

# Usporedba uvijeta uzgoja tartufa i šampinjona

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## Sažetak

Područja oko rijeka Mirne i Raše u Istri pogodna za intenzivnu poljoprivredu no poznata su i kao nalazišta podzemnih gljiva, tartufa. Bijeli tartuf (*Tuber magnatum* Pico), najveća je i najcjenjenija vrsta tartufa. Za razliku od tartufa proizvodnja šampinjona (*Agaricus bisporus*) pripada u proizvodnju gljiva u zaštićenim prostorima i vrlo je zahtjevna grana agronomije. Supstrat za proizvodnju gljiva se sastoji od fermentirane slame, pilećeg gnojiva i gipsa. Omjer navedenih sastojaka, kvaliteta navedenih komponenti te tehnologija proizvodnje su ključni faktori za proizvodnju kvalitetnog supstrata. Cilj ovog rada bio je usporediti različite uvjete uzgoja bijelog tartufa i gljiva šampinjona prvenstveno u sadržaju teških metala u uzgojnom mediju. Istraživanje uzgoja šampinjona provedeno je tijekom četiri vegetacijska ciklusa na uobičajenom supstratu za uzgoj šampinjona. Pokus je postavljen u 4 ponavljanja po dizajnu slučajnog blokno rasporeda sa 2 faktora. Istovremeno, analizirani su uzorci tla s tri međusobno udaljene lokacije u području rijeka Mirne i Raše u Istri poznate kao nalazišta tartufa. Svi uzorci analizirani su na sadržaj ukupnih teških metala Zn, Fe (esencijalni), Pb i Cd (toksični) digestijom zaltotopkom. Podaci su statistički obrađeni ANOVOM F-testom, dok su prosječne vrijednosti ispitivanih parametara ispitivane Duncanovim multiplim testom na razini značajnosti  $p \leq 0,01$ . Utvrđeni sadržaj teških metala u supstratu kao i u tlu kretao se u nizu  $Fe > Zn > Pb > Cd$ . Statistički značajna razlika ( $p \leq 0,01$ ) utvrđena je između sadržaja svih istraživanih elemenata. Naime, u supstratu je utvrđen sadržaj Fe 2 084,55 mg kg<sup>-1</sup>, a u tlu 28 631,67 mg kg<sup>-1</sup>, Zn 137,39 mg kg<sup>-1</sup> (supstrat): 80,96 mg kg<sup>-1</sup> (tlo), Pb 2,28 mg kg<sup>-1</sup> (supstrat): 15,21 mg kg<sup>-1</sup> (tlo), Cd 0,175 mg kg<sup>-1</sup> (supstrat): 0,46 mg kg<sup>-1</sup> (tlo). Utvrđene vrijednosti bile su ispod granica propisanih Pravilnikom o zaštiti od onečišćenja poljoprivrednog zemljišta osim Zn čije su utvrđene vrijednosti bile više od onih propisanih za pjeskovita tla (60 mg kg<sup>-1</sup>). Kako bi se dobili odgovarajući parametri za utvrđivanje pogodnosti šampinjona i tartufa kao funkcionalne hrane, u budućim istraživanjima, potrebno je provesti detaljnije analize i usporedbu translokacije teških metala iz uzgojnog medija u tartufe i šampinjone.

Ključne riječi: tartufi, šampinjoni, uvjeti uzgoja

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# Comparison of growth conditions of truffles and champignon mushrooms

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## Abstract

The areas around the river Mirna and Rasa in Istria are suitable for intensive agriculture but they are also known as the site of underground mushrooms, truffles. White truffle (*Tuber magnatum* Pico) is the largest and the most precious sort of truffles. Unlike truffle production of mushrooms champignon (*Agaricus bisporus*) belongs in mushroom production in protected areas and very demanding branch of agriculture. The substrate for mushroom production consists of fermented straw, chicken manure and gypsum. The ratio of the ingredients, the quality of these components and production technology are key factors for the production of high-quality substrates. The aim of this study was to compare the different growth conditions in the cultivation of white truffle and mushrooms, primarily in the heavy metals content in growing medium. The study of mushroom cultivation was conducted during four cycles of vegetation on the normal substrate for the cultivation of mushrooms. Trials were conducted in four replicates per design randomized complete block design with two factors. At the same time, soil samples were analysed from three mutually distant locations in the river Mirna and Rasa in Istria known as truffle aria. All samples were analysed for total content of heavy metals: Zn, Fe (essential), Pb and Cd (toxic) digestion by aqua-regia. Data were statistically analysed by ANOVA with F-test, while the average values were examined Duncan 'level of significance  $p \leq 0.01$ . Determined heavy metal content in the substrate and in the soil were ranged in a series of  $Fe > Zn > Pb > Cd$ . Statistically significant differences ( $p \leq 0.01$ ) was found between the content of all investigated elements. Namely, the determined contents of Fe in the substrate was 2 084.55 mg kg<sup>-1</sup> and in the ground 28 631.67 mg kg<sup>-1</sup>, Zn 137.39 mg kg<sup>-1</sup> (substrate): 80.96 mg kg<sup>-1</sup> (ground), Pb 2.28 mg kg<sup>-1</sup> (substrate): 15.21 mg kg<sup>-1</sup> (ground), Cd 0.175 mg kg<sup>-1</sup> (substrate): 0.46 mg kg<sup>-1</sup> (ground). Determined values were below the limits prescribed by the Croatian Regulations except Zn whose established values were slightly higher than those prescribed for sandy soil (60 mg kg<sup>-1</sup>). In order to get the appropriate parameters for determining benefits mushrooms and truffles as functional foods, in future research, it is necessary to carry out detailed analysis and comparison of translocation of heavy metals from the growing medium in truffles and in mushrooms.

Key words: truffles, champignon mushroom, growth conditions

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