

plankumu malās. Latvijas apstākļos raganu riņķus parasti ierosina cepurīšu sēnes no *Marasmius* ģints. Viena no visbiežāk sastopamajām sēnēm ir pļavas vītene (personīgās sarunas ar E. Vimbu). Šī sēne (*Marasmius oreades*) pieder *Basidiomycota* nodalījumam, *Agaricales* rindai. Tomēr ir iespējama arī citu sēņu (cepurīšsēņu un pūpēžu) augšana golfa zālienos (James, 1997; Rancane, 2005).

Sausuma plankumi golfa laukuma zālienā ir ļoti aktuāla problēma, tie veidojas galvenokārt ūdens trūkuma rezultātā atsevišķās vietās sablīvējoties velēnai, šīs parādības cēloņi nav pilnīgi izpētīti. Sausuma plankumu veidošanos nevar pilnībā novērst pat ar regulāru laistīšanu. Zālienā veidojās gaiši brūni vai dzeltenīgi brūni plankumi, kuriem raksturīga neregulāra forma un piemīt tendence apvienoties. Reizēm sausuma plankumi izkļiedēti pa visu grīnu. Sausuma plankumu pazīmes ir nespecifiskas, tos var viegli sajaukt ar parazitāro sēņu ierosinātajiem plankumiem. Tādēļ precīzai diagnostikai vēl jāpārbauda, vai bojātajos zāles audos nav sastopamas patogēnās sēnes. Sausuma plankumi golfa laukumā „Viesturi” pirmo reizi konstatēti jūnijā, bet jūlijā vairs netika novēroti. Golfa laukumos „Viesturi” un „Ozo” tie ļoti strauji izplatījās augustā un septembrī. Oktobrī sausuma plankumu izplatības līmenis golfa laukumā „Viesturi” bija visaugstākais – vidēji 23.89 m² no katra grīna kopplatības. Plankumi golfa laukumā „Denderi” novēroti tikai jūlijā.

Patogēnu identifikācija tika veikta Latvijā pirmo reizi, tādēļ ļoti iespējams, ka realitātē ir vēl citi patogēni, kas pagaidām nav identificēti.

Secinājumi

Identificēti sekojoši slimību ierosinātāji: sārtais sniega pelējums (ier. *Microdochium nivale* (Fr.) Samuels & I.C.Hallett), stiebra pamatnes un sakņu puve (*Rhizoctonia solani* Kuhn un *Fusarium avenaceum* (Fr.) Sacc), raganu riņķi (sēnes no *Agaricales* rindas), sarkanā puve (*Laetisaria fuciformis*).

Nozīmīgākās golfa zāliena slimības Latvijā 2005. gadā bija sniega pelējums un sakņu un stiebra pamatnes puve, kā arī neparazitārā slimība sausuma plankumi.

Raganu riņķi 2005. gadā nebija postīga slimība, jo plankumi grīnos būtiski nesamazināja zāliena kvalitāti. Sarkanā puve novērota tikai 7. jūlijā atsevišķās vietās uz spēlēšanas ceļu zāliena.

Golfa zāliena slimības ierosina dažādas sēnes ar dažādām ekoloģiskām prasībām, tādēļ nepieciešami tālāki pētījumi to identifikācijai un attīstības īpatnību skaidrošanai.

Izmantotā literatūra

1. James B. Beard, Toshikazu Tani (1997) Color Atlas of Turfgrass diseases, Ann Arbor Press, Michigan, USA, 245.
2. Malcolm C. Shurtleff, Charles W. Averre III (1997) The plant diseases clinic and field diagnosis of abiotic diseases, APS Press, USA, 245.
3. Mortenson K. (2003) Snow Mold. Planth Pathology, 8.
4. Rancane R. (2005) The most important turf grass diseases. XVI Symposium of mycologists and lichenologists of Baltic states, Cesis, Latvia, 45.
5. Smiley W.R., Dernoeden H.P., Clarke B.B. (2005) Compendium of turfgrass diseases. Third edition, APS Press, USA, 167.
6. Smith J. D. (1965) Fungal diseases of turf grasses. A Sports Turf Research Institute Publication, 3., 97.
7. Вилай В. И. (1977) Фузариин, Наукова думка, Киев, 441.

THE EFFECT OF SELENITE ON GROWTH AND STORAGE OF ONIONS

Zēgnere L., Alsina I.

Latvia University of Agriculture, 2 Liela iela, Jelgava, LV-3001, Latvia
phone: +371 63010612, Ina.Alsina@llu.lv

Abstract

Three year trials were carried out to evaluate the growth, development and storage of onion cultivars ‘Stuttgarter Riesen’, ‘Red Baron’ and ‘Snow Ball’. The growth experiments were placed at the experimental field and in a greenhouse of Institute of Soil and Plant Sciences Latvia University of

Agriculture. During the growth season onions were treated with sodium- or iron selenite, 50 mg m⁻², 100 mg m⁻² or 200 mg m⁻². Controls were without selenite application. The length and weight of onion leaves was determined during plant growth. Fresh and dry weight was registered at harvest. Onion bulbs were stored at different temperatures: +5 °C, +15 °C or +25 °C. The loss of weight during storage was recorded.

The results showed that the weight of onions and the weight and length of depend on cultivar's feature. Sodium- or iron selenite had no significant influence on the parameters of the onion leaves. Onions of the cultivar '*Stuttgarter Riesen*' had the highest weight, and '*Snow Ball*' had the lightest ones. There were significant differences in content of dry matter between cultivars. No significant effect of selenite was observed in onions grown in the greenhouse. A positive correlation was observed between storage temperature and weight loss of the onions bulbs during storage. The onion bulbs quality on storage depended on the cultivar. Onions dressed with small and medium doses of selenite lost less weight in comparison with control.

Key words

Onion, *Allium cepa*, iron selenite, sodium selenite, growth, storage

Introduction

Selenium is a trace element that is essential to good health but is required only in small amounts. Selenium is found in selenoproteins which are important antioxidant enzymes. The antioxidant properties of the selenoproteins prevent cellular damage from free radicals that may contribute to the development of chronic diseases such as cancer, heart disease, hypothyroidism. Selenium deficiency does not usually cause illness by itself. Rather, it can make the body more susceptible to illnesses caused by nutritional, biochemical or infectious stresses (Thomson, 2004; Surai, 2006; Goldhaber, 2003).

The soils of Latvia contain 0.054-0.34 mg kg⁻¹ of selenium (Ермаков, Ковальский, 1974). Soil is considered "selenium deficient" when there is less than 0.5 mg of selenium per kg of soil. The blood levels of selenium of Latvian people average to 0.6 μmol L⁻¹, compared to the normal 1.51-2.91 μmol L⁻¹. Data shows that the average Latvian inhabitant suffers from selenium deficiency (Čerņevskis, 2004).

Plants are the major dietary sources of selenium. The content of selenium in food depends on the selenium content of the soil where plants are grown. Different plant families differ in their ability to accumulate selenium. Literature data show that *Allium* and *Cruciferaeae* vegetables accumulate selenium (Milan, 1995).

Materials and Methods

Experiments were carried out in 2005 -2007 at the Institute of Soil and plant Sciences, Latvia University of Agriculture for investigation of the effect of sodium- and iron selenite on the growth and storage of onions. Onion varieties '*Stuttgarter Riesen*', '*Red Baron*' and '*Snow Ball*' were grown and harvested after 110 days of vegetation. Field and vegetation (pot) experiments were designed.

Field experiments in 4 replicas were placed in loamy sand with the following mineral element content in mg L⁻¹: P 262, K 270, Ca 19,6·10³, Mg 3000, S 78, Fe 1475, Mn 130, Zn 18,5, Cu 5,2, Mo 0,03, B <0,1 mg L⁻¹. Iron selenite, FeSeO₃, was applied at planting: 50, 100 or 200 mg m⁻² (designed in the Figures as Fe50, Fe100 and Fe200 respectively). For equable dispersion iron selenite was mixed with quartz sand. Sodium selenite (Na₂SeO₃) was given in the same doses the month before harvesting (in Figures variants Na50, Na100, Na200 respectively). Control- plants without selenite treatment. All plots were fertilized with KEMIRA 10:10:20 - 20 mg m⁻² and dressed with the same dose of fertiliser after one month of onion growth.

Vegetation experiments were placed in 6 L pots with neutralized peat and fertilized with KEMIRA 10:10:20 1 g per 1 L of peat. Calculated doses - 1.57 mg, 3.14 mg or 6.28 mg of selenite per pot were used. Control- without selenite. Iron selenite was mixed with quartz sand, but sodium selenite (Na₂SeO₃) dissolved in water and added to peat after 2 weeks of vegetation. 5 seed onions were grown in one pot. During vegetation plants were twice dressed with KEMIRA 10:10:20, 0.1 g per 1 L of peat. The pots was placed in greenhouse and grown 130 days.

Plant weight, number of onion leaves and leaves weight were determined. Fresh and dry weight of onions bulbs were tested after harvest. Onion bulbs were stored at +5 °C, +15 °C and +25 °C. The loses of weight during storage were recorded.

Results and Discussion

The pot experiments showed that the length of onion leaves depends on the variety. The significantly shorter leaves were of variety 'Snow ball'. This conformity lasted all period of vegetation. Variety 'Stuttgarter Riesen' had the largest leaves. There were no significant differences between 'Stuttgarter Riesen' and 'Red Baron' (Fig.1 and Fig.2).

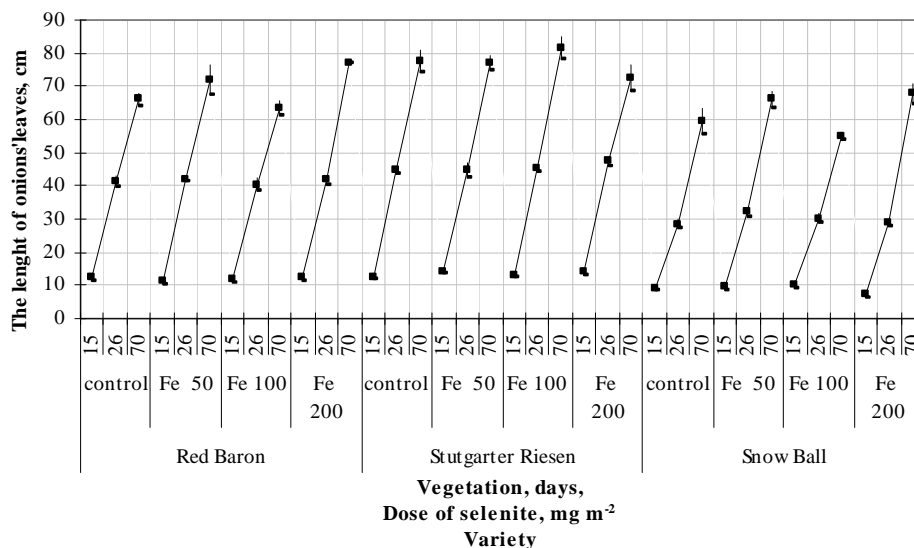


Figure 1. The effect of iron selenite on the length of onion leaves, cm.

There were no statistically significant differences between different selenium treatments. In average, the better results are obtained with iron selenite in comparison to sodium selenite.

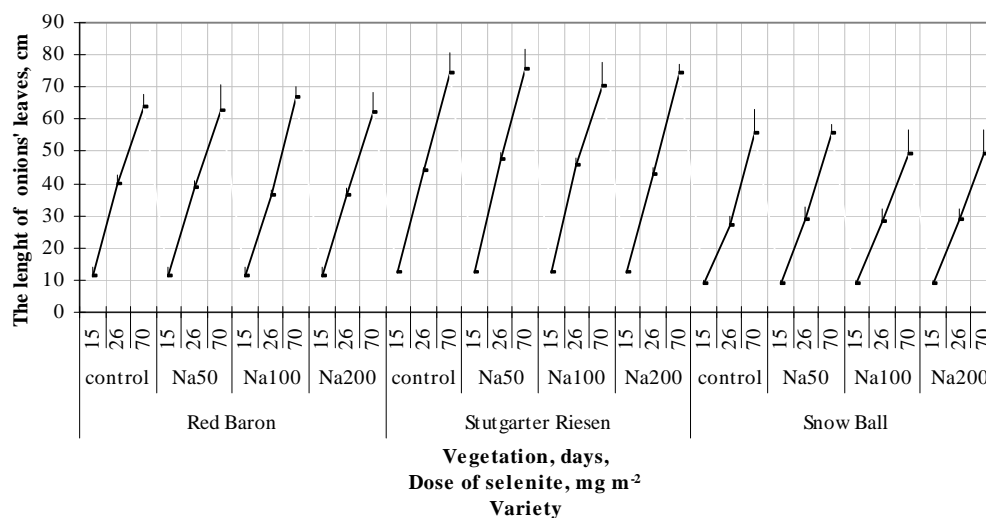


Figure 2. The effect of sodium selenite on the length of onion leaves, cm.

The onions in field conditions had shorter leaves than in the pot experiments. 'Red Baron' was shorter by 23.1 %, 'Stuttgarter Riesen' - 30.8 % and 'Snow ball' by 38.1 %. The length of leaves of the

first two varieties is similar, but 'Snow ball' had 28.1 % shorter leaves in comparison with 'Red Baron' and 'Stuttgarter Riesen'.

Significant differences between selenium treatments and control were not observed. A correlation between the onions leaves weight and length was observed. The coefficient of correlation for greenhouse onions was 0.682 for 'Red Baron', 0.969 - 'Stuttgarter Riesen' and 0.837- 'Snow ball', and for field onions 0.927, 0.935 and 0.963 respectively.

The harvest weight of onion bulbs depended on cultivar. The heaviest bulbs had 'Stuttgarter Riesen'. They weighed 12.9 % more than 'Red Baron' and 44.8 % more than 'Snow ball'. The onions grown in greenhouse were 24.9 % heavier than the field ones. (Fig. 3) The statistical analysis of data showed that the differences between cultivars were significant in the greenhouse experiments. In field only 'Snow ball' had less yield in comparison with the other two varieties.

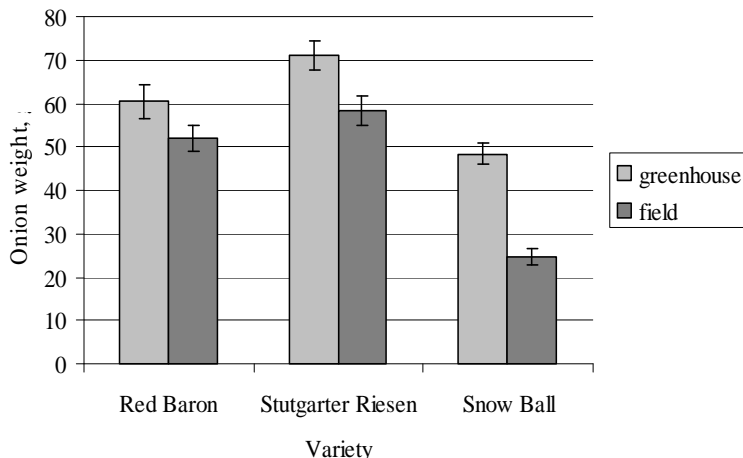


Figure 3. The weight of onion bulbs of different cultivars, g

The average dry matter content in greenhouse onion bulbs was 15.5%, in comparison with 14.5% in onions grown in field. 'Snow ball' had the less amount of dry matter too, it was in average 14.0 % at field and 13.8 % in greenhouse. It is significantly less than 'Red Baron' in both growing conditions (15.6% dry matter at field and 16.8% in greenhouse onions) and 'Stuttgarter Riesen' in greenhouse conditions (16.4 %). The significant differences between 'Stuttgarter Riesen' and 'Red Baron' in dry matter content were not observed.

It was found from the growth experiments that the average weight of the onion bulb increased in presence of selenite (see Fig.4).

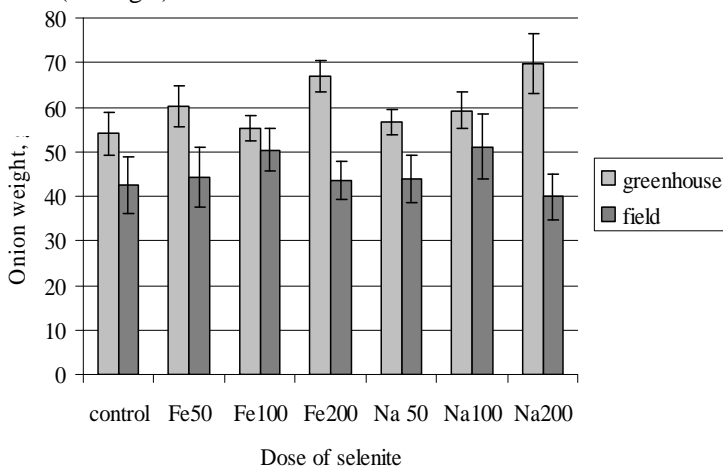


Figure 4. The effect of selenite on the onion bulb weight, g

A statistically significant weight increase was observed in the greenhouse experiments for plants given 200 mg m⁻² selenite or 6.28 mg per pot. Plants treated with sodium selenite showed positive correlation between selenite dose and bulb weight. In the field experiments the largest weight was observed for the dose 100 mg m⁻² for both iron and sodium selenite, see Fig. 4.

The dry weight of greenhouse grown onion did not depend on the selenite dose given. A statistically non-significant finding was that onions given iron selenite had slightly lower average dry weight than those dressed with sodium selenite. In the field grown onions a significant increase in the dry weight was found for all variants when the plants were given a dose of 100 mg m⁻² of iron selenite.

The storage quality of the onion bulbs did depend on the storage temperature as well as the cultivar, see Figures 5 and 6. For onions grown in the greenhouse a correlation between storage temperature and loss of weight was observed. Differences between loss of weight were significant at all storage temperatures. In the field grown onions there was less variation in the loss of weight. The best storage was at 5 °C, but no statistical significant differences between storage at 15 and 25 °C were observed.

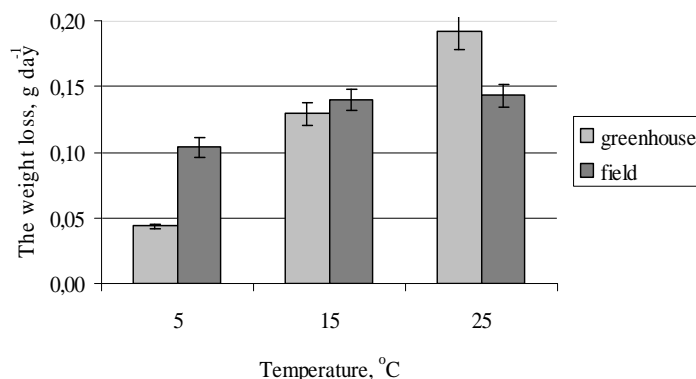


Figure 5. The effect storage temperature on the weight loss of onion bulbs, g per day

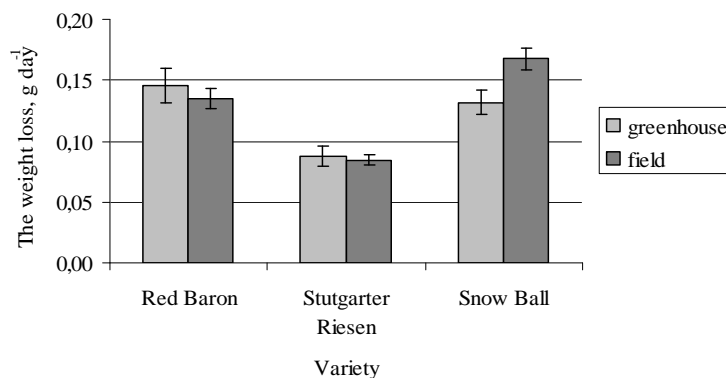


Figure 6. The weight loss of onion bulbs of different cultivars, g per day

The best storage parameters were found for onion bulbs of the cultivar '*Stuttgarter Riesen*' where the loss of weight was independent of the growing conditions and was less than 0.1 g per day. Bulbs of the cultivar '*Red Baron*' on the average lost 0.14 grams per day and even though the differences between the growing variants were not significant, the tendency was observed that onions grown in the field had better storage than onion bulbs from the greenhouse. The largest weight loss average was found for cultivar '*Snow Ball*'. Here significant differences were found between onions grown in the field or in the greenhouse. The major loss of weight can be explained by the lower dry matter content of the onion bulbs at the harvest.

It was found from the experiments that onions grown in the greenhouse with doses of 1.57 mg, 3.14 mg per pot corresponding to 50 and 100 mg m⁻² in field experiments had significantly less bulb

loss of weight during storage. A similar correlation was observed for onions grown in the field with the dose 50 mg m⁻² of sodium selenite(Fig.7.) .

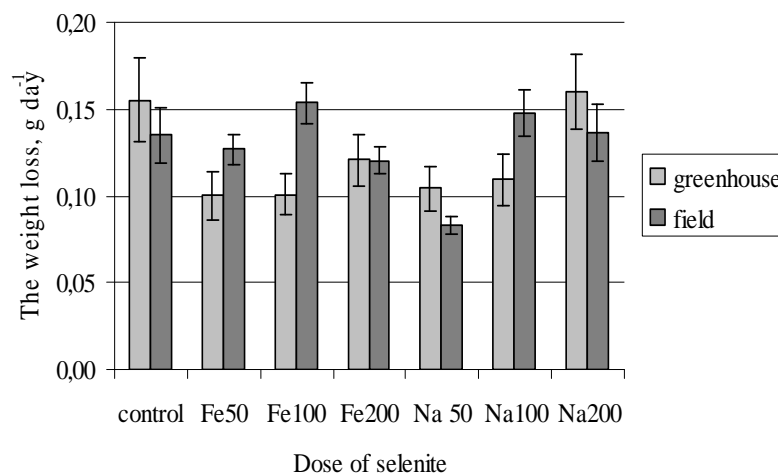


Figure 7. The effect of selenite on the onion bulbs weight loss, g per day

For the rest of the experimental variants no significant change in the loss of bulb weight during storage was found in relation to the dose of iron selenite.

Conclusions

The weight and dry matter of onion bulbs, the weight and length of onion leaves, and the weight loss of the bulbs during storage depend on cultivar's feature.

Sodium or iron selenite had no significant effect on the parameters of onion leaves.

A statistically significant onion bulb weight increase was observed in the greenhouse experiments for plants given 200 mg m⁻² selenite.

Positive correlation between sodium selenite dose and bulb weight was observed for pot grown onions.

The positive correlation between storage temperature and the onion bulb weight loses during storage were observed.

Onions dressed with small and medium dose of selenite (50 and 100 mg m⁻²) lost less weight in comparison with the control.

References

1. Thomson CD. (2004) Assessment of requirements for selenium and adequacy of selenium status: a review Eur J Clin Nutr;58:391-402.
2. Surai P.F. (2006) Selenium in Nutrition and Health, Nottingham University Press, 974.
3. Goldhaber SB. (2003) Trace element risk assessment: essentiality vs. toxicity. Regulatory Toxicology and Pharmacology.;38:232-42.
4. Ермаков В.В.,Ковальский В.В.(1974) Биологическое значение селена Москва, Наука, 300.
5. H.Čerņevskis (2004) Minerālvielas un mikroelementi cilvēka organismā Rīga, 112.
6. Milan I.,(1995) Chapter E., Metals and Other Elements at Trace Levels in Foods // AOAC Official Methods of Analysis.