

EXPLORING THE ROLE OF BROWN ALGAE AS SCAVENGERS OF REACTIVE OXYGEN AND NITROGEN SPECIES

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INTRODUCTION

- Oxidative stress, which occurs when there is an imbalance between reactive oxygen species (ROS) and/or reactive nitrogen species (RNS) and the antioxidants in the body, plays a key role in the development of various diseases. This process contributes to cellular damage, affecting DNA, proteins, and lipids, inducing cellular aging and age-related diseases such as cancer, cardiovascular diseases, and neurodegenerative disorders (Figure 1) [1].
- Various studies [2] have highlighted the ability of brown macroalgae extracts to neutralize ROS and RNS, including superoxide ($O_2^{\bullet-}$) and hydroxyl ($\bullet OH$) radicals, hydrogen peroxide (H_2O_2) and nitric oxide radical ($\bullet NO$) which are known to contribute to oxidative stress. This antioxidant capability of these extracts is attributed to the presence of bioactive compounds such as polyphenols among others secondary metabolites found in these marine species.

METHODOLOGY

Algae were handpicked on the northwestern Galician coasts, identified and washed with deionized water to remove superficial debris. After, the algae material was subjected to microwave-assisted extraction (MAE) and studied as ROS and RNS scavengers .

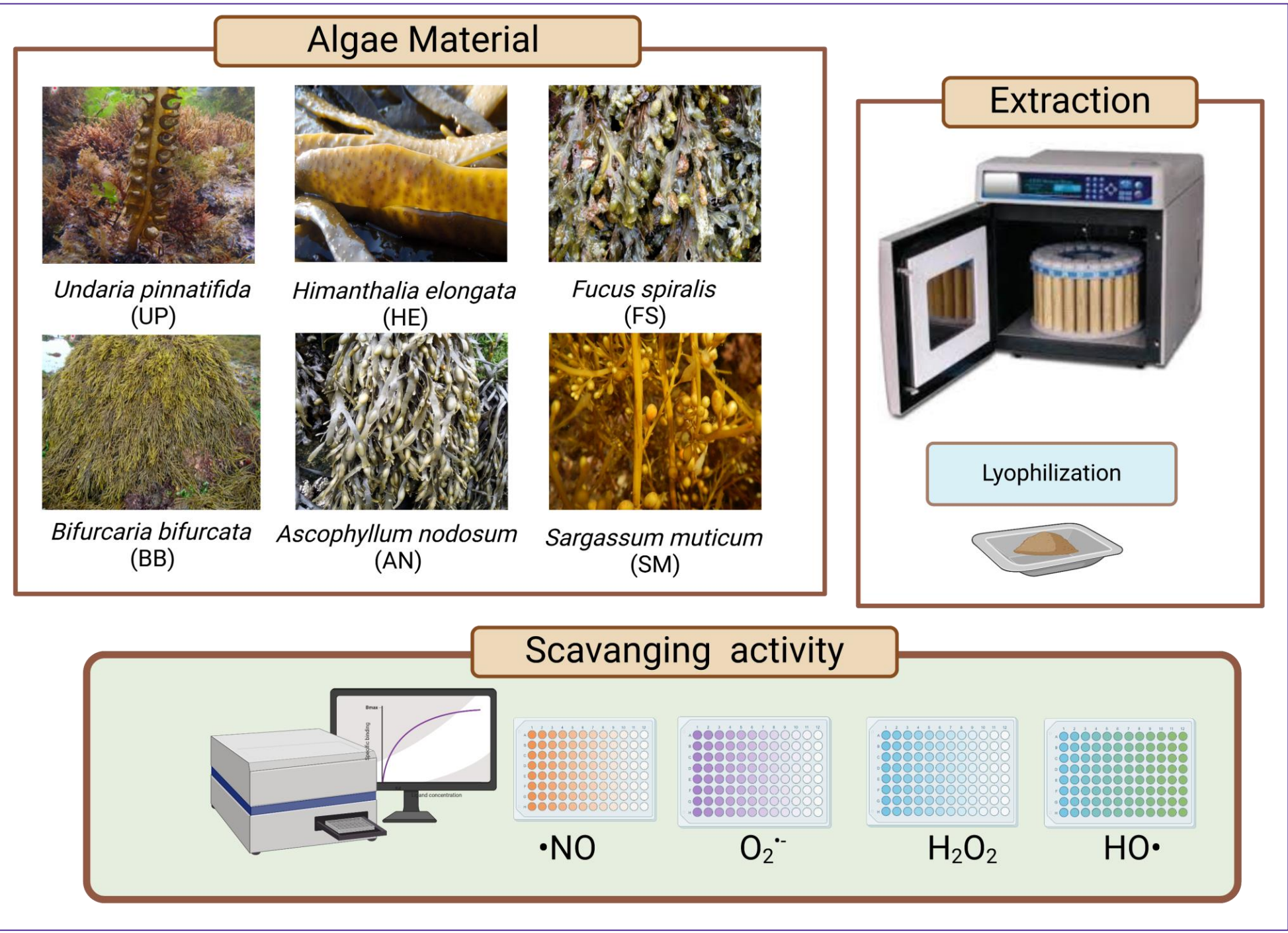


Figure 2 Scheme of the experimental procedure

The lyophilized extracts were dissolved in the adequate buffer and tested as scavengers of NOS and RNS species by previous established techniques [3].

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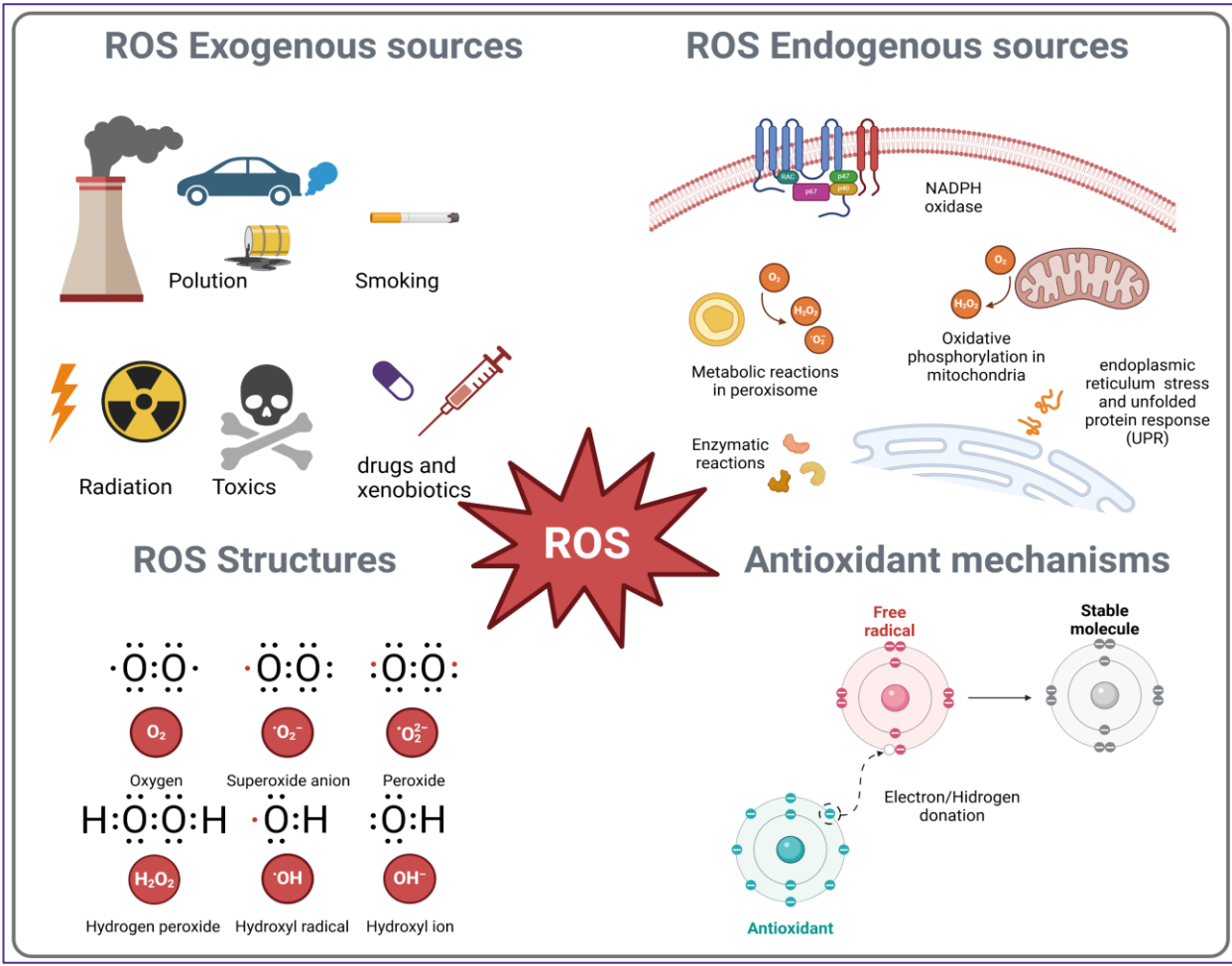


Figure1 Sources of ROS, electronic structures and antioxidant mechanisms.

RESULTS

The results of the antioxidant activity showed a dose response relation that allowed to calculate the EC_{50} (Figure 3) based on the Weibull model (equation 1) .

$$Y(X) = K[1 - EXP(-Ln2\left(\frac{X}{EC_{50}}\right)^a)] \quad \text{Eq.1}$$

Were the adjust parameters were the dose-response curve slope (a) and asymptote (K), and the EC_{50} value. These parameters were calculated with a 95% confidence level $p < 0.05$ (Shapiro-Wilk test) [4].

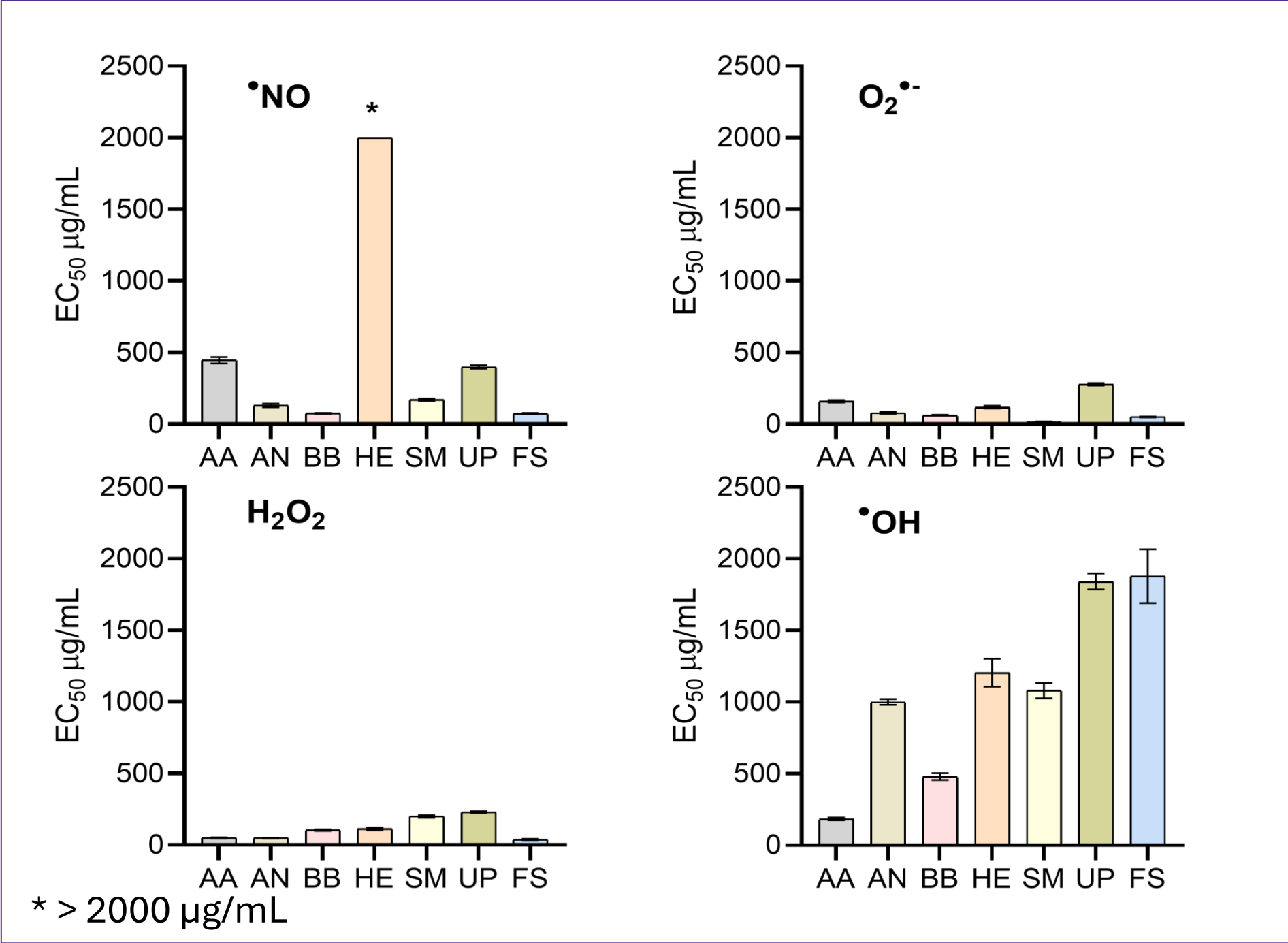


Figure 3 EC_{50} values obtained against $\bullet NO$, $O_2^{\bullet-}$, H_2O_2 and $\bullet OH$

CONCLUSIONS

- $\bullet NO$ scavenging activity: EC_{50} ranged from 74 $\mu g/mL$ (*Fucus spiralis*) to $>2000 \mu g/mL$ (*Himanthalia elongata*).
- $O_2^{\bullet-}$ scavenging activity: EC_{50} ranged from 16 $\mu g/mL$ (*Sargassum muticum*) to 279 $\mu g/mL$ (*Undaria pinnatifida*).
- H_2O_2 scavenging activity: Best result was obtained by *Fucus spiralis* ($EC_{50} = 39 \mu g/mL$).
- $\bullet OH$ radical scavenging: Required the highest quantity of algae extract for 50% depletion, averaging 1240 $\mu g/mL$.
- The results emphasize the antioxidant potential of algae extracts in reducing oxidative stress.