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Orthophenylphenol-based fumigant as a strategy for controlling fungi in the food processing environment

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Food safety and quality are closely related to microbial contamination in the industrial environment. By adopting effective hygienic-sanitary procedures, it is possible to reduce the microbial load to a safe level, which will impact the food shelf life. Thus, the investigation of sanitation strategies with a broad spectrum of action, disinfection of difficult-to-access places and easy applicability has aroused the interest of researchers. Although liquid sanitizers are still commonly used, fumigants have been identified as an alternative due to their great potential in controlling microorganisms, with application in various sectors of the food industry. Thus, the present study aimed to evaluate the effectiveness of a fumigant on fungi present in the air of a food processing environment. A fumigant, based on orthophenylphenol 15% w/w, was applied to a cold chamber in a deactivated dairy industry in a 2.8 g/m³ dosage. The fumigant container was positioned in the middle of the chamber and the place was kept closed for 7 h. To determine the effectiveness of the intervention, an air sampler (MAS-100) was used, before and after disinfection procedure, at different points, including areas close to the insufflator, middle and bottom of the chamber. The equipment operated at a flow rate of 100 L per minute and was disinfected with ethanol between the different sampling points. The samples were collected at a height of 1.5 meters above the ground and also close to the ground. Sterile Petri dishes containing Dicloran Rose Bengal agar with Chloramphenicol (DRBC) were used to fungi cultivation. After 5 days of incubation at 25 °C, the fungi colonies were counted, and the results were expressed in Log CFU/m³. The paired t test was used to compare the mean Log CFU/m³ before and after the intervention. The analyzes were carried out using the R software version 4.0.3 adopting the significance level of 5%. The results showed that there was a statistically significant difference between the microbial load before (3.8 ± 0.23) and after (3.18 ± 0.01) the application of the orthophenylphenol-based fumigant; $p = 0.005$. When it comes to an industrial environment, high levels of fungal contamination are a matter of concern, as these microorganisms can be responsible for food spoilage or food poisoning considering the micotoxigenic fungi. Added to this, it is known that airborne microorganisms are ubiquitous and are a natural part of almost all environments, however, choosing effective strategies contributes to the reduction of associated hazards and risks. This study revealed important insights into the effect of fumigant in reducing environmental contamination, expanding knowledge about the fungal sensitivity of a sanitizer permitted for use in the food industry. However, the use of orthophenylphenol-based fumigants is not yet allowed to indoor industrial rooms in the presence of food products. More studies like this must be carried out in order to clarify decision-making about the processes that help to improve the sanitary status of the industrial environment.

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