

Figure S1: Molecular identification of non-ribosomal lipopeptide synthetases of *Bacillus atrophaeus* L193. Lane 1: molecular weight markers 1000 bp DNA ladder; lane 2: negative control; lanes 3, 4, 5 and 6: fengycin, surfactin, bacillomycin and iturin synthetases genes *fenC*, *srfA-A*, *bmyB* and *ituD*, respectively.

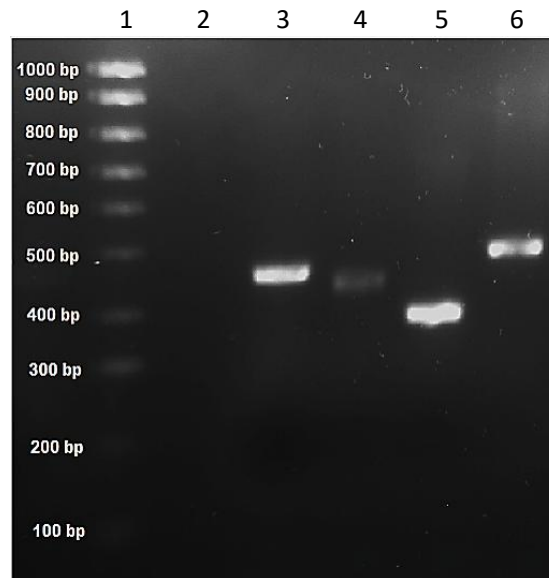


Figure S2: Oil spreading test of the *Bacillus atrophaeus* L193 surfactant (A) and Triton X-100 (B) as positive control tested on plated with crude oil.

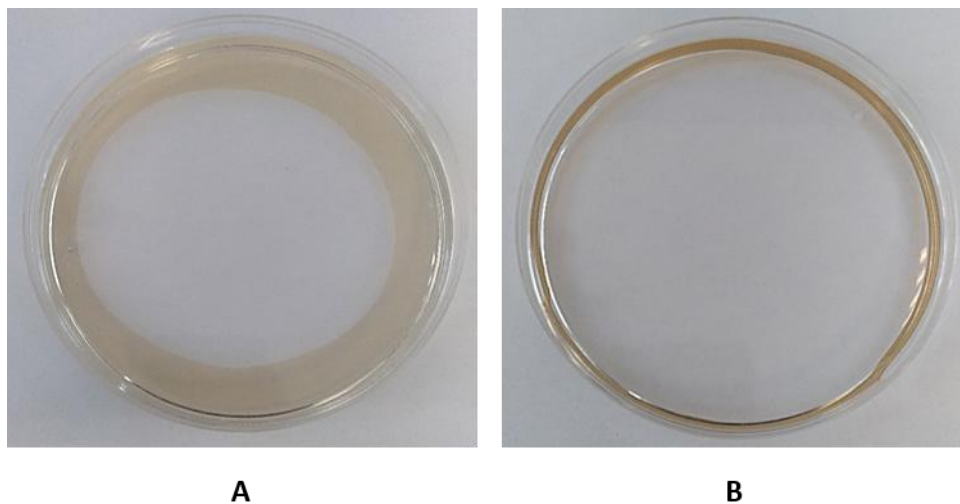


Figure S3: Emulsification index (E₂₄) of *Bacillus atrophaeus* L193 cell-free supernatant, L193 surfactant and Triton X-100 (positive control) for different hydrophobic compounds. Data represent mean ± standard deviation of the triplicates.

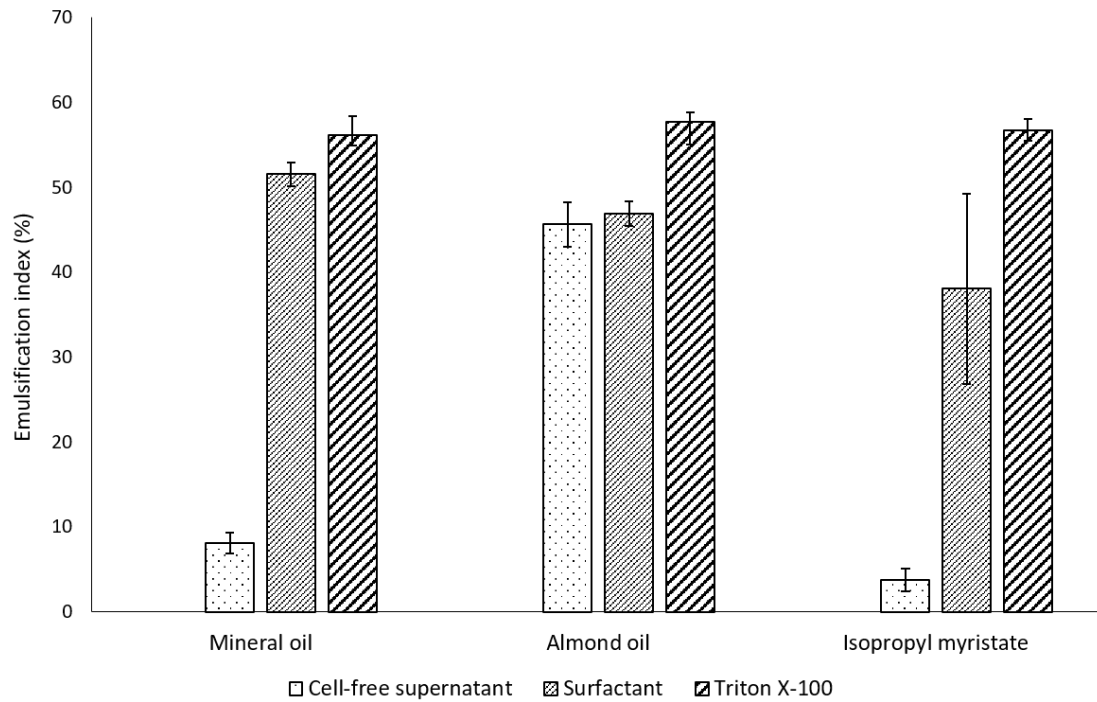


Figure S4: Micrographs of transmission electron microscopy (A) and scanning electron microscopy (B) of the aphids treated with the *Bacillus atrophaeus* L193 culture.

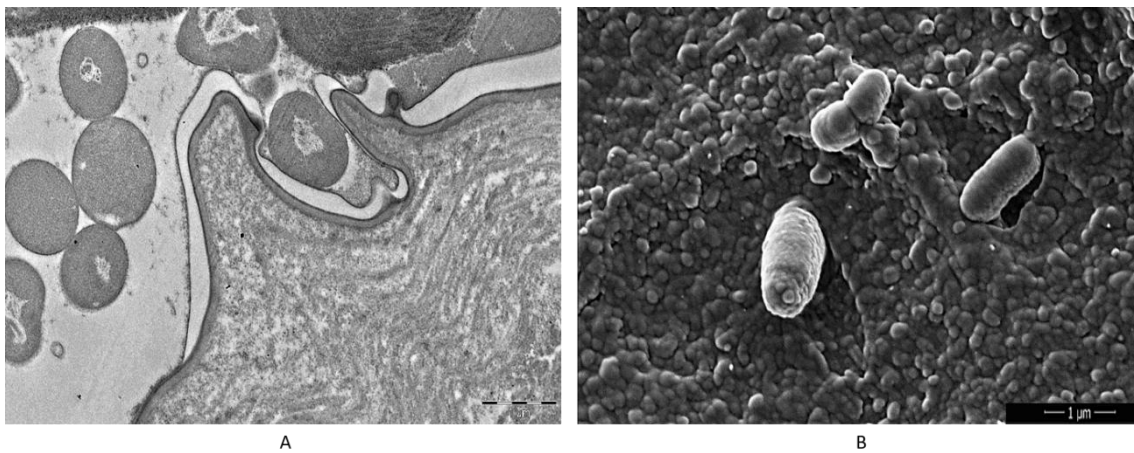


Table S1: Physicochemical characteristics of *Bacillus atrophaeus* L193 surfactant in comparison with Triton X-100, a commercial control.

Physicochemical characteristics	L193	Triton X-100
Oil spreading test (cm ²)	33.87	55.42
Emulsification index (% ± SD):		
Mineral oil	51.53 ± 1.39	56.19 ± 2.21
Almond oil	46.87 ± 1.46	57.67 ± 1.09
Isopropyl myristate	38.05 ± 11.21	56.74 ± 1.30
Surface tension reduction (mN/m)	33.0	30.0
Critical micelle concentration (mg/L)	9.38	129.4

Table S2: Mortality percentage according to Abbot's formula.

Treatment	Alive aphid	Mortality (%)
TSB medium	1222	0.0
Culture	604	50.6
Cell-free supernatant	639	47.7
Sterile water	1345	0.0
Biosurfactant	541	59.8