

# Selenium and its compounds in selenium and iodine enriched pea sprouts

Ana Kroflič<sup>1,2</sup>, Ana Jerše<sup>1,2</sup>, Nina Kacjan Maršič<sup>3</sup>, Mateja Germ<sup>3</sup>, Helena Šircelj<sup>3</sup>, Vekoslava Stibilj<sup>1,2</sup>

<sup>1</sup> Department of Environmental Sciences, "Jožef Stefan" Institute, Jamova 39, Ljubljana, Slovenia

<sup>2</sup> Jožef Stefan International Postgraduate School, Jamova 39, Ljubljana, Slovenia

<sup>3</sup> Biotechnical Faculty, University of Ljubljana, Jamnikarjeva 101, Ljubljana, Slovenia

## 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

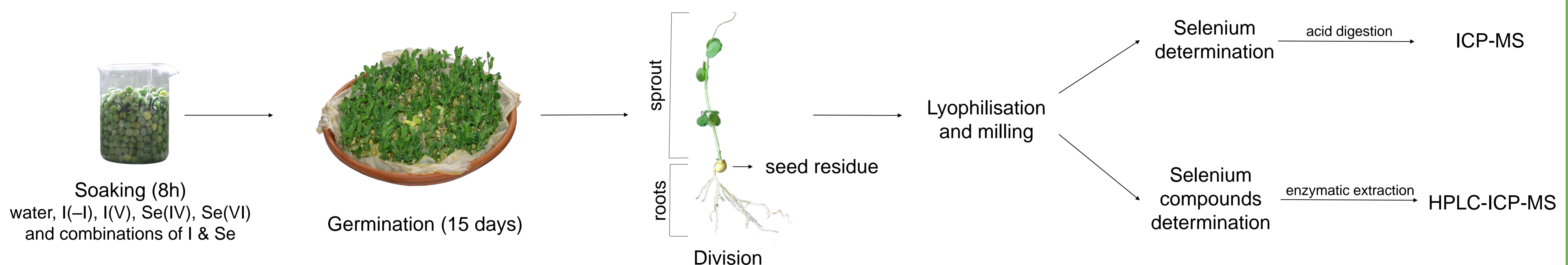
| Vegetable | Content (ng Se/g wet weight) <sup>a</sup> |
|-----------|-------------------------------------------|
| Potato    | 1.1 – 1.7                                 |
| Cabbage   | 1.1 - 76.7                                |
| Carrot    | 0.6 - 11.6                                |
| Lettuce 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

<sup>a</sup> 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)

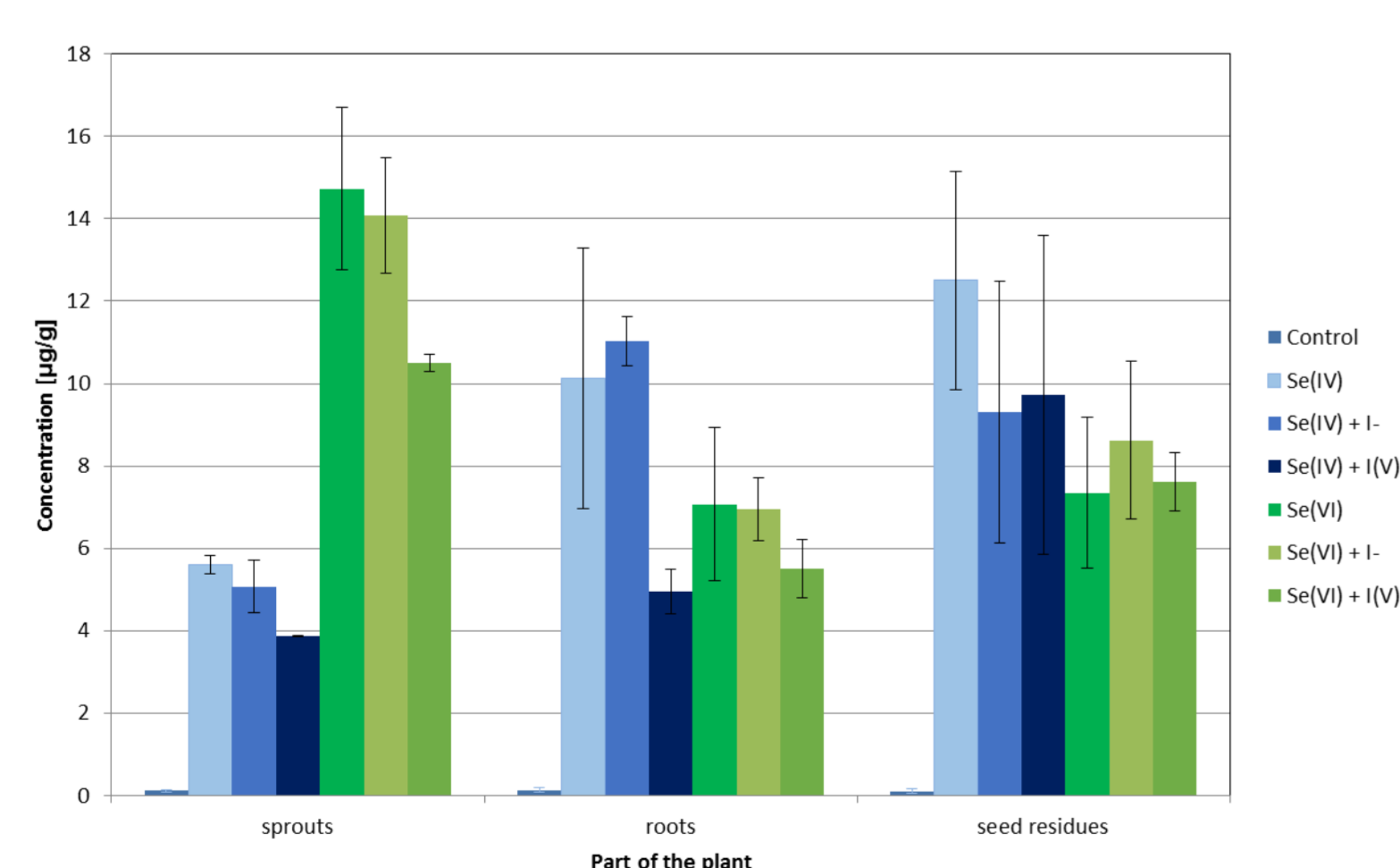


Figure 1: Selenium concentrations in different parts of pea sprouts

### 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) |      |               |
|           | % of identified Se compounds <sup>a</sup> | 54                        | 29   | 41            |
| Se(VI)    | Soluble Se (%)                            | 60                        | 43   | 64            |
|           | Identified compounds                      | SeMet, Se(IV), Se(VI)     |      |               |
|           | % of identified Se compounds <sup>a</sup> | 50                        | 22   | 47            |

<sup>a</sup>according to total Se concentration

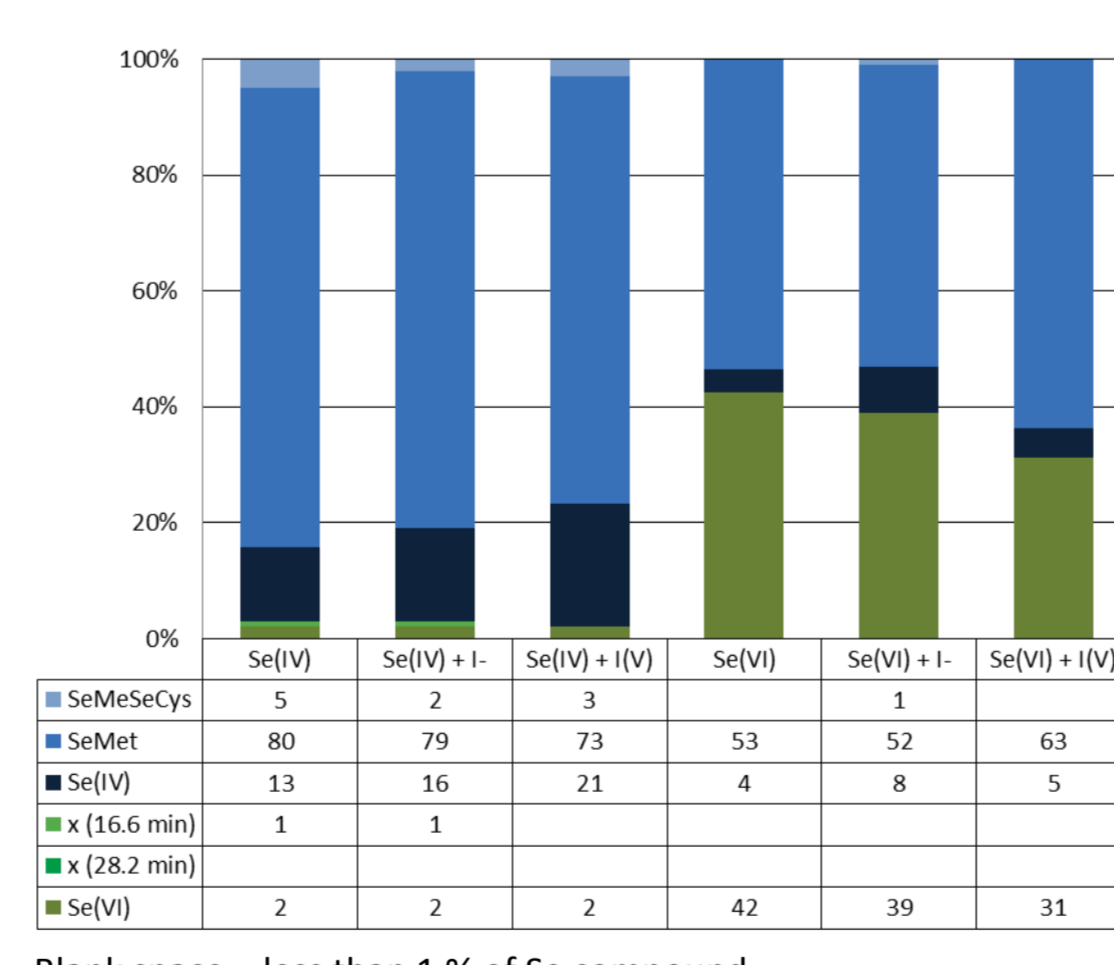


Figure 2: Selenium compounds in pea sprouts

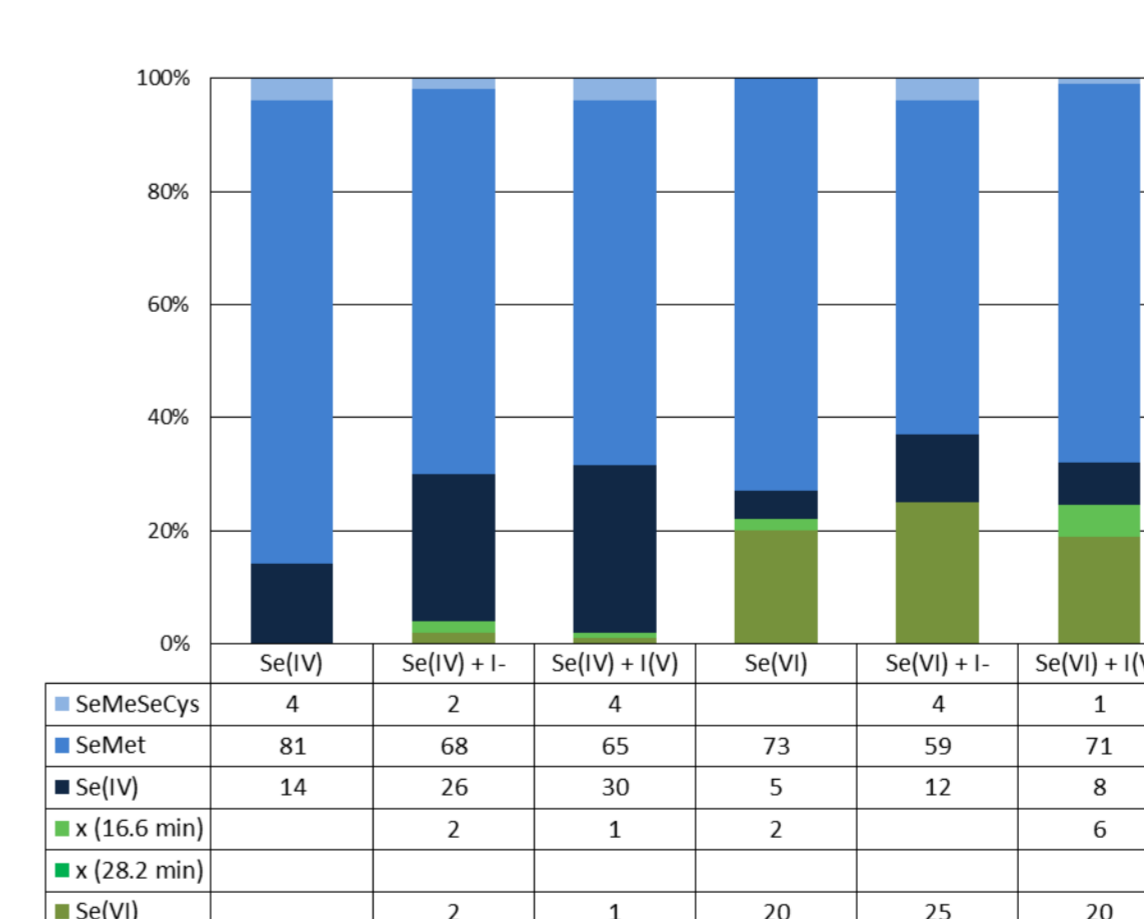


Figure 3: Selenium compounds in roots

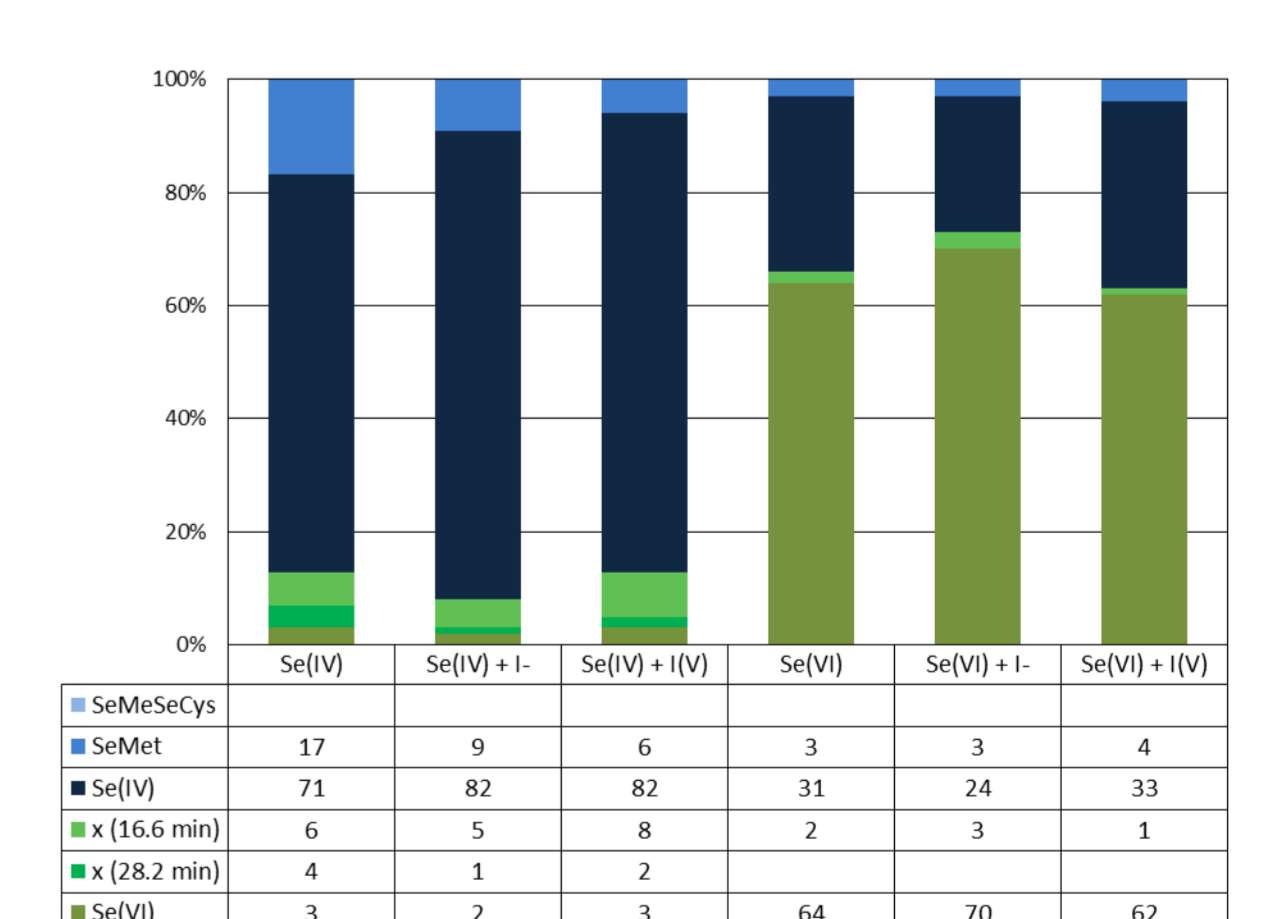


Figure 4: Selenium compounds in seed residues

- 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 (dependence 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).