**TABLE 2.**The zones of inhibition (mm) of the volatile oil extracted under different extraction conditions.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | *L. monocytogens* ATCC19117 (LM) | | | *L. innocua* ATCC33090(LI) | | | *L. welshimeri* ATCC43548 (LW) | | | *L. ivanovii*ATCC BAA-678 (LL) | | | *L. grayi*ATCC25400(LG) | | | *V. parahaemolyticus*ATCC33847 (VP) | | |
|  |  | cassia bark | Bay | cloves | cassia bark | bay | cloves | cassia bark | bay | cloves | cassia bark | bay | cloves | cassia bark | bay | cloves | cassia bark | bay | cloves |
| Spice  to  solvent  ratio | 1:5 | 7.0 ± 0.01 | 7.2 ± 0.01 | 1.6 ± 0.29 | 7.2 ± 0.03 | 7.2 ± 0.01 | 1.6 ± 0.08 | 6.9±0.02 | 7.6 ± 0.06 | 1.6 ± 0.16 | 7.3±0.07 | 6.8 ± 0.01 | 1.7 ± 0.08 | 7.2 ±0.07 | 7.2 ± 0.06 | 1.6 ± 0.08 | 15.9 ± 0.35 | 12.4 ± 0.85 | 1.5 ± 0.12 |
| 1:10 | 8.4 ± 0.24 | 7.2 ± 0.01 | 1.8 ± 0.31 | 7.4 ± 0.01 | 7.3 ± 0.03 | 1.7 ± 0.22 | 7.4 ±0.06 | 7.4 ± 0.06 | 1.7 ± 0.09 | 7.2±0.06 | 7.1 ± 0.03 | 1.8 ± 0.13 | 7.4 ±0.06 | 7.3 ± 0.06 | 1.7 ± 0.22 | **19.2\* ± 0.17** | 15.1 ± 0.68 | 1.5 ± 0.06 |
| 1:15 | 7.2 ± 0.03 | 7.2 ± 0.01 | 1.6 ± 0.25 | 7.5 ± 0.02 | 7.3 ± 0.05 | 1.8 ± 0.09 | 7.2±0.05 | 7.7 ± 0.13 | 1.9 ± 0.20 | 7.0±0.02 | 7.2 ± 0.01 | 1.8 ± 0.11 | 7.0±0.02 | 7.3 ± 0.13 | 1.7 ± 0.09 | 17.4 ± 0.41 | 9.8 ± 0.32 | 1.6 ± 0.15 |
| 1:20 | 7.2 ± 0.03 | 7.1 ± 0.02 | 1.6 ± 0.08 | 7.6 ± 0.06 | 7.6 ± 0.07 | 1.9 ± 0.31 | 7.5 ±0.02 | 7.1±0.02 | 1.8 ± 0.26 | 7.4±0.04 | 7.7 ± 0.12 | 2.0 ± 0.32 | 8.9±0.23 | 7.9 ± 0.02 | 1.8 ± 0.31 | 14.0 ± 0.07 | 9.5 ± 0.26 | 1.4 ± 0.12 |
| 1:25 | 7.0 ± 0.02 | 7.1 ± 0.03 | 1.8 ± 0.36 | 7.6 ± 0.04 | 7.7 ± 0.05 | 1.8 ± 0.13 | 7.4 ±0.04 | 7.3 ± 0.04 | 1.8 ± 0.18 | 8.9±0.28 | 7.2 ± 0.01 | 1.9 ± 0.06 | 7.4±0.09 | 8.1 ± 0.04 | 1.9 ± 0.13 | 14.5 ± 0.06 | 12.1 ± 0.32 | **1.7\* ± 0.03** |
| Ethanol  Concentration  (%) | 10% | 6.9 ± 0.02 | 7.1 ± 0.01 | 1.6 ± 0.20 | 6.8 ± 0.01 | 7.1 ± 0.01 | 1.2 ± 0.11 | 7.0±0.02 | 6.9 ± 0.02 | 1.6 ± 0.35 | 7.2±0.00 | 7.0 ± 0.02 | 1.8 ± 0.27 | 7.2±0.09 | 6.8 ± 0.02 | 1.2 ± 0.13 | 9.7 ± 0.21 | 13.2 ± 0.18 | 1.2 ± 0.13 |
| 30% | 6.8 ± 0.00 | 7.1 ± 0.02 | 1.7 ± 0.32 | 6.8 ± 0.01 | 7.0 ± 0.02 | 1.3 ± 0.08 | 7.0±0.03 | 7.0 ± 0.02 | 1.7 ± 0.11 | 7.4±0.03 | 7.1 ± 0.02 | 1.8 ± 0.21 | 7.8 ±0.03 | 7.0 ± 0.12 | 1.3 ± 0.18 | 10. 1± 0.11 | 14.5 ± 0.30 | 1.2 ± 0.05 |
| 50% | 8.8**\*** ± 0.29 | 7.2 ± 0.01 | 1.9 ± 0.13 | 6.9 ± 0.02 | 7.1 ± 0.01 | 1.4 ± 0.25 | 7.5±0.08 | 7.0 ± 0.02 | 1.8 ± 0.15 | 8.9±0.37 | 7.2 ± 0.00 | 1.9 ± 0.20 | 8.1 ±0.27 | 7.0 ± 0.32 | 1.4 ± 0.26 | 15.0 ± 0.04 | 13.1 ± 0.18 | 1.4 ± 0.07 |
| 70% | 7.9 ± 0.12 | 7.3 ± 0.01 | 1.9 ± 0.15 | 7.1 ± 0.01 | 7.1 ± 0.02 | 1.4 ± 0.11 | 74±0.09 | 7.1 ± 0.03 | 1.7 ± 0.17 | 7.4±0.03 | 7.2 ± 0.01 | 2.1 ± 0.17 | 7.5 ±0.04 | 7.1 ± 0.33 | 1.4 ± 0.21 | 13.3 ± 0.20 | 15.9 ± 0.15 | 1.6 ± 0.31 |
| 95% | 8.2 ± 0.18 | 7.5 ± 0.06 | 1.8 ± 0.25 | 6.9 ± 0.02 | 7.2 ± 0.02 | 1.3 ± 0.28 | 8.1±0.11 | 7.2 ± 0.00 | 1.9 ± 0.16 | 7.7±0.05 | 7.1 ± 0.02 | 2.0 ± 0.07 | 7.7±0.06 | 7.2 ± 0.00 | 1.3 ± 0.28 | **21.0\* ± 0.96** | 16.8 ± 0.15 | 1.7 ± 0.45 |
| Extraction  temperature  (℃) | 40℃ | 7.4 ± 0.02 | 7.1 ± 0.02 | 1.8 ± 0.38 | 7.6 ± 0.06 | 7.0 ± 0.02 | 1.7 ± 0.15 | 10.0 ±0.25 | 7.4 ± 0.08 | 2.3 ± 0.17 | 8.6±0.05 | 7.5 ± 0.05 | 1.9 ± 0.37 | 8.6±0.05 | 7.3 ± 0.08 | 1.7 ± 0.15 | 9.1 ± 0.03 | 9.1 ± 0.22 | 1.7 ± 0.25 |
| 50℃ | 7.7 ± 0.04 | 7.2±0.02 | 1.9 ± 0.18 | 7.6 ± 0.03 | 6.9 ± 0.02 | 1.6 ± 0.07 | 9.7±0.30 | 7.3 ± 0.08 | 2.3 ± 0.15 | 9.2±0.17 | 7.5 ± 0.04 | 2.2 ± 0.27 | 9.0 ±0.17 | 7.2 ± 0.08 | 1.6 ± 0.07 | 11.2 ± 0.06 | 10.4 ± 0.42 | 1.6 ± 0.25 |
| 60℃ | 7.6±0.05 | 7.1±0.02 | 1.9 ± 0.09 | 7.2 ± 0.01 | 7.2 ± 0.01 | 1.6 ± 0.05 | 9.1±0.18 | 7.4 ± 0.04 | 2.1 ± 0.33 | 9.0±0.27 | 7.3 ± 0.00 | 1.8 ± 0.13 | 8.3 ±0.27 | 7.3 ± 0.04 | 1.6 ± 0.05 | **15.9\* ± 0.07** | 9.6 ± 0.32 | 1.7 ± 0.08 |
| 70℃ | 7.5±0.03 | 7.1±0.02 | 1.9 ± 0.08 | 7.7 ± 0.05 | **7.4 \*± 0.04** | 1.6 ± 0.14 | 9.2 ±0.23 | 6.8 ± 0.00 | 2.2 ± 0.10 | 8.1 ±0.15 | 7.2 ± 0.00 | 2.1 ± 0.23 | 8.4 ±0.15 | 6.7 ± 0.00 | 1.6 ± 0.14 | 15. 2± 0.05 | 9.9 ± 0.24 | 1.7 ± 0.08 |
| 80℃ | 7.4±0.07 | 7.1±0.02 | 1.9 ± 0.26 | 8.6 ± 0.14 | 7.2 ± 0.02 | 1.7 ± 0.26 | 8.1±0.09 | 7.4 ± 0.04 | 2.1 ± 0.11 | 8.5±0.13 | 7.1 ± 0.02 | 2.2 ± 0.26 | 8.6 ±0.13 | 7.2 ± 0.04 | 1.7 ± 0.26 | 9.1 ± 0.05 | 10.2 ± 0.27 | 1.6 ± 0.08 |
| Extraction  time | 0h | 7.5±0.08 | 7.0±0.07 | 1.5 ± 0.31 | 7.6 ± 0.03 | 7.1 ± 0.02 | 1.8 ± 0.10 | 6.8±0.00 | 7.0 ± 0.02 | 2.0±0.16 | 7.2±0.01 | 7.2 ± 0.00 | 2.0 ± 0.38 | 7.5 ±0.01 | 7.1 ± 0.02 | 1.8 ± 0.14 | 16.8 ± 0.35 | 8.6 ± 0.14 | 1.6 ± 0.08 |
| 2h | 7.8 ±0.06 | 7.3±0.06 | 1.7 ± 0.22 | 7.8 ± 0.12 | 7.2 ± 0.01 | 2.0 ± 0.36 | 7.3±0.08 | 7.3 ± 0.06 | 2.1±0.20 | 9.1±0.28 | 7.2±0.02 | 2.1 ± 0.52 | 9.2 ±0.28 | 7.4 ± 0.06 | 2.0 ± 0.12 | 18.6 ± 0.48 | 9.7 ± 0.28 | **1.9\* ± 0.06** |
| 4h | 7.6 ±0.06 | 7.5±0.08 | 1.6 ± 0.28 | 7.5 ± 0.03 | 7.2 ± 0.02 | 1.6 ± 0.29 | 6.9±0.02 | 7.4 ± 0.06 | 2.2 ± 0.34 | 7.4±0.02 | 7.5 ± 0.05 | 1.9 ± 0.47 | 8.4±0.02 | 7.4 ± 0.09 | 1.6 ± 0.25 | 15.3 ± 0.39 | 10.4 ± 0.23 | 1.7 ± 0.20 |
| 6h | 7.9±0.11 | 7.3±0.03 | 1.5± 0.26 | 8.5 ± 0.11 | 7. 3± 0.02 | 1.8 ± 0.17 | 8.5±0.24 | 7.3 ± 0.01 | 2.2 ± 0.34 | 7.4±0.01 | 7.7 ± 0.07 | 2.0 ± 0.42 | 8.4±0.01 | 7.3 ± 0.08 | 1.7 ± 0.17 | 16.3 ± 0.01 | 9.6 ± 0.16 | 1.7 ± 0.09 |
| 8h | 7.7±0.08 | 7.4±0.06 | 1.6 ± 0.22 | 7.4 ± 0.03 | 7.4 ± 0.06 | 1.7 ± 0.26 | 8.9±0.22 | 7.0 ± 0.02 | 2.2 ± 0.23 | 8.1±0.03 | 7.4 ± 0.04 | 2.0 ± 0.45 | 8.1±0.03 | 7.0 ± 0.12 | 1.7 ± 0.26 | 16.8± 0.28 | 10.5 ± 0.23 | 1.5 ± 0.08 |
| Ultrasonic  power (W) | 200W | 8.1±0.10 | 6.8±0.05 | 2.4 ± 0.84 | 8.1 ± 0.17 | 7.2 ± 0.04 | 1.9 ± 0.10 | 7.4±0.10 | 7.0 ± 0.03 | 1.9 ± 0.31 | 8.0±0.17 | 7.1 ± 0.02 | 1.7 ± 0.21 | 7.2 ± 0.04 | 7.4 ± 0.07 | **1.7\* ± 0.12** | 16.3 ± 0.01 | 9.1 ± 0.12 | 1.6 ± 0.08 |
| 250W | 8.4±0.07 | 6.9±0.07 | 1.7 ± 0.46 | 7.1 ± 0.02 | 7.0 ± 0.07 | 1.5 ± 0.06 | 7.2±0.02 | 7.1 ± 0.03 | 1.4 ± 0.25 | 8.8±0.21 | 7.6 ± 0.03 | 1.7 ± 0.32 | 7.7 ± 0.06 | 6.8 ± 0.00 | 1.4 ± 0.15 | 16.8 ± 0.28 | 10.4 ± 0.32 | 1.9 ± 0.06 |
| 300W | 7.3 ± 0.11 | 7.6 ± 0.05 | 1.9 ± 0.68 | 6.8 ± 0.07 | 7.9 ± 0.14 | 1.4 ± 0.38 | 7.2 ±0.05 | 6.9 ± 0.02 | 1.9 ± 0.10 | 7.4±0.02 | 6.8 ± 0.00 | 1.6 ± 0.12 | 7.6 ± 0.04 | 7.1 ± 0.06 | 1.1 ± 0.4 | 17.4 ± 0.40 | 9.6 ± 0.38 | 1.7 ± 0.08 |
| 350W | 6.7 ± 0.06 | 6.9 ± 0.00 | 2.0 ± 0.84 | 6.6 ± 0.04 | 8.5 ± 0.23 | 1.5 ± 0.62 | 7.6±0.15 | 7.2 ± 0.01 | 1.5 ± 0.55 | 8.4±0.06 | 6.7 ± 0.02 | 1.9 ± 0.10 | 8.0 ± 0.05 | **9.3\*±0.24** | 1.3 ± 0.00 | 16.8 ± 0.31 | 9.9 ± 0.54 | 1.6 ± 0.08 |
| 400W | 7.3 ± 0.08 | 7.0 ± 0.05 | 3.0 ± 1.08 | 7.0 ± 0.14 | 6.6 ± 0.05 | 1.4 ± 0.72 | 7.2±0.11 | 7.5 ± 0.07 | 2.0 ± 0.36 | 7.5±0.10 | 7.6 ± 0.11 | 1.7 ± 0.12 | 7.4 ± 0.02 | 7.1 ± 0.03 | 2.0 ± 0.26 | 15.3 ± 0.31 | 10.2 ± 0.22 | 1.7 ± 0.08 |
| Ultrasonic  time | 15min | 7.3 ± 0.11 | 6.9 ± 0.07 | 2.1 ± 0.46 | 7.1 ± 0.02 | 7.0 ± 0.07 | 1.5 ± 0.06 | 7.2±0.02 | 7.1 ± 0.03 | 1.4 ± 0.25 | 7.2 ±0.21 | 7.6 ± 0.03 | 1.7 ± 0.32 | 7.7 ± 0.06 | 6.8 ± 0.00 | 1.4 ± 0.15 | 15.2 ± 0.03 | 8.6 ± 0.24 | 1.7 ± 0.08 |
| 30min | 6.5 ± 0.03 | 6.9 ± 0.06 | 2.5 ± 0.58 | 7.7 ± 0.05 | 8.2 ± 0.10 | 1.6 ± 0.32 | 6.3±0.02 | 8.7 ± 0.29 | 1.8 ± 0.15 | 7.3±0.12 | 6.9 ± 0.02 | 1.8 ± 0.06 | 6.6 ± 0.04 | 7.1 ± 0.01 | **1.9\* ± 0.40** | 15.3 ± 0.30 | 9.7 ± 0.08 | 1.8 ± 0.09 |
| 45min | 7.9 ± 0.11 | 6.6 ± 0.05 | 2.1 ± 0.15 | 7.8 ± 0.10 | 7.3 ± 0.05 | 1.6 ± 0.06 | 7.1±0.11 | 7.6 ± 0.05 | 1.8 ± 0.12 | 7.9±0.13 | 7.1 ± 0.01 | 1.5 ± 0.26 | 7.0 ± 0.03 | 7.0 ± 0.01 | 1.9±0.31 | 16.3 ± 0.01 | 10.4 ± 0.13 | 1.8 ± 0.09 |
| 60min | 7.2 ± 0.06 | 6.8 ± 0.06 | 2.2 ± 0.80 | 7.1 ± 0.05 | 9.2 ± 0.24 | 1.8 ± 0.06 | 7.3±0.05 | 7.4 ± 0.01 | **1.9\* ± 0.10** | 7.4±0.06 | 6. 9± 0.02 | 1.5 ± 0.26 | 7.0 ± 0.03 | 7.5 ± 0.06 | 1.8±0.35 | 15.9 ± 0.25 | 9.6 ± 0.36 | 1.7 ± 0.08 |
| 75min | 7.7 ± 0.11 | 8.1 ± 0.19 | 2.5 ± 0.55 | 8.7 ± 0.31 | 7.8 ± 0.06 | 1.8 ± 0.47 | 7.1 ±0.06 | 7.1 ± 0.03 | 1.8 ± 0.29 | 7.0±0.02 | 8.8 ± 0.34 | 1.9 ± 0.38 | 7.8 ± 0.11 | **8.8\*±0.20** | 1.7±0.49 | 15.8 ± 0.30 | 10. 5± 0.13 | 1.7 ± 0.08 |

aValues are the means of 3 replicates± the standard deviation.

\*Comparisons within a species of the minimal inhibitory values obtained at same experimental variables with different values that are significantly different to the same tested strains (P < 0.05). We chose the value of an experimental variable that gave the maximal mean zones of inhibition, significantly different from other values as the optimum value of experimental variable to every tested strains