



Introduction

- Mustard is a valuable oilseed crop in the food, health, oil and gas industry
- Mustard seed is rich in antioxidants, minerals and vitamins
- Antioxidants protect mustard oil from going rancid and increase the product's shelf life
 - Ex: Sinapine, Sinapic acid, Canolol, Coumaric acid, Syringic acid, etc.,
 - Also known as "polyphenols" or "phenolic compounds" due to their chemical structure
- This study investigated how cooking temperature, time, pressure, acidity and particle size can affect polyphenols in mustard seed
 - Novel aspect: cooking mustard seed in vinegar (high acidity)

Objectives

- To evaluate the concentration of Sinapic acid, Sinapine, Canolol, Coumaric and Syringic acid in Yellow and Black mustard seed response to:
 - Cooking temperature, pressure and time
 - Acidic environment
 - Particle size – whole seed versus crushed seed

Material and methods

- Ingredients: Yellow and Black mustard seeds, Heinz white vinegar
- Cooking and analysing equipment: Instant Pot Lux and High Performance Liquid Chromatography machine (Ultimate 3000)
- Methodology
 - 10.0g of Yellow and Black mustard were prepared in duplicates; one sample in each variety were slightly crushed
 - Samples were dry heated for 0, 2, 4 and 8 minutes at 76°C in Instant Pot
 - Continue to cook in 50 ml vinegar/water (6:4, v/v) for 3 minutes at 115°C at 10.2 PSI
 - Extracts were purified, filtered and analyzed



Yellow mustard



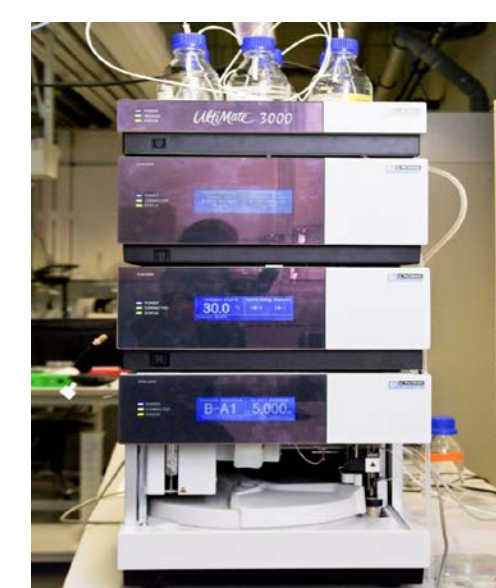
Black mustard



White vinegar



Instant Pot



Ultimate 3000

Results

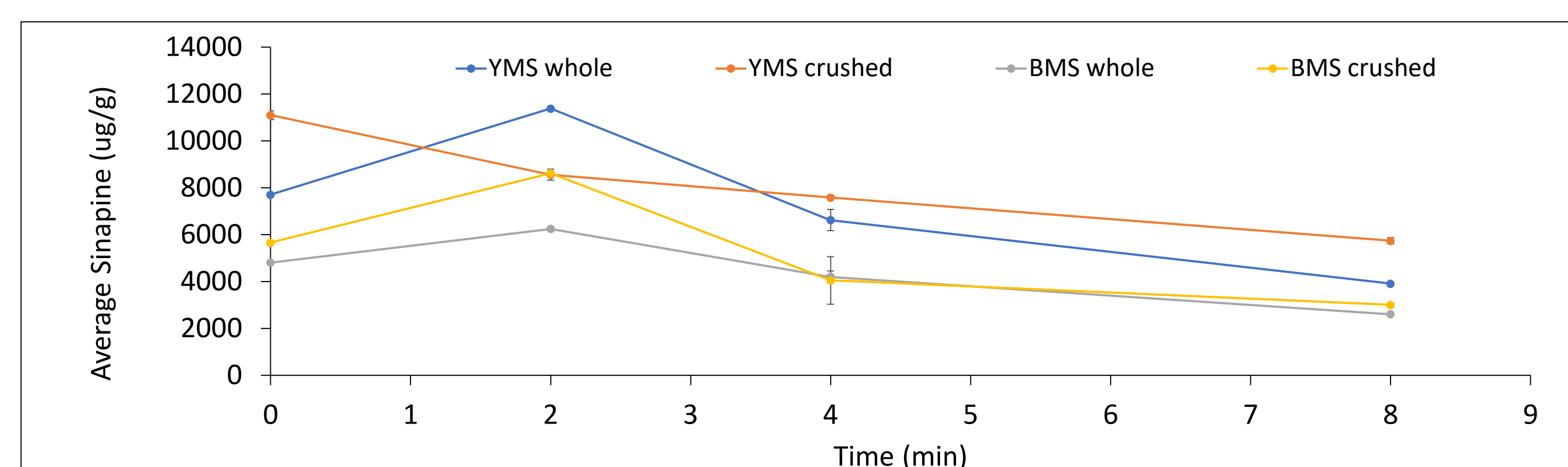


Figure 1: Changes in Sinapine concentration (µg/g) of Yellow and Black mustard seeds extracts

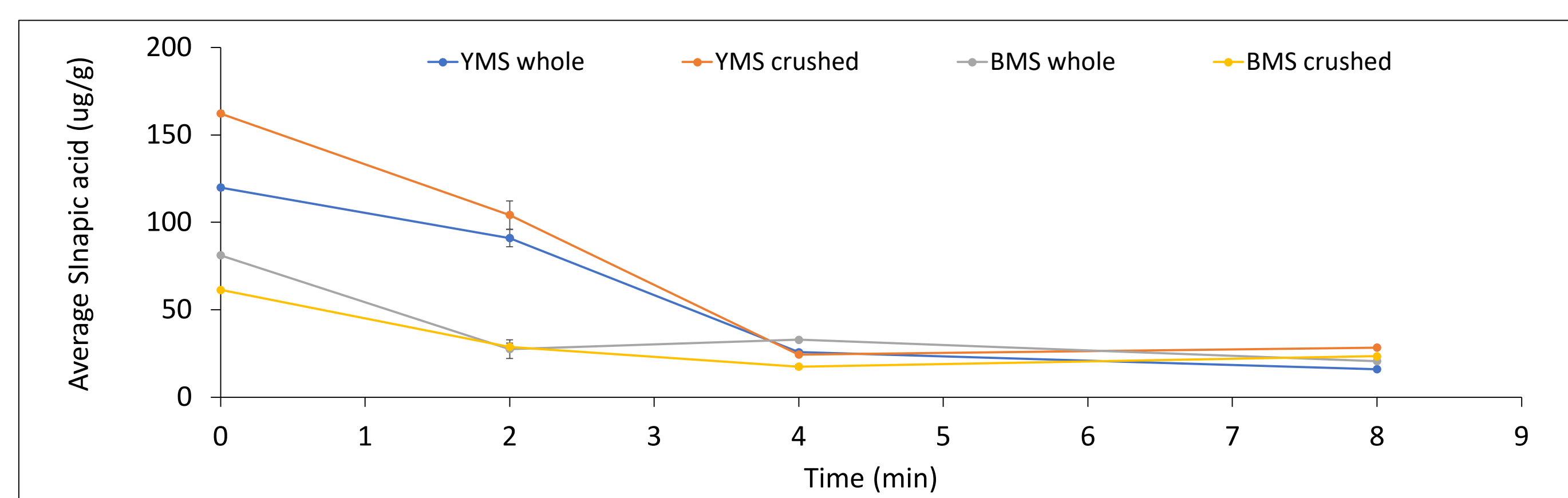


Figure 2: Changes in Sinapic acid concentration (µg/g) of Yellow and Black mustard seeds extracts

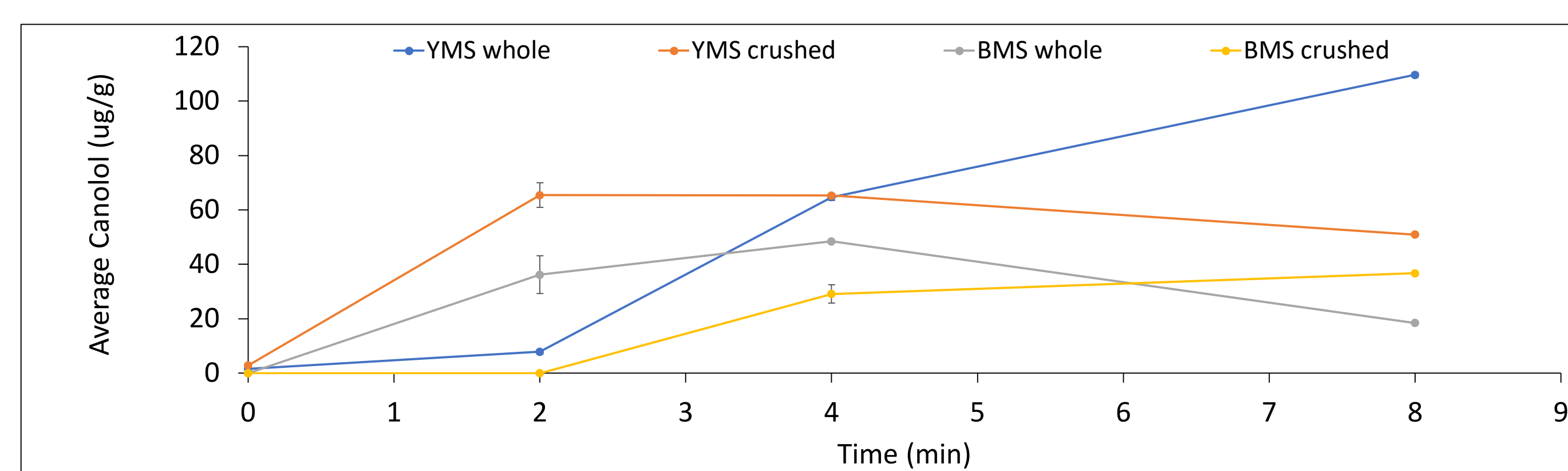


Figure 3: Changes in Canolol concentration (µg/g) of Yellow and Black mustard seeds extracts

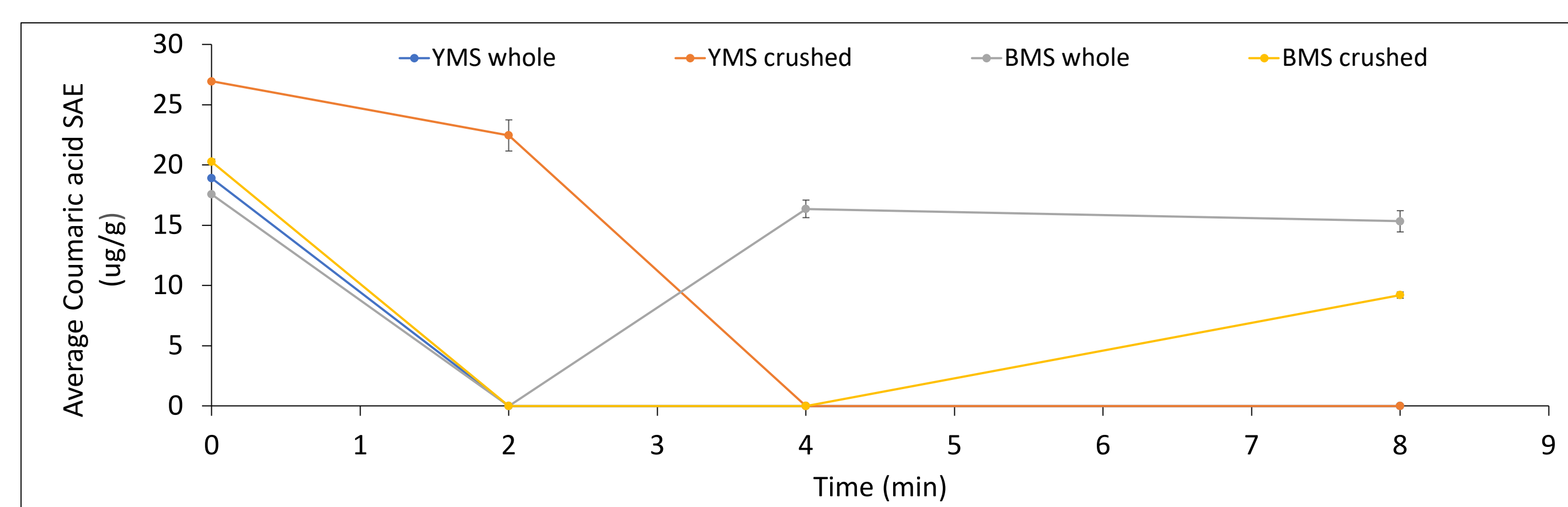


Figure 4: Changes in Coumaric acid concentration (µg/g) of Yellow and Black mustard seeds extracts

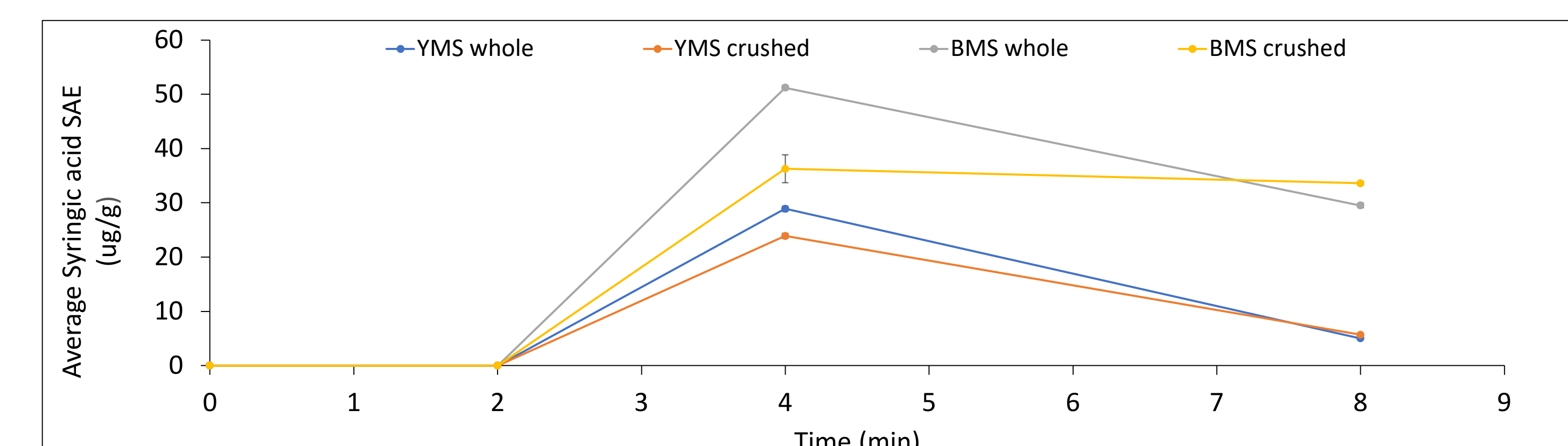


Figure 5: Changes in Syringic acid concentration (µg/g) of Yellow and Black mustard seeds extracts

Findings

- Sinapine
 - Optimal concentration at 2 minutes of dry heating and decreased subsequently
 - The reduction in Sinapine was due to thermal degradation and conversion into Sinapic acid
- Sinapic acid
 - Optimal concentration with no dry heating
 - Thermal degradation of Sinapic acid can result in formation of Canolol
- Canolol
 - No Canolol detected at the beginning, of dry heating and increased overtime
 - Implications for
 - Decarboxylation of sinapic acid lead to the formation of canolol
- High temperature, pressure, time and acidity can increase yield and change the compositions of antioxidants
 - Disruption of seed's matrix and cleavage chemical bonds
 - Sinapine converted into Sinapic acid; Sinapic acid decarboxylated into Canolol
- Extreme temperature and prolonged cooking time can degrade heat sensitive antioxidants
- Particle size in this study does not have a significant effect on antioxidants level

Conclusion

- Temperature, pressure, time and acidity have both positive and negative effects
- No overall trend was observed, individual polyphenol behaved differently

References

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