materials

MDPI

Article

Supplementary material

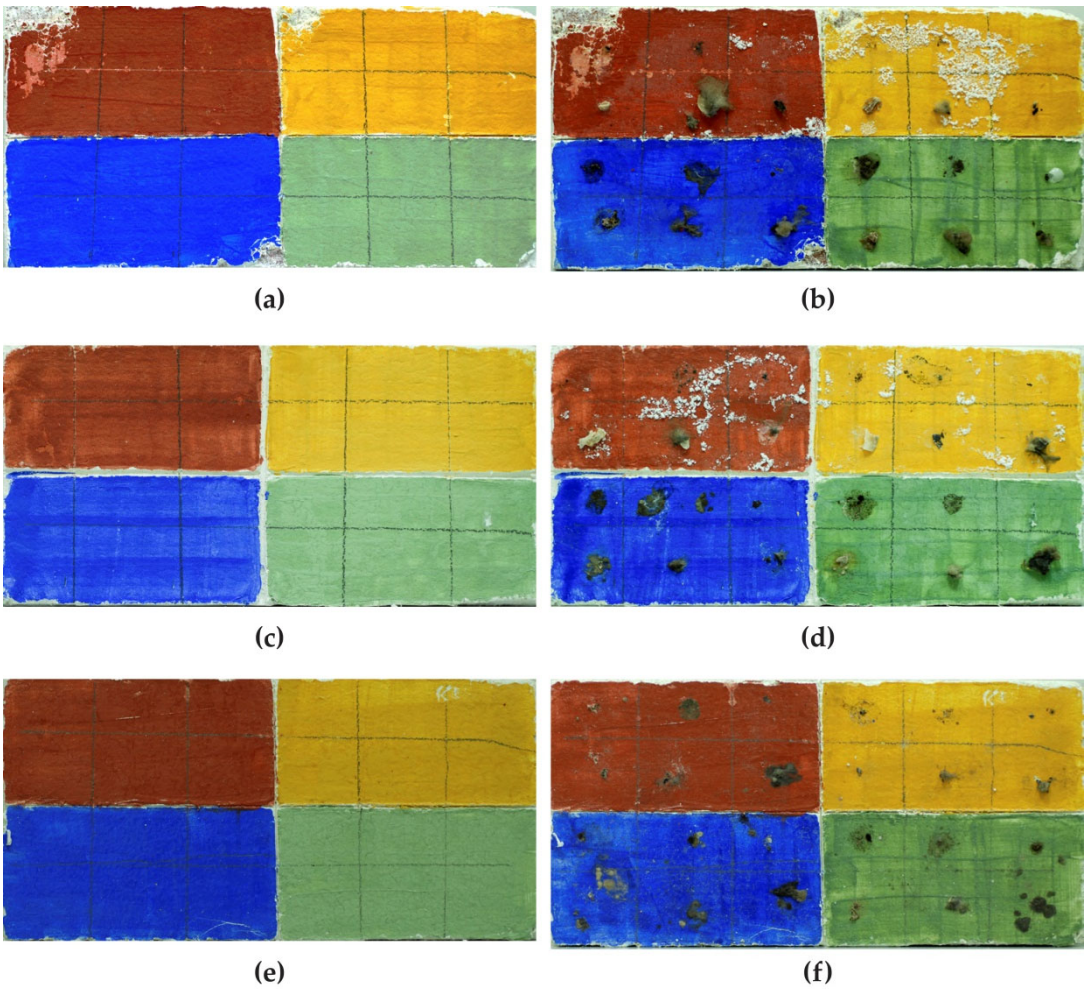
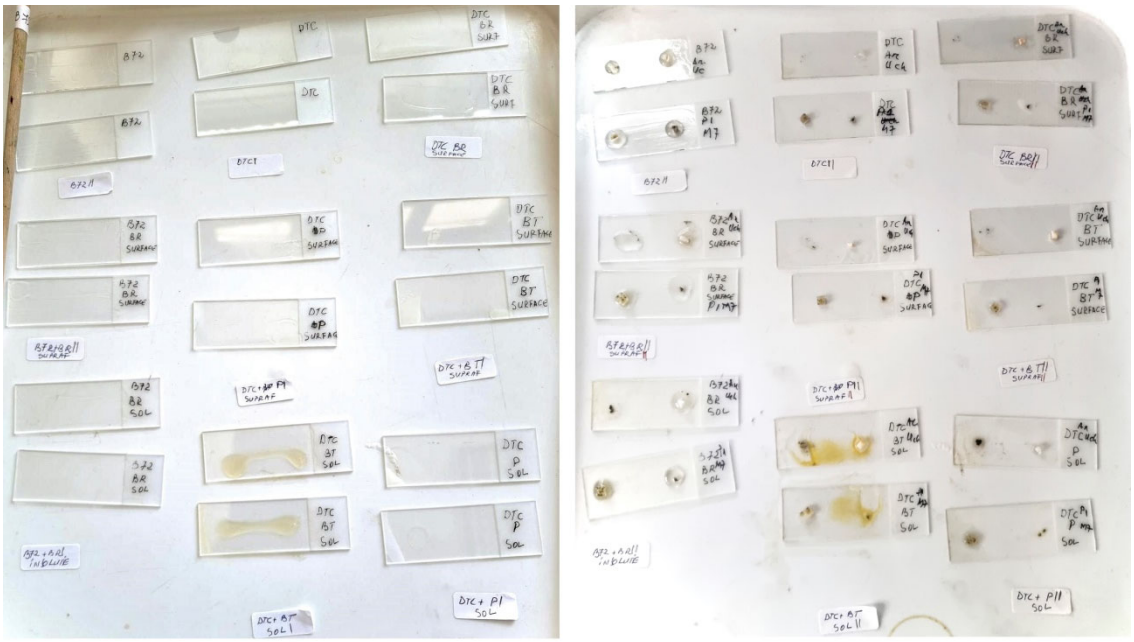


Figure S1. Painted laboratory models before and after inoculation with *Aspergillus* sp. S1, *Bipolaris* sp. P2, *Bipolaris* sp. M3, *Ulocladium* sp. H1, *Bipolaris* sp. M4, *Bipolaris* sp. M7. (**a**) Control before inoculation; (**b**) Control after inoculation; (**c**) Painted laboratory model covered with TDC before inoculation; (**d**) Painted laboratory model covered with TDC after inoculation; (**e**) Painted laboratory model covered with Paraloid® B72 before inoculation; (**f**) Painted laboratory model covered with Paraloid® B72 after inoculation.



(a) (b)

Figure S2. Experimental design to evaluate the resistance of consolidants with biocides integrated to fungal colonization: (**a**) glass slides uninoculated; (**b**) glass slides inoculated.



(a) (b)

Figure S3. Experimental design to evaluate the resistance of consolidants with biocides integrated to fungal colonization: (**a**) frescoes fragments uninoculated; (**b**) frescoes fragments inoculated.

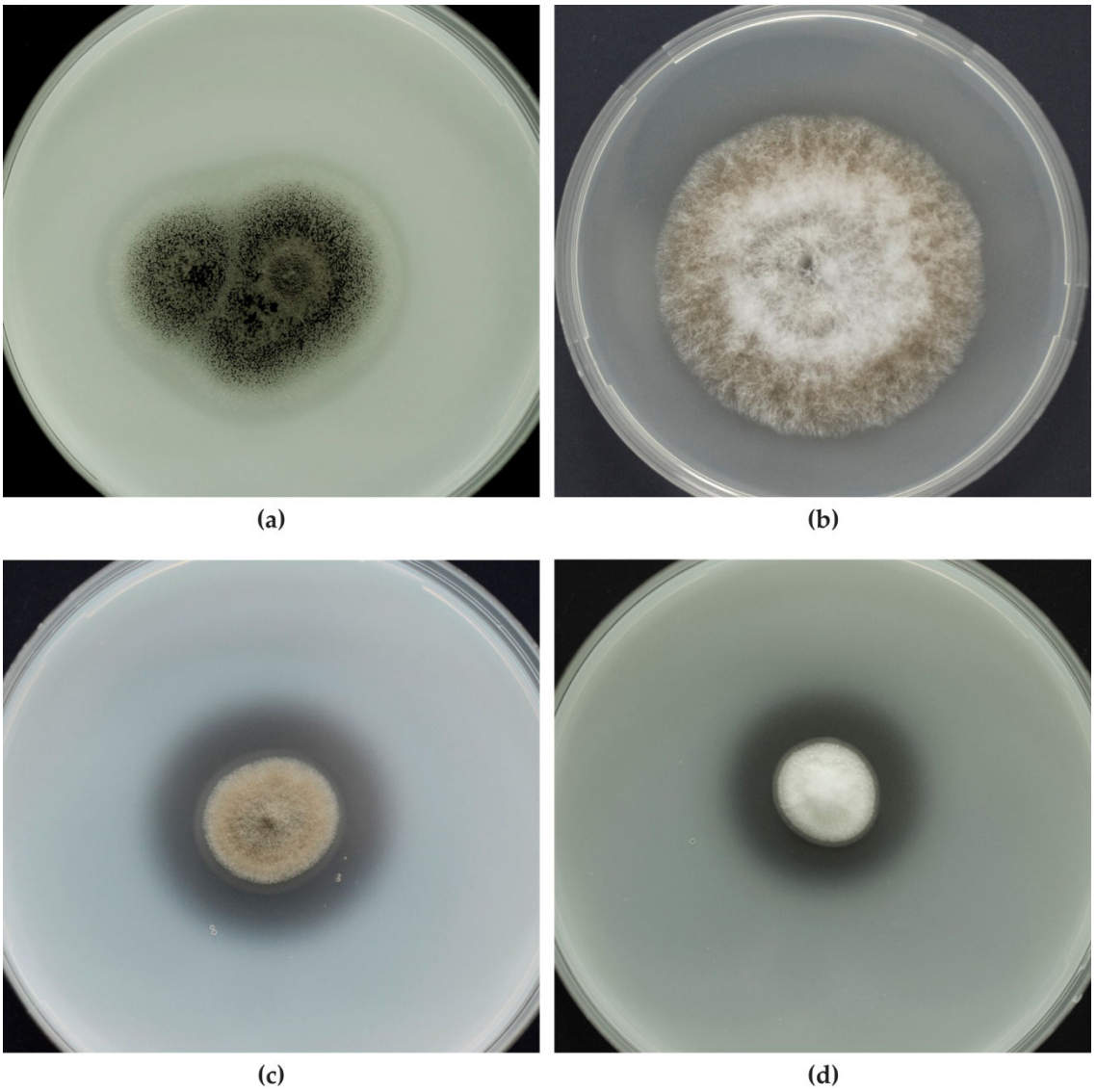


Figure S4. Identification of protease activity by plate assay method: (**a)** *Aspergillus* sp. S1; (**b**) *Bipolaris* sp. M3; (**c**) *Bipolaris* sp. P2; (**d**) *Ulocladium* sp. H1.

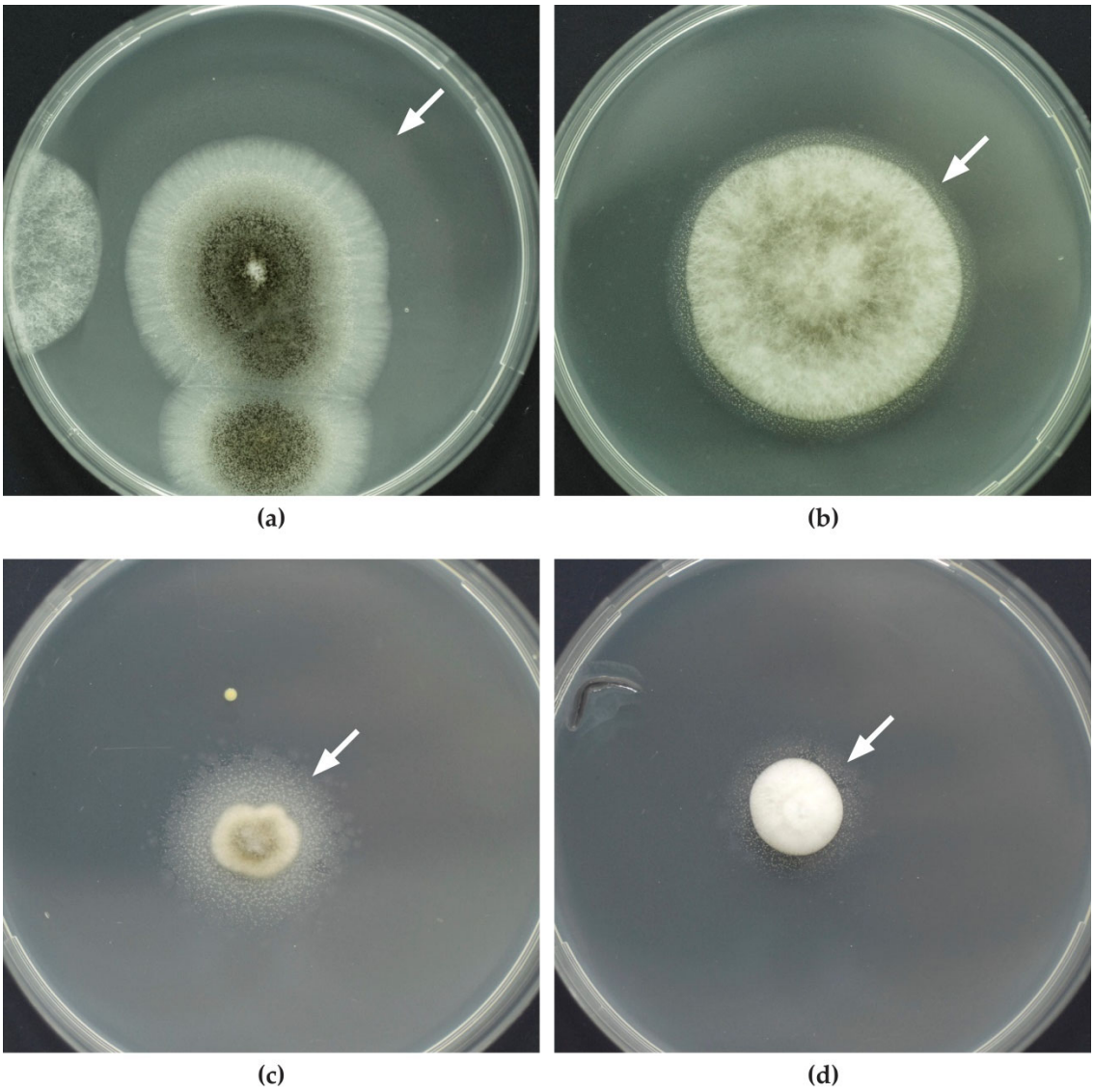


Figure S5. Identification of esterase activity by plate assay method: (**a)** *Aspergillus* sp. S1; (**b**) *Bipolaris* sp. M3; (**c**) *Bipolaris* sp. P2; (**d**) *Ulocladium* sp. H1.

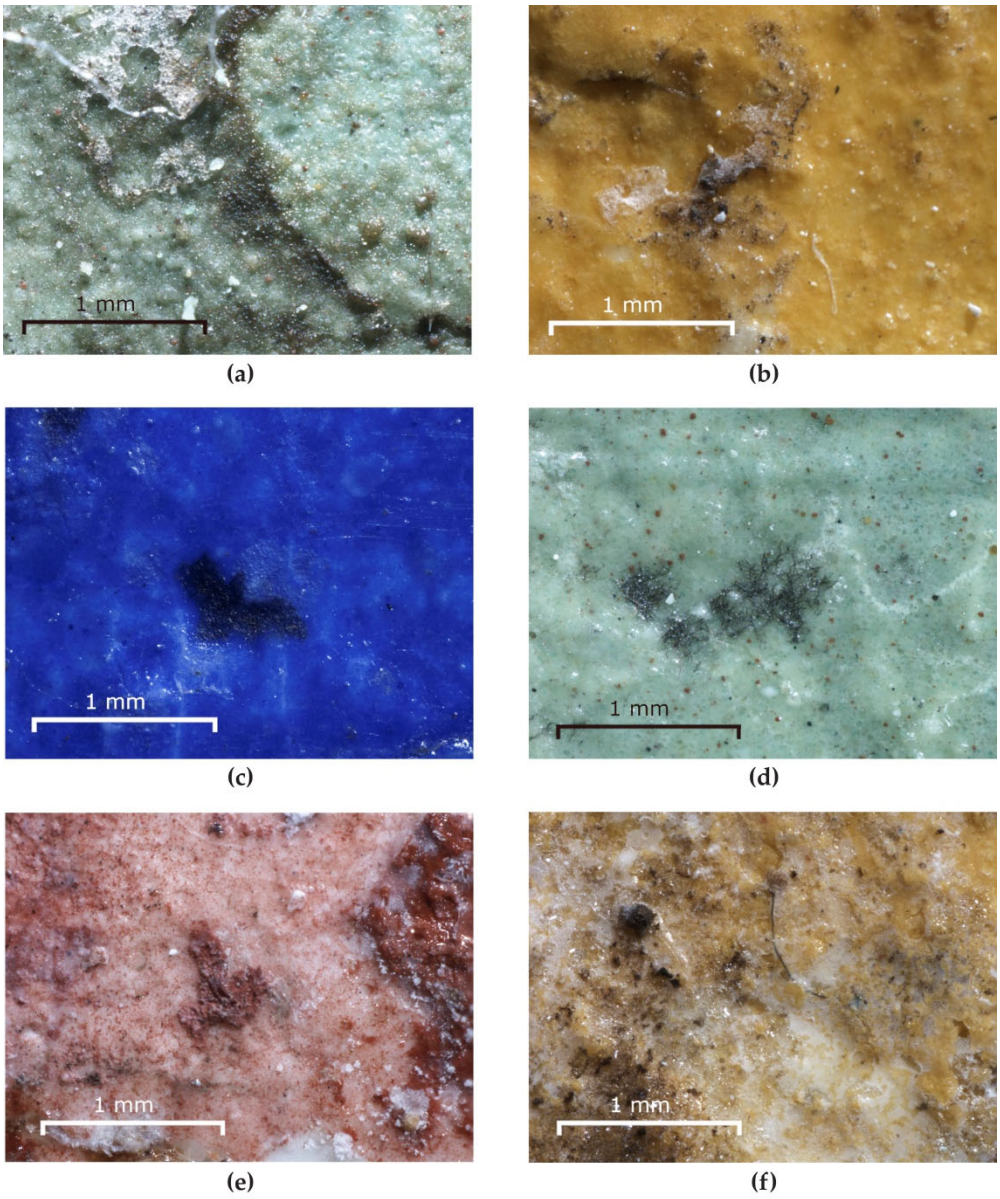


Figure S6. Changes produced by fungi on the surface of consolidants. (**a**) blackening due to migration of melanins produced by *Bipolaris* sp. M7 on TDC; (**b-c**) blackening due to the sticky mass spores and mycelium of *Aspergillus* sp. S1 on Paraloid® B72; blackening due to the sticky mass of mycelium of *Bipolaris* sp. M7 on Paraloid® B72; (**e, f**) loss of pigment by removal of the fixed mycelium of *Bipolaris* sp. M7on the control.

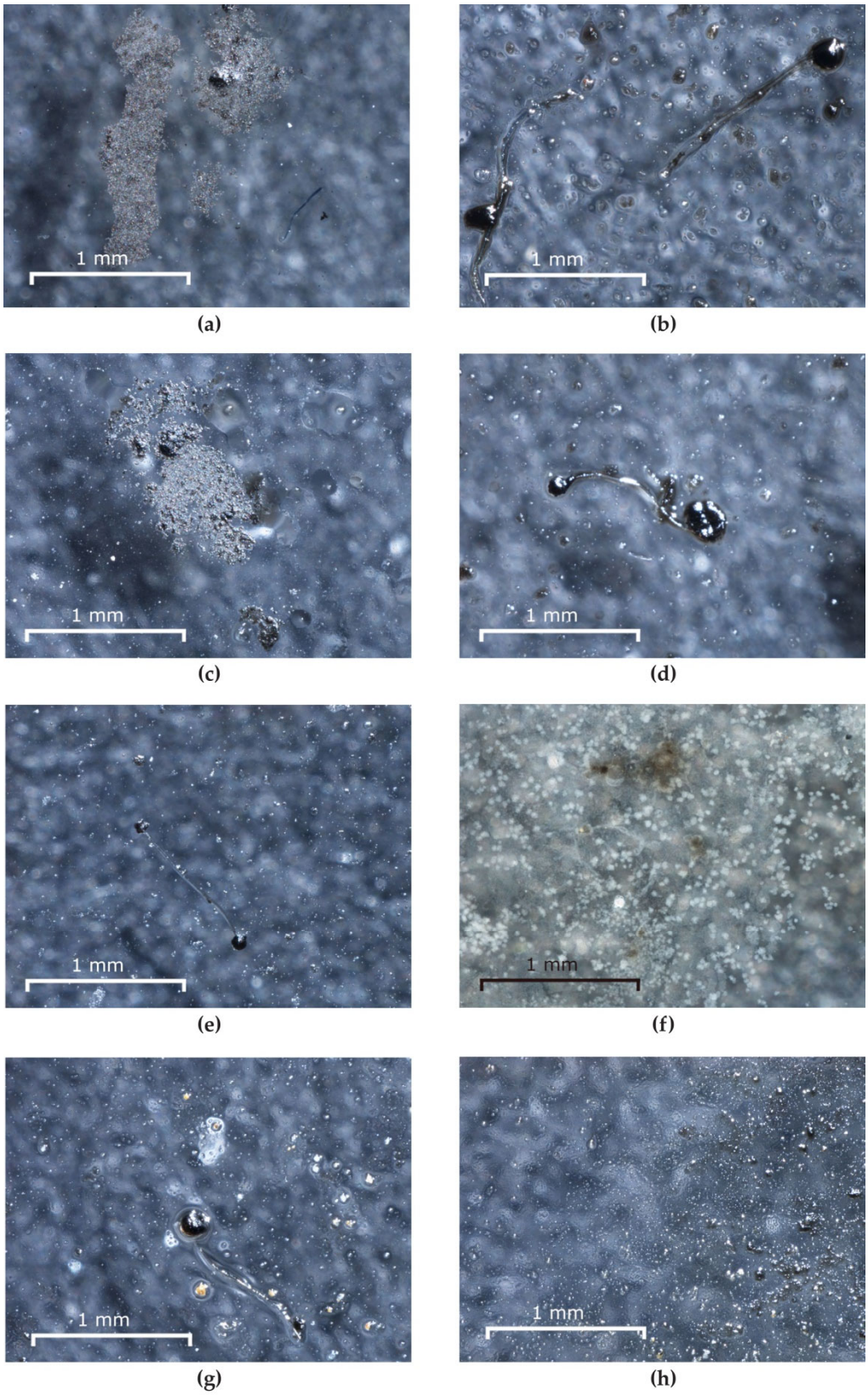


Figure S7. The effect of biocides applied on consolidants on the growth of *Aspergillus* sp. S1. (**a**) Paraloid® B72 + BR_s; (**b**) Paraloid® B72 + BR_m; (**c**) TDC + BR_s; (**d**) TDC + BR_m; (**e**) TDC + BT_s; (**f**) TDC + BT_m; (**g**) TDC + P_s; (**h**) TDC + P_m.

Table S1. Calculated ΔE for all treated areas.

	ΔE - Paraloid B72				**ΔE – TDC**			
	Green	Blue	Yellow	Red	Green	Blue	Yellow	Red
Aspergillus sp. S1	4.03	23.56	1.54	11.93	11.1	25.45	7.75	8.38
Bipolaris sp. P2	4.88	2.31	3.12	1.49	5.31	20.4	5.31	11.49
Bipolaris sp. M3	1.81	10.42	12.3	13.33	7.5	21.98	14.44	22.48
Ulocladium sp. H1	3.79	5.42	25.94	6.59	4.87	12.32	17.15	14.27
Bipolaris sp. M4	3.25	4.54	1.61	1.28	4.02	8.21	10.7	13.96
Bipolaris sp. M7	3.28	2.74	6.76	1.74	3.17	12.82	9.5	19.2

ΔE≤1: Color change is not perceptible by the human eye

ΔE=1÷2: Color change is perceptible through close observation

ΔE=2÷ 10: Color change is perceptible at a glance

Table S2. Cleaning efficient percentage as calculated from the colorimetry data.

Fungal strain	**ΔE - B72 (%)**				**ΔE - TDC (%)**			
	Green	Blue	Yellow	Red	Green	Blue	Yellow	Red
Aspergillus sp. S1	-354.762	-1580.56	-35.2632	-1011.11	-1201.19	-1706.94	-214.211	-658.586
Bipolaris sp. P2	-434.524	-62.5	-4.73684	25.25253	-547.619	-1333.33	-92.6316	-981.818
Bipolaris sp. M4	-107.143	-604.861	-455.263	-1147.47	-853.571	-1430.56	-569.474	-2075.76
Ulocladium sp. H1	-342.857	-286.806	-1172.11	-470.707	-435.714	-724.306	-715.789	-1246.46
Bipolaris sp. M3	-257.143	-215.972	10.52632	50.50505	-359.524	-440.972	-375.789	-1216.16
Bipolaris sp. M7	-213.095	-147.917	-158.421	-30.303	-234.524	-773.611	-309.474	-1743.43