

Evaluation of the antibacterial activity and colouring capacity of two *Hylocereus* spp. epicarps.

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Introduction

Betalains are a group of secondary metabolites named chromoalkaloids that are synthesized from tyrosine. These compounds have gained some attention in the last few years mainly due to their interesting bioactive potential, namely antioxidant, antimicrobial, and other bioactive properties [1]. Their strong and vibrant colours are also one of the characteristics by which these compounds have gained visibility in the food and pharmaceutical industries [2]. Betalains can be divided in two groups regarding the colour range: betaxanthins in the orange to yellow range, and betacyanins in the purple to pink range. Thereby, these compounds can be used as natural colouring agents, providing alternatives to the massively used artificial counterparts [3]. Although there are already some natural options in the market, these are not enough to meet the needs of the food industry, due to the growing concern of consumers regarding what they eat.

Results

It was possible to identify the same six compounds in both samples.

For the *Hylocereus undatus* the major compounds identified were 6'-O-malonyl-betanin (phylocactin) (15.5±0.2 mg/g of extract) and 4'-O-malonyl-betanin (16.8±0.7 mg/g of extract). For the *Hylocereus costaricensis* sample only one major compound was identified, phylocactin (14.8±0.3 mg/g of extract). In the evaluation of the antibacterial activity, both extracts showed MIC and MBC values that ranged from 10 to 20 mg/mL. Gram-positive bacteria showed to be more susceptible to both extracts than the negative strains.

	<i>Hylocereus costaricensis</i> (F.A.C.Weber) Britton & Rose		<i>Hylocereus undatus</i> (Haworth) Britton & Rose		Ampicillin (20 mg/mL)		Imipenem (1 mg/mL)		Vancomycin (1 mg/mL)	
	MIC	MBC	MIC	MBC	MIC	MBC	MIC	MBC	MIC	MBC
Gram-negative bacteria										
<i>Escherichia coli</i>	20	>20	20	>20	<0.15	<0.15	<0.0078	<0.0078	n.t.	n.t.
<i>Klebsiella pneumoniae</i>	20	>20	20	>20	10	20	<0.0078	<0.0078	n.t.	n.t.
<i>Morganella morganii</i>	20	>20	20	>20	20	>20	<0.0078	<0.0078	n.t.	n.t.
<i>Proteus mirabilis</i>	20	>20	20	>20	<0.15	<0.15	<0.0078	<0.0078	n.t.	n.t.
<i>Pseudomonas aeruginosa</i>	>20	>20	>20	>20	>20	>20	0.5	1	n.t.	n.t.
Gram-positive bacteria										
<i>Enterococcus faecalis</i>	10	>20	10	>20	<0.15	<0.15	n.t.	n.t.	<0.0078	<0.0078
<i>Listeria monocytogenes</i>	10	>20	10	>20	<0.15	<0.15	<0.0078	<0.0078	n.t.	n.t.
MRSA	10	>20	10	>20	<0.15	<0.15	n.t.	n.t.	0.25	0.5

Conclusions

Further studies need to be conducted to better understand the correlation between the bioactive potential and the betacyanins' composition. Nevertheless, these natural matrices proved to be viable alternatives for obtaining colouring extracts with antimicrobial properties.

Acknowledgments

To FCT and FEDER under Programme PT2020 for financial support to CIMO (UID/AGR/00690/2019); C. Lobo Roriz (SFRH/BD/117995/2016) and T.C.S. Pires (SFRH/BD/129551/2017) grants and National funding by FCT- Foundation for Science and Technology, P.I., through the institutional scientific employment program-contract for L. Barros contract. This work is funded by the European Regional Development Fund (ERDF) through the Regional Operational Program North 2020, within the scope of Project Mobilizador Norte-01-0247-FEDER-024479: ValorNatural®.

References

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Methodology

The objectives of this work were to: i) obtain bioactive extracts with strong colouring capacity from the epicarp from two *Hylocereus* spp., white-fleshed pitaya *Hylocereus undatus* (Haworth) Britton & Rose and red-fleshed pitaya *Hylocereus costaricensis* (F.A.C.Weber) Britton & Rose; ii) chemically characterize the betalains' content through HPLC-DAD-ESI/MS; iii) evaluate the bioactive properties of the extracts, namely the antimicrobial activity. The extracts were obtained through a dynamic maceration assisted by heat, and the betacyanins' profile was characterized by HPLC-DAD-ESI/MS. The antibacterial capacity was determined against a panel of Gram-negative and Gram-positive bacteria using the colorimetric method of rapid detection with p-iodonitrotetrazolium chloride (INT), and the responses obtained were expressed as minimum inhibitory (MIC) and minimum bactericidal (MBC) concentrations.

