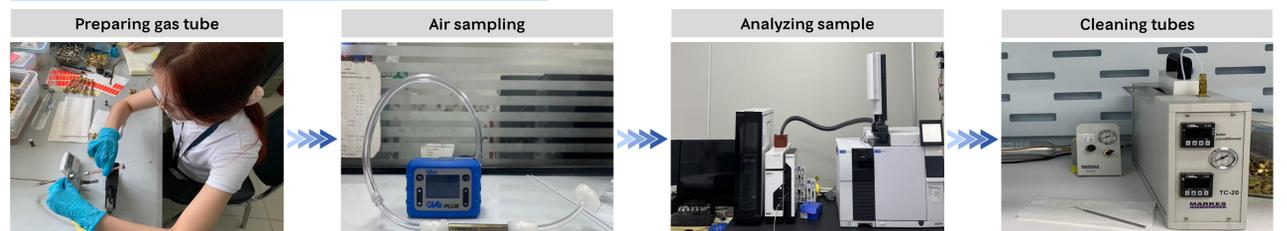
## Introduction

PM 2.5 and VOCs pose significant health risks due to their ability to penetrate the respiratory system and affect other bodily functions. Their microscopic size allows them to disperse easily in the atmosphere. These pollutants originate from various sources, including fossil fuel combustion, waste burning, agricultural fires, vehicle emissions, and even plant emissions.



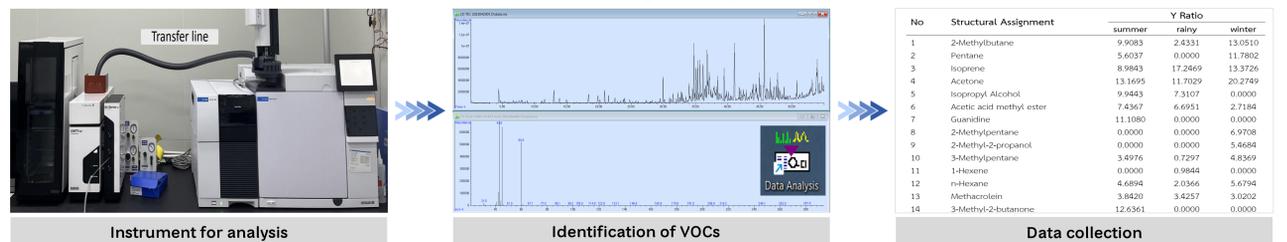
## Methodology

### Gas Collection



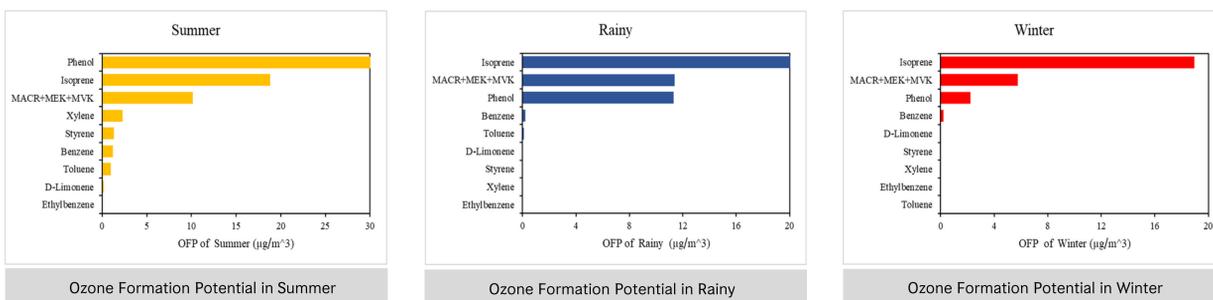
### Instrument for analyzing

#### Thermal Desorption Unit Gas Chromatography Mass Spectrometry

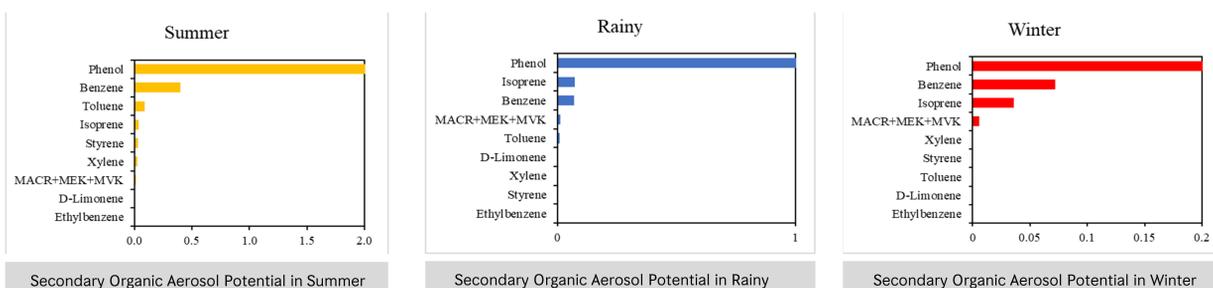


## Result

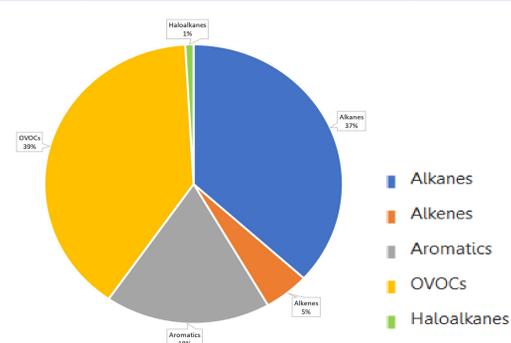
### Results of Ozone Formation Potential (OFP)



### Results of Secondary Organic Aerosol Potential (SOAP)



### Analysis results of VOCs profiles



### BTEX Index

Ratio	Rice fields		
	Summer	Rainy	Winter
T/B	0.147656	0.090533	0
E/B	0.01258	0	0
X/B	0.173004	0	0

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## Discussion and Conclusion

In the summer, Phenol has the highest OFP value, leading to elevated ozone formation. During the rainy and winter seasons, OFP is primarily driven by Isoprene, which originates from vegetation. SOAP remains highest for Phenol across all seasons, indicating its continuous potential to generate PM2.5. As for the BTEX Index, it reaches its peak in summer due to emissions from vehicles and industries, whereas in the rainy and winter seasons, the values decrease due to rainfall scavenging and atmospheric changes. Overall, summer poses the highest risk for both ozone and PM2.5 formation, as it provides the optimal precursors and conditions for air pollution.

## References

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