Selenium and its compounds in selenium and iodine enriched pea sprouts

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1. INTRODUCTION

Selenium and iodine are essential trace elements for human and animals health. Slovenia is known as a country with low selenium (up to 0.7 µg/g) and iodine content in soil and consequently cultivated plants contain low concentrations of both elements. To avoid health problems caused by selenium and iodine deficiency, other sources of these two elements should be found. Selenium and/or iodine enriched cultivated plants could be an effective way to improve food quality and to provide sufficient intake of these elements for humans.

Table 1: Selenium content in Slovenian foodstuff

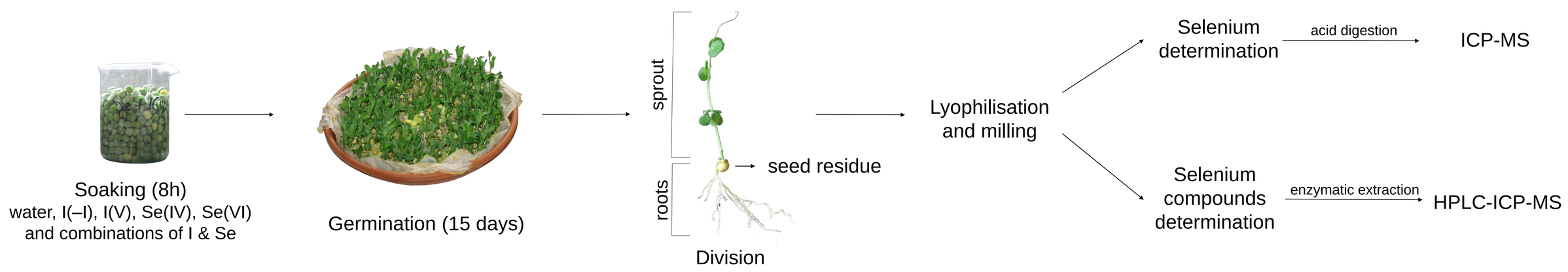
Vegetable	Content (ng Se/g wet weight)[a]
Potato	1.1 – 1.7
Cabbage	1.1 - 76.7
Carrot	0.6 - 11.6
Lettuce	0.3 – 20.0
Onion	1.1 - 10.5
Parsley	1.4 - 24.2

[a] Smrkolj et al., 2004

2. AIM

- To study the effect of iodine on selenium uptake in pea sprouts from seeds, soaked in solution of Se(IV) or Se(VI) (10 mg/L) and in solution of I(–I) or I(V) (1000 mg/L)
- To identified Se compounds in pea sprouts by HPLC-ICP-MS, after enzymatic extraction with non-specific enzyme Protease XIV

3. METHODS



4. RESULTS

SELENIUM

- High amount of Se in all parts of the plants in comparison with control plants
- In roots higher amount of Se when treated with Se(IV)
- in sprouts higher amount of Se when treated with Se(VI)
- easier transport of Se(VI) than Se(IV)
- I(–I) had no influence on uptake of Se (in sprouts and roots, regardless to Se form)
- I(V) decreased uptake of Se (in sprouts and roots, regardless to Se form)

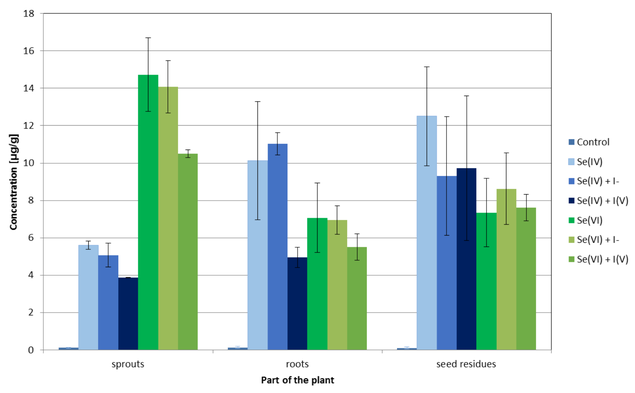


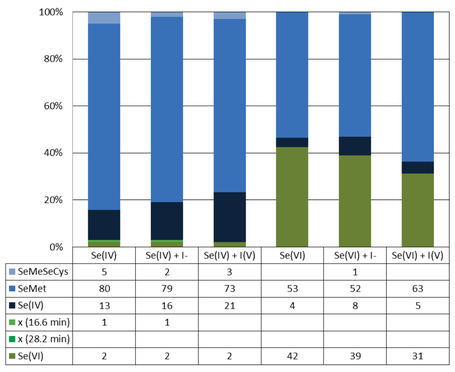
Figure 1: Selenium concentrations in different parts of pea sprouts

SELENIUM COMPOUNDS

Table 2: Soluble and identified Se compounds

Treatment		Pea sprouts	Root	Seed residues
Se(IV)	Soluble Se (%)	55	42	72
	Identified compounds	SeMeSeCys, Se(IV), Se(VI)		Se(IV)
	% of identified Se compounds[a]	54	29	41
Se(VI)	Soluble Se (%)	60	43	64
	Identified compounds	SeMet, Se(IV), Se(VI)		Se(IV), Se(VI)
	% of identified Se compounds[a]	50	22	47

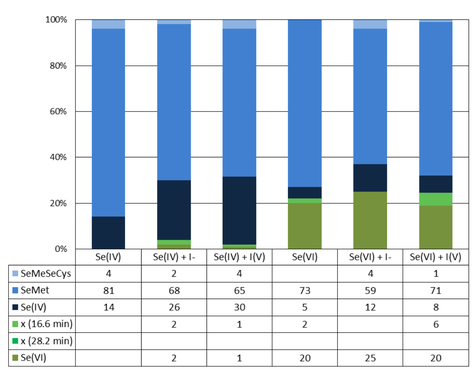
[a]according to total Se concentration



	Se(IV)	Se(IV) + I-	Se(IV) + I(V)	Se(VI)	Se(VI) + I-	Se(VI) + I(V)
SeMeSeCys	5	2	3		1	
SeMet	80	79	73	53	52	63
Se(IV)	13	16	21	4	8	5
x (16.6 min)	1	1				
x (28.2 min)						
Se(VI)	2	2	2	42	39	31

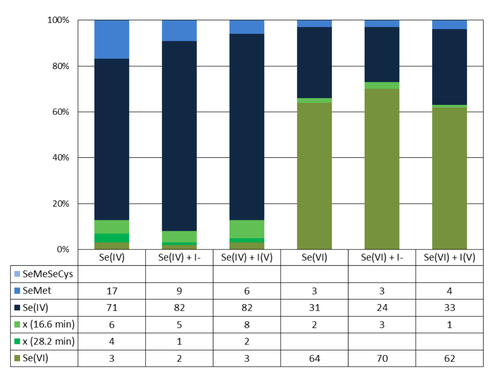
Blank space – less than 1 % of Se compound

Figure 2: Selenium compounds in pea sprouts



	Se(IV)	Se(IV) + I-	Se(IV) + I(V)	Se(VI)	Se(VI) + I-	Se(VI) + I(V)
SeMeSeCys	4	2	4		4	1
SeMet	81	68	65	73	59	71
Se(IV)	14	26	30	5	12	8
x (16.6 min)		2	1	2		6
x (28.2 min)						
Se(VI)		2	1	20	25	20

Figure 3: Selenium compounds in roots



	Se(IV)	Se(IV) + I-	Se(IV) + I(V)	Se(VI)	Se(VI) + I-	Se(VI) + I(V)
SeMeSeCys						
SeMet	17	9	6	3	3	4
Se(IV)	71	82	82	31	24	33
x (16.6 min)	6	5	8	2	3	1
x (28.2 min)	4	1	2			
Se(VI)	3	2	3	64	70	62

Figure 4: Selenium compounds in seed residues

- Iodine had no impact on determination of Se compounds
- Results are in agreement with Se compounds in buckwheat sprouts (Cuderman, 2010)

5. CONCLUSIONS

- Pea sprouts uptake higher amount of Se according to control plants
- Higher amount of Se(VI) than Se(IV) in pea sprouts was observed
- Se compounds in pea sprouts depend on Se form in soaking solution
- Iodine has impact on Se uptake (depence on iodine form)
- Iodine has no impact on Se compounds (%) and determination

References:

- P. Smrkolj and V. Stibilj. Determination of selenium in vegetables by hydride generation atomic fluorescence spectrometry. Anal Chim Acta, 512:11-17, 2004.
- P. Cuderman, L. Ožbolt, I. Kreft, V. Stibilj. Extraction of Se species in buckwheat sprouts grown from seeds soaked in various Se solutions. Food Chem, 23:941-948, (2010).

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