Antibacterial properties of honey-like fraction from *Averroha carambola* fruits

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INTRODUCTION

Antimicrobial resistance (AMR) has been identified one of the world's most pressing public health problems after the COVID-19 pandemic. If left unchallenged, mortality due to AMR could reach up to 10 million deaths/year by 2050, surpassing deaths from cancer at 8.2 million death/year. Honey has been used to treat infections since ancient time due to its antimicrobial properties and thus far, no microbial resistance against honey has been reported. Manuka honey (MH) has been used as the main active ingredient in many topical antibacterial products such as cream, gels and wound dressings due to its excellent antimicrobial activity. However, these products depend heavily on the availability of MH that are unique to certain geographical region. Recognizing a potential alternative source of natural honey, a honey-like fraction from the fruits of *Averroha carambola* (HLFAC) or commonly known as starfruit was discovered.

OBJECTIVES

- To determine the physiochemical properties of HLFAC as compared to the recommended parameter of common honey
- To determine and compare the antibacterial properties of HLFAC against a commercially-available MH with MGO 250+

MATERIALS & METHODS

RESULTS

Table 1 Physiochemical properties of HLFAC

Physiochemical Parameters & Total Protein Content (TPC)	HLFAC	Recommended range for honey
Moisture content (%)	15.6	15 to 18
Specific gravity ± RSD (%)	1.4243 ± 0.1	1.4171 to 1.4350
Viscosity	234	138
pH	4.19	3.4 to 6.1
Fructose (%) ± SD	47.3 ± 0.6	27.2 to 44.3
Glucose (%) ± SD	33.7 ± 0.7	22.0 to 40.7
F/G ratio	1.40	0.76 to 1.86
Refractivge index (RI)	1.4975	1.4849 to 1.5026
Brix degree (%)	82.6	79 to 84

Table 2 MIC values for HLFAC as compared to MH

Bacterial Isolates	MIC Values	
	HLFAC	MH
MRSA (HS770)	7.5	17.5
MRSA (U949)	7.5	20.0
MRSA (ATCC 33591)	7.5	17.5
MSSA (ATCC 25923)	7.5	17.5
MSSA (ATCC 6538)	10.0	15.0
Escherichia coli (ATCC 8739)	7.5	17.5
Pseudomonas aeruginosa (ATCC 9027)	7.5	15.0
Salmonella typhimurium(ATCC 14028)	7.5	17.5

DISCUSSION

- As seen in Table 1, HLFAC adhered to the basic physiochemical parameters of an unadulterated honey.
- HLFAC showed lower MIC values as compared to MH with MGO 250+ against all of the tested bacteria
- This analysis suggests that HLFAC has a better, if not comparable, inhibitory properties as medical-grade honey against various medically-important bacteria.
- MH with a minimum of 250 mg/kg of dietary methylglyoxal (MGO 250+) was used as a positive control of a medical-grade honey
- Medical-grade honey has been used as topical treatments of acute and chronic wounds in many countries such as United Kingdom, Greece, Netherlands, Czech Republic, South Africa and India.
- Based on its low pH and high sugar content, HLFAC may exert its antibacterial properties with similar mechanism-of-action as the common honey which would be attributed from its high osmotic pressure and low pH

CONCLUSION

This preliminary study showed that HLFAC adhered to the basic physiochemical parameters of an unadulterated honey. Moreover, HLFAC showed comparable, if not better antibacterial properties with MH MGO 250+ based on the MIC assay conducted. Nevertheless, further toxicological and pre-clinical studies are warranted before these new plant-based fractions could be utilized as an alternative source of natural honey with wide-spectrum antibacterial properties.

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