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The changes of vitamin C, chlorophyll, carotene, xanthophylls content and the antiradicalic activity of sunflower sprouts after selenium treatment

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Abstract

In this paper we present some of the consequences of the selenium treatment on sunflower sprout. We determined: vitamin C, chlorophyll pigments, xanthophylls and carotens content and antiradical activity (AA). Sunflower sprouts were obtained by sunflower seeds germination in presence of sodium selenite (5 and 10 ppm Se) – experimental group, and water – control group. The methods used in our study were: Vitamin C – by iodometric method, AA – by DPPH method, chlorophyll pigments, xanthophylls and carotenes – by spectrophotometric method. The selenium treatment has led to increasing all of these parameters in experimental group, comparing to control group. The selenium treatment of sunflower seeds improves the nutritive quality of sunflower sprouts with beneficial effect on the human consumption.

Keywords: sunflower sprout, selenium, vitamin C, chlorophyll, carotene, xanthophylls, antiradicalic activity.

1. Introduction

The nutritionists of our day are focused on healthy nutrition. Fruits of vagetables are unanimously considered healthy by they [13], but the sprouts (germinated seeds and shoots) are some of the most valuable from nutritional point of view. It is known that there are major differences regarding the nutritional value of seed compared to the sprout. By germination, functional foods can be obtained [15], so sprouts provide very high nutrient levels [1, 2, 15, 17, 18]. The sprouts are reach in phytochemical nutrients, vitamins, minerals, enzymes and amino acids, having great importance in human health [13, 15]. For its wealth of nutrients and its high conversion rate of anorganic compounds in organic compounds [12], sprouts are suitable for selenium fortified, especially in European countries, where selenium deficiency was observed and different strategies are followed to fortify foods [7]. There are numerous studies [4, 7, 9, 10, 14, 15, 18, 22, 23] were made to selenium supplementation of different sprouts (sunflower, rucola, wheat, barley, oats, lettuce, green tea, clover, rape, lupine, garden cress). The consequences of selenium supplementation were observed about different biochemical parameters like antioxidant activity [3, 7, 9, 18, 21], clorophyll's pigments [10, 11, 23], carotenoid content [10, 11, 22, 23], vitamin C [4, 14, 20]. Thus, the researchers have reported that selenium supplementation determines an increasing of clorophyll's pigments on rucola, on wheat [11, 23], lettuce [10]. The variation of carotenoids level, consecutive to selenium treatment was reported in wheat [10, 23], rucola [11], carrot [22].

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The level of vitamin C increased significantly in green tea [20], lettuce [19], wheat [4, 14], clover, sunflower [14], barley and oats [4]. Antiradical activity improved after treatment with selenium of rape [9], lupine [8], clover [3, 21], garden cress [7], sunflower [18].

In this paper we present some of the consequences of the selenium treatment on sunflower sprout. We determined: vitamin C, antiradical activity (AA), chlorophyll pigments, xanthophylls and carotens.

2. Materials and Methods

Sunflower sprouts were obtained by sunflower seeds germination on textile supports. There were two experimental groups whom it was administered sodium selenite: E1(5 ppm Se) and E2 (10 ppm Se), and a control group (C) which we have given water. All of sprout samples were given in the same environmental conditions (temperature, humidity, light). Our experiment was conducted over a period of 14 days, after which was evaluated the content of: chlorophylls, xanthophylls and carotens, vitamin C and antiradicalic activity.

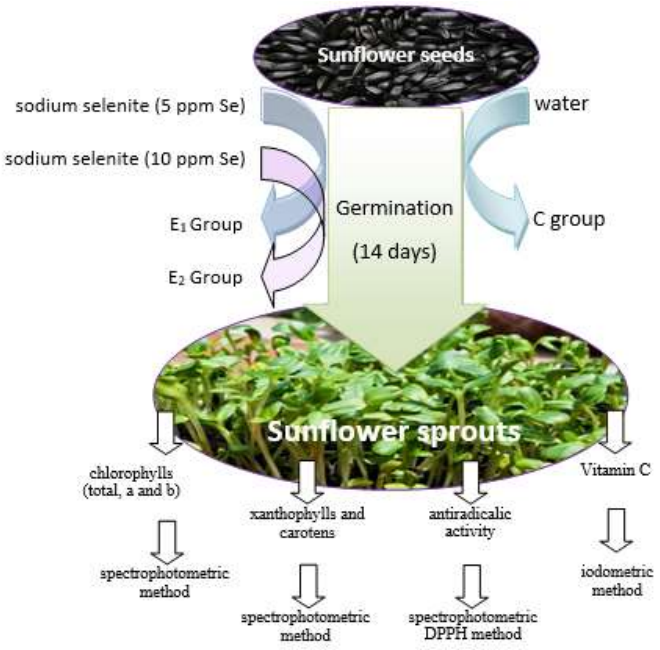

Figure 1. Scheme of assessing the level of key antioxidants in the sunflower seedlings consecutive sodium selenite treatment

The chlorophyll pigments, xanthophylls and carotenes level were assesing by spectro-photometric method using UV-VIS Perkin Elmer - Lambda 25 spectrophotometer and vitamin C - by iodometric method. All of these methods were presented by [5, 6, 16].

3. Results and Discussion

The selenium treatment has led to increasing all of these parameters in experimental group, comparing to control group.

The results of the chlorophyll pigments level of sunflower sprout analyzed samples are shown in Figure 2. From the total chlorophyll, the chlorophyll "a" has share of majeure, while the chlorophyll "b" has insignificant share.

The experimental groups with added selenium doubled their total chlorophylls and chlorophyll "a" level (18.056, respectively 21.38 mg/g) compared to control group (10.882 mg/g). The increases of chlorophyll level were direct correlated with selenium doses. This fact was similar with other research on rucola [11], on wheat [16, 23], and lettuce [10].

The results about level of the carotenes and xanthophylls in sunflower sprout analyzed samples are shown in Figure 3. The carotenes and xanthophylls level was substantially increased (double or even triple content) following selenium treatment of the sunflower sprout,

The increase in carotenoids content, consecutive to selenium treatment was reported in wheat [10, 16, 23], rucola [11] and carrot [22].

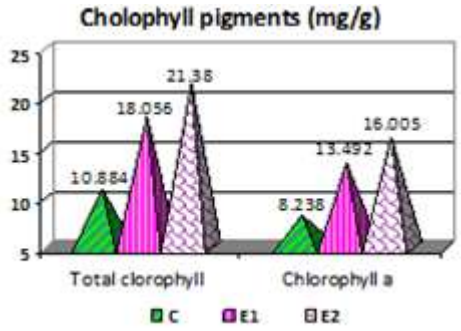

Figure 2. Chlorophyll pigments level in sunflower sprouts after selenium treatment (mg/g)

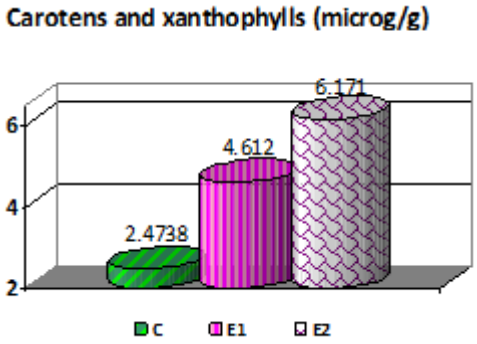

Figure 3. Carotens and xanthophylls level in sunflower sprouts after selenium treatment (μg/g)

In the Figure 4 are present the results of the vitamin C level from sunflower sprout analyzed samples. Our results have shown beneficial effects of selenium supplementation on sunflower sprout. In the experimental groups was registered a higher (3.048, respectively 4.931 mg/100 g) content of vitamin C, compared to control group (0.194 mg/100 g). The literature data presents similar aspects regarding vitamin C – which increased significantly after selenium treatment in green tea [20], lettuce [19], wheat [4, 14, 16], clover, sunflower, alfaalfa [14], barley and oats [4,16].

The antiradical activity of sunflower sprout samples are shown in Figure 5. As expected (all of mentioned parameters until now are known as antioxidants) antiradical activity of sunflower sprout was significantly improved in selenium exposed groups, showing direct correlation with chlorophylls, vitamin C, carotens and xanthophylls.

There are a lot of other research works which reported that antiradical activity was improved after selenium treatment in rape [9], lupine [8], clover [3, 21], garden cress [7], sunflower [18].

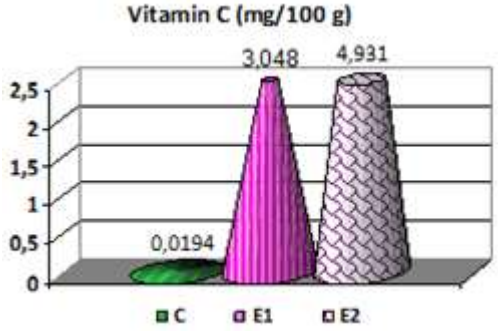

Figure 4. Vitamin C level in sunflower sprouts after selenium treatment (mg/100g)

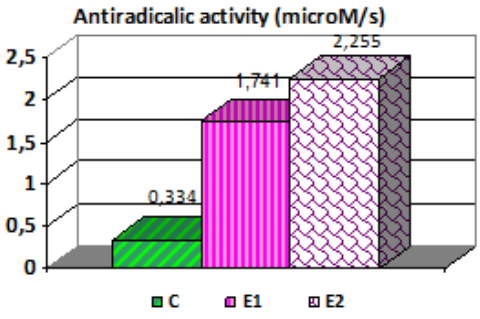

Figure 5. Antiradicalic activity in sunflower sprouts after selenium treatment (μM/g)

Conclusion

The selenium treatment of sunflower seeds improves the nutritive quality of sunflower sprouts with beneficial effect on the human consumption.

- The selenium treatment (5 respectively 10 ppm Se, as sodium selenite) of sunflower sprouts had beneficial effects on antioxidant contents: chlorophyll pigments, vitamin C, carotens and xanthophylls, which lead to overall improvement of antioxidant activity.
- The increasing of antioxidants level in sunflower sprout was direct correlated with the increasing of selenium dose (until 10 ppm Se).

The nutritional value of sunflower sprouts increased consecutive to selenium treatment.

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

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