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BOOK OF ABSTRACTS

Asparagopsis armata dichloromethane extract: biological activity and chemical composition

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Topic

Seaweed and others

Abstract text

Asparagopsis armata Harvey is a red alga with heteromorphic life cycle and one of the worst biological invaders in the Mediterranean sea. Some studies show that the extracts exhibit some antibacterial activity against *Bacillus subtilis* which may be due to the presence of some halogenated compounds that have already been identified. In the Azores, despite the large amount of biomass produced by this alga, there is neither traditional application nor application with economic profitability. Dichloromethane extract of *A. armata* harvested in the Azores has been obtained and analyzed by GC-MS. The main compounds were palmitic acid, 1-monopalmitin and brominated compounds. According to our analysis, the most represented families are respectively the saturated and monounsaturated fatty acids, brominated compounds and small carboxylic acids. In terms of antioxidant activity, the extract shows about 24 % and 31 % of activity for the DPPH and ABTS scavenging tests, respectively, at a maximum concentration of 250 microg/mL. Concerning the anticholinesterasic activity, it was found to cause similar percentages of inhibition to BuChE and AChE activity, which is an interesting feature in terms of Alzheimer's disease therapy. More detailed results will be presented and discussed in poster section. Acknowledgements: This study was financed by ASPAZOR project (DRCT: ACORES-01-0145-FEDER-00060-ASPAZOR), Portuguese National Funds, through FCT – Fundação para a Ciência e a Tecnologia, and as applicable co-financed by the FEDER within the PT2020 Partnership Agreement by funding the Organic Chemistry Research Unit (QOPNA) (UID/QUI/00062/2013) and the cE3c centre (UID/BIA/00329/2013).

Introduction

General context

Asparagopsis armata Harvey is a red alga belonging to the Rhodophyta Division. In Azores, this invasive alga presents large amounts of biomass, notably in São Miguel coast. Its overall impact is currently being studied by a funded project, named ASPAZOR.¹

Commercialization

Internationally, derived products of *A. armata* are commercialized for example in cosmetic products (Invincity®, <http://www.algues-et-mer.com/cosmetique>).

Potential applications

Some studies, already published, show that the extracts exhibit some antibacterial activity against *Bacillus subtilis*,² which may be due to the presence of some halogenated compounds that have already been identified.³

Local potential uses

In the Azores, despite the large amount of biomass produced by this alga, there is no traditional application neither any use with economic profitability.

Objectives

Asparagopsis armata was harvested in Azores coast to be investigated for its:

- ✓ chemical composition
- ✓ biological activities

in order to find potential future applications.

Material and Methods

Dichloromethane extract of dried seaweed was prepared by maceration at room temperature during 3 days (1:10 algae:solvent). The solvent was evaporated to dryness with a rotary vacuum evaporator at 35 °C (yield 1.25%). Before GC-MS analysis, 20 mg of extract dissolved in 1 mL of dichloromethane, was silylated using 250 µL of pyridine, 250 µL of BSTFA and 50 µL of TMSCl in a screw glass tube during at 70°C for 30 min. GC-MS analyses, were performed using a QP2010 Ultra Shimadzu apparatus equipped with a DB-5- J & W capillary column (30 m x 0.25 mm i.d. and a film thickness of 0.25 µm). The temperature of the column was 70°C during 2 min., at 3.5 °/min. until 120°C, at 9 °/min. until 170°C, 170°C during 10 min., at 9 °/min. until 300°C, which was maintained for 6 min. Injector temperature was at 320 °C and the transfer-line temperature was at 200 °C. The mass spectrometer was operated in the EI mode with energy of 70 eV. The antioxidant and anticholinesterase activities were evaluated by well known spectrophotometric methods describe in literature.⁴⁻⁷

Results and Discussion: Chemical Composition

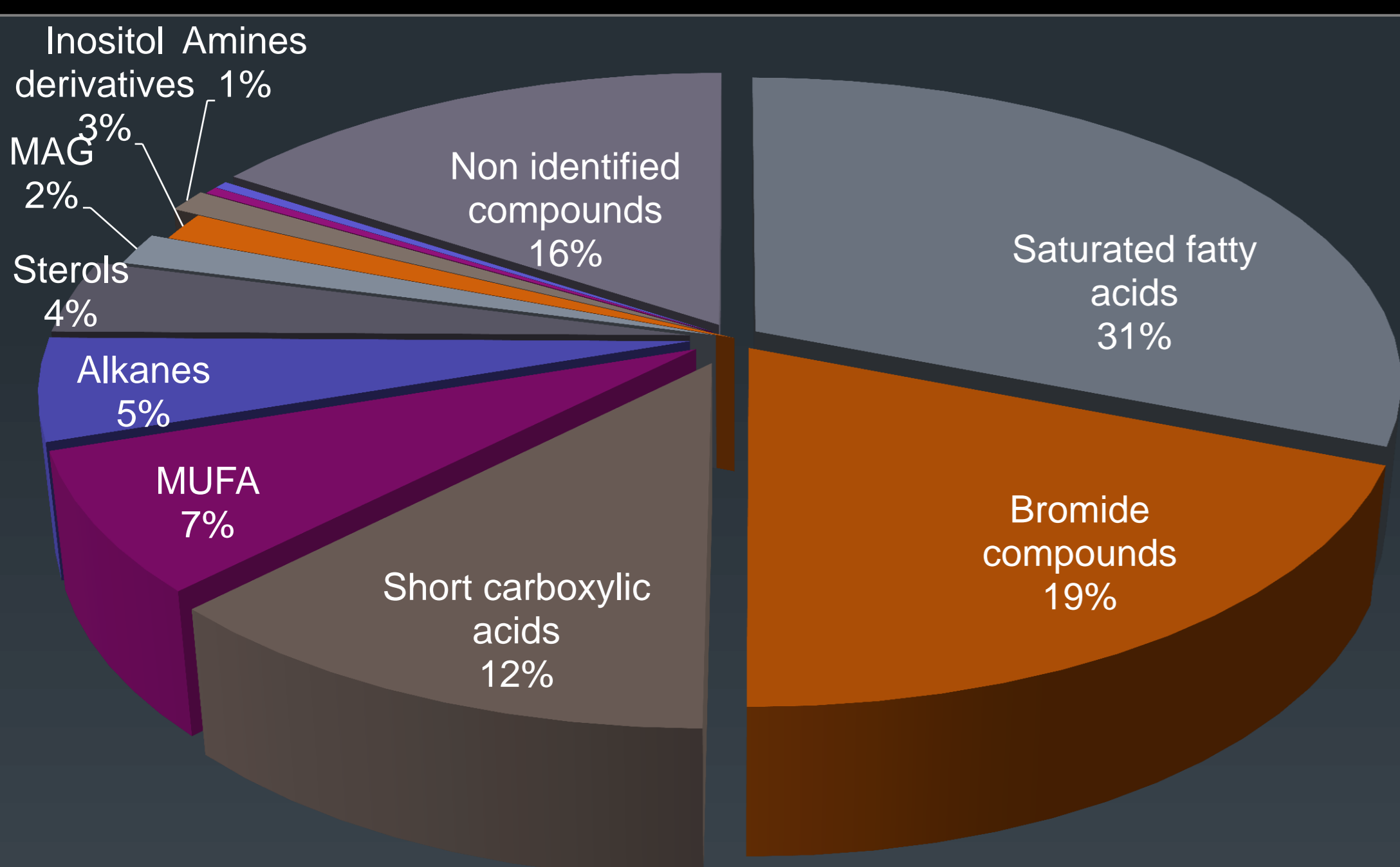


Fig. 1: Organic compounds families in dichloromethane extract of *A. armata*.

✓ Fatty acids, saturated and monounsaturated (MUFA), plus sterols, families with nutritional interest, represent 42% of total compounds.

✓ Monoacylglycerols (MAG) were also detected (2%).

✓ A significant amount of compounds with bromine in its structure were identified (19%).

✓ As shown in Fig 2. the most abundant compounds in dichloromethane extract of *A. armata* are hexadecanoic acid (29.5%) and a dibromoacetic acid derivative (14.2%).

✓ Cholesterol are the most abundant sterol while heptadecane is the alkane most relevant.

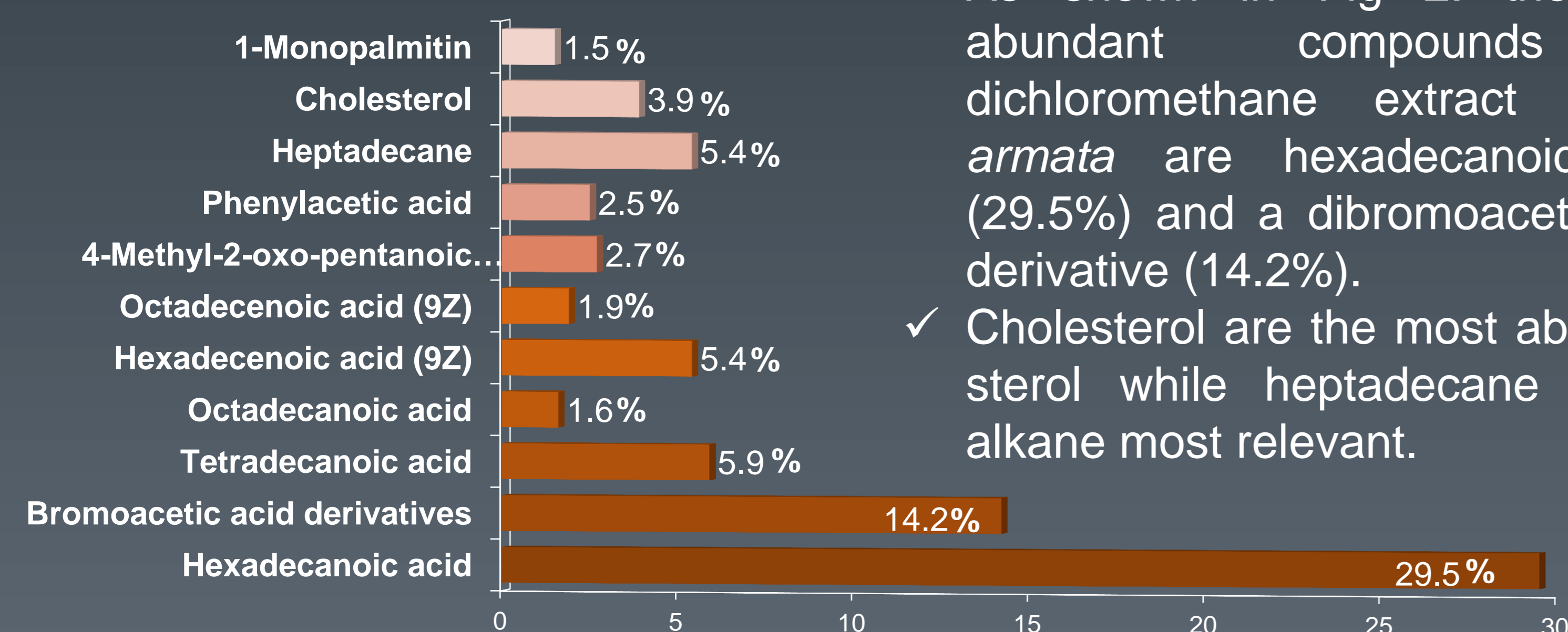


Fig. 2: Relative proportion (%) of the 11 most abundant compounds in the dichloromethane extract of *A. armata*.

Results and Discussion: Biological Activities

Antioxidant activity

Table 1: Antioxidant activity of *A. armata* dichloromethane extract (±SD).

Samples/References	DPPH Radical Scavenging Activity		ABTS Radical Scavenging Activity	
	EC ₅₀ [µg/mL]	% inhibition at 250 µg/mL	EC ₅₀ [µg/mL]	% inhibition at 250 µg/mL
Extract	> 250	31.4 ± 2.8	> 250	23.6 ± 2.6
Trolox	7.2 ± 0.1	Not determined	2.7 ± 0.1	Not determined
BHT	2.2 ± 0.5	Not determined	20.1 ± 1.9	Not determined

Table 1 shows the dichloromethane extract of *A. armata* exhibit lower antioxidant activity than the antioxidant used as reference.

However, the extract shows higher ability to donate an hydrogen to reduce the ABTS radical than to transfer an electron to inhibit the DPPH radical.

Anticholinesterase activity

Table 2: Anticholinesterase activity of *A. armata* dichloromethane extract (±SD).

Samples/References	Anti-acetylcholinesterase Activity		Antibutrylcholinesterase Activity	
	Max. conc. tested [µg/mL]	% inhibition	Max. conc. tested [µg/mL]	% inhibition
Extract	150	17.1 ± 2.3	150	19.0 ± 2.0
Gаланthamine	50	98.4 ± 1.5	50	37.8 ± 0.9
Donepezil	2.0	95.2 ± 0.43	5	71.8 ± 4.0

Concerning the anticholinesterase activity, table 2 shows a similar levels of BuChE and AChE inhibition by extract, which is an interesting feature in terms of Alzheimer's Disease therapy.

Conclusions:

The dichloromethane extract of *A. armata* exhibits low antioxidant and anticholinesterase activity and is not nutritionally interesting but can be an excellent source of palmitic acid and bromine compounds.

References

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