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Effect of Biostimulant Application on Yield of Rocket Subjected to Different Nitrogen Levels and Grown under Different Greenhouse Cover Films

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Introduction

Perennial wall rocket is an important leafy vegetable mostly cultivated in greenhouses; the optical properties of greenhouse cover film can strongly affect crop yield but also quality. To date, various commercial products are available in the market, and they differ by several factors, between which light diffusion and solar radiation transmission. The diffused light films are widely spreading, indeed, it is well known that diffuse radiation determines beneficial effects on plant productivity. In addition, light intensity also influences the nitrate content in leaves, that is a fundamental aspect of quality especially for nitrate hyper-accumulating species, such as rocket. The aim of the research was to explore the effect of two greenhouse films with different optical characteristics on yield of rocket cultivated under different nitrogen levels, combined or not with biostimulant application.

Materials and Methods

Site Department of Agricultural Science - University of Naples Federico II, Portici ;
two plastic tunnels covered with a material with different optical characteristics

Soil sandy (253 ppm P_2O_5, 490 ppm K_2O, organic matter 2.5% and total N 0.09%)

Crop Perennial wall rocket (*Diplotaxis erucoides* L.) cv. *Reset*

Transplant October 8, 2020

Treatments 2 films **T1** (SUNSAVER Diff) and **T2** (LIRSALUX) were combined with 3 nitrogen levels (not fertilized control = **N0**, sub-optimal N dose, 25 kg ha^{-1} = **N25**, and optimal N dose, 50 kg ha^{-1} = **N50**) and 2 biostimulants application (treated with Stimolo Mo = **St-Mo**, at dose of 3 ml l^{-1}; not treated = **Control**).

Harvest 7 times, starting on November 27, 2020 and until June 11, 2021

At each harvest, yield, number of leaves per square meter, and average weight of leaves were determined. The yield is reported as the sum of all harvests instead, the other parameters are reported as the mean of the 7 harvests.

Results

Interaction of greenhouse cover film and N fertilization affected the total yield of perennial wall rocket; under T1 film, the yield was always higher than T2 (+33.1%), and under both films, yield increased at N dose increasing (Fig. 1). The mean value of fertilized treatments was 10.1 and 7.5 kg m-2 under T1 and T2 films, respectively. Interestingly, the T1_N25 was not different from T2_N50. Also the interaction between cover films and biostimulant application was significant (Fig. 2); under both films, the plants treated with St-Mo reached a higher value than Control plants, with a 62.6% and 46.2% increase under T1 and T2, respectively. The number of leaves per square meter per each harvest was significantly higher under T1, as well as it statistically increased with N dose increase and in plants treated with St-Mo (Table 1). The greenhouse film didn't affect average leaf weight and leaves dry matter, which instead were influenced both by N dose and biostimulant application, but with different trends (Table 1). Indeed, average leaf weight increased and leaves dry matter decreased at N levels increasing but for leaves DM without differences between N25 and N50. Finally, St-Mo elicited a 22% increase in average leaf weight but leaves had a lower dry matter percentage (Table 1).

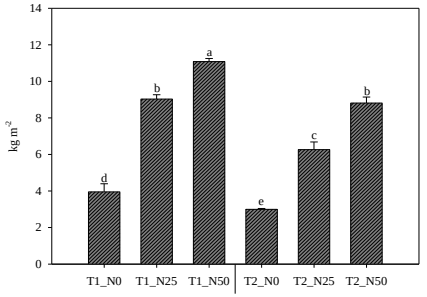

Figure 1. Effect of greenhouse cover film and N fertilization on total yield of rocket.

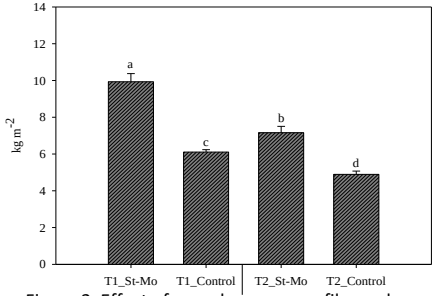

Figure 2. Effect of greenhouse cover film and biostimulant application on total yield of rocket

Treatments	Leaves		Leaves DM
	n° m^{-2}	g $leaf^{-1}$	%
T1	6520.4 a	0.20	11.3
T2	5082.9 b	0.20	12.1
N0	3921.4 c	0,15 c	14.1 a
N25	6245.7 b	0,21 b	10.9 b
N50	7238.2 a	0,24 a	10.3 b
Control	5057.1 b	0.18 b	12.6 a
St-Mo	6546.4 a	0.22 a	10.8 b
Significance			
Greenhouse film (T)	**	ns	ns
Fertilization (F)	**	**	*
Biostimulant (B)	**	**	**
T x F; T x B; F x B; T x F x B	ns	ns	ns

Conclusions

The film with transmissivity to UV-B radiation resulted in the best productive performance, assuring already at N sub-optimal dose (25 kg ha^{-1}) yield similar to optimal N dose reached by plants grown under the plastic film which blocks UV-B radiation. Also biostimulant application boosted rocket yield greatly under film with transmissivity to UV-B radiation.