



BBI TEST LABS

Study Report #TR 23110714b

for

Kleen-TeX

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December 15, 2023

Study Report: Determining Resistance of Synthetic Polymeric Materials to Fungi

Client: Kleen-Tex

Report #: 23110714b

Study: Determining Resistance of Synthetic Polymeric Materials to Fungi Using ASTM G21-2015 Standard Practice

This study was conducted to determine the ability of three Nitrile rubber mat samples to resist a mix of five fungal isolates. The samples were inoculated with the suspension containing five fungal isolates and incubated for 28 days at $29 \pm 1^\circ\text{C}$. After incubation, the samples were evaluated for the presence of fungal growth.

The above study was conducted in the laboratories of Microban International at 11400 Vanstory Drive, Huntersville, NC 28078. This report represents a true and accurate account of the results obtained.

Study Start Date: November 8, 2023

Study Completion Date: December 6, 2023

Report Issued Date: December 15, 2023

Analyst:
Person who
conducts/reports test
(Microbiologist)



Valerie Jenkins, Microbiologist III

Reviewer:



James Hanna
Microbiology Lab Manager BBI Test Labs

Contents

1. Introduction	4
2. Test Materials	4
3. Methods	4
4. Results	5-7
5. Raw Data	8
6. References	8
7. Exclusion of Liability	8-9

1. Introduction

This report summarizes a study performed to assess the antifungal resistance of three Nitrile rubber mat samples against *Aspergillus brasiliensis* (ATCC 9642), *Penicillium funiculosum* (ATCC 11797), *Chaetomium globosum* (ATCC 6205), *Trichoderma virens* (ATCC 9645), and *Aureobasidium pullulans* (ATCC 15233) using the method described in ASTM G21-2015 (1).

2. Test Materials

Test samples were supplied by Kleen-Text. The samples were held in the original package at ambient conditions until testing was performed.

-Sample 3: 23110714-03 PGC R1

-Sample 3: 23110714-03 PGC R2

-Sample 4: 23110714-04 Standard Mat R1

-Sample 4: 23110714-04 Standard Mat R2

-Sample 7: 23110714-07 25 Washes Mat R1

-Sample 7: 23110714-07 25 Washes Mat R2

-Sample 10: 23110714-10 50 Washes Mat R1

-Sample 10: 23110714-10 50 Washes Mat R2

A Validity Control specimen of sterilized filter paper, provided by the BBI Test Labs, was inoculated, and incubated simultaneously.

The laboratory added an untreated testing positive growth control sample of a similar material.

3. Methods

Antifungal resistance of each sample was determined using the protocol described in ASTM G21-2015 (Ref. 1).

In summary:

- Two replicates of each sample specimen measuring 50 x 50 mm (2 x 2 in.) were placed on the surface of separate Petri dishes containing solidified Nutrient-Salts Agar (NSA).
- The samples and the NSA surface were inoculated with the composite spore suspension by spraying the suspension from a sterilized atomizer so that the entire surface was moistened with the spore suspension [*Aspergillus brasiliensis* (ATCC 9642), *Penicillium funiculosum* (ATCC 11797), *Chaetomium globosum* (ATCC 6205), *Trichoderma virens* (ATCC 9645), and *Aureobasidium pullulans* (ATCC 15233)].
- The spore suspension contained approximately 1.2×10^6 spores/mL as confirmed with a hemocytometer.
- All plates were incubated at $29 \pm 1^\circ\text{C}$ and $> 90\%$ relative humidity for 28 days.
- The incubated plates containing the test samples were visually and microscopically analyzed to confirm the presence of fungal mycelia and/or spores.

4. Results

The validity of the test was ascertained by the copious growth of the inoculated fungi on the filter paper control specimen. Test results are shown in Table 1.

Table 1: Observation of Fungal Presence on Test Samples After 28-Day Challenge

Sample Number	Sample Description	Replicate #1 Score	Replicate #2 Score
23110714-03	Untreated Positive Growth Control (PGC)	2	2
23110714-04	Standard Mat R1	0	0
23110714-07	25 Washes Mat R1	0	0
23110714-10	50 Washes Mat R1	0	0
Validity Control (sterilized filter paper)		4	

Rating of Observed Growth on Specimens (Sporulating or Non-Sporulating, or Both)

0: No presence of fungal growth

1: Traces of growth (less than 10 %)

2: Light growth (10 to 30 %)

3: Medium growth (30 to 60 %)

4: Heavy growth (60 % to complete coverage)

Figures 1-9 depicts the test plates for each sample following 28 days of incubation.

Figure 1: 23110714-03 Untreated PGC R1

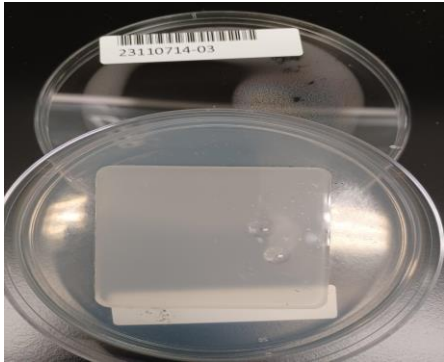


Figure 2: 23110714-03 Untreated PGC R2

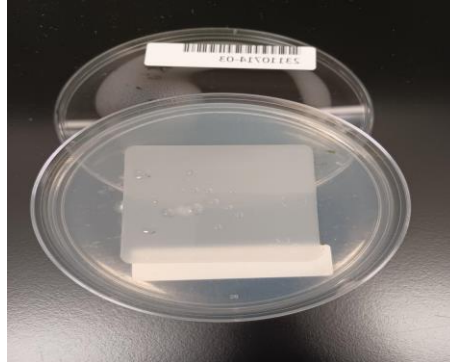


Figure 3: 23110714-04 Standard Mat R1

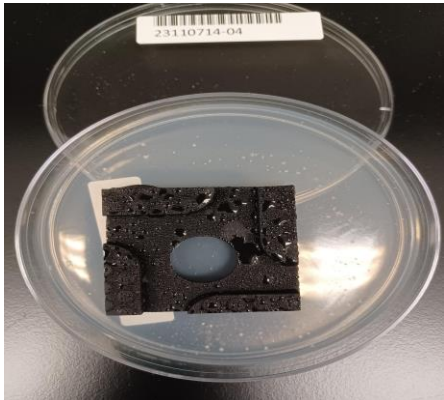


Figure 4: 23110714-04 Standard Mat R2

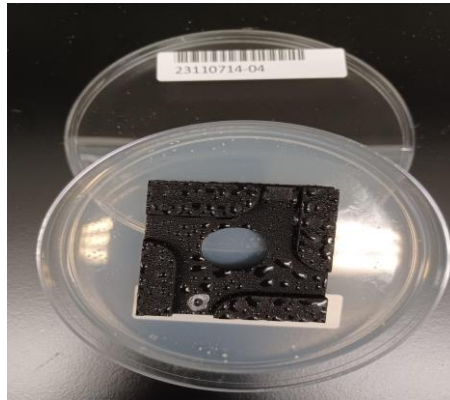


Figure 5: 23110714-07 25 Washes Mat R1

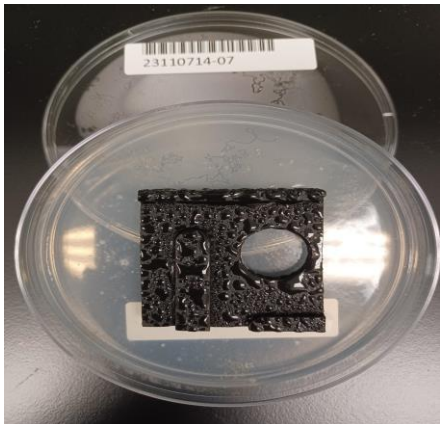


Figure 6: 23110714-07 25 Washes Mat R2

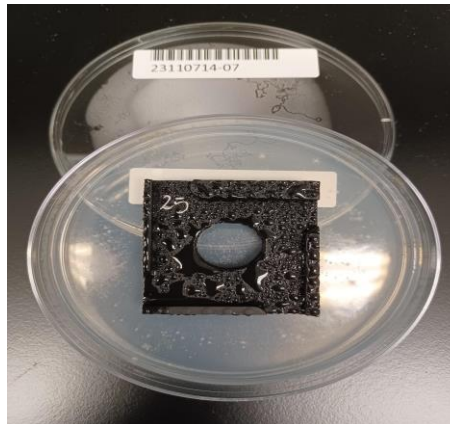


Figure 7: 23110714-10 50 Washes Mat R1

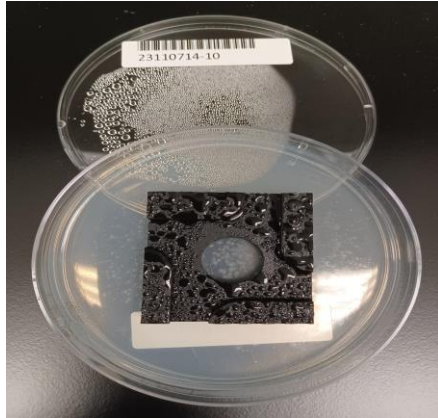


Figure 8: 23110714-10 50 Washes Mat R2

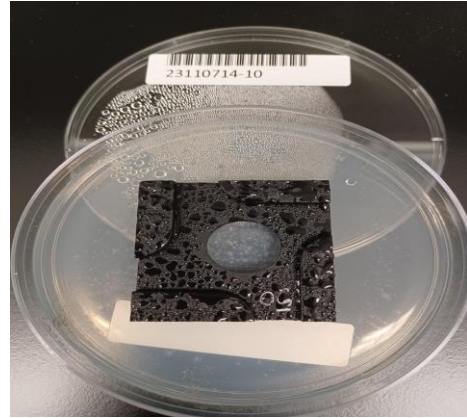
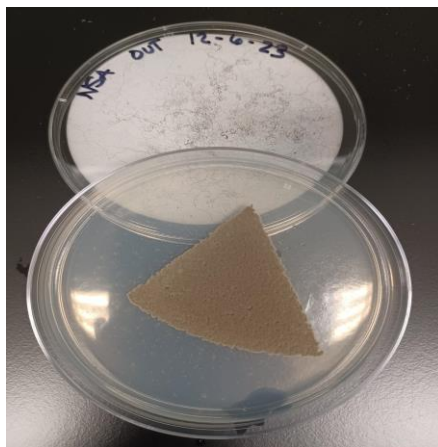


Figure 9: Validity Control



5. Raw Data

The raw data for this study will be held in file BBI TEST LABS 23110714b in the Archive of BBI TEST LABS at 11400 Vanstory Drive for 6 years from the date of this report unless other specific instructions are given.

6. References

(1) ASTM G21-2015: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

7. Exclusion of Liability

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