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The antimicrobial and antioxidant properties of *Syzygium smithii*, an Australian bush food

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INTRODUCTION & AIM

Many native Australian plants, including *Syzygium* spp., have been used as traditional medicines by indigenous Australians; however, they have been underutilised in modern medicine due to a lack of scientific studies [1]. The berries of *Syzygium smithii*, commonly known as lilly pillies, are considered to be a protective food [2] and have not been investigated previously. This is a preliminary study of the antimicrobial and antioxidant properties of the berries and leaves of *S. smithii*.

Figure 1 Pictures of the lilly pilly berries (left) and leaves (right) on the bush before collection.

METHOD

S. smithii berries and leaves were collected in Tasmania, Australia. Extracts were made following a cold extraction process in ethanol and water. The stock concentrations of the extracts were as follows (in mg/ml): ethanol leaves = 49.76, water leaves = 50, ethanol berries = 2.95, water berries = 3.85.

The antimicrobial properties were evaluated using the disc diffusion assay against four Gram-positive and four Gram-negative bacteria using the stock concentrations. A zone of inhibition (ZOI) >8 mm (Table 1) was considered a positive result. Minimum inhibitory concentration (MIC) studies were also determined with the highest concentration tested being half of the stock concentration.

The antioxidant properties were investigated using DPPH radical inhibition and ferric reducing antioxidant power (FRAP) assays with a concentration range of 15.63 to 2000 µg/ml. The total phenolic content (TPC) and total flavonoid content (TFC) of the stock extracts were also quantified. All the experiments were carried out in triplicates with positive and negative controls to compare the results.

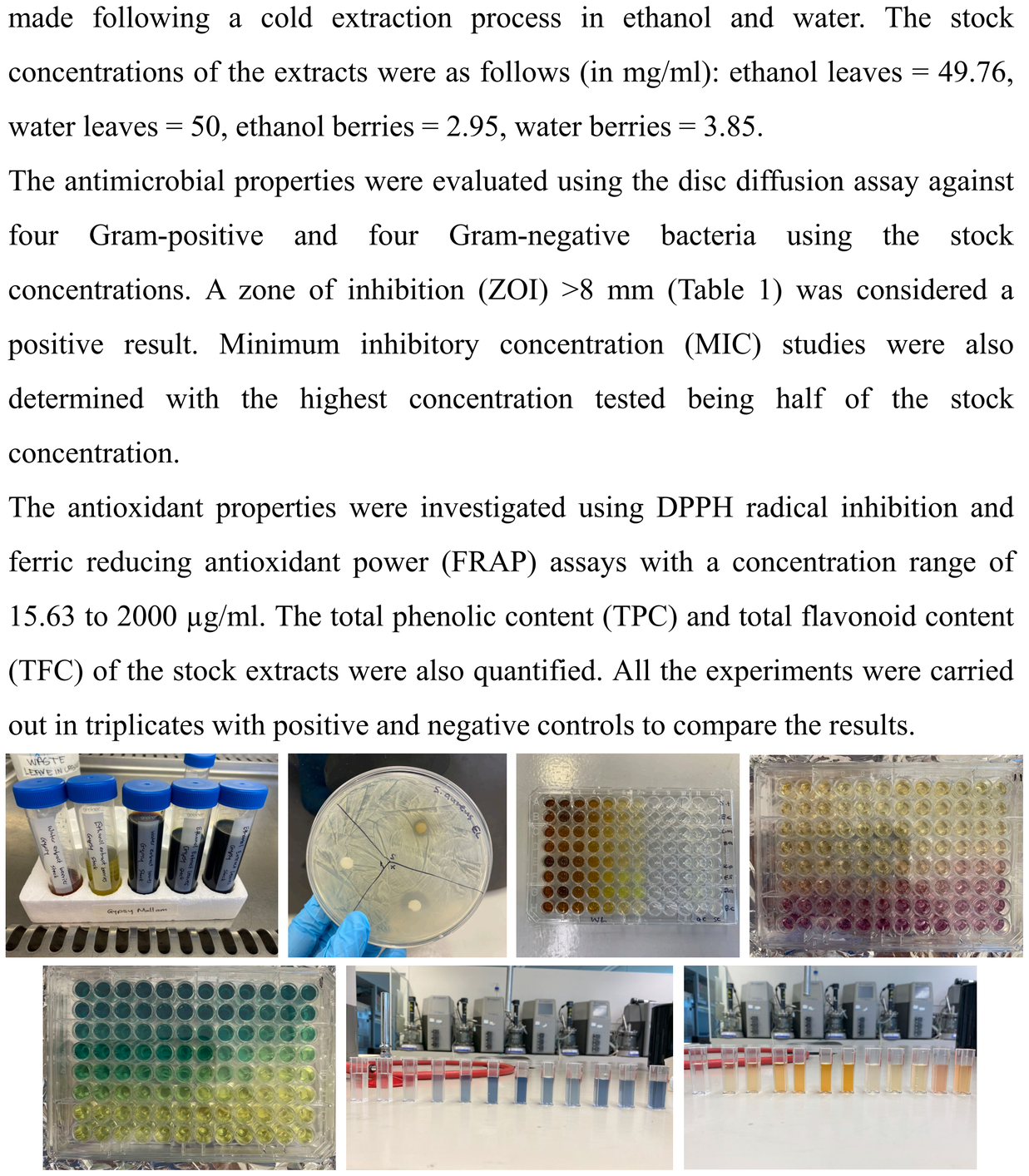

Figure 2 Pictures of each method. Top row, left to right: extracts, disc diffusion, MIC, DPPH. Bottom row, left to right: FRAP, TPC, TFC.

RESULTS & DISCUSSION

ANTIMICROBIAL PROPERTIES

Table 1 Preliminary assessment of antimicrobial activity of *S. smithii* extracts.

	Microbial species	Ethanol leaves (49.76 mg/ml)	Ethanol berries (2.95 mg/ml)	ABX
G+	*B. cereus*	+	+	Chl
	E. faecalis	+	+	Amp
	L. monocytogenes	+	+	Amp
	S. aureus	+	-	Amp
G-	*E. coli*	-	-	Chl
	K. pneumoniae	-	-	Chl
	P. aeruginosa	-	-	Cip
	S. enterica	-	-	Chl

"+" indicates growth inhibition observed. "–" indicates no growth inhibition observed. Amp = ampicillin (2 µg). Chl = chloramphenicol (10 µg). Cip = ciprofloxacin (5 µg).

No ZOI was observed for both water extracts against all bacteria. The MIC of the leaf extracts were 25 mg/ml against almost all bacteria. The MIC was not found for the berry extracts as the highest concentration tested was too low. Disc diffusion and MIC assay results were not in agreement; however, broth dilution assays, such as MIC, give more reliable results as there is no diffusion required [3]. There was limited access to berries at the time of collection due to poor growth conditions, therefore, retesting the antimicrobial properties is necessary.

ANTIOXIDANT PROPERTIES

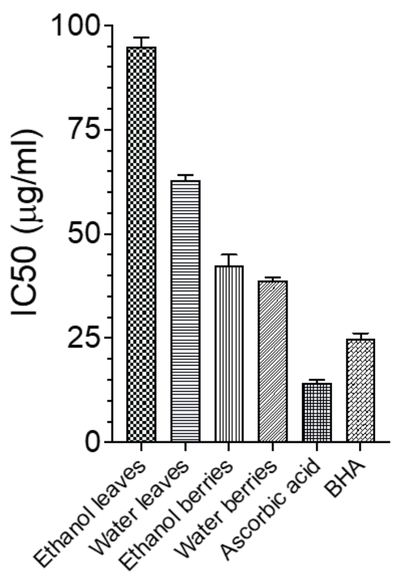

Figure 3 DPPH radical scavenging IC50 of *S. smithii* extracts. Values represent the mean of triplicate experiments ± standard error of mean. BHA = Butylated hydroxyanisole.

Table 2 Total phenolic (TPC) and total flavonoid content (TFC) for *S. smithii* extracts.

Plant extract	TPC (µg GAE/mg extract)	TFC (µg QE/mg extract)
Ethanol leaves	149.94 ± 5.86	261.42 ± 23.99
Water leaves	220.65 ± 2.82	156.59 ± 15.23
Ethanol berries	366.88 ± 23.63	273.59 ± 15.96
Water berries	663.44 ± 14.89	489.80 ± 22.22

Values indicate mean results of triplicate experiments ± standard error of mean. GAE = gallic acid equivalents, QE = quercetin equivalents.

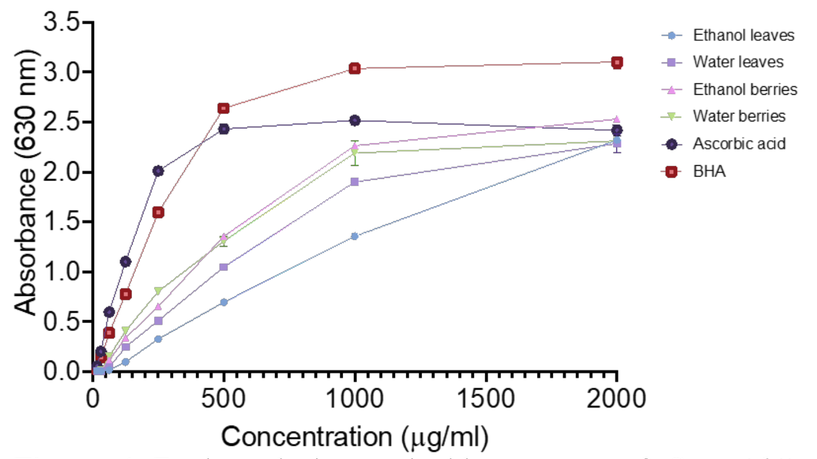

Figure 4 Ferric reducing antioxidant power of *S. smithii* extracts. Values represent the mean of triplicate experiments ± standard error of mean. BHA = Butylated hydroxyanisole.

The DPPH and FRAP assays showed the leaf extracts have moderate antioxidant activity and the berry extracts have strong antioxidant activity. The TPC and TFC of all extracts were quite high, especially the berry extracts.

CONCLUSION

In conclusion, *S. smithii* has the potential to be utilised by modern medicine as an antimicrobial and antioxidant agent. Further studies are needed to confirm these biological activities of *S. smithii*.

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