

EFFECT OF DIFFERENT DRYING METHODS ON THE ANTIMICROBIAL ACTIVITY OF THE GREEN ALGAE *ULVA SPP.*



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INTRODUCTION

Ulva species are green seaweeds belonging to the order Ulvales (Chlorophyta), rich in proteins, ash, fatty acids and essential amino acids, and compounds with antimicrobial activity. However, its chemical composition is affected by environmental conditions, geographic location and processing. Drying is the traditional process that has been used for many centuries to preserve seaweed. However, the selection of suitable drying methods and conditions is of great importance to produce quality-drying seaweed. Therefore, a characterization of Chilean Ulva spp. was carried out to describe the effect of drying (freeze-, vacuum-, solar- and convective-drying) on its antimicrobial potential.

MATERIALS AND METHODS



(1) **Freeze-drying (FD)** at a vacuum pressure of 200 mTorr for 73 h.
(2) **Vacuum drying (VD)** at 70 °C and 15 kPa for 390 min.

(3) **Solar drying (SD)**, an average temperature of 50 °C for 480 min.
(4) **Convective drying (CD)** at 70 °C and constant air flow of 1.5 m/s for 120 min.

OBJECTIVES

The aim of this investigation is to assess the effect of different drying methods (freeze drying (FD); vacuum drying (VD); sun drying (SD); convective drying (CD) applied to Ulva spp. on antimicrobial activity against pathogens of interest in food products.

ANTIMICROBIAL ACTIVITY

Extracts of Ulva spp. in 60 % aqueous methanol were obtained and the halo of inhibition (mm) was measured as the area around an antibiotic disk in an ambigram where bacterial growth does not occur on an agar plate inoculated with the pathogenic microorganisms. Ampicillin (10 µg/disk) and Fluconazole (25 µg/disk) were positive control.

RESULTS

Table 1. Diameter (mm) of inhibition zones caused for *Ulva spp* extracts prepared by different drying methods against pathogenic microorganisms

<i>Ulva spp</i>	Inhibition zone (mm)			
	<i>E. coli</i>	<i>S. aureus</i>	<i>S. cerevisiae</i>	<i>Penicillium</i>
Fresh	6.00 ± 0.08 ^a	S/H ±	8.77 ± 0.85 ^a	12.87 ± 0.59 ^a
FD	8.98 ± 0.50 ^c	7.55 ± 0.17 ^a	11.97 ± 0.15 ^c	15.87 ± 0.35 ^b
VD	7.15 ± 0.31 ^b	-	10.47 ± 0.50 ^b	11.4 ± 1.81 ^{bc}
SD	-	-	9.3 ± 0.01 ^a	10.6 ± 1.05 ^c
CD	-	-	10.66 ± 0.58 ^b	11.25 ± 0.96 ^{bc}
Negative Control	0	0	0	0
Positivo Control	16.05 ^x ± 0.04 ^d	15.32 ^x ± 0.06 ^b	8.96 ^y ± 0.06 ^a	9.95 ^y ± 0.07 ^c

FD: freeze drying; VD: vacuum drying; SD: sun drying; CD: convective drying. Values are expressed as mean ± standard deviation. Different letters in the same column indicate significant differences (p < 0.05) according to multiple range test (MRT). Standard deviation was calculated on three replicates. (-) no visible zone; ^xAmpicillin (10 µg /disk); ^y Fluconazole (25 µg /disk)

CONCLUSIONS

There was no inhibition halo for fresh algae or for VC, SD and CD extracts, but a halo was obtained for FD, in the case of *S. aureus*.

In turn, increments of 34 % and 19 %, for FD and CD respectively, were detected with respect to the positive control. All the extracts showed an increase in the inhibition of the halo for *Penicillium spp* with respect to the positive control with increases of 7 % and 60 %. The FD was the only one with the greatest increase in mm.

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