

ogenic synthesis and characterization of chitosan-CuO nanocomposite and evaluation of antibacterial activity against gram positive and negative bacteria

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SUPPLEMENTARY MATERIALS

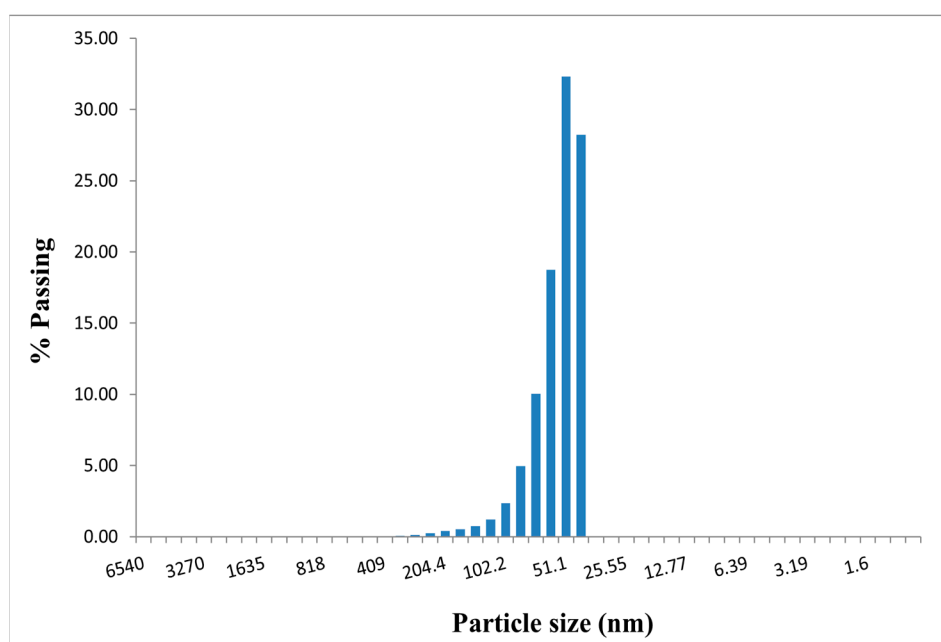


Figure S1: Particle size distribution of CuO nanoparticles obtained by DLS method

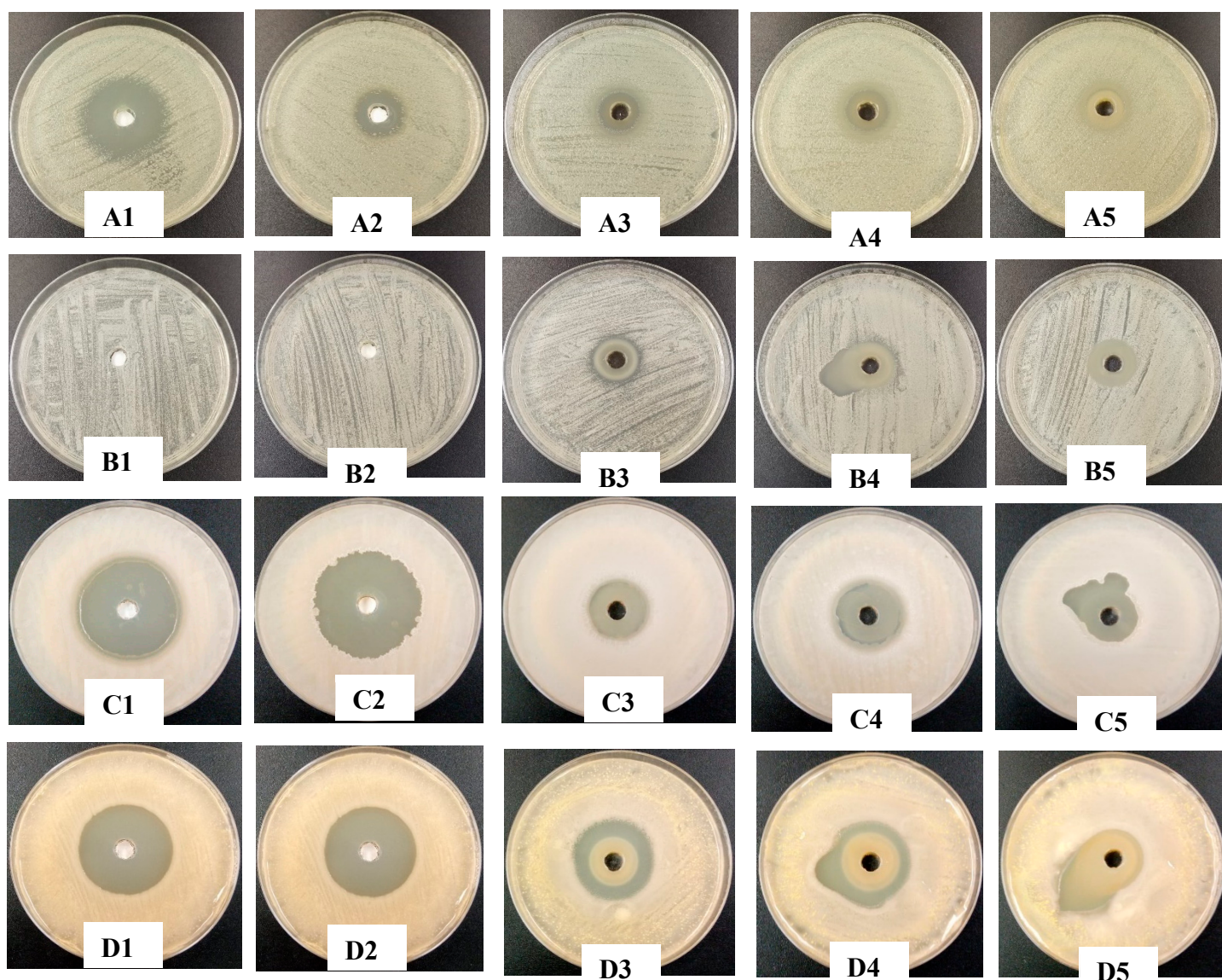


Figure S2: Inhibition of bacterial growth by cup plate experiment. A, B, C and D show inhibition of *Bacillus licheniformis*, *Staphylococcus heamolitica*, *Bacillus cereus* and *Micrococcus luteus* respectively in the presence of 1- Ciprofloxacin, 2-Amoxacillin, 3-CHT_{0.5}-CuO nanocomposite, 4 – CHT_{1.0}-CuO nanocomposite and 5- CHT_{2.0}-CuO nanocomposite

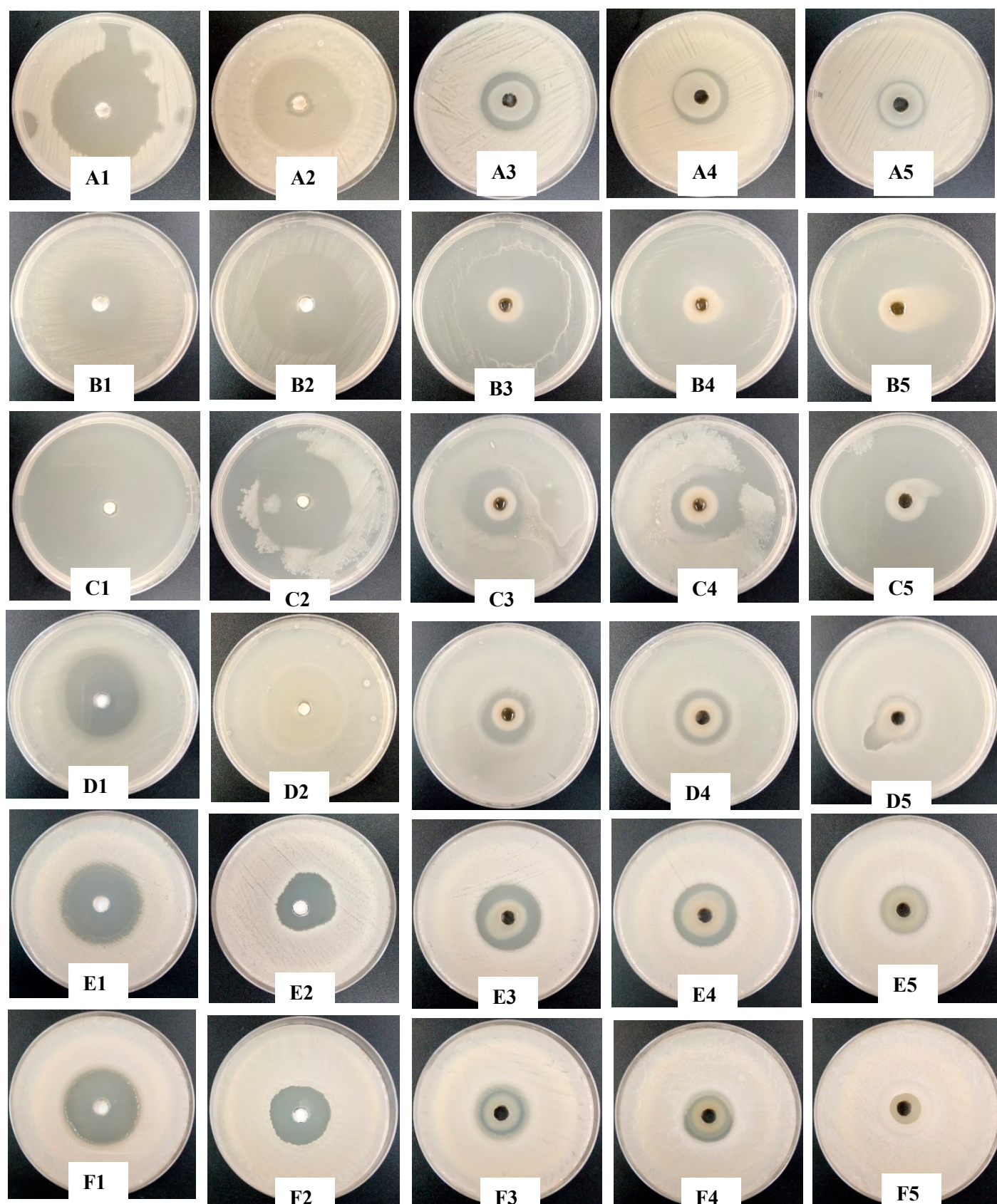


Figure S3: Inhibition of bacterial growth by cup plate experiment. A, B, C, D, E and F show inhibition of *Escherichia coli*, *Pseudomonas citronellolis*, *Pseudomonas aeruginosa*, *Klebsiella sp*, *Bradyrhizobium japonicum* and *Ralstonia pickettii* respectively in the presence of 1- Ciprofloxacin, 2-Amoxacillin, 3-CHT_{0.5}-CuO nanocomposite, 4 – CHT_{1.0}-CuO nanocomposite and 5- CHT_{2.0}-CuO nanocomposite

Table S1: Assessment of the antimicrobial effect of CHT -CuO nanocomposites on gram positive and gram negative bacteria based on turbidity visualization of the culture and bacterial count on solid Agar plate. Values in brackets represent bacteria counts or colony forming units (CFU $\times 10^6$ /ml) after 24 h culture. Positive control presents culture liquid without bacterial inhibitor substance, and negative control is the culture without bacteria. ‘–’ infers complete growth inhibition where ‘+’ indicate bacteria growth.

Bacterium	CHT _{0.5} -CuO nanocomposite Conc (%)					CHT _{1.0} -CuO nanocomposite Conc (%)					CHT _{2.0} -CuO nanocomposite Conc (%)					controls	
	10 ⁻¹	10 ⁻²	10 ⁻³	10 ⁻⁴	10 ⁻⁵	10 ⁻¹	10 ⁻²	10 ⁻³	10 ⁻⁴	10 ⁻⁵	10 ⁻¹	10 ⁻²	10 ⁻³	10 ⁻⁴	10 ⁻⁵	+ve	-ve
<i>B. licheniformis</i>	- (0)	++ (5.6 $\times 10^5$)	++ (9.5 $\times 10^7$)	+++ (1.1 $\times 10^8$)	++++ (1.4 $\times 10^{10}$)	- (0)	+ (5.6 $\times 10^5$)	++ (9.5 $\times 10^7$)	+++ (1.1 $\times 10^8$)	++++ (1.4 $\times 10^{10}$)	- (0)	++ (5.6 $\times 10^5$)	++ (9.5 $\times 10^7$)	+++ (1.1 $\times 10^8$)	++++ (1.4 $\times 10^{10}$)	++++ (1.8 $\times 10^{10}$)	- (0)
<i>B. cerus</i>	- (0)	- (0)	+ (6.4 $\times 10^4$)	+++ (1.2 $\times 10^8$)	++++ (1.3 $\times 10^{10}$)	- (0)	- (0)	+ (3.6 $\times 10^3$)	++ (8.0 $\times 10^6$)	+++ (1.6 $\times 10^{10}$)	- (0)	- (0)	+ (7.0 $\times 10^3$)	++ (3.0 $\times 10^6$)	++++ (1.9 $\times 10^{10}$)	++++ (2.5 $\times 10^{10}$)	- (0)
<i>S. haemolítica</i>	+ (3.0 $\times 10^4$)	++ (1.3 $\times 10^7$)	++ (1.8 $\times 10^7$)	++ (5.8 $\times 10^7$)	++++ (1.7 $\times 10^{12}$)	+ (6.8 $\times 10^3$)	++ (1.7 $\times 10^7$)	++ (1.1 $\times 10^7$)	++ (7.6 $\times 10^7$)	++++ (1.4 $\times 10^{12}$)	+ (7.0 $\times 10^3$)	++ (1.1 $\times 10^5$)	++ (7.6 $\times 10^6$)	++ (8.0 $\times 10^7$)	+++ (2.1 $\times 10^8$)	++++ (2.1 $\times 10^{12}$)	- (0)
<i>M. luteus</i>	- (0)	++ (3.2 $\times 10^5$)	++ (9.4 $\times 10^7$)	++ (5.8 $\times 10^7$)	+++ (1.7 $\times 10^8$)	- (0)	++ (5.6 $\times 10^5$)	++ (6.2 $\times 10^5$)	++ (3.4 $\times 10^7$)	+++ (1.8 $\times 10^8$)	- (0)	+ (7.2 $\times 10^3$)	++ (6.0 $\times 10^4$)	++ (4.7 $\times 10^5$)	+++ (2.1 $\times 10^8$)	++++ (8.6 $\times 10^9$)	- (0)
<i>E. coli</i>	- (0)	+ (3.6 $\times 10^4$)	++ (2.4 $\times 10^7$)	+++ (1.2 $\times 10^8$)	++++ (2.8 $\times 10^{10}$)	- (0)	+ (3.2 $\times 10^4$)	++ (8.0 $\times 10^8$)	+++ (7.1 $\times 10^9$)	++++ (1.9 $\times 10^{10}$)	- (0)	- (0)	++ (4.0 $\times 10^4$)	+++ (2.1 $\times 10^8$)	++++ (1.7 $\times 10^{10}$)	++++ (2.4 $\times 10^{10}$)	- (0)
<i>P. citronellolis</i>	- (0)	- (0)	++ (7.2 $\times 10^4$)	++ (8.0 $\times 10^5$)	++++ (2.3 $\times 10^{10}$)	- (0)	- (0)	++ (7.0 $\times 10^4$)	++ (3.6 $\times 10^7$)	++++ (1.5 $\times 10^{10}$)	- (0)	- (0)	++ (3.6 $\times 10^4$)	++ (1.9 $\times 10^7$)	++++ (1.9 $\times 10^{10}$)	++++ (1.9 $\times 10^{10}$)	- (0)
<i>P. aeruginosa</i>	- (0)	+ (2.0 $\times 10^4$)	++ (4.8 $\times 10^6$)	++ (8.8 $\times 10^6$)	++ (2.6 $\times 10^7$)	- (0)	+ (1.2 $\times 10^4$)	++ (5.8 $\times 10^6$)	+++ (2.8 $\times 10^9$)	+++ (8.0 $\times 10^9$)	- (0)	+ (4.4 $\times 10^4$)	++ (1.6 $\times 10^7$)	+++ (2.1 $\times 10^8$)	++++ (6.2 $\times 10^9$)	++++ (2.8 $\times 10^{10}$)	- (0)
<i>Klebisella sp</i>	- (0)	- (0)	++ (4.6 $\times 10^4$)	+ (9.8 $\times 10^4$)	++++ (2.4 $\times 10^{10}$)	- (0)	- (0)	+ (6.2 $\times 10^3$)	++ (1.4 $\times 10^7$)	++++ (1.9 $\times 10^{10}$)	- (0)	+ (2.8 $\times 10^3$)	++ (8.4 $\times 10^6$)	+++ (1.9 $\times 10^8$)	++++ (2.9 $\times 10^{10}$)	++++ (2.5 $\times 10^{10}$)	- (0)
<i>B. japonicum</i>	- (0)	- (0)	+ (3.4 $\times 10^4$)	++ (4.8 $\times 10^7$)	++++ (1.8 $\times 10^{10}$)	- (0)	- (0)	+ (6.4 $\times 10^4$)	++ (1.6 $\times 10^7$)	++++ (2.0 $\times 10^{10}$)	- (0)	+ (4.8 $\times 10^4$)	+ (7.6 $\times 10^4$)	+++ (1.9 $\times 10^8$)	++++ (2.1 $\times 10^{10}$)	++++ (2.3 $\times 10^{10}$)	- (0)
<i>R. pickettii</i>	- (0)	- (0)	+ (7.4 $\times 10^4$)	++ (5.4 $\times 10^6$)	++++ (1.9 $\times 10^{10}$)	- (0)	- (0)	+ (3.2 $\times 10^4$)	++ (1.6 $\times 10^7$)	++++ (2.5 $\times 10^{10}$)	- (0)	+ (4.0 $\times 10^4$)	++ (1.9 $\times 10^7$)	++ (1.6 $\times 10^7$)	++++ (2.6 $\times 10^{10}$)	++++ (2.9 $\times 10^{10}$)	- (0)

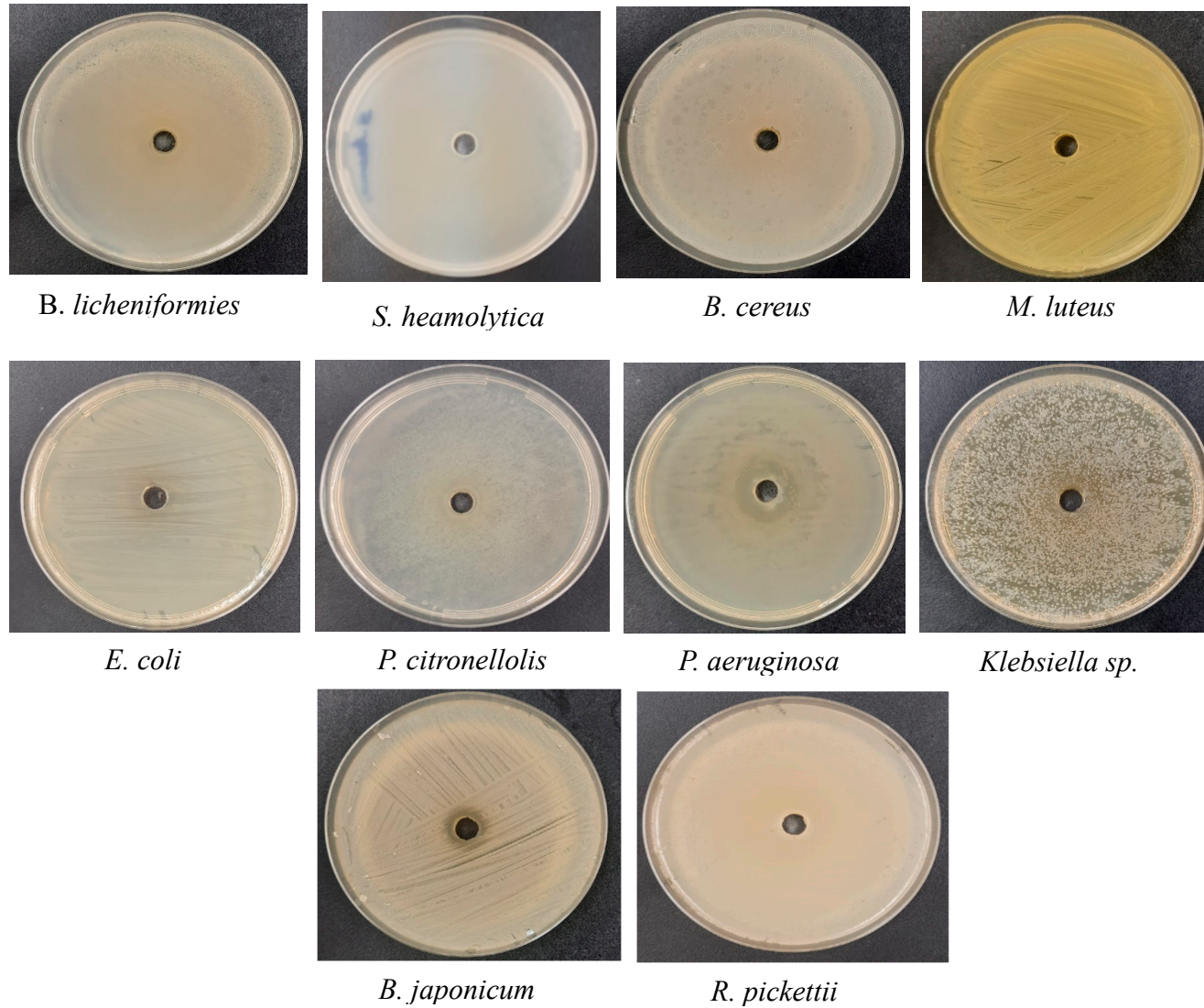


Figure S4: Inhibition of bacterial growth by cup plate experiment in the presence of OLE for all bacteria strains