

**Title** Efficacy of combined antimicrobial agents packaging films  
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### **Abstract**

Antimicrobial (AM) packaging films are used to enhance the preservation of packaged foods. Early developments of AM films considered the incorporation of individual AM active agents into films. With the potential benefits of combining two or more AM agents into a packaging film, research on AM packaging is moving in the direction of using combined AM agents. Although there are several recent examples of the use of AM combinations in packaging films, there is no current method of assessment of the interactions between combined AM agents in these films. The paper evaluates the applicability of conventional approaches. “dose additively” and “effect additively”, to assess the interaction effects between AM agents in packaging films. In particular, the interaction of combinations of carvacrol and thymol in low-density polyethylene packaging films is evaluated. Moreover, the practical limitations of conventional methods and the need for new analytical tools for the assessment of interaction effects when using combined AM agents in food packaging films are identified.