Evaluation of changes in the content of selected antioxidants in the holy basil - Tulsi depending on nutrition in the form of selenium

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Foto: source - internet

- Small plot trial – Department of vegetable production, HLEF, SUA in Nitra (2016)
- Experimental plant - less cultivated species of holy basil - Tulsi

Holy basil (*Ocimum sanctum*) -Tulsi

- tropical plant from India
- Tulsi, also known as the sacred basil, is India's "**Queen of Herbs**,"
- "The **Incomparable One**,"
- and "Mother Medicine of Nature."
- Many refer to it as the "**elixir of life**" because it's said to promote well-being and longevity.

Foto: source - internet

- The nutritional value is also high, as it contains:
- vitamin **A** and **C**
- **Essential oils**
- calcium
- zinc
- iron
- chlorophyll

Ocimum sanctum -

Tulsi

- in addition to religious significance - a vital healing value - Ayurvedic medicine
- antibiotic, anti-viral, anti-bacterial and anti-carcinogenic properties
- relieving from fever, headache, sore throat, cold, cough, flu and chest congestion
- beneficial in treating respiratory ailments like chronic bronchitis, asthma et cetera
- beneficial for diabetics
- effective insect repellant and can aid in treating insect bite
- relieve stress, strengthen immunity, and facilitate proper digestion

Selenium:

Foto: source - internet

- an essential element for normal growth and development of the body
- Slovak soil - poor
- ? different ways of increasing this antioxidant in the food chain

Selenium:

Foto: source - internet

- one of the most important antioxidants
- recommended min. a dose ranging from 50-200 µg / day
- in Slovakia: 38 µg per day (27 to 43 µg)
- to supplement the organic selenium intake with biofortification

Selenium:

- the selenium content in the soil ranges from 0.04 to 0.8 mg/kg
- **foliar** application - do NOT contaminate the soil
- excessive selenium doses - **toxicity**!

Foto: source - internet

The aim

- the investigation of the **selenization** effect on selenium **increase** in plants as well as its subsequent **activity** on other antioxidants (chlorophyll *a*, *b*, carotenoids) in holy basil - **Tulsi** (*Ocimum sanctum*)

Methodology:

- small plot field trial : 5,88 m^2
- locality: Nitra (Department of vegetable production, HLEF, SUA in Nitra (2016)
- 2 variants – control vs. Variant with selenium aplication
- 3 replictaions = 1 variant

Arrangement of Field Experiment with Basil (2016)

sowing: 8. 3. 2016

transplanting:
11. 4. 2016

planting: 16. 5. 2016

Fertilization:

- (LAD 27) - 0,4 kg in 2 dosages

1. two weeks after planting
2. directly to the plants after the first harvest (12.7.2016)

Protection:

- Aphids - 3.6.2016 - Actara in dosage 0,40 g / 2 l

- Biofortification with inorganic Se :
- phenological phase - beginning of flowering (6 weeks after planting)
- foliar spraying of sodium selenate (50 mg $Se.m^{-2}$)

Harvest

and after - harvest treatment

1. harvest – 12. 7. 2016
2. harvest – 28. 8. 2016

- the beginning of the flowering phase
- the results subsequently compared with the untreated, control variant

Methodology - Laboratory analysis

- D. of Vegetable Production
- AgroBioTech, SUA in Nitra

- determination - spectrophotometrically

- karotenoids (445 nm)

- Hegedűsova et al., 2007

- fresh herb

Extrakcia karotenoidov v bazalke Tulsi , Agrobitoech , SPU, 2016

Methodology - Laboratory analysis

- D. of Vegetable Production
- AgroBioTech, SUA in Nitra

- chlorophyll *a* (vln. 649 nm)
- chlorophyll *b* (vln.665 nm)

- determination - spectrophotometrically

- Hegedűsova et al., 2007

- fresh herb

Spektrofotometer Spektroqant PHARO 100

Methodology - Laboratory analysis

- Selenium estimation:
- Regional Office of Public Health, Nitra
  - methods ET - AAS
  - dry matter

A dried sample of opal basil Red Rubin

Methodology - Laboratory analysis

- Essential oils - water vapor distillation, D. of Vegetable Production, SUA, in Nitra
- Dry matter

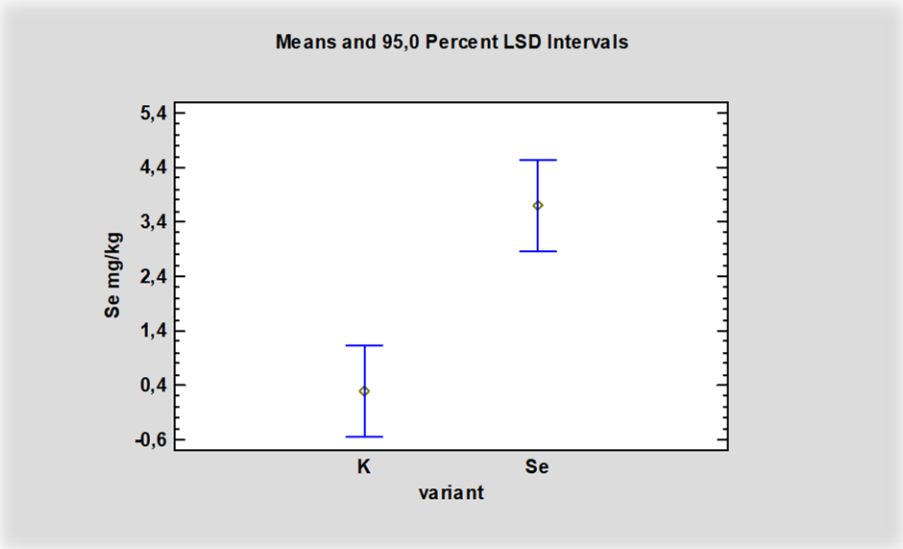
Distillation apparatus, Laboratory of D. of Vegetable Production, SUA, Nitra, 2016

Statistical analysis of results

- Standard methods (MANOVA), LSD test
- multifactor analysis of variance

- statistical software - Statgraphics Centurion XVII (StatPoint Inc. USA)

Selenium content

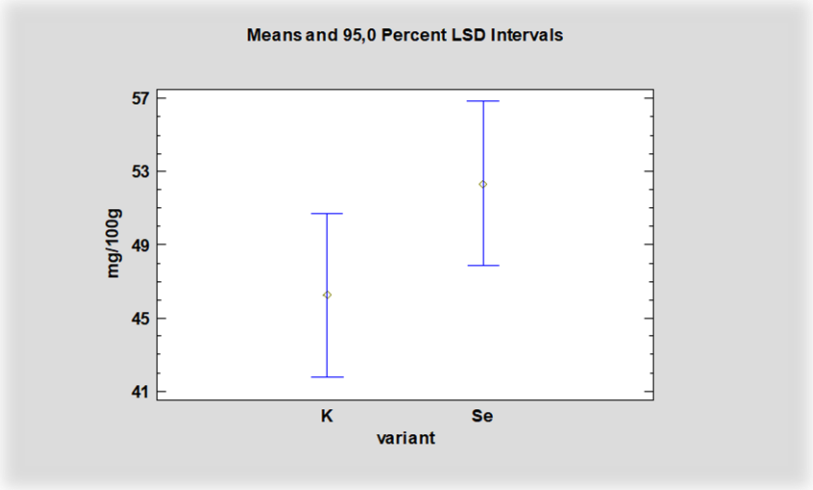


- Effect of selenium biofortification on the average content of selenium incorporated in the plant in mg/kg of dry matter

	Variant	Tulsi
1. Harvest[a]	Control	0,26
	Se	3,72
2. Harvest[b]	Control	0,11
	Se	0,08

a, b - Different letters (upper index) in the column represent a statistically significant difference (P < 0,05, LSD test, ANOVA (Statgraphic XVII)

Carotenoids

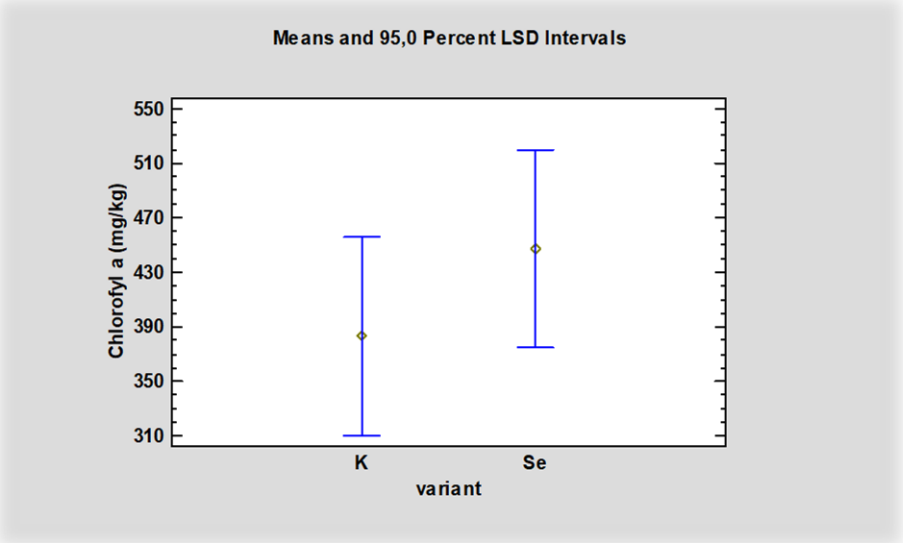


- Effect of selenium biofortification on the average content of carotenoids in mg/100 g of fresh matter

	Variant	Tulsi
1. Harvest[a]	Control	27,84
	Se	31,79
2. Harvest[b]	Control	64,68
	Se	72,90

a, b - Different letters (upper index) in the column represent a statistically significant difference (P < 0,05, LSD test, ANOVA (Statgraphic XVII)

Chlorophyll *a*

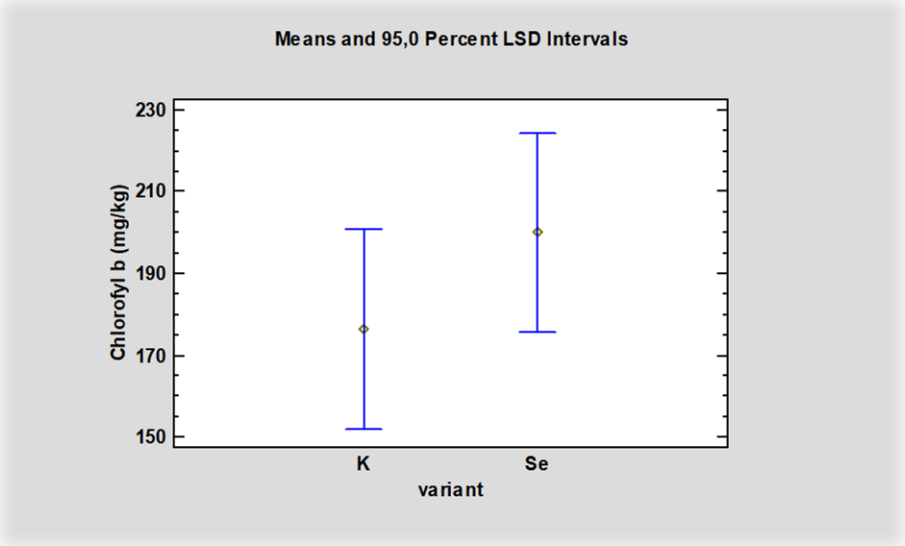


- Effect of selenium biofortification on the average content of chlorophyll *a* in mg/kg of fresh matter

	Variant	Tulsi
1. Harvest[a]	control	403,07
	Se	433,85
2. Harvest[a]	control	319,31
	Se	461,26

a, b - Different letters (upper index) in the column represent a statistically significant difference (P < 0,05, LSD test, ANOVA (Statgraphic XVII)

Chlorophyll *b*

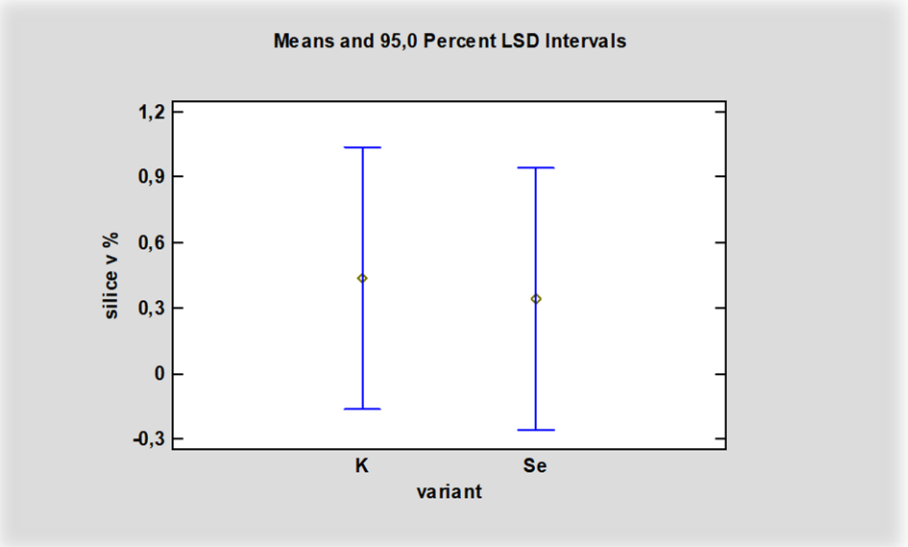


- Effect of selenium biofortification on the average content of chlorophyll *b* in mg/kg of fresh matter

	Variant	Tulsi
1. Harvest[a]	control	167,03
	Se	190,95
2. Harvest[a]	control	185,59
	Se	208,89

a, b - Different letters (upper index) in the column represent a statistically significant difference (P < 0,05, LSD test, ANOVA (Statgraphic XVII)

Essential oils



- Effect of selenium biofortification on the average content of essential oils in % of dry matter

	Variant	Tulsi
1. Harvest[a]	control	0,5042
	Se	0,5038
2. Harvest[a]	control	0,3662
	Se	0,1773

a, b - Different letters (upper index) in the column represent a statistically significant difference (P < 0,05, LSD test, ANOVA (Statgraphic XVII)

Conclusions

- Selenization – **increasing** in selenium built - in plant (statistically significant)

- other parameters – carotenoids, chlorophyll *a*, *b* – slight increase (statistically insignificant), essential oils - insignificant

Selenium in selected dosage - does not damage the plant in the frame of the antioxidant parameters !

- The **term of harvest** – variable influence :

  - the content of **selenium** in dry mass of basil - after the first harvest NO biofortification with selenium – no Se building in the plant in the second harvest (soil - Se in plants - during first weeks after selenization)

Carotenoids - Significantly – in second harvest – higher values

Chlorophylls, **Essential oils** – no significant difference

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Thank you for your attention!

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