EFFECTS OF "SARGAÇO" EXTRACTION RESIDUES ON SEED GERMINATION

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EFFECTS OF "SARGAÇO" EXTRACTION RESIDUES ON SEED GERMINATION

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Introduction

- The marine macroalgae have been used in Portugal as fertilizers since the 14th century, particularly in agricultural fields near the sea.
- The traditional harvest of the "sargaço" is realized on the beach, where macroalgae loosen from the rocks with the movement of waves and then spread on the beach to be dried, then harvested and stored in specific structures.
- Today the use of "sargaço" as fertilizers is restricted to the northern zone, in the horticultural fields of the Póvoa de Varzim and Viana do Castelo Zone [1].
- "Sargaço" is a mixture of seaweed (*Saccorhiza*, *Laminaria*, *Fucus* - brown, *Codium* - green, *Palmaria*, *Gelidium* and *Chondrus* – red algae) [2].
- Previously studied algae extracts have shown benefits to plants in terms of seed germination, growth stimulation [3], promoting biotic and abiotic stress resistance, conferencing or improving nutritional fruit quality [4].

Fig. 1- "Campos de maceira".

Objectives

- This study aimed to evaluate the seed germination potential using the sub product from aqueous extraction process of "sargaço", the macroalgae extractive substrate, providing better knowledge of using the undervalued sub product of the extraction.

Material and Methods

- The samples of "sargaço" were collected in 2017 and 2018 in Viana do Castelo coast, Portugal;
- The extracts of "sargaço", were made in 2 ways, with (S17CL and S18CL) and without washing (S17SL and S18SL), and the remaining process was the same;
- We used seeds of bean cultivar Torino (*Phaseolus vulgaris*) and kale (*Brassica oleracea* var. *acephala*) in the assays;
- The seeds were sterilized in NaClO 2% for 1 minute and washed in tap water 3 times [5], and then placed in the respective treatments, with the petri dishes being sealed with parafilm and placed in the greenhouse at light and room temperature ~23 ºC (Fig. 2). In the control petri dishes, we placed cotton with a filter paper above it and add 70 mL of distilled water;
- During the experiment, the emergence rate, the germination rate and the total weight difference, were recorded. At the end of the experiment, the root and shoot length and also the fresh plantlet weight were measured .

Fig. 2- Insertion of petri dishes sealed with parafilm into the incubator at light and room temperature.

Results

- The pH and electrical conductivity (EC) of "sargaço" extracts were measured at 20ºC and 20,5 ºC respectively, and the results obtained were: S17CL pH= 7,0 and EC= 11,68 mS/cm; S17SL pH= 6,7 and EC= 30,2 mS/cm; S18CL pH= 6,2 and EC= 4,98 mS/cm; S18SL pH= 6,8 and EC= 24,4 mS/cm.

Bean:

- Seeds treated with "sargaço"2018 washed (S18CL), germinated 32% (Table 1);
- In root weight, the S18CL had the best results (0.299 gr), while the control had the worst result (0.035 gr). The remaining samples showed intermediate values (S17CL= 0.140 gr; S17SL= 0.114 gr; S18SL= 0.132 gr) (Table 2).

Kale:

- In the kale, seeds showed the best emergence rate treated with "sargaço" 2017 washed (S17CL= 76%) of the tested seeds presenting seedling emergence (Fig. 3).
- Seeds treated with "sargaço" 2017 washed (S17CL= 64%) had a similar germination rate with the control seeds (C= 80%) (Table 3).
- Seedlings that resulted from "sargaço" 2017 washed (S17CL= 0,0102 gr) presented an increase of weight compared to the control (C= 0,0026 gr).
- In root weight, the control (C= 0,00058 gr) had a slightly better result than de S17CL treatment (S17CL= 0,00050 gr).

Table 1- Germination rate in bean seeds *(Phaseolus vulgaris*) with the treatments.

Germination rate of bean seeds (%)				
Control	S17CL	S17SL	S18CL	S18SL
60	0	0	32	0

Table 2- Root weight average (gr) in bean seeds (*Phaseolus vulgaris).*

Root weight of bean seeds (gr)				
Control	S17CL	S17SL	S18CL	S18SL
0,0350	0,140	0,114	0,299	0,132

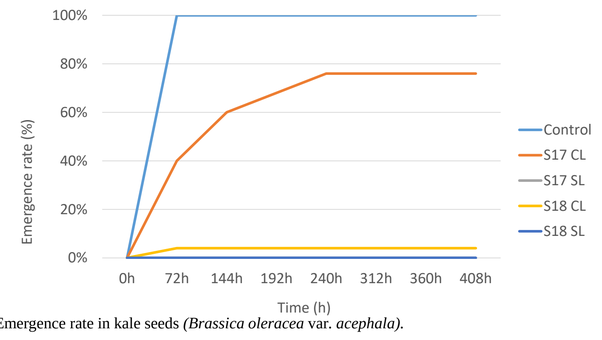

Fig. 3- Emergence rate in kale seeds *(Brassica oleracea* var. *acephala).*

Table 3- Germination rate in kale seeds *(Brassica oleracea* var. *acephala).*

Germination rate of kale seeds (%)				
Control	S17CL	S17SL	S18CL	S18SL
80	64	0	4	0

Conclusions

- The "sargaço" from 2018 and 2017 reacted in the different ways because the "sargaço" 2017 was dried and washed by the rain more time than the "sargaço" 2018 that was collected more recently and have more compound than the 2017 equivalent.
- In bean, there was an improvement in bean seedlings mainly at a root weight with the washed "sargaço" 2018. This shows better seedling root water and nutrient uptake, turning it more resistant.
- In kale seeds "sargaço" may increase the size and/or vigor of the seedlings, that leads to higher crop success rate.
- In conclusion, the treatments obtained by the washing process were more effective than the treatments without washing, in both species.

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