A Sticky Situation: Low Diastase Activity in Mānuka Honey

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Background

- Diastase activity is used as a honey export quality control parameter
- Low levels of diastase activity are used to indicate high temperature heating or poor storage conditions
- Diastase activity in honey must be diastase number (DN) ≥8 for export
- Mānuka honey containing high methylglyoxal (MGO) often falls under DN8 and cannot be exported
- Unique or prevalent compounds (e.g. polyphenolic compounds, MGO) in mānuka honey may be inhibiting diastase activity

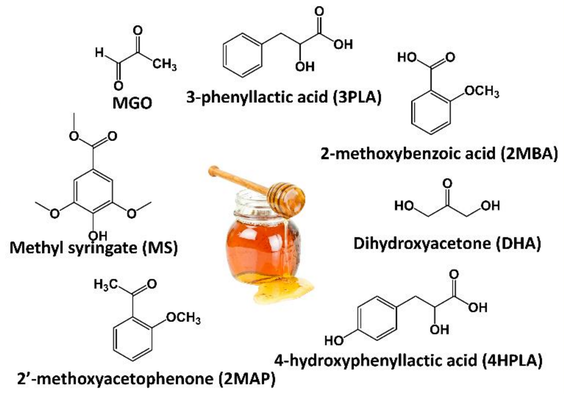
Aim

To investigate if intrinsic honey compounds have an effect on diastase activity in mānuka honey.

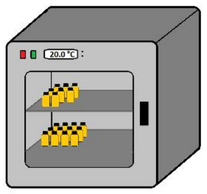
Methods

1. Test fresh honeys of different floral origins for phenolic compounds, diastase activity and moisture. Store a sub-set of these honeys at 20°C for 161 days to track parameter changes over time.
2. Carry out spiked honey matrix trials (below)

1 Add individual compounds to honey matrix



2 Incubate at different temperatures



- 20 °C
- 27 °C
- 34 °C

3 Analyse monthly

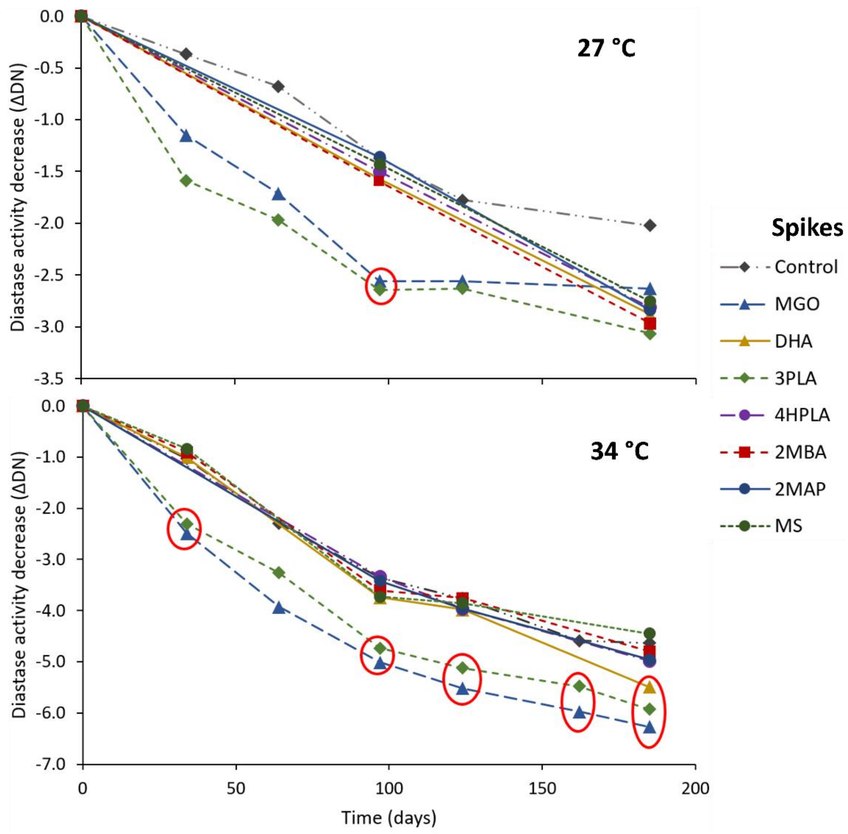
- Diastase activity
- Polyphenolic compounds (3PLA, 2MBA, 4HPLA, MSY)
- 3in1 (DHA, MGO, HMF)

Results

Table 1. Diastase activity, DHA, MGO, 5-hydroxymethylfurfural (HMF) and 3-PLA concentrations for a range of fresh honeys, ordered by MGO concentration.

Floral Type	Diastase activity (DN)	DHA (mg/kg)	MGO (mg/kg)	HMF (mg/kg)	3-PLA (mg/kg)
Mānuka	1.1	3960	995	5.4	1760
Mānuka	26.8	3850	625	1.8	1750
Mānuka	8.6	899	297	2.3	780
Mānuka	28.9	1750	185	1.4	590
Mānuka	6.1	446	153	6.4	830
Mānuka	14.7	192	69.6	12.2	320
Tawari	6.0	80.9	11.0	0	0
Southern Rata	8.4	57.5	4.4	0	7.4
Rewarewa	5.6	23.0	1.5	0.5	0

Figure 1. The decrease of diastase activity over time in the spiked honey samples stored at 27°C and 34°C. Points circled in red show a statistically significant difference from the control.



Results cont.

In fresh honey:

- **Table 1** shows variation in results, with no clear correlation between diastase activity and other measured parameters
- Some fresh non-mānuka honeys have diastase activity below DN 8
- When fresh honey was stored (20°C, 161 days), diastase activity loss was significantly greater in mānuka than non-mānuka honey samples

In spiked honey:

- Compared to the control, MGO and 3-PLA spiked honey samples had significantly lower diastase activity over time at higher temperatures (**Figure 1**)
- Diastase half life was shorter in the MGO and 3-PLA samples compared to the control (**Table 2**)

Table 2. Calculated half life of diastase (time taken for diastase activity to drop by half) for the control, MGO and 3-PLA spiked samples

	Diastase Half Life (Days)		
Spike	20°C	27°C	34°C
Control	1340	590	160
MGO	820	440	80
3-PLA	340	380	97

Conclusions

- Temperature and time are the significant drivers of diastase activity loss, however, they are not the only factors
- MGO and 3-PLA accelerate diastase activity loss in honey
- Diastase activity may be an unreliable test for mānuka honey quality, and potentially other native honeys

Future Work

- Investigate the mechanism of diastase activity loss by 3-PLA and MGO
- Investigate the effects of other chemical and physico-chemical parameters on diastase activity in honey
- Carry out a more comprehensive survey on New Zealand floral honeys

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Full thesis

Publication

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