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Improvement of tomato aromatic compounds through novel organic substrates from *Posidonia oceanica* residues

Borja Ferrández-Gómez[1], Antonio Sánchez-Sánchez[1], Juana D. Jordá[1], Mar Cerdán[1]

[1]Department of Biochemistry, Molecular Biology, Edaphology and Agricultural Chemistry, University of Alicante, Alicante, Spain.

borja.ferrandez@ua.es

INTRODUCTION

Tomato (*Solanum Lycopersicum* L.) is the most popular fruit crop worldwide

The **deterioration of the flavor quality** of commercial tomatoes is one of the main causes of consumer complaints

One of the most important factors influencing the synthesis of aromatic compounds in tomato is the **growing medium**, though studies on the effect of the growing substrate on its volatile profile **are limited**

***Posidonia oceanica* L. Delile (PO)** is a marine seagrass endemic to the Mediterranean, forming underwater meadows protected under the European Habitats Directive (92/43/EEC)

These meadows are essential for **water oxygenation, sediment stabilization, coastal erosion prevention, and as habitats for various marine species**

PO contains **high levels of nutrients and secondary metabolites** that play a key role

When its leaves die, they accumulate on beaches, creating environmental and economic issues in tourist areas as they must be **removed**

These residues, classified as **urban waste**, are taken to landfills, where their slow decomposition leads to **long-term accumulation**

Valorization of marine waste for the development of new products with agronomic interest

OBJECTIVES

O.1 **To evaluate the influence of the cultivation substrate on the physicochemical properties of tomatoes obtained in the first fruiting.**

O.2 **To improve the aromatic and flavor properties of tomato through the use of novel growing media obtained from the remains of PO, favoring the revalorization of residues.**

EXPERIMENTAL SECTION

- Tomato seedling cv. sweet Cherry
- Treatments:
  1. **Control:** 50% peat–50% perlite.
  2. **PO:** 50% PO washed/sieved–50% perlite.
  3. **IP:** 50% PO unaltered–50% perlite.
- 9 weeks under controlled temperature conditions (18°C/27°C (night/day)), 60% RH, and two daily irrigations of 100 mL with tap water.

Characterization in fruit

- **Fresh weight**
- **Size**
- **Total soluble solids**
- **Macro- and micronutrient**
- **%Acidity**
- **Volatile compounds by SPME-GC/MS**

RESULTS & DISCUSSION

Table 1. Quality parameters on tomato fruits for the different soilless substrates proposed.

Treatment	FW (g)	Size (mm)	TSS (°Bx)	Acidity (%)	Ripening index
Control	4.97	19.8	8.7	0.25	34.4
PO	5.77	22.1	7.4	0.23	45.7
IP	4.65	18.0	10.0	0.39	22.1

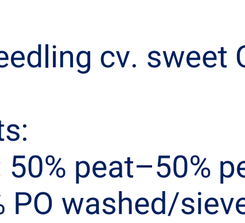
Table 2. Mineral analysis on tomato fruits for the different soilless substrates.

Treatment	Control	PO	IP
P (mg/kg)	6436	5463	5898
Na (mg/kg)	513	849	1594
K (mg/kg)	25814	25689	20073
Mg (mg/kg)	1153	1390	1099
Ca (mg/kg)	291	562	430
Mn (mg/kg)	18	6	5
Fe (mg/kg)	49	47	30
Zn (mg/kg)	31	22	17
Cu (mg/kg)	3.5	1.8	1.7
Si (mg/kg)	18	23	9

This variation was due to the high salinity of the IP sample, which resulted **from not washing away the salts from the *Posidonia oceanica* debris**, favoring the production of sweeter, although smaller, tomatoes

Volatile compounds analysis by SPME-GC/MS

IP substrate, followed by PO and the control, presented the highest concentrations:



Octanal

Hexyl acetate

Citrusy, fresh, and sweet aromas

α-terpineol

Nonanal

Tomatoes from PO treatments also had a notable concentration of these compounds that, contributing to their herbal and fresh notes

CONCLUSION

- The composition of secondary metabolites, macro and micronutrients, as well as the high silicon concentration of *Posidonia oceanica* produced a slight stress in the tomato plants that allowed the activation of the intrinsic response mechanisms of tomato plants.
- The substrate from PO favored an enrichment in Na, conferring a salty point to the tomato in a natural form.
- It is important to note that the composition of the growing substrate had a direct effect on the organoleptic, ripening and quality properties of the tomatoes.

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