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PP-581 [Pollination and Bee Flora]

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Antioxidant and antibacterial properties of ethanolic pot-pollen extracts of *Melipona beecheii* and determination of main components

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INTRODUCTION

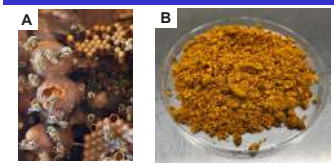


Figure 1. A) *Melipona beecheii*. **B**) *Melipona beecheii* pot-pollen.

Melipona beecheii pot-pollen is a natural product of high cultural value in traditional Maya medicine but remains less studied than honey or propolis. It is considered nutritionally complete and contains metabolites with biological activity that may aid in the treatment of foodborne and oxidative stress-related diseases.

Chronic and neurodegenerative diseases are global health concerns, often linked to oxidative stress (an imbalance caused by excess of reactive species). This imbalance is also related to gastrointestinal problems, it can also disrupt native bacterial microbiota and promotes foodborne bacteria that form biofilms and exhibit antibiotic resistance. These challenges require alternative antimicrobial and antioxidant sources as the ones found in nature.

METHODOLOGY

Figure 2. Pot-pollen samples from five sites in the Yucatan peninsula.

Figure 3. Obtaining the *Melipona beecheii* pot-pollen ethanol crude extract.

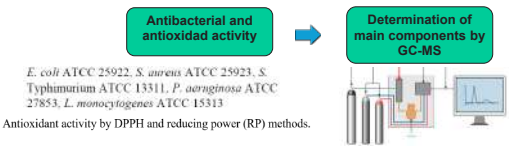
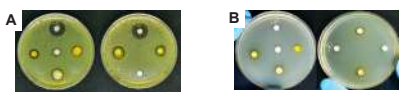


Figure 4. Biological activity and chromatographic analysis.

RESULTS



C

Extracto	CMI (mg / ml)			
	E. coli ATCC 25922	*S. Typhimurium* ATCC 13311	*P. aeruginosa* ATCC 27853	*S. aureus* ATCC 25923	*L. monocytogenes* ATCC 15313
MPC-1 Mama	8 ± 0.01[a]	8 ± 0.01[a]	6 ± 0.01[a]	40 ± 0.18[b]	8 ± 0.01[a]
MPC-2 Ticimul	40 ± 0.11[b]	40 ± 0.06[b]	6 ± 0.03[a]	40 ± 0.16[b]	8 ± 0.01[a]
MPC-3 Maní	40 ± 0.12[b]	8 ± 0.03[a]	8 ± 0.01[a]	40 ± 0.05[b]	8 ± 0.02[a]
MPC-4 José Ma. Morelos	40 ± 0.09[b]	8 ± 0.03[a]	8 ± 0.05[a]	8 ± 0.09[a]	8 ± 0.03[a]
MPC-5 Calkini	40 ± 0.15[b]	40 ± 0.02[b]	8 ± 0.01[a]	8 ± 0.04[a]	8 ± 0.05[a]

D

Pot-pollen ethanol extract	IC_{50} DPPH (µg/ml)	IC_{50} RP (µg/ml)
MPC-1 Mama	28 ± 0.014[a]	30 ± 0.025[c]
MPC-2 Ticimul	70 ± 0.011[d]	40 ± 0.030[d]
MPC-3 Maní	55 ± 0.057[b]	50 ± 0.169[e]
MPC-4 José Ma. Morelos	80 ± 0.062[e]	40 ± 0.115[d]
MPC-5 Calkini	17 ± 0.014[a]	20 ± 0.078[b]
Ac. ascórbico	3 ± 0.048[a]	2 ± 0.033[a]

Figure 5. Antibacterial activity of pot-pollen ethanol extracts against **A**) *Pseudomonas aeruginosa* and **B**) *Listeria monocytogenes*. **C**) Minimum inhibitory concentration (MIC). *P. aeruginosa* and *L. monocytogenes* were the most susceptible strains to all the extracts (MIC: 6-40 mg/ml). **D**) Antioxidant activity by DPPH (EC50 28µg/ml) and Reducing power (RP) (EC50 30 µg/ml) methods.

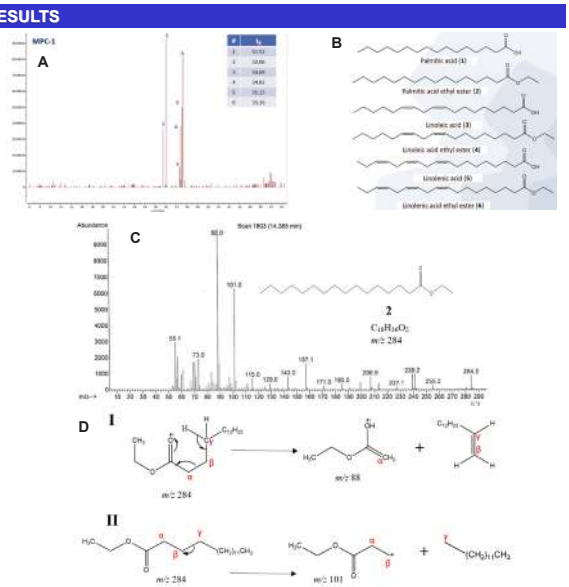


Figure 6. Gas-Chromatography - Mass Sepectroscopy analysis (GC-MS) **A)** Gas chromatogram of pot-pollen ethanol extract (MPC-1). **B**) Metabolites identified in the pot-pollen ethanol extract. **C**) Mass spectrum of palmitic acid ethyl ester (**2**). **D**) Fragmentation by Mass Spectrometry of palmitic acid ethyl ester (**2**).

CONCLUSIONS

The aim of this work is to contribute as far as posible to Yucatan peninsula's flora influencing in the value-added perceived that has not been recognized until nowadays and that is linked to the vegetal species in this región. The Discovery of valuable metabolites in studied and middle-know species contribute to the protection of ecosystems since their value and their biocultural diversity is attended and prometed its conservation.

ACKNOWLEDGMENTS

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Antioxidant and antibacterial properties of ethanolic pot-pollen extracts of Melipona beecheii and determination of main components

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Melipona beecheii pot-pollen is a natural product of high cultural value in traditional Mayan medicine but remains less studied than honey or propolis. It is considered nutritionally complete and contains metabolites with biological activity that may aid in the treatment of foodborne and oxidative stress-related diseases. Chronic and neurodegenerative diseases are global health concerns, often linked to oxidative stress (an imbalance caused by excess of reactive species). This imbalance is also related to gastrointestinal problems, it can also disrupt native bacterial microbiota and promotes foodborne bacteria that form biofilms and exhibit antibiotic resistance. These challenges require alternative antimicrobial and antioxidant sources as the ones found in nature. Ethanolic extracts were obtained from pollen samples from five sites in the Yucatan peninsula. The antibacterial activity of the extracts against Escherichia coli, Salmonella enterica serovar Typhimurium, Pseudomonas aeruginosa, Staphylococcus aureus and Listeria monocytogenes were evaluated. The antioxidant activity was also evaluated using a free radical scavenging assay (DPPH: 2,2-diphenyl-1-picrylhidrazyl) and reducing power of Fe III (RP). The main compounds were identified by gas chromatography-mass spectrometry (GC-MS). Among tested bacteria P. aeruginosa and L. monocytogenes were the most susceptible. Antioxidant activity was higher than previous reports. GC-MS analysis identified palmitic, linoleic, and linolenic acids along with their ethyl ethers in all samples. The pot-pollen extract from Mama, Yucatan exhibited the highest biological activity (MIC: 6-40 mg/mL, EC50 DPPH: 28 µg/mL, EC50 RP: 30 µg/mL), likely to its higher content of unsaturated fatty acids and their ethyl esters.
The aim of this work is to contribute as far as possible to Yucatan peninsula's flora, influencing in the value-added perceived that has not been recognized until nowadays and that is linked to the vegetal species of this region. The discovery of valuable metabolites in studied and middle-known species contribute to the protection of ecosystems since their value and their biocultural diversity is attended and promoted its conservation.