The Effect of a Hydrogen Peroxide Preparation with Silver Ions on the Qualitative Traits of Table Eggs and on Reducing the mycotoxin biosynthesis

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INTRODUCTION

The production of table eggs is increasing worldwide, including alternative systems, i.e. organic and deep-litter production systems. However, it has been proved that eggs, especially those produced in alternative systems, are likely to be microbiologically contaminated and thus they may be potentially dangerous to consumers' health. So far research has focused on bacterial microflora. However, the latest research has also indicated the risk of the presence of microfungi and their metabolites in table eggs. Studies on the population of fungi in table eggs have shown that they may penetrate through the shell and subshell membranes into the egg content. Researchers have found fungi of the *Alternaria, Penicillium, Chaetomium* and *Fusarium* genera on the eggshell surface. During egg storage these fungi grow into the egg content and produce mycotoxins in the egg white. The highest diversity and quantity of microfungi was observed on the shells of eggs laid by hens kept in the deep-litter and free-range systems. Therefore, it is necessary to improve the microbiological state of the eggshell surface to ensure the safety of consumption of table eggs and slow down their spoilage.

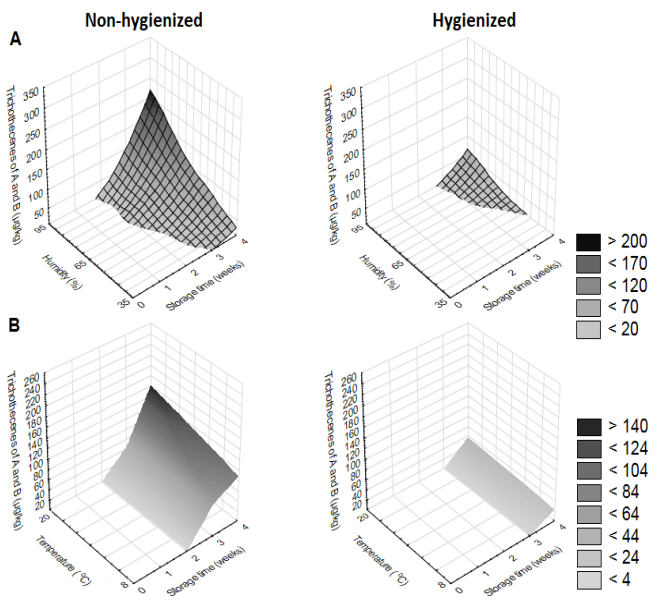

Fig. 1. Variation in the content of type B trichothecenes in the eggs stored at different temperatures (B) and humidity (A)

MATERIAL

The research was conducted on 290 class M eggs with an average weight of 53 g laid by Hy-Line White hens kept in the free-range system. An aqueous preparation containing hydrogen peroxide (1.5%) and silver ions (0.015%) was used for the tests. The study conducted by Tomczyk et al. (2018) proved that this concentration of the preparation did not cause an elastic deformation of eggshells. The tested preparation is commonly used in contact with food. The eggs were sanitised by being immersed in a 3% aqueous solution at 10°C for 5 min.

RESULTS

The qualitative traits and the concentration of ERG and mycotoxins in the eggs sanitised with a hydrogen peroxide preparation containing silver ions were analysed to check whether the sanitation treatment limited the growth of microfungi and mycotoxin biosynthesis and inhibited egg spoilage processes.

ERG in eggshell and egg white

The analysis of the ERG content showed mycobiota neither in the shell nor in the content of freshly laid eggs. After 3 weeks of storage of the eggs which were not treated with H_2O_2 containing silver ions there was a statistically significant dynamic growth of mycobiota on the eggshell surface. The results of measurements of the ergosterol content show that it is possible to inhibit the growth of mycobiotia on the eggshell surface by sanitation, regardless of the egg storage conditions.

There were no fungi found in the content of non-sanitised eggs immediately after laying. After the second week of storage there was increased production of mycotoxins. Increased humidity and temperature during egg storage significantly affected the microfungal growth dynamics. The fungal growth in the content of the eggs sanitised with H_2O_2 containing silver ions was slowed down regardless of the storage conditions

Mycotoxins in egg white

There were no type A or B Fusarium mycotoxins found in the content of non-sanitised eggs immediately after they had been laid and after the first week of their storage regardless of temperature and humidity. After the second week of egg storage there was intensified mycotoxin production, which depended significantly ($p < 0.05$) on humidity during storage. After 4 weeks of egg storage at a humidity of 95% the following concentrations of type A and B trichothecenes were measured: DON – 24 µg/kg, FUS-X – 16 µg/kg, 3-AcDON – 8 µg/kg, 15-AcDON – 16 µg/kg, NIV – 12 µg/kg, Scirpentriol – 5 µg/kg, T-2 Tetraol – 3 µg/kg, T-2 Triol – 2 µg/kg, DAS – 2 µg/kg, HT-2 – 14 µg/kg and T-2 – 21 µg/kg. The presence of mycotoxins in the sanitised eggs stored at high humidity (95%) was detected only after 3 weeks. The storage of the sanitised eggs at low humidity (35%) totally inhibited the production of mycotoxins. The concentrations of the abovementioned mycotoxins in the sanitised eggs stored for 4 weeks at 95% humidity were as follows: 15 µg/kg, 4 µg/kg, 2 µg/kg, 1 µg/kg, 1 µg/kg, 23 µg/kg, 0 µg/kg, 0 µg/kg, 0 µg/kg, 0 µg/kg, 5 µg/kg, 8 µg/kg, 13 µg/kg.