Cyprus University of Technology

9th International Conference on Sustainable Solid Waste Management
15 - 18 June 2022
Corfu, Greece

Olive-mill and grape-mill waste as a substitute growing medium component for unexplode vegetables production in nurseries

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Financial support has been provided by PRIMA (ValueFarm project), a programme supported by the European Union with co-funding by the Funding Agencies RIF – Cyprus.

Introduction

Oliveculture and grape-vines production are the main crops in Mediterranean basin and in several other places all over the world.

Intensive crop production is revealing high yields but also great amount of wastes being of environmental and human health concern.

Olive mill waste, including olive leaves, pulp, and stones and also olive mill wastewater present great organic load and high phenolic components with phytotoxic effects and also great amounts of nutrients (K, N, P, Ca, Mg, Fe).

Wine industry produces increasing amount of liquid and solid wastes, whose management and disposal pose environmental difficulties due to both the seasonal nature and polluting attributes of these residues.

Introduction

Under nursery and greenh… based material is the principal constituent of media u… series production of young and potting p…

Approximately 14-20% of extracted peat is … sector.

Due to high cost of peat extraction, transportation and e… constrains (greenhouse gases emissions, carbon loses), alternatives to peat are examined.

- Olive mill wastes
- Grapes mill waste
- Paper waste
- Compost
- Biochar
- Sawdust
- Coffee waste
- Citrus peel waste
- Bark
- Sewage sludge

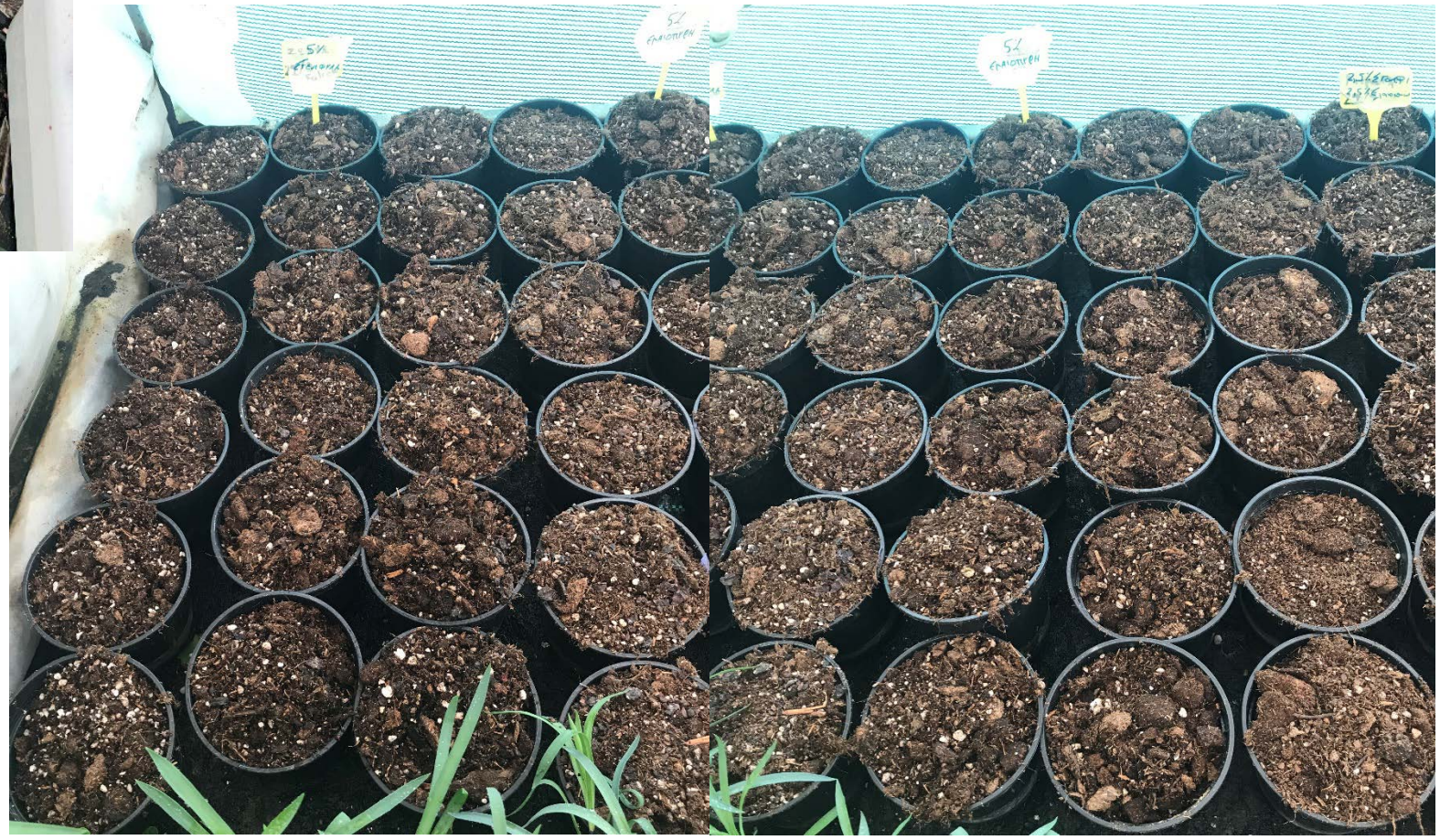
Experimental layout

- **Plant based waste:**
  olive-mill wastes (OMW)
  grape-mill wastes (GMW)
- **Species:**
  Portulaca oleraceae (purslane)
  Sonchus oleraceous (sowthistle)
- **System:**
  Pot culture
- **Growing media:**
  OMW or GMW in different ratios (0-5-10-20-40% v/v) with peat
- **Crop duration:** 25 days
- **Location:** Greenhouse infrastructure at Cyprus University of Technology.

Experimental layout…….

Measurements:

- Physicochemical properties of the growing media (pH, EC, O.O., minerals (N, K, P, Na), total porosity, air filed porosity, bulk density etc).
- Plant growth (plant height, leaf number, fresh and dry plant weight).
- Physiological (chlorophylls, total carotenoids, leaf stomatal conductance, leaf fluorescence).
- Minerals (N, K, P, Ca, Mg with AAS and Kjeldahl).
- Antioxidants (polyphenols, flavonoids and antioxidant activity- FRAP, DPPH).
- Damage index and antioxidant enzymes (H_2O_2, lipid peroxidation, SOD, CAT, APX).

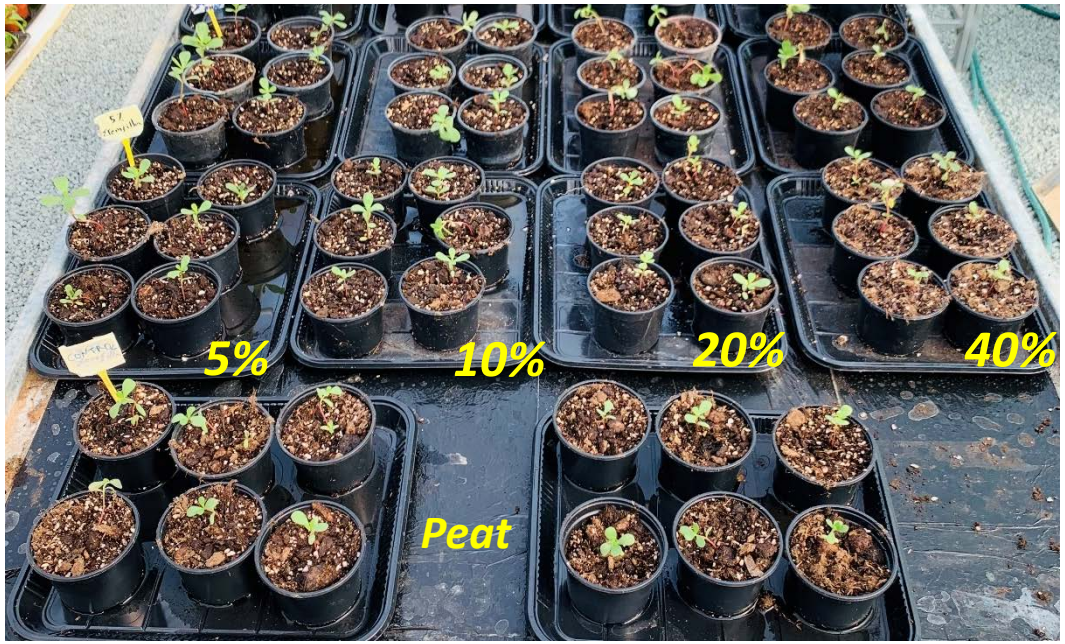


5% 10% 20% 40%

Peat

Sonchus oleraceous

Portulaca oleraceae



Olive Mill Waste-OMW

	Peat 100%	OMW 5%	OMW 10%	OMW 20%	OMW 40%	OMW 100%
pH	6.43 c	6.59 bc	6.46 c	6.51 bc	6.73 a	6.57 b
EC (µS/cm)	209.65 e	226.10 e	290.30 d	350.40 c	612.25 b	1006.60 a
Organic matter (%)	94.14 bc	93.63 c	94.72 ab	94.57 ab	94.51 ab	95.15 a
N (g/kg)	6.73 b	7.41 ab	7.71 ab	7.64 ab	7.61 ab	8.19 a
K (g/kg)	1.51 e	2.41 d	2.74 d	3.43 c	4.01 b	6.23 a
P (g/kg)	0.93 a	0.84 b	0.82 bc	0.78 c	0.63 d	0.65 d
Na (g/kg)	0.34 a	0.32 ab	0.30 bc	0.31 b	0.27 d	0.28 de
Total porosity %	82.59 a	74.71 b	81.74 ab	75.84 b	74.79 b	80.40 ab
Air filled porosity (% v/v)	12.86 a	8.93 c	11.43 ab	6.61 d	5.36 d	8.00 bc
Bulk density (g/cm^3)	0.18 e	0.18 e	0.22 d	0.24 c	0.35 b	0.50 a
Container capacity (% v/v)	69.73 a	65.78 a	70.32 a	69.24 a	69.43 a	70.40 a

Adding OMW ➔ ↑ EC, OO, N,K, bulk density

↓ P, Na

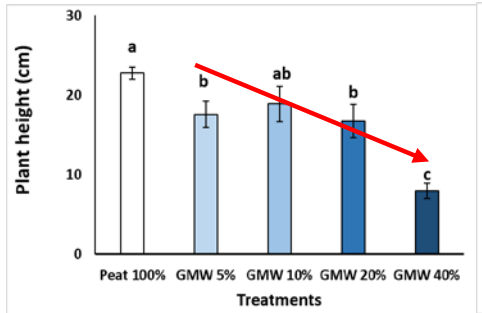
Grape Mill Waste-GMW

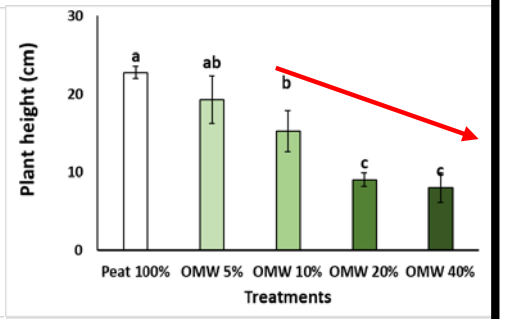
	Peat 100%	GMW 5%	GMW 10%	GMW 20%	GMW 40%	GMW 100%
pH	6.43 e	6.59 d	6.89 c	7.10 b	7.40 a	7.19 b
EC (µS/cm)	209.65 c	230.90 c	265.15 c	351.65 b	388.40 b	767.05 a
Organic matter (%)	94.14 a	93.16 b	92.90 b	93.18 b	92.91 b	92.70 b
N (g/kg)	6.73 f	8.97 e	10.43 d	14.81 c	18.29 b	20.53 a
K (g/kg)	1.51 f	3.56 e	4.57 d	5.79 c	6.75 b	9.86 a
P (g/kg)	0.93 d	1.36 bc	1.26 c	1.57 b	2.10 a	2.08 a
Na (g/kg)	0.34 a	0.34 a	0.31 b	0.27 c	0.21 d	0.13 e
Total porosity %	82.59 c	79.46 cd	77.83 d	75.88 d	87.81 b	99.59 a
Air filled porosity (% v/v)	12.86 c	9.29 d	8.75 d	14.11 bc	15.00 b	33.57 a
Bulk density (g/cm^3)	0.18 d	0.19 d	0.19 d	0.21 c	0.24 b	0.34 a
Container capacity (% v/v)	69.73 ab	70.18 ab	69.08 ab	61.77 c	72.81 a	66.02 b

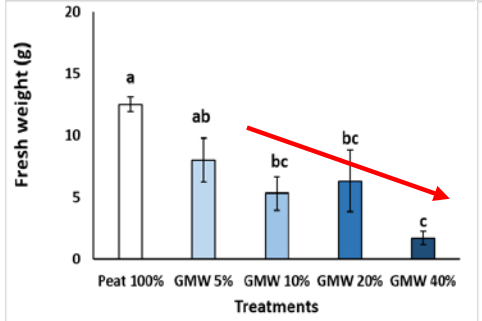
Adding GMW ➔ ↑ pH, EC, N,K, P, Porosity, air filled porosity, bulk density

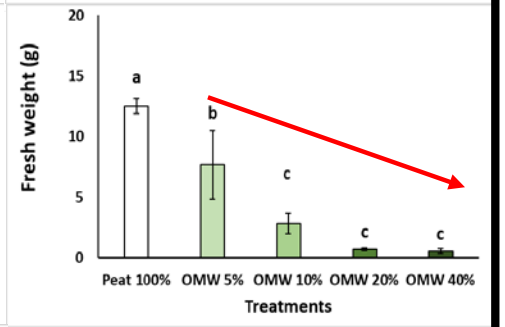
↓ OO, Na

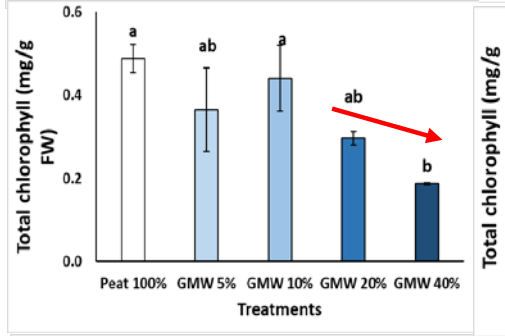
Portulaca oleraceae (purslane)

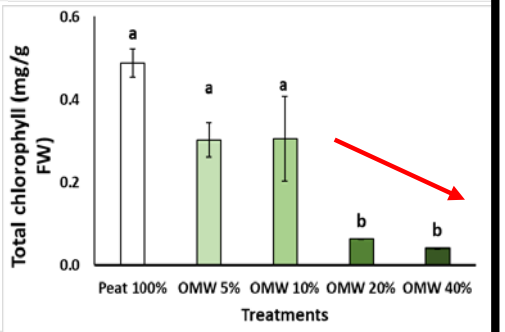


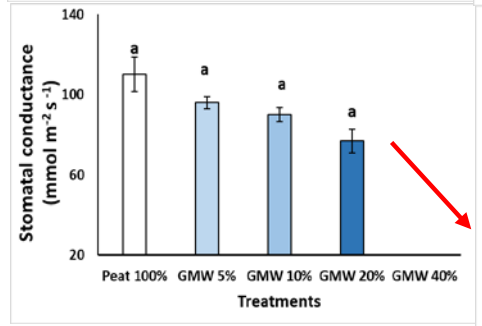


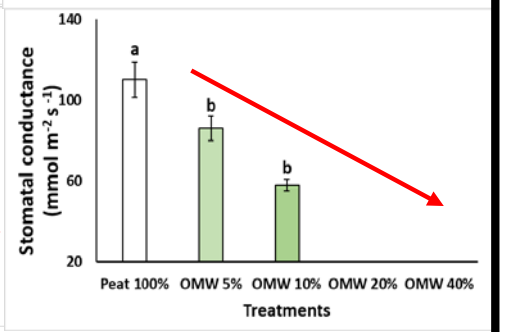




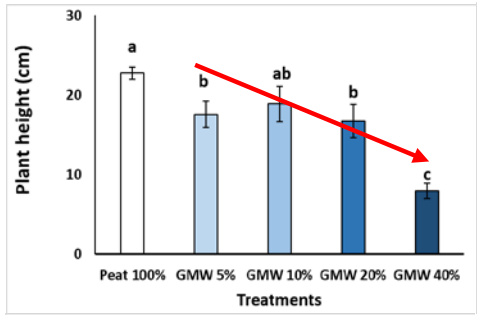


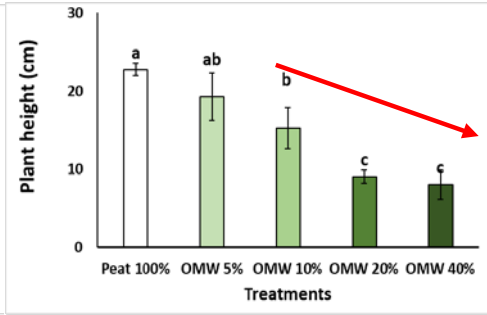


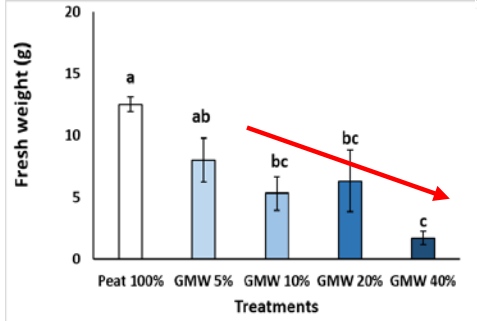


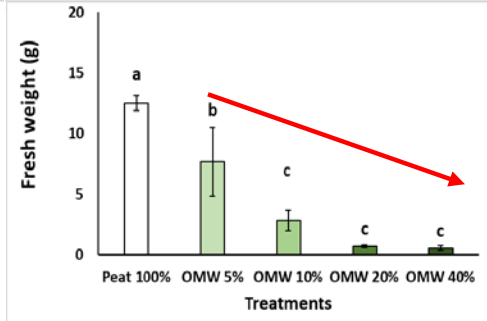


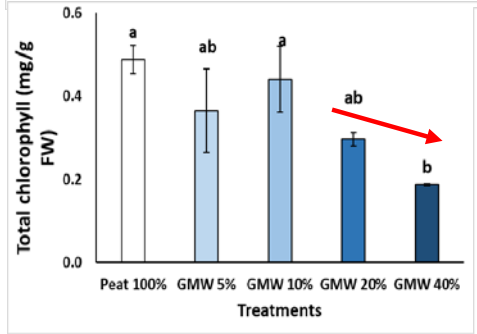
Portulaca oleraceae (purslane)

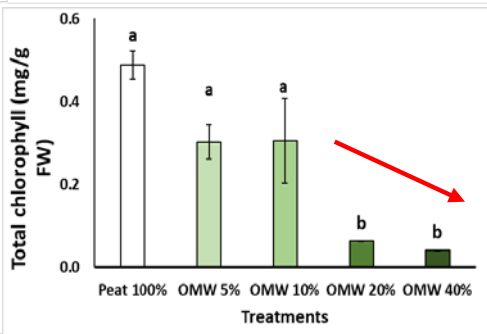


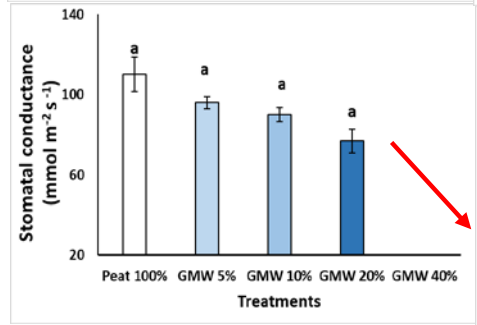


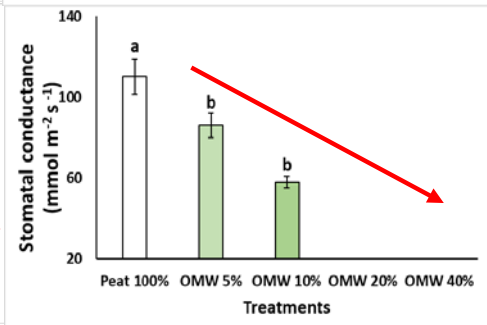




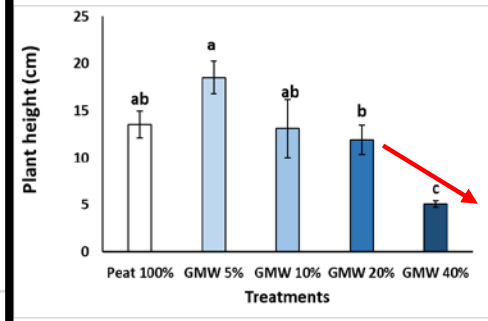


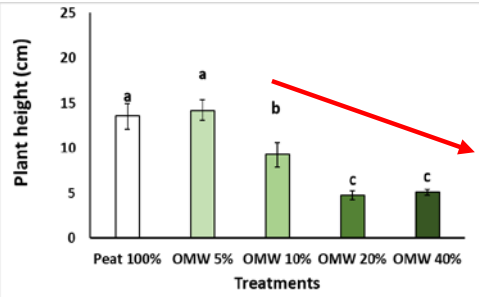


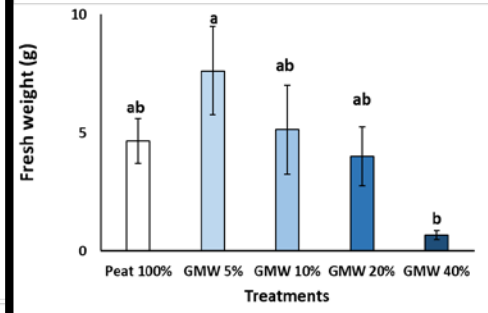


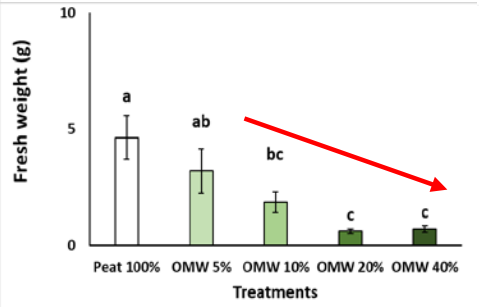


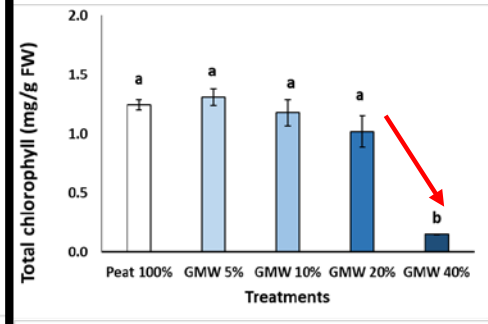
Sonchus oleraceous (sowthistle)

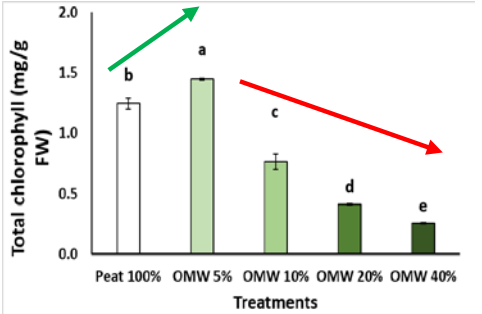


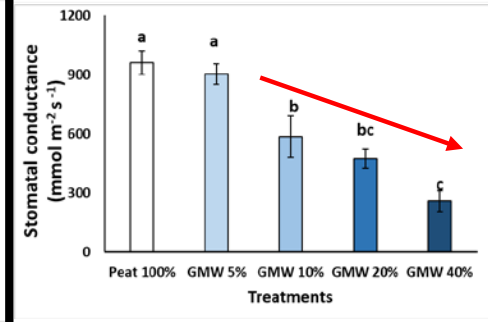


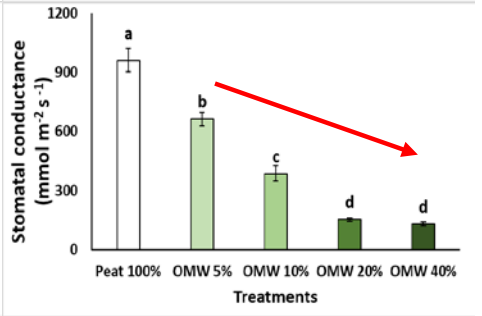




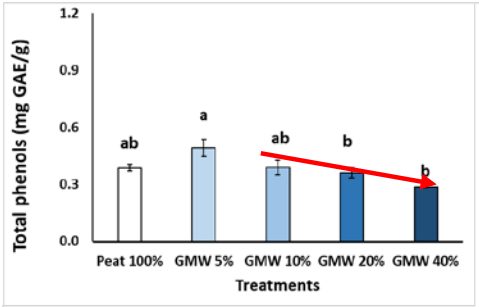


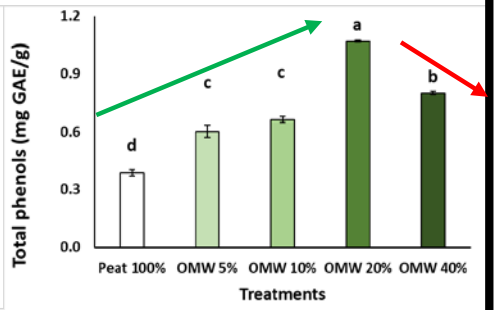


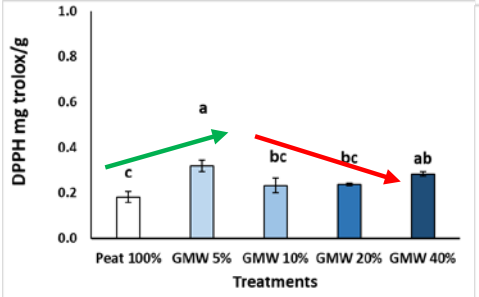


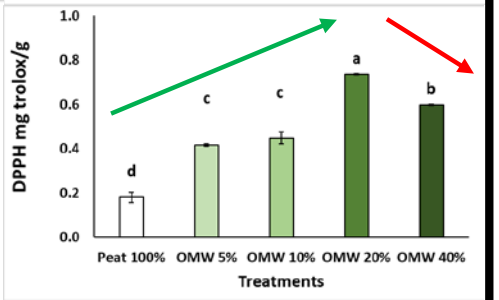


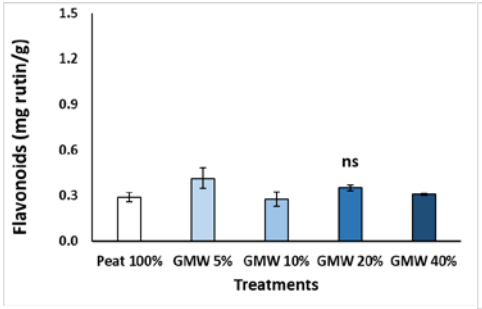
Portulaca oleraceae (purslane)

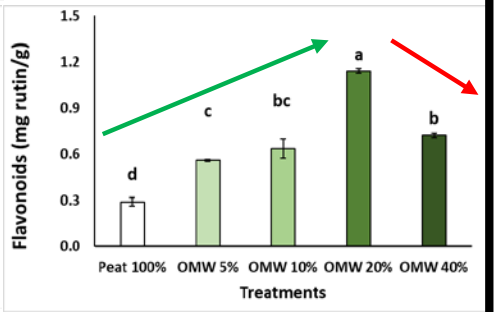












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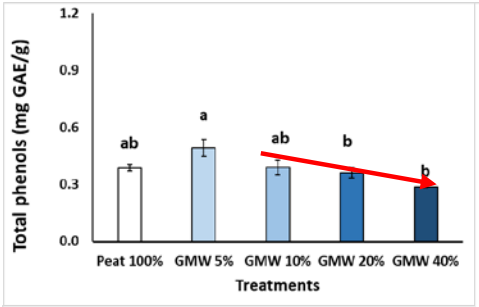
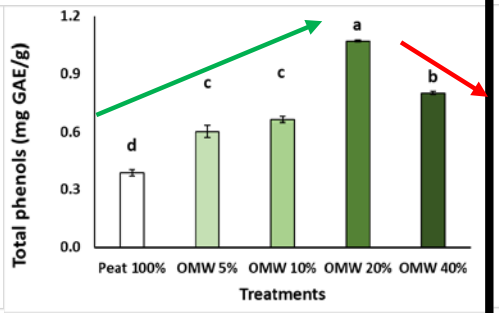
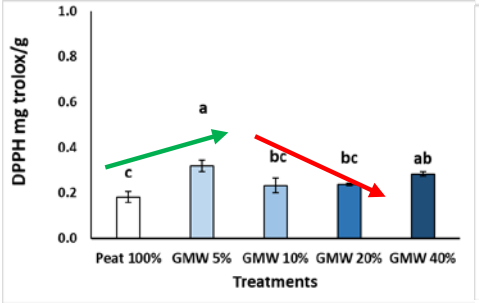
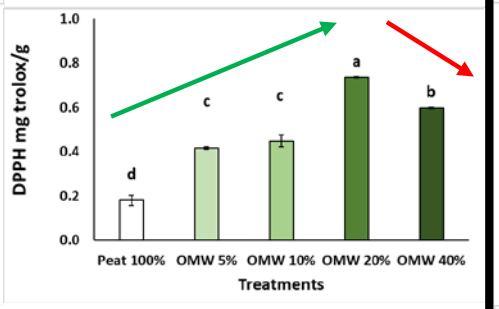
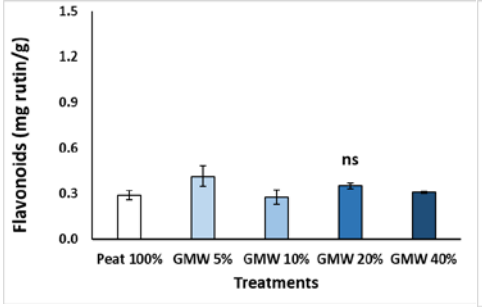
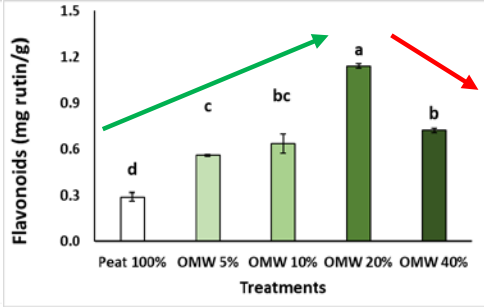




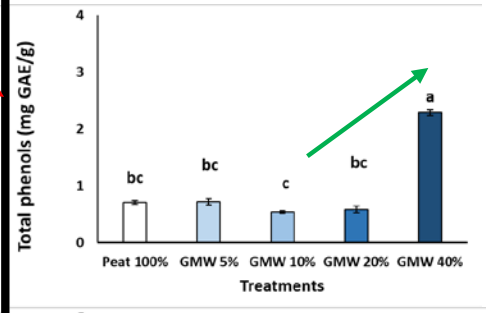


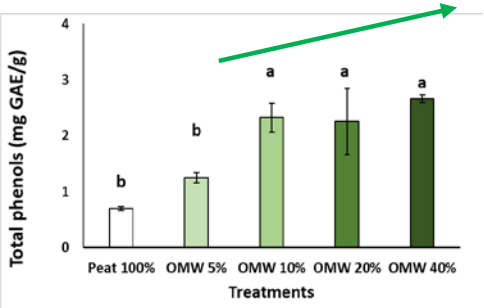


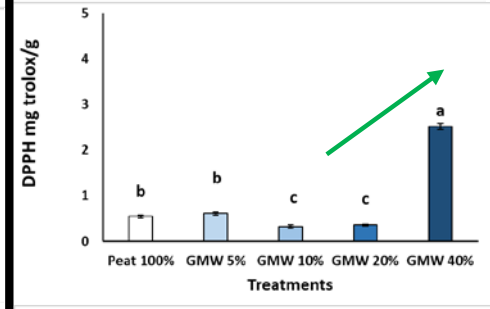


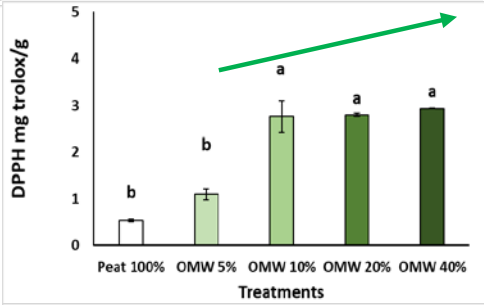


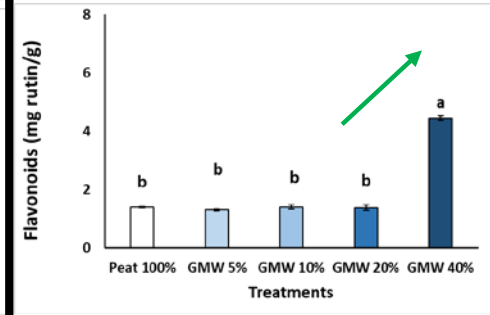
Sonchus oleraceous (sowthistle)

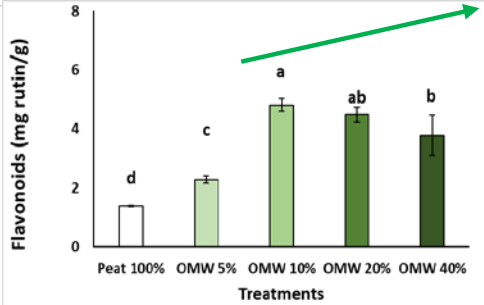




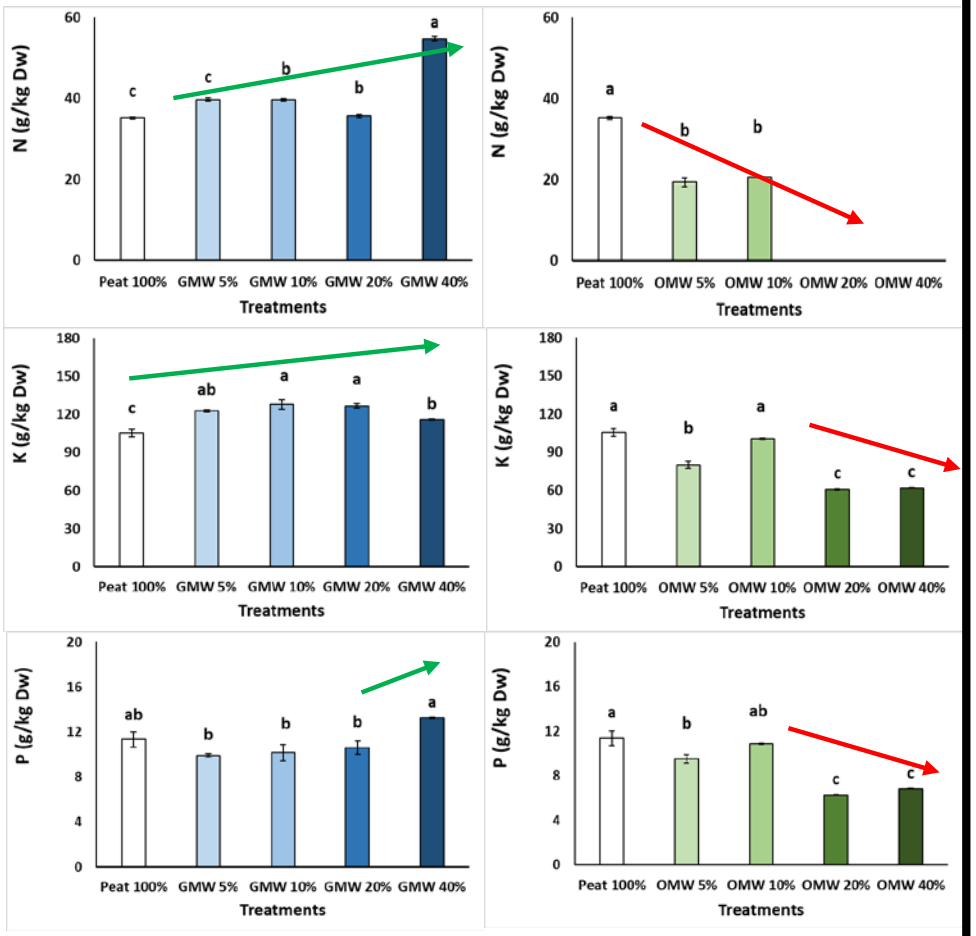








Portulaca oleraceae (purslane)



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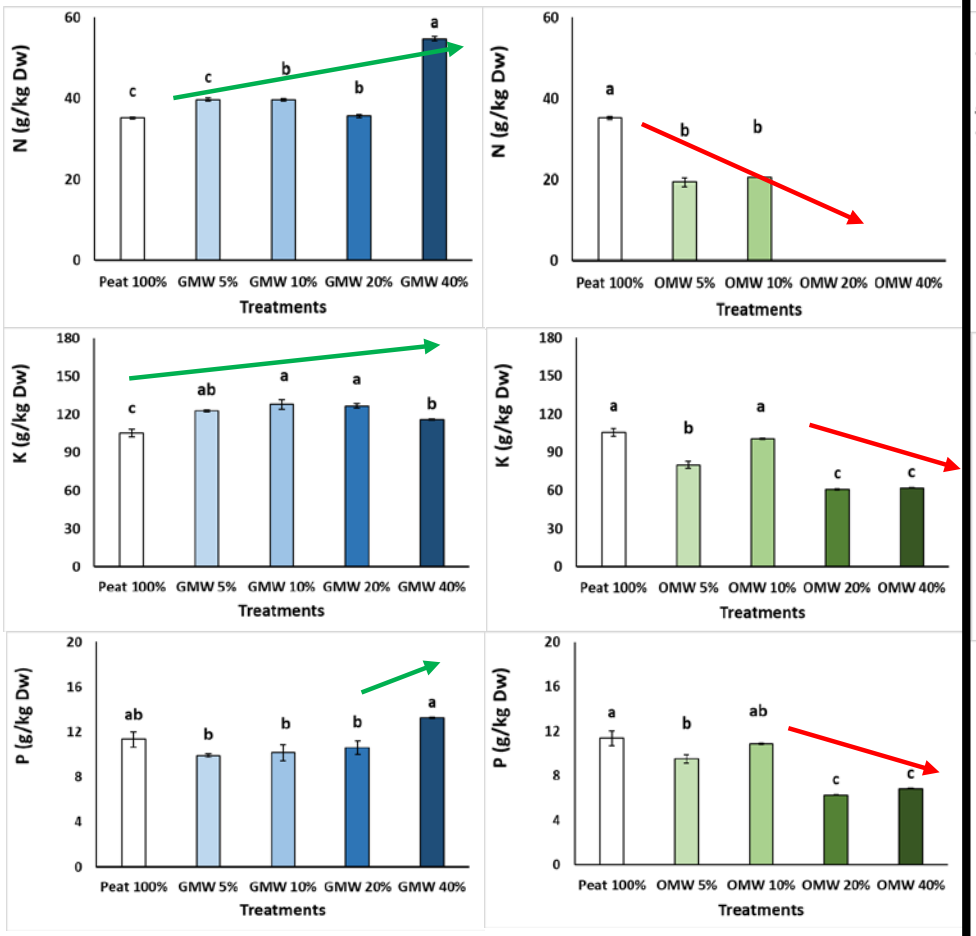
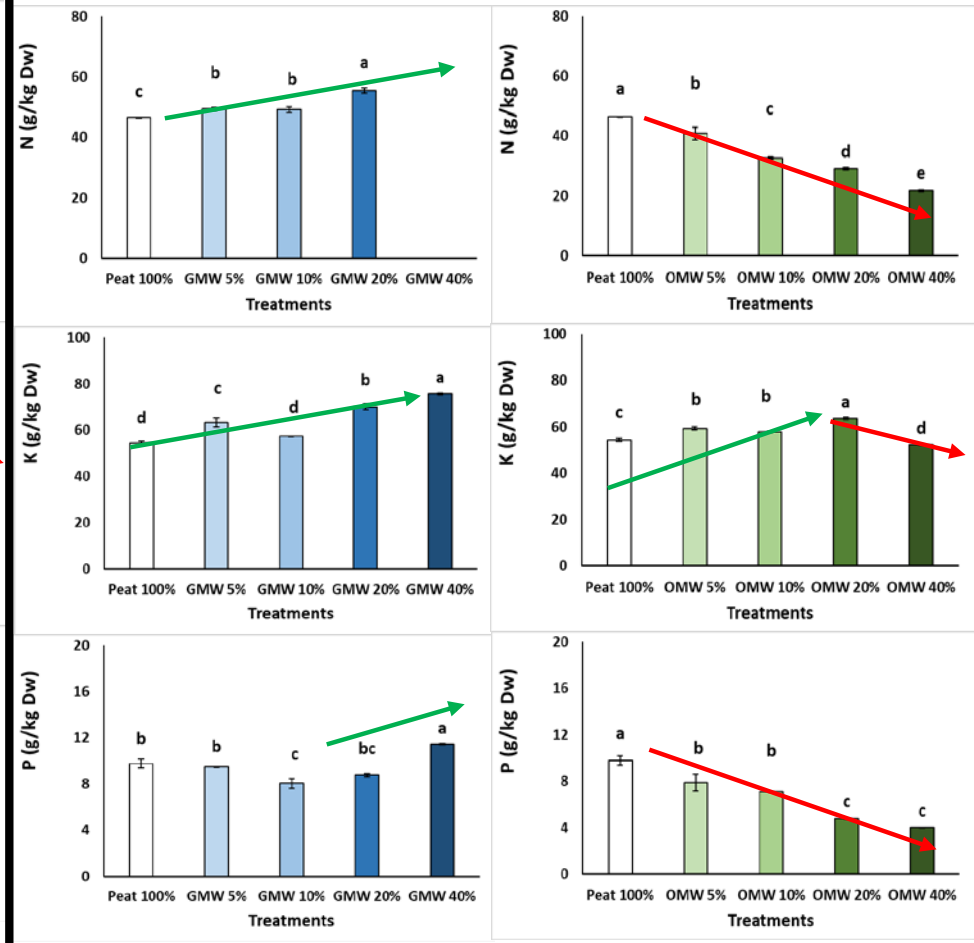


Sonchus oleraceous (sowthistle)



Conclusions:

In ***Portulaca oleraceae***,

- GMW affected plant growth with more pronounced effects at the high ratio of 40%. Plant height, leaf number, plant biomass and chlorophyll content (SPAD) did not change at ≤20% GMW. Leaf stomatal conductance decreased as the GMW ratio increased into the growing media.
- The application of OMW had similar effects as GMW with the high ratios of ≥ 20% *to substantially decrease plant growth (height, number of leaves, fresh and dry weight) and physiological metabolism, with decreased chlorophyll content and leaf stomatal conductance.*

In ***Sonchus oleraceous***,

- The addition of GMW up to 10% stimulated or did not affect the plant height, number of leaves, fresh weight and chlorophylls. In contrast, OMW at ≥10% decreased plant growth. Leaf stomatal conductance was decreased proportionally with the increased ratios of GMW and OMW into the growing media.

Conclusions:

- The application of GMW and OMW affected to some extent the antioxidant activity, total phenolic content and total flavonoids in both species

- Both OMW and GMW provided mineral enrichment to the growing media which is of great importance regarding the fertilizers/mineral management during plant growth.

- Both GMW and OMW can be used in the growing media at low ratios of 10% and 5%, respectively.

Sonchus sp.

Portulaca oleracea L.

Thank you for your attention

Any questions?

Financial support has been provided by PRIMA (ValueFarm project), a programme supported by the European Union with co-funding by the Funding Agencies RIF – Cyprus.