

Microbial and SARS-CoV-2 Efficiency Analysis of Froumann HEPA Filter Air Cleaner Brand

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Abstract : Air, which is necessary for living things to survive; while it carries some useful substances in it, it can also carry foreign particles of different sizes that may be harmful to the health. All airborne organic substances of biological origin, including bacteria, fungi, fungal spores, viruses, pollen, and their components, are called "bioaerosols". Nowadays, everyone spends most of their time in closed areas such as home, workplace, school, etc. Although it is known that outdoor air pollution affects health, it is not known that indoor air pollution has harmful effects in terms of health. In this study, indoor air microbial load and SARS-CoV-2 virus cleaning efficiency of Froumann brand air cleaners were studied. This work in 300 m³, 600 m³, and 1000 m³ completely closed areas without any air circulation with Froumann N80, N90, and N100 air-cleaning devices. Analyzes were performed for both areas at 60 minutes before and after the device was operated using a particle measuring device (Particles Plus 7302) and an air sampler (Mas-100 ECO). The measurements were taken by placing the test equipment 1.5-2 m away from the air cleaner. At the same time, the efficiency of the HEPA filter was evaluated by taking samples from the air outlet point of the HEPA filter using the air sampling device (Mas-100 ECO) after the device was started. Nutrient agar and malt agar are used as total mesophilic bacteria and total fungi. The number of colony-forming units per m³ (cfu/m³) was calculated by counting colonies in Petri dishes after incubation for 48 hours at 37°C for bacteria and 72 hours at 30°C for fungi. The change in the number of colonies and the decrease in the microbial load was calculated as a percentage value. SARS-CoV-2 activity analysis studies were carried out by İnönü University Microbiology Department in accordance with the World Health Organization regulations. Finally, the HEPA filter in the devices used was taken and kept under a certain temperature and humidity, and the change in the microbial load on it was monitored over a 6-month period. At the end of the studies, a 91%-94% reduction was determined in the total mesophilic bacteria count of Frouman brand N80, N90, and N100 model air cleaners. A decrease of 94%-96% was detected in the total number of yeast/molds. HEPA filter efficiency was evaluated, and at the end of the analysis, 98% of the bacterial load and approximately 100% of yeast/mold load at the HEPA filter air outlet point were decreased. According to the SARS- CoV-2 analysis results, when the device is operating at the medium airflow level 3, it can filter virus-carrying aerosols by 99%. As a result, it was determined that the Froumann model air cleaner was effective in controlling and reducing the microbial load in the indoor air.

Keywords : HEPA filter, indoor air quality, microbial load, SARS-CoV-2

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