IMSL

INDUSTRIAL MICROBIOLOGICAL SERVICES LTD

STUDY REPORT: **Antimicrobial Activity of Jotun Fenomastic Gold**

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Contents

1 Introduction

This report summaries 2 studies performed to assess both the mould resistance and antibacterial performance Fenomastic Gold ex Jotun (UAE) Ltd.

2 Test Materials

A sample of Fenomastic Gold Blank and Fenomastic Gold White were supplied by Jotun (UAE) Ltd. All samples were held in the dark at 20°C prior to use and between phases of testing.

2.1 Preparation of Test Coatings

For the mould resistance tests, panels (60 x 80mm) were cut from sheets of calcium silicate board (Masterboard ex Cape Products Ltd, UK). Each panel was sanded on all faces and a slight bevel was made on the edges of the upper face of each panel. The prepared panels were then leached in water for 3 days to reduce their pH then allowed to air dry. Three replicate panels were painted on all faces with 2 coats of each of the formulations described in Section 2 above. Coats were allowed to air dry for between 12 and 18 hours between coats. After coating, all panels were held at 20°C for 28 days to dry and stabilise.

For the antibacterial assays, test panels (225 x 225 mm) were created using unglazed ceramic tiles (these provide a robust and smooth surface suitable for the assay procedure). The tiles were leached in water for 3 days prior to use to eliminate any potentially antimicrobial materials then allowed to air dry. Three replicate panels were painted on the upper face with 2 coats of each of the formulations described in Section 2 above. Coats were allowed to air dry for between 12 and 18 hours between coats. After coating, all panels were held at 20°C for 28 days to dry and stabilise.

3 Methods

Fungicidal activity was determined using BS3900 Part G6. Individual panels were inoculated with a consortium of fungi then incubated under humid conditions to stimulate their growth.

Antibacterial activity was determined using a surface activity technique based on the Japanese Film Adherence Method and including developments introduced by both IBRG and IMSL.

3.1 BS3900 Part G6: Inoculation / Incubation of Materials

Three replicate panels of each test system were inoculated (1000 µl per sample) with a mixed spore suspension ($> 10^5$ spores ml^{-1} of each species) of the fungi described in BS3900 part G6 (see Table 1 and Ref. 1 for details). The samples were then allowed to stand at ambient room temperature overnight then transferred to humid chambers (each containing 200g sterile vermiculite moistened with 700g sterile water) and incubated in the dark at 20°C for 3 months.

Table 1: Fungal Inoculum

Species	Reference Number
Alternaria alternata	IMI342924
Aspergillus versicolor	IMI45554
Aureobasidium pullulans	IMI45533
Cladosporium cladosporioides	IMI178517
Penicillium purpurogenum	IMI178519
Phoma violacea	IMI49948ii
Rhodotorula rubra	NCYC1659
Ulocladium attrum	IMI342923
Sporobolomyces roseus	NCYC 717
Rhodotorula rubra	NCYC 1659

At the end of the incubation period the coatings were assessed for growth and the appearance recorded by direct digital capture (Fuji S1 fitted with a Nikkor 55mm lens).

3.2 Antibacterial Activity Method

To determine antibacterial activity, samples were analysed using a method developed from the Japanese Film Adherence Method (Ref. 2).

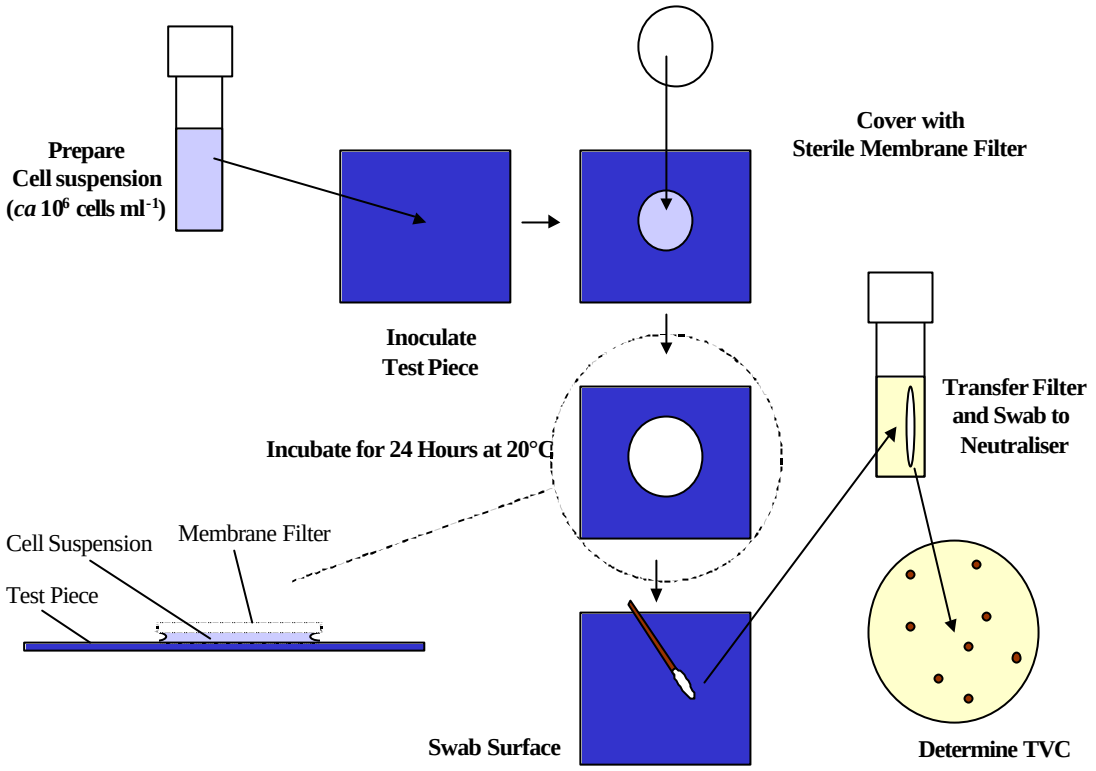
Replicate (3) aliquots of a log phase cell suspension (*ca* 10^6 cells ml^{-1}) of selected species listed in Table 2 in ¼-strength Ringers' solution were placed onto the surface of both the panels coated with Fenomastic Gold Blank and Feniomastic Gold White and held in intimate contact using a membrane filter for 3 days at 20°C in humid conditions. After 0, 24 hours and 3 days contact time, the cell suspensions were recovered by swab and by transferring the membrane filter into sterile distilled water. The number of surviving bacteria were then enumerated by spiral dilution onto Trypcase Soya Agar (see schematic diagram below).

Table 2: Test Strains

Test Species	Stain Number†
Escherichia coli	NCIMB 8879
Staphylococcus aureus	NCIMB 9518

The test strains used are those listed in the current European disinfection test EN1276.

Figure 1: Schematic of Surface Test Method



4 Results / Discussion

The results of the mould growth study are shown in Plates 1 and 2 and Table 3 below. The results of the antibacterial study are shown in Table 4 and Figure 2 below.

Table 3: Mould Growth ratings

Test System	Fungal Growth Rating
Fenomastic Gold Blank	5
Fenomastic Gold White	0

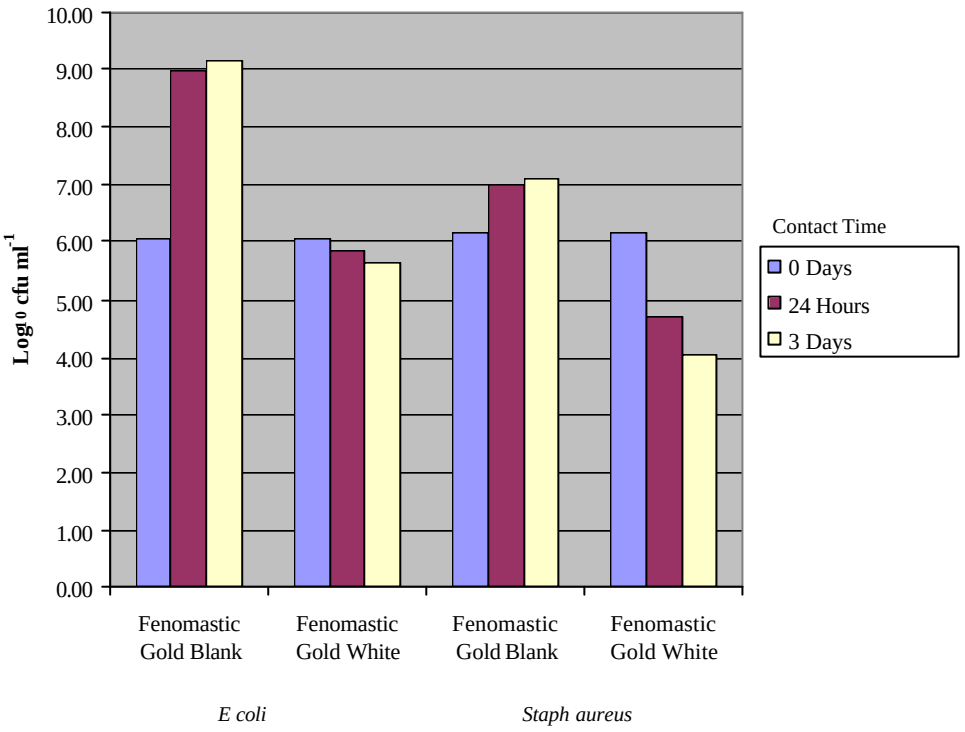
Key 0 = No Growth, 1 = Trace to 1%, 2 = 1 - 10%, 3 = > 10 - 30%, 4 = > 30 - 70%, 5 = > 70%

It can be seen from the results in Table 1 above and in Plates 1 and 2 below that the blank formulation supported extensive growth following incubation for 3 months. In contrast, no growth was detected on Fenomastic Gold White.

Table 4: Antibacterial Activity of Fenomastic Gold (as Colony Forming Units ml^{-1})

Test Species	Total Viable Count (Geometric Mean of 3 Replicate Counts)					
	0 Hours Contact		24 Hours Contact		3 Days Contact	
	Blank	White	Blank	White	Blank	White
E coli	1.1×10^6	1.1×10^6	9.3×10^8	7.1×10^5	1.4×10^9	4.4×10^5
Staph aureus	1.4×10^6	1.4×10^6	1.0×10^7	5.0×10^4	1.3×10^7	1.1×10^4

Figure 2: Antibacterial Activity of Fenomastic Gold



It can be seen from the results in Table 4 and Figure 2 above that *E coli* readily grew on the surface of the Fenomastic Gold Blank and the population increased by 3 orders of magnitude over the exposure period. *Staph aureus* also grew and the population increased by 1 order of magnitude. In contrast, no growth (an approximate 0.5 log reduction occurred) of *E coli* was seen on the Fenomastic Gold White system and the population of *Staph aureus* declined by *ca* 2 orders of magnitude. It would therefore appear from these results that Fenomastic Gold White inhibits the growth of *E coli* and *Staph aureus* (the decline seen was probably more a loss of viability than anti-bacterial activity *per se*) on moist surfaces.

Plate 1: Fenomastic Gold Blank

Plate 2: Fenomastic Gold White

6 Raw Data

The raw data for this study will be held in file IMSL/2000/05/002 in the Archive of IMSL at Pale Lane, Hartley Wintney, Hants, RG27 8DH, UK for 6 years from the date of this report unless other specific instructions are given.

7 References

1 BS3900 Part G6: Assessment of Resistance to Fungal Growth, (1989) BSI, London

2 Japanese Industrial Standard JIS Z 2801: 2000 (E)

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