

7. SUMMARY

Part I:

A grand total of eighty random samples of meat products (minced meat, beef burger, sausage and luncheon) (20 of each) were collected from different shops, supermarkets and street vendors of different sanitation levels in Gharbia governorate. The samples were examined bacteriologically for detection of *B. cereus* as well as studying the antimicrobial effects of some chemical preservatives (nisin, potassium sorbate and sodium nitrite) with different concentrations on *B. cereus* count artificially inoculated into minced meat samples.

The obtained results showed that 70%, 55%, 55% and 40% of the examined minced meat, beef burger; sausage and luncheon samples were contaminated with *Bacillus* species, respectively. The total *Bacillus* count (log cfu/g) in the examined samples ranged from 4.07 to 5.90 with a mean value of 5.39 ± 2.44 , for minced meat, 2.95 to 5.30 with a mean value of 4.63 ± 1.78 , for beef burger, 3.69 to 6.00 with a mean value of 5.28 ± 2.43 for sausage and 3.77 to 5.00 with a mean value of 4.47 ± 1.50 for luncheon. Mean values within the examined samples of meat products showed high significant differences ($P < 0.05$).

Bacillus cereus was isolated from 65%, 35%, 40% and 35% of the examined minced meat, beef burger, sausage and luncheon samples, respectively. *Bacillus cereus* count (log cfu/g) in the examined samples ranged from 3.95 to 5.87 with a mean value of 5.08 ± 2.38 for minced meat, 2.69 to 4.60 with a mean value of 4.22 ± 1.48 for beef burger, 3.30 to 5.09 with a mean value of 4.68 ± 1.83 for sausage and 2.84 to 4.30 with a mean value of 3.90 ± 0.72 for luncheon. Mean values within the

examined samples of meat products showed high significant differences ($P < 0.05$).

Part II:

Regarding to the effect of some chemical preservatives on isolated *B. cereus*, the study declared that addition of nisin (20 ppm) reduced *B. cereus* count (log cfu/g) artificially inoculated into minced meat samples from 8.46 (infective dose) to 8.05, 7.81, 7.14, 6.51 and 4.98 after 3, 6, 9, 24 and 48 hrs., respectively, with reduction percentages 4.85%, 7.68%, 15.60%, 23.05% and 41.13%, respectively. In comparison, nisin (40 ppm) reduced *B. cereus* count (log cfu/g) to 7.98, 7.44, 5.72, 3.91 and zero after 3, 6, 9, 24 and 48 hrs., respectively, with reduction percentages 5.67%, 12.06%, 32.39%, 53.78% and 100%, respectively. While, nisin (60 ppm) reduced *B. cereus* count (log cfu/g) to 7.80, 6.66, 3.56, zero and zero after 3, 6, 9, 24 and 48 hrs., respectively, with reduction percentages 7.80%, 21.28%, 57.92%, 100% and 100%, respectively.

Potassium sorbate (0.1%) reduced *B. cereus* count (log cfu/g) artificially inoculated into minced meat samples from 8.46 (infective dose) to 7.80, 7.65, 6.12, 5.20 and 4.81 after 3, 6, 9, 24 and 48 hrs., respectively, with reduction percentages 7.80%, 9.57%, 27.66%, 38.53% and 43.14%, respectively. In comparison, potassium sorbate (0.2%) reduced *B. cereus* count (log cfu/g) to 7.75, 7.63, 5.77, 4.61 and 2.13 after 3, 6, 9, 24 and 48 hrs., respectively, with reduction percentages 8.39%, 9.81%, 31.80%, 45.51% and 74.82%, respectively. While, potassium sorbate (0.3%) reduced *B. cereus* count (log cfu/g) to 7.66, 6.95, 4.72, 3.66 and zero after 3, 6, 9, 24 and 48 hrs., respectively, with reduction percentages 9.46%, 17.85%, 44.21%, 56.74% and 100%, respectively.

sodium nitrite (50 ppm) reduced *B. cereus* count (log cfu/g) artificially inoculated into minced meat samples from 8.46 (infective

dose) to 7.82, 7.77, 6.95, 6.69, and 6.49 after 3, 6, 9, 24 and 48 hrs., respectively, with reduction percentages 7.57%, 8.16%, 17.85%, 20.92% and 23.29%, respectively. In comparison, sodium nitrite (125 ppm) reduced *B. cereus* count (log cfu/g) to 7.73, 7.46, 6.49, 5.86, and 5.77 after 3, 6, 9, 24 and 48 hrs., respectively, with reduction percentages 8.63%, 11.825, 23.29%, 30.73% and 31.80%, respectively.

Mixture of nisin (40 ppm) and sodium nitrite (50 ppm) reduced *B. cereus* count (log cfu/g) artificially inoculated into minced meat samples from 8.46 (infective dose) to 7.53, 6.73, 4.60, 3.73 and zero after 3, 6, 9, 24 and 48 hrs., respectively, with reduction percentages 10.99%, 20.45%, 45.63%, 55.91% and 100%, respectively.

Combination of sodium nitrite (50 ppm) and potassium sorbate (0.2%) reduced *B. cereus* count (log cfu/g) artificially inoculated into minced meat samples from 8.46 (infective dose) to 7.80, 6.51, 4.53, 3.58 and zero after 3, 6, 9, 24 and 48 hrs., respectively, with reduction percentages 7.80%, 23.05%, 46.45%, 57.68% and 100%, respectively (20, 40 and 60 ppm), potassium sorbate (0.1%, 0.2% and 0.3%) and sodium nitrite (50 and 125 ppm) to minced meat samples inoculated by *B. cereus* (8.46 log cfu/g) may help in reduction of the inoculated organism.

Combination of nisin (40 ppm), potassium sorbate (0.2%) and sodium nitrite (50 ppm) reduced *B. cereus* count (log cfu/g) artificially inoculated into minced meat samples from 8.46 (infective dose) to 7.67, 6.04, 3.66, zero and zero after 3, 6, 9, 24 and 48 hrs., respectively, with reduction percentages 9.34%, 28.61%, 56.74%, 100% and 100%, respectively. However, using mixture of nisin (60 ppm), potassium sorbate (0.3%) and sodium nitrite (125 ppm) reduced *B. cereus* count (log cfu/g) artificially inoculated into minced meat samples from 8.46 (infective dose) to 7.77, 5.71, 3.44, zero and zero after 3, 6, 9, 24 and 48

hrs., respectively, with reduction percentages 8.16%, 32.51%, 59.34%, 100% and 100%, respectively.

Finally, the mixture of nisin (40 ppm), sodium nitrite (50 ppm) and potassium sorbate (0.2%) is the best formula to be used for controlling *B. cereus* for the economic and public health importance view point.

Sources of contamination and public health importance of *B. cereus* as well as suggested measures for improving the quality of meat products were discussed.