

SMALL SCALE SPATIAL VARIABILITY IN THE PHENOLIC CONTENT OF *Zostera* spp FROM SALSSES-LEUCATE LAGOON

Abstract: The presence and abundance of phenolic compounds of *Zostera* spp from Salses-Leucate lagoon (Languedoc Roussillon, France) were studied. Seven sites were sampled on August 2009, and analyzed for both the identity and quantity of phenolics present using NMR and HPLC. The concentrations found are greater in *Zostera noltii* Hornem (mean value 20 mg.g⁻¹) than in *Z. marina* var. *angustifolia* Hornem (mean value 6 mg.g⁻¹ dw). The proportions of the phenolics varied substantially with the major proportion comprising flavonoids (56-99%), whereas zosteric acid and caffeic acid each represent 0-5%. Important discrepancies appeared between the 7 sampling sites, especially in the rosmarinic acid content which varies in the range 0-56%. The results show the negative effect of epiphytic load on the phenolic concentration.

Key-words : *Salses-Leucate lagoon*, *Zostera noltii* Hornem, *Z.marina* var. *angustifolia* Hornem, *phenolic content*, *variability*

Introduction

Mediterranean lagoons are highly productive areas representing more than 50% of the coastline in Languedoc-Roussillon (South of France). Many of them suffer from eutrophication and concomitant deterioration of water quality. Seagrass meadows are susceptible to coastal environmental impacts and can serve as early indicators of system-wide degradation. It is of interest to develop and validate chemical biomarkers for monitoring conservation status and ecotoxicological impact in *Zostera* meadows. In this context, phenolic compounds constitute good candidates, which may provide insights into water quality. They play several important functions in plants, and they are common in marine ecosystems. Documenting the presence of those compounds in alive tissues, and how they vary in abundance becomes crucial to understand how human activities influence marine communities. To do this we analyzed the abundance of specific phenolic compounds (rosmarinic (RA), caffeic (CAF), zosteric acids (ZA) and flavonoids (F)) of *Zostera* spp. from different sites located across the Salses Leucate lagoon (Achamlale *et al.*, 2009a, b).

Materials and Methods

Samples were collected at Salses-Leucate lagoon (42.8°N 3.0°E, France) on August 29th 2009 at 7 stations (S1-S7) providing a large gradient of physico-chemical and environmental parameters. After collection, the seagrass material was sorted and divided into all green leaves (A) without visible epiphytes and leaves still loaded with epiphytes and macroalgae (B). This led to 11 samples of *Z. noltii* and 5 samples of *Z. marina* var. *angustifolia* (Table 1). Methanolic extracts were prepared from the plant material, and analyzed for both the identity and quantity of phenolics present using NMR and HPLC (Table 1, data are expressed in mg (gdw⁻¹) of dry matter of *Zostera*).

Results and Discussion

The phenolic profile was largely dominated by flavonoids whatever the species, but the concentration mean values are greater in *Z. noltii* (20 mg.g⁻¹) than in *Z. marina var. angustifolia* (6 mg.g⁻¹ dw). The proportions remain constant with *Z. marina var. angustifolia*, for which only traces of RA, ZA and CAFF were found, whereas important variations of the amount of RA were observed with specimen (A) of *Z. noltii*: (42, 31 and 39% respectively at S4, -6 and -7, but only 9% at S2 and -3. Concentrations in specimen A are always higher than in B, showing the negative effect of macroalgae and epiphytes, which were particularly abundant at S3 and -6. Interestingly, the lowest values were found for the specimen B from these two stations. The highest values were found at S7, in the northern part of the lagoon, which is less eutrophicated than S5 and -6 (Ifremer, 2010). The lowest content with *Z. marina var. angustifolia* was found at S1, an artificial channel affected by pollution and physical disturbance of the sediment due to the passage of boats. Understanding the specific functional role of each of these compounds is now necessary. However, this first approach highlights the potential of polyphenols as indicators of the coastal lagoon environmental quality.

Bibliography

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Table 1 : Spatial variation of the phenolic content of *Zostera* spp

Species	Sampling station	Extract codes	Phenolic proportions (% of the total)				Total mg.g ⁻¹ dw
			F	RA	ZA	CAFF	
<i>Z. noltii</i>	Pointe de la Coudalère (S2)	2-A-Zn	88	9	1	1	19.84
		2-B-Zn	93	4	1	2	15.35
	Les petites dosses (S3)	3-A-Zn	89	9	1	1	21.98
		3-B-Zn	94	3	2	1	8.742
	Chenal du portel (S4)	4-A- Zn	56	42	1	1	27.83
	St Laurent de la Salanque (S5)	5-A-Zn	81	15	3	1	25.54
		5-B- Zn	88	7	3	1	16.45
	Anse de la Roquette (S6)	6-A- Zn	66	31	2	1	24.86
		6-B- Zn	79	15	5	1	2.76
	Iles des Sidrières (S7)	7-A- Zn	59	39	1	1	41.57
7-B- Zn		77	20	1	2	16.20	
<i>Z. marina var angustifolia</i>	Port Barcares (S1)	1-A- Za	98	1	1	0	6.02
		1-B-Za	99	0	1	0	2.42

Les petites dosses (S3)	3-A-Za	92	3	1	3	9.17
	3-B-Za	94	2	1	4	6.80
St Laurent de la Salanque (S5)	5-A-Za	97	1	1	1	5.92



Synthèse des appréciations visuelles de la présence d'algues opportunistes sur la commune de Mèze par Voile de Neptune (GT 4)

Aucune algue opportuniste n'est présente sur le site de la plage. Cependant un herbier de zostères naines est présent au bord de ces plages, même si il est d'une faible surface. L'herbier de zostères marines est plus profond (plus d'1m50 en moyenne), et très peu d'algues sont piégées au pied de sa limite haute.

Une accumulation est visible sur le NE de la plage de la plage (cf la photo 32), celle-ci est composée d'algues filamenteuses en majorité. Bien que faible, cette présence d'algue opportuniste est à souligner.

Les plages du Taurus sont très peu colonisées. On note tout de même la présence de *cladophora* déposé en taches sur l'herbier de zostères naines, et en zones parfois plus importantes sur l'herbier de zostères marines plus profond. (cf Taurus-photo 24)

L'herbier de la zone du kite surf est de faible superficie. Du fait de la présence d'un substrat rocheux il est cantonné à l'Est de la zone vers le port, au Nord de la zone collé à la digue, et à l'Ouest côté Conque. Les algues opportunistes s'y développant sont les *cladophora* sur l'herbier de zostères naines, une bande d'ulves d'1m de largeur environ est présente au Nord de la zone avec une densité faible à moyenne, et d'importantes quantités de gracilaires et de *cladophora* sont présentes sur le côté Ouest de cette zone (mélangée aux sargasses). La conque semble bénéficier d'apports en nutriments et en eau douce importants, car le gradient de concentration des algues opportunistes est flagrant de l'Est vers l'Ouest de cette zone de Kite surf.