

# The use of native succulent *Chenopodiaceae* (*Amaranthaceae sensu APG*) to treat marine aquaculture wastewater in the Mediterranean area

Salemi, D. <sup>1\*</sup>, Santulli, A. <sup>2</sup>, Messina, C.M. <sup>2</sup>, Troia, A. <sup>1</sup>

<sup>1</sup> Università degli Studi di Palermo, Dipartimento STEBICEF, via Archirafi 38, 90123 Palermo, Italy

<sup>2</sup> Università degli Studi di Palermo, Dipartimento DISTEM, Palermo, Italy

\*lead presenter ([salemi.dario@gmail.it](mailto:salemi.dario@gmail.it))

The sector of aquaculture contributes almost 60% of the global production of aquatic organisms and this percentage is going to grow in the coming years [1]. The release of nutrients into the environment, in open marine systems, could represent a risk for environmental effects. For these reasons, in accordance with the Water Framework Directive (2000/60/CE), land-based aquaculture farms are increasing, suggesting more efficient methods for the treatment of nutrient-rich saline wastewater.

Ecological Floating Beds (EFBs) are a young technology which, compared to traditional purification methods, has economic and ecological advantages [2]. EFBs consist of artificial floating rafts on which emerging rooted macrophytes are grown. The roots, developing on the underlying water, provide a large surface area for the development of the microbial biofilm, responsible for most of the purification process.

Halophilic plants combined with EFBs technologies can play an important role in the purification of saline waters and investigating this possibility is the aim of this project.

The study area is represented by a small settling basin, receiving wastewater from a land-based marine fish farm located in Petrosino (western Sicily). The characteristics of the surrounding environment determined the choice of plant species to be used, and these were propagated starting from material coming from the farm site.

Rooted halophilic Mediterranean plants of the genera *Salicornia* (Slc), *Sarcocornia* (Src) and *Salsola* (SlS) were placed in EFBs in highly nutrient-rich saline water. Morphometric measurements were periodically carried out on these and weight increases were recorded.

In these conditions, *SlS* seems to be disadvantaged in comparison with individuals growing in open ground. *Src* and *Slc* instead have shown an excellent growth response. *Src* and *Slc* therefore seem to be useful, in constructed wetlands or floating beds for treatment of effluents of land based marine fish farms. However, considering their life cycle characterized by a winter rest period, tests with other species are desirable in order to obtain good performances also during the cold period.



*Sarcocornia alpini* (22 June)



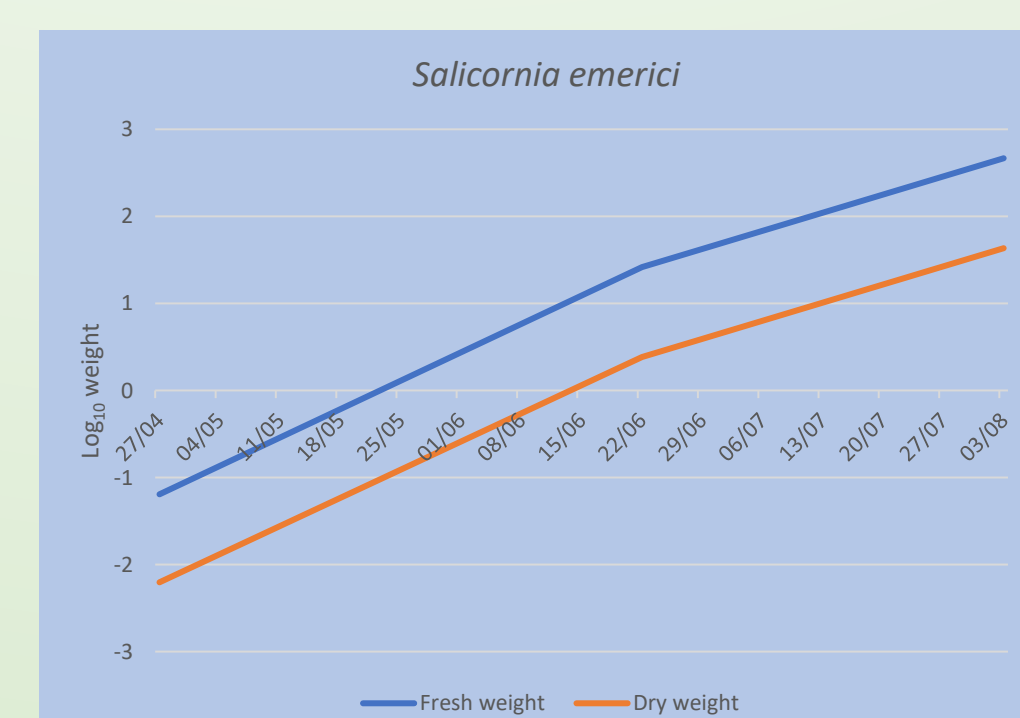
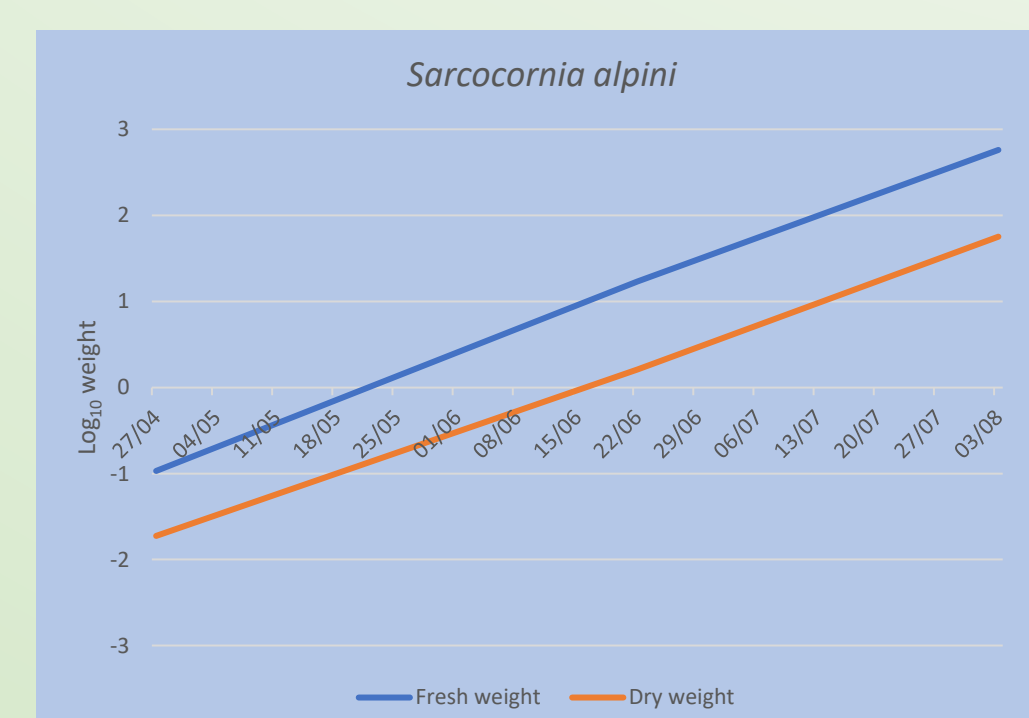
*Salicornia emerici* cultivated in EFBs (3 August)



From left to right: a) 27 April; b) 22 June; c) 3 August; d) 6 September



Comparison of individuals of *Salicornia emerici* growing on EFBs with individuals growing in open ground. (22 June)



Shoot weight	<i>Sarcocornia alpini</i>		<i>Salicornia emerici</i>	
	Fresh weight (g)	Dry weight (g)	Fresh weight (g)	Dry weight (g)
27-apr	0.107	0.019	0.064	0.006
22-giu	17.10	1.63	26.28	2.42
03-ago	577.00	56.53	466.67	43.18

Up: Log10 of the average shoot weight of *Sarcocornia alpini* and *Salicornia emerici*; Down left: shoot height; Down right: average shoot weight



## References:

- [1] FAO. (2022) The State of World Fisheries and Aquaculture. Towards Blue Transformation. Rome, FAO.  
 [2] ZHAO F, et al. (2012) Ecological Engineering, 40: 53-60.