Stinging nettle cultivation in floating hydropon

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Introduction

Stinging nettle *(Urtica dioica* L.)

- Perennial herb widely distributed throughout the temperate regions of the world (Bacci et al., 2009)
- Best known as an abundant weed (Weiβ, 1993; Harwood and Edom, 2012)
- Undervalued despite great medicinal value (Bisht et al., 2012)

Introduction

Stinging nettle *(Urtica dioica* L.)

- Long history of use in alternative medicine for the treatment of many diseases
- Source of fiber and natural green color
- Recently recognized as a promising plant because of its exceptional nutritional, medicinal and economic value

Introduction

Stinging nettle *(Urtica dioica* L.)

- Used in medicine, food industries, textile industries, cosmetic industries and in organic production
- Source of essential nutrients, vitamins, minerals (Rutto et al., 2013) phenolic compounds (Otles et Yalcin, 2011)
- Expressed antioxidant and antimicrobial activity (Stepanović et al., 2009)

Introduction

Stinging nettle *(Urtica dioica* L.)

- If nettle is grown as a leafy vegetables harvest should be done before flowering
- The largest percentage of stinging nettle is wild - harvested (Upton, 2013)
- When nettles are gathered from natural habitat the control of quality standards is difficult (Weiβ, 1993)
- Excessive collection from nature leads to habitat degradation ⇨ natural resources are limited

Introduction

- It is necessary to introduce nettle in agricultural production
- ✓ Application of modern cultivation technology (floating hydropon) can eliminate problems of growing nettle in the open field
- ✓ Consistent quality of plant material, higher yield and increased number of harvest can be achieved

Aim of the research

The aim of research was:

- to examine the possibility of growing nettle in floating hydropon
- to determine the effect of sowing densities and different substrates on morphological characteristics and nettle yield

Material and methods

- *Urtica dioica* L.
- Autumn and spring growing period, 2012/2013
- Two factorial trials
  - three sowing densities: 0.2, 0.5 and 0.9 g m^{-2}
  - two substrates: perlite, vermiculite
- Randomized block scheme with 3 replication
- Sowing was made in polystyrene boards, on September 6, 2012

❖ Nutrient solution was adjusted for leafy vegetables and prepared according to Tesi (2002)

Abiotic parameters

➢ Air

- minimum, maximum and mean temperature
- relative humidity

➢ Nutrient solution

- pH- and EC-values

Material and methods

Harvests

- Autumn growing period
  - 1. harvest: October 23, 2012
  - 2. harvest: November 29, 2012
- Spring growing period
  - 1. harvest: March 15, 2013
  - 2. harvest: April 16, 2013
  - 3. harvest: May 6, 2013

Material and methods

- The cutting was at the height approximately 5 centimeters

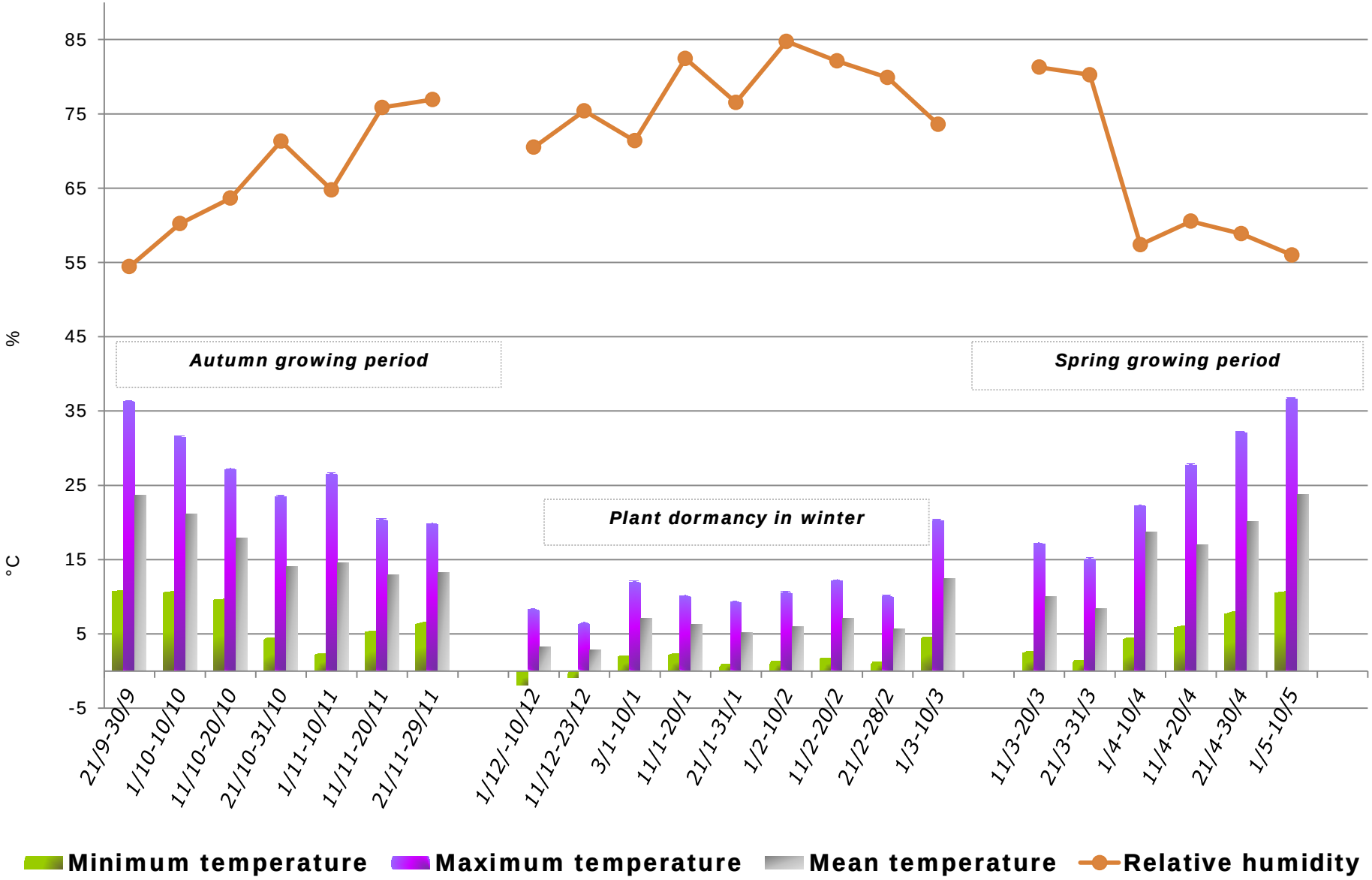
- Because of the capability of the apical plant parts regeneration it is possible to achieve several harvests

Material and methods

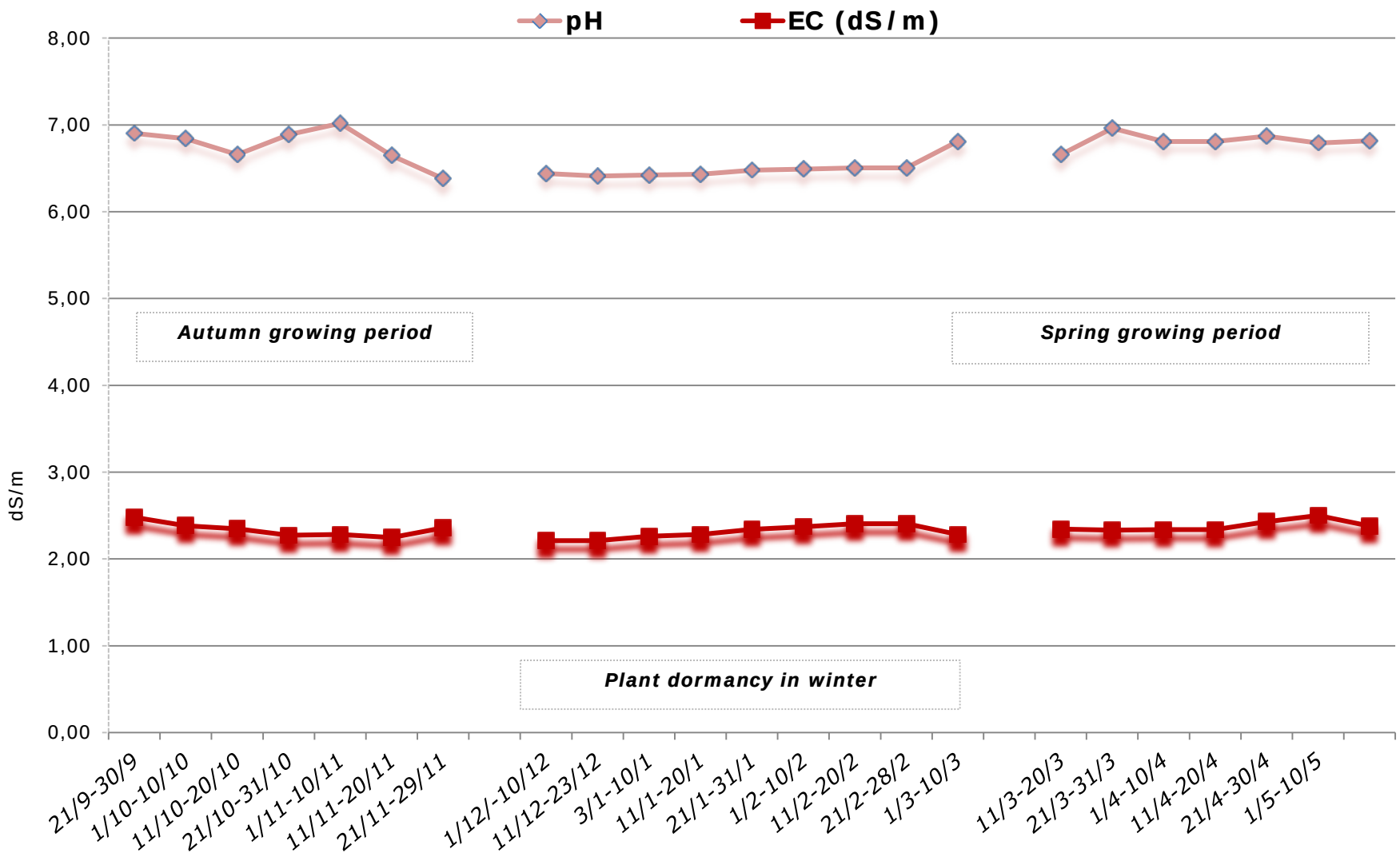
- Morphological characteristics (plant mass, number, length and width of leaves, number of nodes, plant height) and nettle yield were analyzed

- Statistic analysis: ANOVA ⇒ LSD test, significance at $p \leq 0.05$ and $P \leq 0.01$.

Abiotic parameters of air



Abiotic parameters of nutrient solution



Results – Analysis of variance for morphometric parameters in autumn growing period

Source of variance	Plant mass, g	Number of leaves	Length of leaves, mm	Width of leaves, mm	Number of nodes	Plant height, mm
First harvest						
Substrate (S)	*	*	*	**	*	**
Sowing density (D)	**	*	n.s.	**	*	**
S×D	*	*	**	**	**	**
Second harvest						
Substrate (S)	*	*	*	**	**	*
Sowing density (D)	**	**	**	**	**	**
S×D	*	**	**	**	*	**

*significant at p≤0.05,

**P≤0.01, n.s.=not significant

Results – Analysis of variance for morphometric parameters in spring growing period

Source of variance	Plant mass, g	Number of leaves	Length of leaves, mm	Width of leaves, mm	Number of nodes	Plant height, mm
First harvest						
Substrate (S)	**	*	*	**	**	**
Sowing density (D)	**	**	**	**	**	**
S×D	**	**	**	**	**	**
Second harvest						
Substrate (S)	*	*	*	**	**	*
Sowing density (D)	**	**	**	n.s.	**	**
S×D	**	**	**	**	**	**
Third harvest						
Substrate (S)	*	*	*	*	**	*
Sowing density (D)	**	*	*	**	**	**
S×D	*	**	*	**	*	**

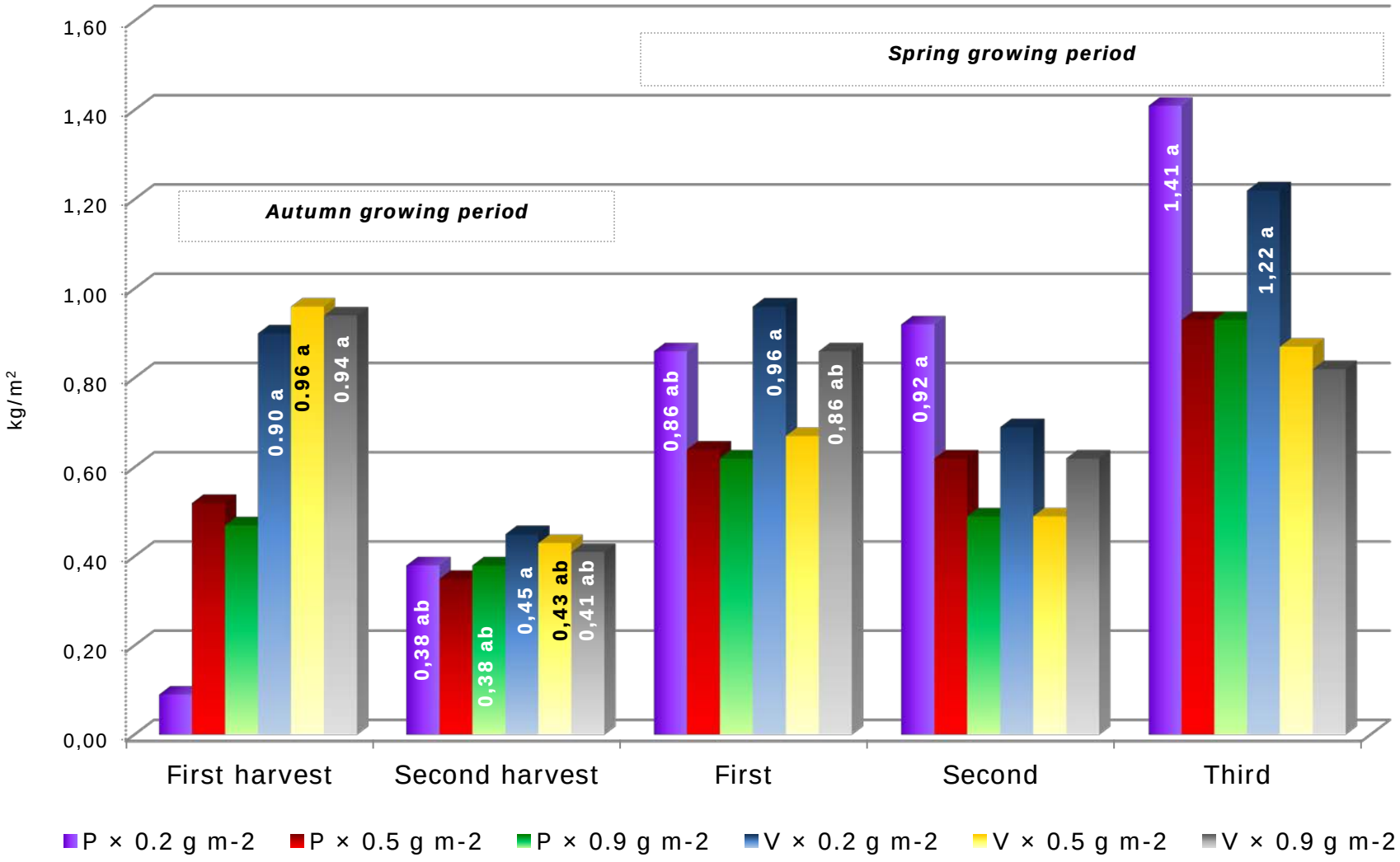
*significant at p≤0.05, **P≤0.01, n.s.=not significant

Results – Effect of substrate and sowing density on stinging nettle yield

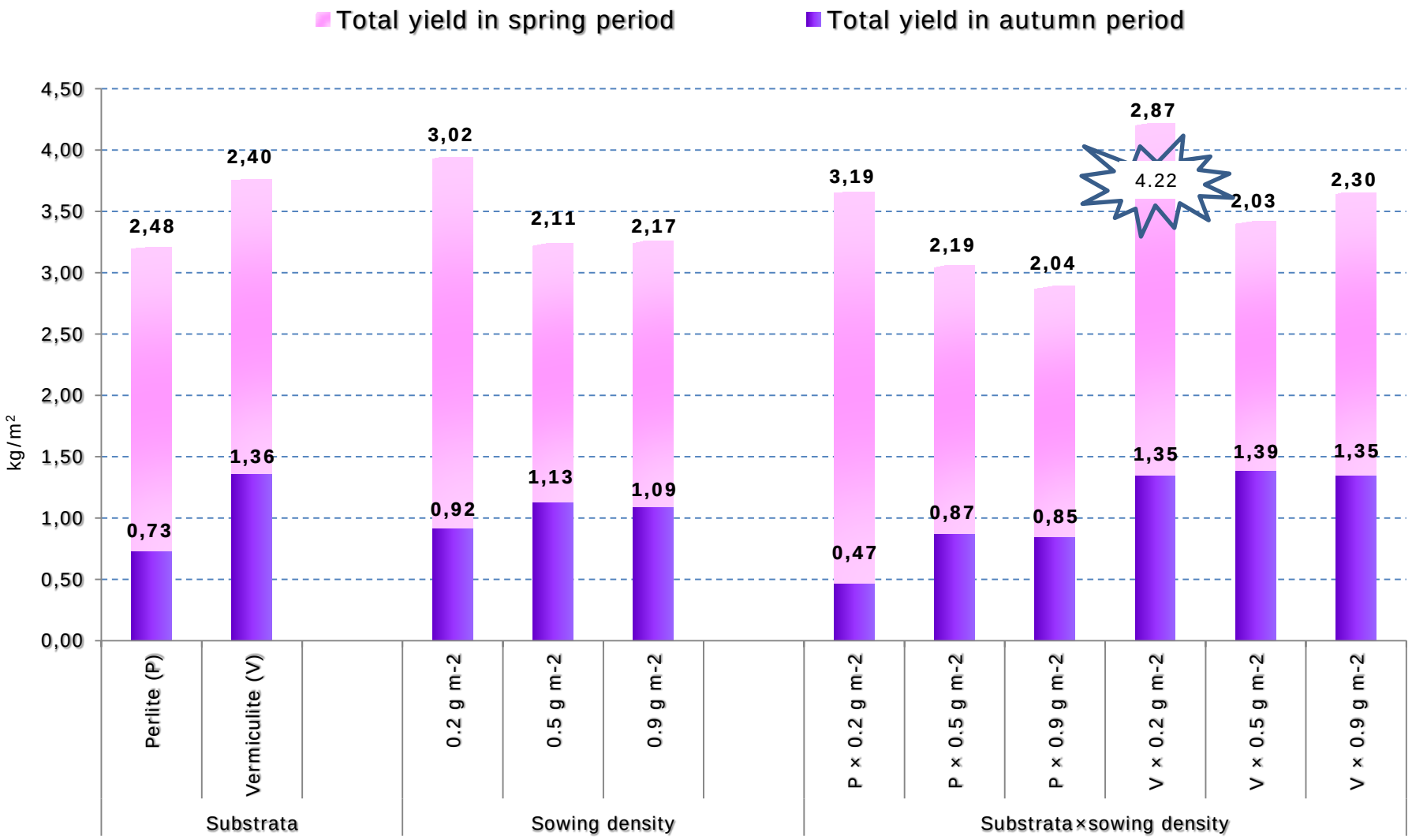
Yield (kg m^{-2})					
Treatment	**Autumn growing period**		**Spring growing period**		
	First harvest	Second harvest	First harvest	Second harvest	Third harvest
Substrate					
Perlite (P)	0.36 B	0.37	0.71 b	0.68	**1.09 a**
Vermiculite (V)	**0.93 A**	0.43	**0.83 a**	0.60	0.97 b
Sowing density					
0.2 g m^{-2}	0.50 b	0.42	**0.91 A**	**0.80 A**	**1.31 A**
0.5 g m^{-2}	**0.74 a**	0.39	0.65 B	0.56 B	0.90 B
0.9 g m^{-2}	**0.70 a**	0.39	**0.74 AB**	0.56 B	0.87 B

*Mean values followed by the same letter within each column do not differ significantly at $p \leq 0.05$ and $P \leq 0.01$ according to the LSD test

Results – Effect of substrate x sowing density on stinging nettle yield



Results – Effect of substrate and sowing density on nettle total and cumulative yield



Conclusions

- Stinging nettle showed good suitability to soilles cultivation by floating system achieving satisfactory yield per harvest
- The highest yield was recorded in third harvest in spring growing period by combination perlite × 0.2 g m^{-2} (1.41 kg m^{-2}) and vermiculite × 0.2 g m^{-2} (1.22 kg m^{-2})

Conclusions

- The highest cumulative yield:
  - In spring: perlite × 0.2 g m^{-2} (3.19 kg m^{-2})

- Combination perlite × 0.2 g m^{-2} can be proposed for nettle cultivation in floating hydropon

Conclusions

- Further investigations: nutritional and chemical values at different nutrient solutions

Thank you for Your attention ☺