



## Can Biostimulant Application Reduce the Detrimental Effect of Saline Irrigation Water in Rocket?

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### Introduction

Soil salinization takes up to 1.5 million ha of farmland per year out of production; salinity mainly affects irrigated lands, where the use of saline water or the excessive pumping of groundwater increases the concentration of salts in the soil. Plant salinity exposure is one of the most limiting factors to crop yield, accounting altogether for almost 70% loss. Recently, several studies highlighted the ability of biostimulants to increase crop tolerance to abiotic stress. In our previous research also found a beneficial effect of a protein hydrolysates (PHs) product on yield and physiology of food-hemp subjected to saline water irrigation. In this view, the current research aimed to assess the agronomical response of rocket irrigated with saline water and treated or not with a biostimulant.

### Materials and Methods

**Site** “Gussone Park” of the Department of Agricultural Science of Portici (NA); plastic tunnel  
The pots were 0.18 m<sup>2</sup>

**Soil** sandy soil (2.6% OM, 1.1 g kg<sup>-1</sup> of total N, and 0.68 dS m<sup>-1</sup> of initial EC).

**Crop** perennial wall rocket (*Diplotaxis erucooides* L.) cv. *Reset*

**Sowing** October 8, 2020

**Treatments** 4 salinity levels (S) of irrigation water and three biostimulants application (B). The salinity levels were: (no-salinity) -**EC0**; irrigation with water at 2 dS m<sup>-1</sup> -**EC2**, 4 dS m<sup>-1</sup> -**EC4**, and 6 dS m<sup>-1</sup> -**EC6**. The biostimulant treatments were: not treated -**Control**, treated with tropical plant extracts (**BA**) at dose of 2 ml l<sup>-1</sup>, and treated with legume-derived protein hydrolysate (**BT**) at dose of 2 ml l<sup>-1</sup>.

**Design** randomized complete block design and replicated three times

**Harvest** six harvests starting from November 25, 2020 until May 20, 2021

At each harvest, yield (kg m<sup>-2</sup>), number of leaves per square meter, and average weight of leaves were determined; in addition, dry matter percentage was calculated.

### Results

Saline water negatively affected the fresh yield of perennial wall rocket, with a linearly decrease at increasing of saline stress (Fig. 1); indeed, the yield percentage decrease of the saline treatments with respect to EC0 was 4.8%, 19.6%, and 33.4% for EC2, EC4, and EC6, respectively. Both biostimulants elicited a 36.5% increase in yield of perennial wall rocket over not treated plants (Fig. 2), without differences between the two biostimulants.

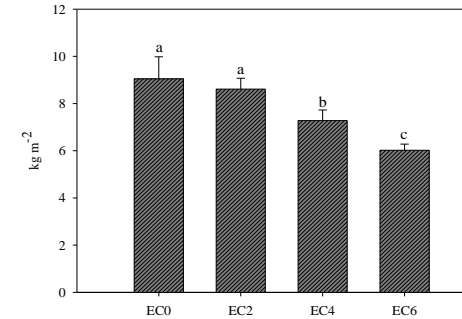


Figure 1. Effect of saline water irrigation on total yield of perennial wall rocket.

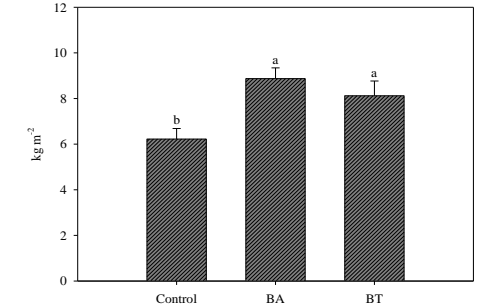


Figure 2. Effect of biostimulant application on total yield of perennial wall rocket.

The main effect of the two experimental factors also affected the number of leaves per square meter, which significantly decreased at the increase of saline stress, resulting in a 35% decrease in the most stressed treatment, instead, it increased in plants sprayed with biostimulants (+41.36% over Control) (Table 1). Instead, no differences were found for the average weight of leaf neither under saline stress neither under biostimulants application. Finally, in the two most stressed treatments (EC4 and EC6), the leaves dry matter was higher than EC0 and EC2, as well as the treatment with legume-derived protein hydrolysate determined an increase in leaves DM with respect to the mean value of the other two treatments (+6.1%), but in none case, the differences were significantly (Table 1).

Table 1. Main effect of saline water irrigation and biostimulant application on number, average weight, and dry matter (DM) percentage of leaves of perennial wall rocket (average values of the six harvests).

Treatments	Leaves		Leaves DM
	n° m <sup>-2</sup>	g leaf <sup>-1</sup>	%
EC0	7660.8 a	0.26	10.74
EC2	6833.3 b	0.28	10.19
EC4	6083.3 c	0.27	11.28
EC6	4974.2 d	0.26	11.06
Control	5010.8 b	0.27	10.36
BT	6948.3 a	0.26	11.25
BA	7208.3 a	0.28	10.84
<b>Significance</b>			
Salinity (S)	**	ns	ns
Biostimulant (B)	**	ns	ns
S x B	ns	ns	ns

### Conclusions

The salinity negatively affects yield and number of leaves per harvest, while it increases the dry matter percentage of leaves of perennial wall rocket. The biostimulants application improves both analyzed parameters, and only legume-derived protein hydrolysate positively affects the leaves' dry matter too. Further studies could better explain the possible interaction between these two factors.