

Title: Synergic interaction between antimicrobial substances present in plant essential oils against *Salmonella* Typhimurium and *Staphylococcus aureus*.

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Resume:

The use of plant essential oils and their constituents may be an alternative to control microbial contamination, since they exhibit efficiency in inhibiting the growth of pathogens and food spoilage, whereas they are Generally Recognized as Safe by the Food and Drug Administration, thus increasing interest in using them as natural preservatives. In this work we evaluated the synergistic action of thymol, cinnamaldehyde, carvacrol and eugenol, recognized for their antimicrobial properties, present in essential oils of spices against *Salmonella* Typhimurium ATCC 14028, *Staphylococcus aureus* ATCC 25923 and *Escherichia coli* ATCC 25922. We used the checkerboard method to obtain the fractional inhibitory concentration (FIC), where the substance A was diluted in the X axis, and the substance B, in Y axis. Bacterial suspension (5.10^5 CFU/mL) was inoculated into the microtiter plate and incubated at 35 °C for 24h. The indices were calculated as $FIC_{xA} + FIC_{xB}$ where FIC.A and FIC.B are the minimum concentrations that inhibit the bacterial growth for tested substances A and B, respectively. Results were interpreted as synergism ($FIC < 0.5$), addition ($0.5 \leq FIC \leq 1$), indifference ($1 < FIC < 4$) or antagonism ($FIC > 4$). *S. aureus* ATCC 25923 showed indifference FIC indices for three of the combinations performed (carvacrol + cinnamaldehyde; carvacrol + eugenol and eugenol + cinnamaldehyde); for the combination thymol + cinnamaldehyde it showed addition activity and for two combinations (carvacrol + thymol and thymol + eugenol) it showed synergism, with FIC indices of 0.31 for both combinations. The results for *S. Typhimurium* ATCC 14028 was synergism for the combinations eugenol + carvacrol and carvacrol + thymol, with FIC indices of 0.25 and 0.14, respectively, and for the combinations carvacrol + cinnamaldehyde and thymol + eugenol it showed addition and, for the combinations thymol + cinnamaldehyde and eugenol + cinnamaldehyde the result was indifference. These results demonstrate that interactions between these substances were not satisfactory with the exception of carvacrol + eugenol and thymol + eugenol interactions which were efficient for Gram-negative and Gram-positive bacteria, respectively, and the combination carvacrol + thymol which were efficient for both gram-negative and gram-positive bacteria.

Keywords: Antimicrobial activity; Phenolics compounds; Microbiological quality; Natural antimicrobials.

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