

Research on the Microbial Reducing Effect of Photo catalytically Active Titanium Oxide Nanoparticles on Black Mold (*Aspergillus Brasiliensis*)

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Introduction:

The company Projectmanagement B.V. has commissioned us to test the germ-reducing effect of the product MULTIPURUS on black mold under the influence of sunlight / artificial UVA light.

The product MULTIPURUS is supplied as an aqueous suspension and can be applied using a sprayer. After drying, in combination with the UV spectrum in, for example, sunlight, it can generate hydroxyl radicals.

These radicals are highly reactive and can engage in a variety of chemical reactions. In addition to the breakdown of numerous chemical compounds, these reactions can lead to the destruction of microorganisms such as bacteria, fungi, and viruses.

The client claims that, after impregnation of surfaces with the product, microorganisms that come into contact with the treated surface and are exposed to a UV light source decrease in number.

We aim to test this claim under laboratory conditions.

Method:

Trespa tiles (dimensions: 11 × 6 × 0.6 cm) are treated with MULTIPURUS spray. The tiles are then dried for 24 hours in an incubator at 42 °C.

After this drying period, the tiles are inoculated with the fungus *Aspergillus Brasiliensis*. This is done using a cotton swab, applying an inoculum concentration of 9×10^6 . The tiles are then further dried for 1 hour in an incubator at 42 °C.

The experiments are carried out in triplicate. For each strain, two tiles are wrapped in aluminium foil to prevent daylight from activating the photocatalytic effect of the product. The remaining tiles are exposed to a UVA LED lamp (365 nm), at a distance of 22.5 cm, for 72 hours and 120 hours.

After the exposure periods, the tiles are sampled. For this, a swab moistened with peptone-physiological saline solution is rubbed over the tile surface to collect the fungal cells present. The samples are then plated using the pour plate method on Sabouraud Dextrose Agar.

After 120 hours of incubation, the colonies are counted, and the colony-forming units (CFUs) are determined. The reduction in fungal growth is calculated using the following formula:

$$\text{Reductionpercentage} = \frac{(\text{Test plate} - \text{Positive control})}{\text{Positive control}} \times 100\%$$

Results:

T= 72 hours

N = 3	<i>Aspergillus Brasiliensis</i> CFU/plate
Controle plate	2.025.000
Processed plate	120000
Reduction %	94,07%

T= 120 hours

N = 3	<i>Aspergillus Brasiliensis</i> CFU/plate
Controle plate	53.681
Processed plate	<10
Reduction %	99,98%

Conclusion:

The conducted test demonstrates that the treatment of Trespa tiles with MULTIPURUS spray, in combination with UVA exposure, has a clear antimicrobial effect against *Aspergillus Brasiliensis*. The calculated reduction percentage was sufficiently high to confirm that the method was successfully performed and that the product is effective under the tested conditions.

Discussion:

One point of attention is that the positive control also showed a reduction. This may indicate that factors unrelated to the product's mechanism are involved, such as environmental influences or a natural decline of the fungus in the test setup. Although this complicates direct comparison, the reduction observed relative to the control remains large enough to confirm the effectiveness of the treatment.

Sunlight contains approximately 10% UV light, of which 95% is UVA. Surfaces coated with UVclean can therefore inactivate microorganisms such as black mold not only outdoors, but also indoors (with the aid of a UVA-rich lamp or sunlight).

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