Pharmacodynamic research plays an important role in the development of new antibacterial agents. Characterization of this pharmacodynamic can be used to design the best dose and dosing strategy for clinical trials. The pharmacodynamic properties can be determined by studying the bactericidal activity and the postantibiotic effects (PAE). Measurements of both bactericidal activity and the lag time could be useful in screening the efficacy of antimicrobial agents. In this study, the pharmacodynamic properties of essential oils from Cymbopogon flexuosus (lemongrass) and Cymbopogon nardus (citronella) as well as the combinations of both essential oils were evaluated against Staphylococcus aureus and Escherichia coli. At high concentrations (1.0 x minimum bactericidal concentration (MBC) and 0.5 x MBC), citronella and lemongrass essential oils alone or in combinations indicate high bactericidal activities toward S. aureus and E. coli, as shown by the decrease of optical absorbance values serially up to 24 h. However, these two essential oils or its combinations at lower concentrations (0.25 x MBC and 0.125 x MBC) showed the bacterial regrowth after 3 and 1 h of exposure time against S. aureus and E. coli, respectively. Generally, citronella and lemongrass essential oils as well as its combinations indicate a significant lag of regrowth or PAE values which were more than 0.5 h towards both E. coli and S. aureus. This finding suggests that essential oils from Cymbopogon species showed a potential antimicrobial activity that can further be used for clinical treatment; thus, there is need for a study on the possible impact of PAE in the clinical situation.