Abstract

The aim of this study was to investigate the presence of tetracycline and oxytetracycline resistance determinants in Bacillus cereus strains isolated from honey samples. Of a total of 77 isolates analyzed, 30 (39%) exhibited resistance to tetracyclines according to the results of a disk diffusion method. Resistant strains (n=30) were screened by PCR for the presence of the resistant determinants tetK, tetL, tetM, tetO, tetW, otrA and otrB and their MIC values for tetracycline, oxytetracycline and minocycline were assessed. According to the PCR results, 23 isolates (77%) presented at least one tetracycline or oxytetracycline resistance determinant. The tetK genotype was present in 10 isolates while the tetL, tetM, and otrA genotypes were present in 3, 2, and 5 isolates, respectively. In addition, 2 isolates of the tetK plus tetM genotype, 1 of the tetK plus tetL genotype, and 1 of the tetK plus otrA genotype were found. All isolates were tetW, tetO and otrB negatives. On the other hand, 7 isolates (23%) showed a tetracycline-resistant and/or minocycline-resistant phenotype (MIC) but did not carry any of the tet or otr determinants investigated in this study. This research has shown that B. cereus isolates from honey samples contain a variety of tetracycline and oxytetracycline resistance genes, including the tetK and tetL determinants which encode for efflux proteins, and tetM and otrA, which encode for ribosomal protection proteins. These findings indicate that strains isolated from honeys could represent a reservoir for tetracycline resistance genes. To our knowledge, this is the first report of tetracycline-resistant and oxytetracycline-resistant B. cereus strains carrying the tetK determinant, and also the first report of oxytetracycline-resistant and tetracycline-resistant Bacillus species carrying the otrA determinant.

Keywords

Bacillus cereus, honey, tetracycline resistance determinants, tetK, tetM, tetL, otrA