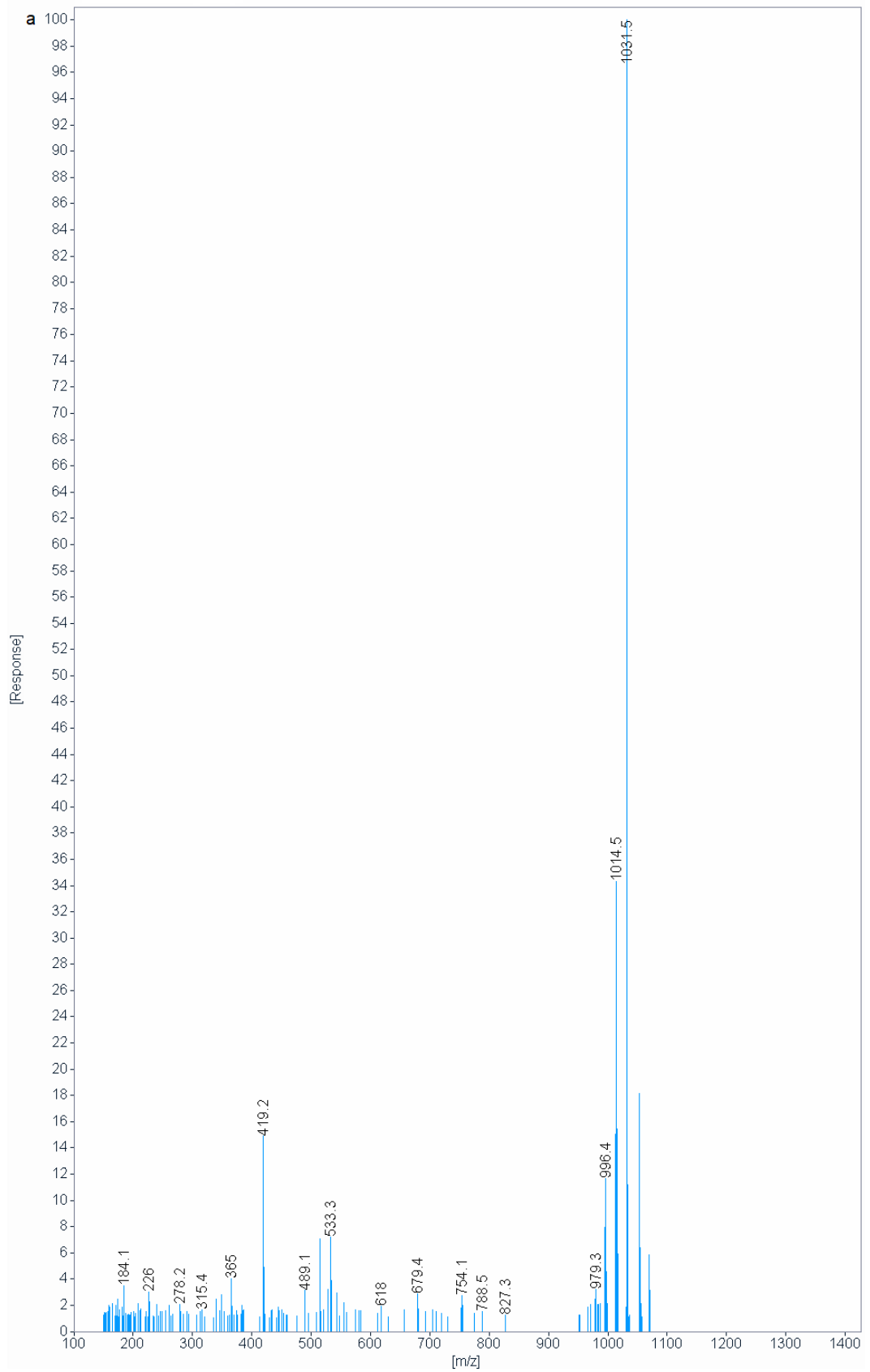


Supplementary Information: Figure S1-S5



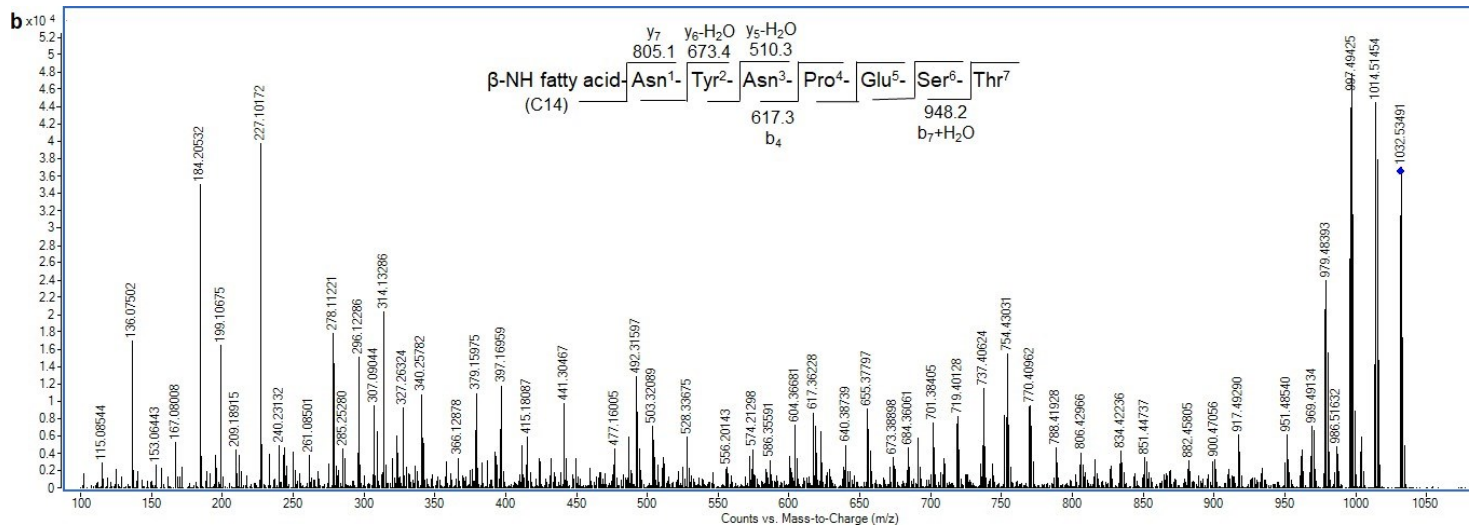
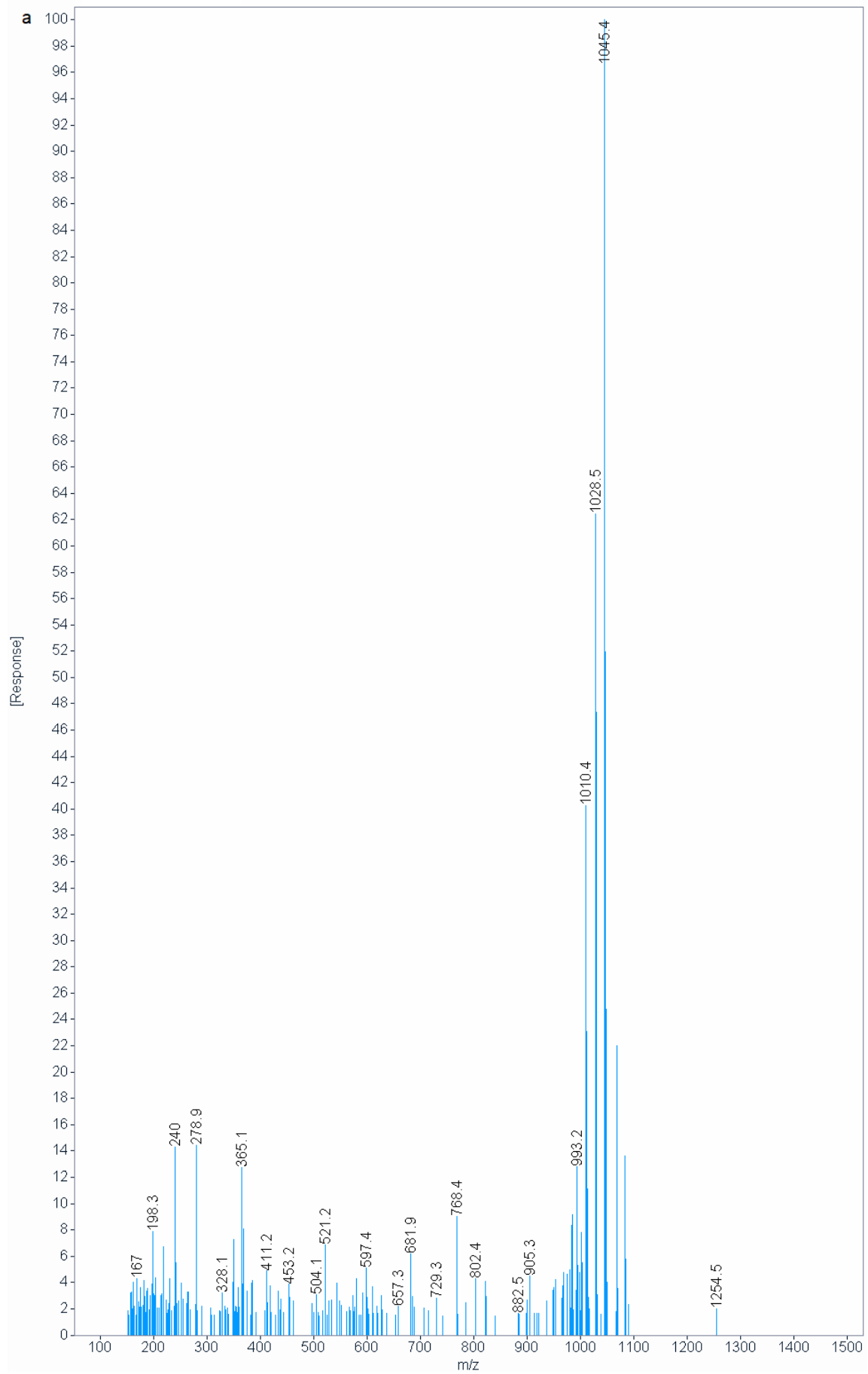


Fig S1. Mass spectroscopic analysis of fraction 1 of lipopeptides extract (LPE) from *B. amyloliquefaciens* MTCC 10456. **a.** ESI-MS spectrum of C14 bacillomycin D $[M+H]^+$ at m/z 1031.4 at retention time 22.8 min **b.** LC-ESI-MS/MS spectrum of C14 bacillomycin D containing a Asn¹-Tyr²-Asn³-pro⁴-Glu⁵-Ser⁶-Thr⁷ peptide and a C14 β -amino fatty acid chain



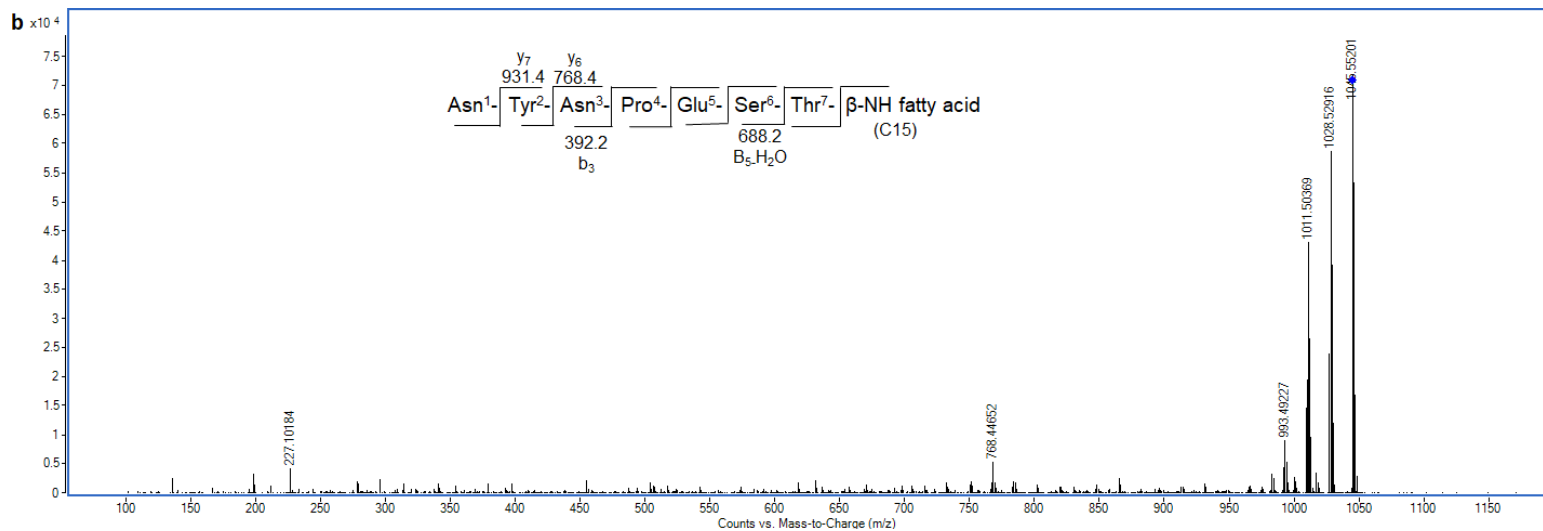


Fig. S2. Mass spectroscopic analysis of fraction 1 of lipopeptides extract (LPE) from *B. amyloliquefaciens* MTCC 10456. **a.** ESI-MS spectrum of C15 bacillomycin D $[M+H]^+$ at m/z 1045.4 at retention time 22.8 min **b.** LC-ESI-MS/MS spectrum of C15 bacillomycin D containing a Asn¹-Tyr²-Asn³-pro⁴-Glu⁵-Ser⁶-Thr⁷ peptide and a C15 β -amino fatty acid chain

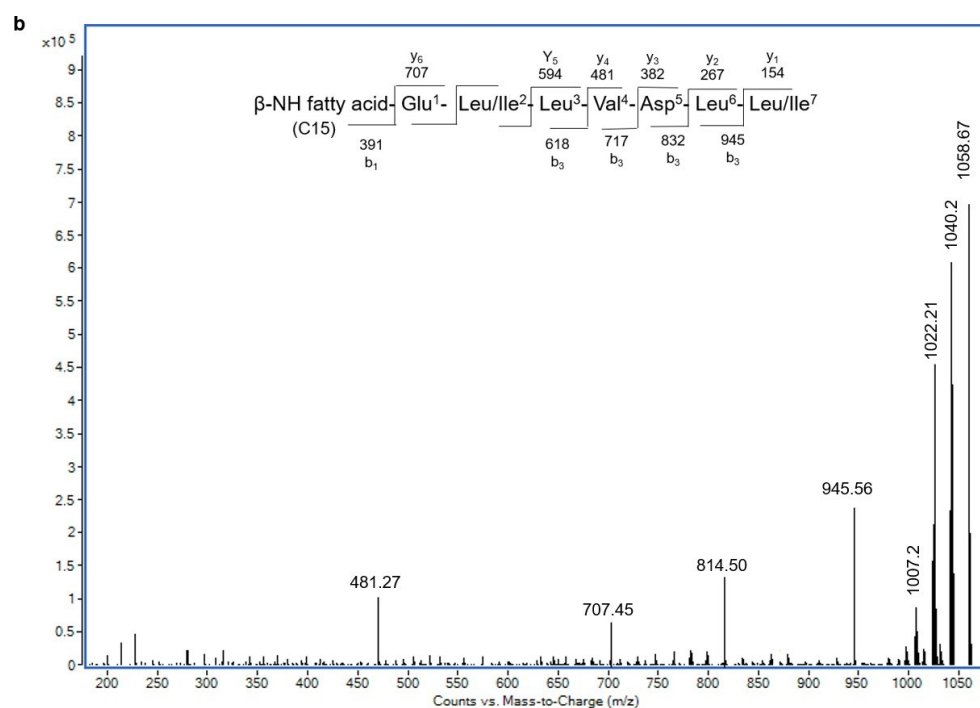
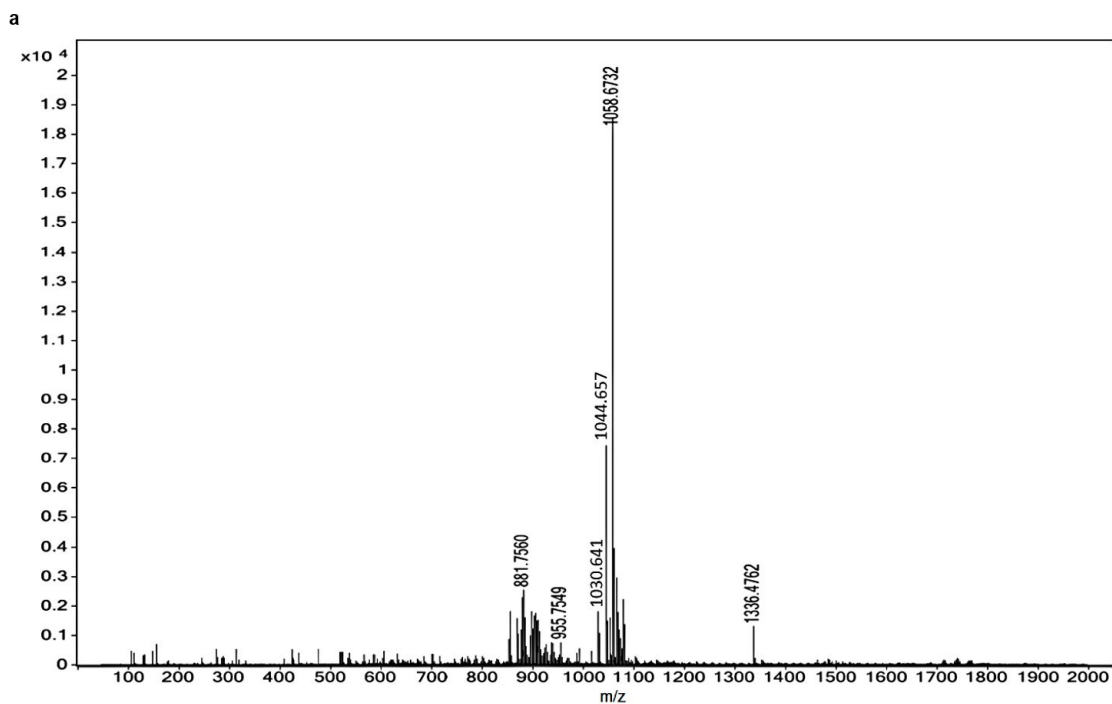


Fig. S3. Mass spectroscopic analysis of fraction 2 of lipopeptides extract (LPE) from *B. amyloliquefaciens* MTCC 10456. **a.** ESI-MS spectrum of peaks corresponded with C13 ($[M+Na]^+$ at m/z 1030.641), C14 ($[M+Na]^+$ at m/z 1044.657) and C15 ($[M+Na]^+$ at m/z 1058.67) of surfactin at retention time 22.8 min. **b.** LC-ESI-MS/MS spectrum of C15 surfactin containing a Glu¹-leu/ile²-leu³-val⁴-asp⁵-leu⁶-leu/ile⁷ peptide and a C15 β -amino fatty acid chain

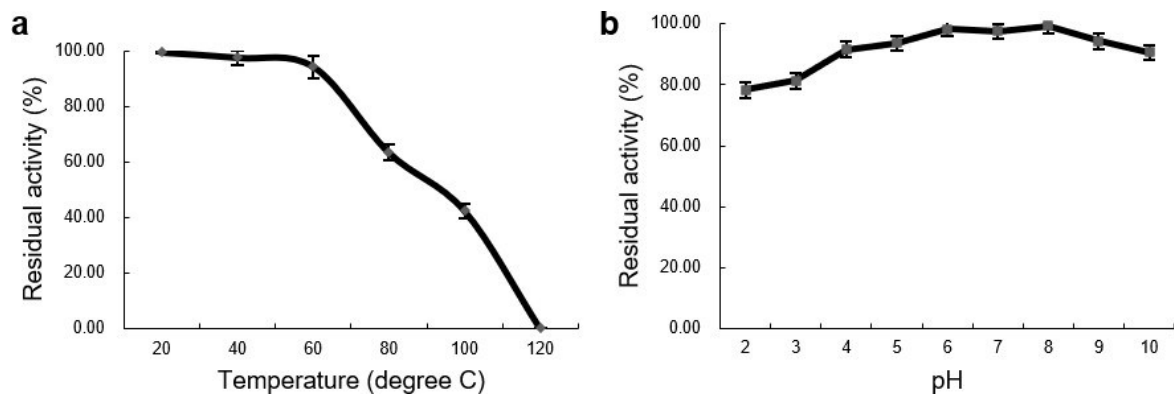


Fig. S4. Stability profile of lipopeptides extract (LPE) from *B. amyloliquefaciens* MTCC 10456. a. Effect of temperature at residence time of b. Effect of pH

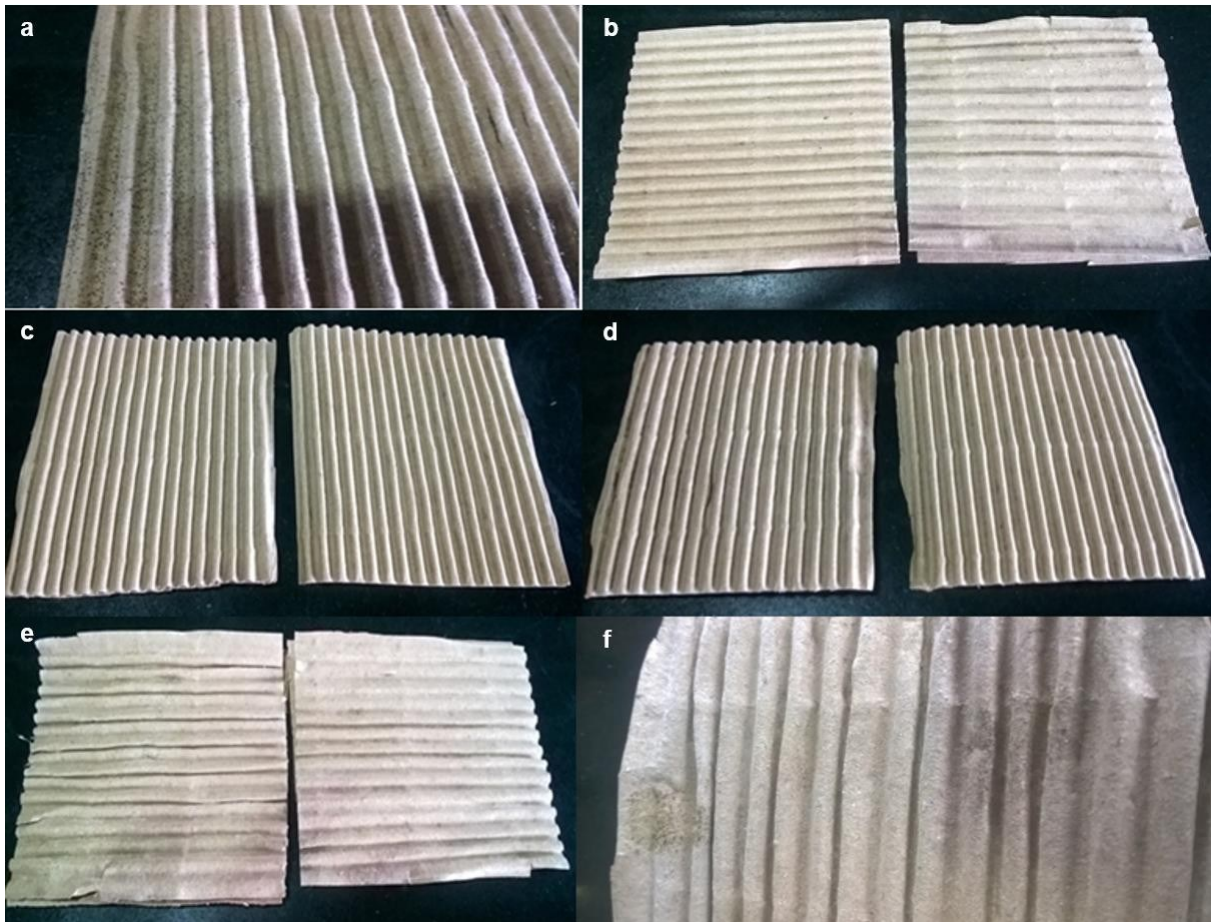


Fig. S5. Factory trials of cardboard boxes preparation **a.** Untreated cardboard samples with fungal spoilage (Negative control) **b.** Cardboard samples treated with 1% *w/w* salicylic acid **c.** Cardboard samples treated with 1% *w/w* of Test mixture-1 **d.** Cardboard samples treated with 0.6% *w/w* of Test mixture-1 **e.** Cardboard samples treated with 0.4% *w/w* of Test mixture-1 **f.** Zoomed-in picture of cardboard samples treated with 0.4% *w/w* of Test mixture-1 with fungal spoilage

Supplementary Information: Table S1

Table 1 The inhibitory effect of LPE+Nisin on the total microbial growth on corrugated cardboard samples during accelerated spoilage study at 25°C. The values were reported as means ± standard deviation of total microbial count from the triplicate experiments

Incubation time (Weeks)	Negative control	Positive control (Salicylic acid 1% w/w)	LPE+Nisin (1% w/w)	LPE+Nisin (0.6% w/w)	LPE+Nisin (0.4% w/w)
1	10 ⁶ ±23.5	10 ⁶ ±21.2	10 ⁶ ±20.5	10 ⁶ ±22.6	10 ⁶ ±23.1
2	1.2×10 ⁶ ±21.2	10 ⁴ ±10.5	3.2×10 ⁴ ±16.8	4×10 ⁴ ±17.8	5.6×10 ⁴ ±12.5
3	2×10 ⁷ ±186.1	4.5×10 ² ±8.2	2.8×10 ² ±9.6	5.6×10 ² ±10.4	10 ³ ±19.8
4	2.5×10 ⁷ ±176.2	2.2×10 ² ±7.5	2.1×10 ² ±8.5	3×10 ² ±9.5	3.5×10 ² ±10.5
5	3.2×10 ⁷ ±152.2				
6	4×10 ⁷ ±165.5				
7	2×10 ⁸ ±200.2				
8	2.1×10 ⁸ ±220.1				
9	4×10 ⁸ ±196.8				
10					<10 ² ±6.5
11					
12					
13					
14					
15					
16					
17					10 ³ ±21.06
18	>10 ⁹ ±235.7	<10 ² ±7.8	<10 ² ±5.2	<10 ² ±5.1	1.5×10 ³ ±40.05
19					1.6×10 ⁴ ±116.7
20					1.7×10 ⁴ ±121.7
21					1.75×10 ⁴ ±185.2
22					1.8×10 ⁴ ±179.3
23					1.92×10 ⁴ ±200.6
24					2×10 ⁴ ±220.4