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Antimicrobial activity of five essential oils against origin strains of the *Enterobacteriaceae* family

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An *in vitro* assay measuring the antimicrobial activity of essential oils of *Coridothymus capitatus* (Spanish origanum), *Satureja montana*, *Thymus mastichina* (Spanish *Origanum majorana*), *Thymus zygis* (Spanish variety of *Thymus vulgaris*) and *Origanum vulgare* has been carried out against poultry origin strains of *Escherichia coli*, *Salmonella enteritidis* and *Salmonella essen*, and pig origin strains of enterotoxigenic *E. coli* (ETEC), *Salmonella choleraesuis* and S*almonella typhimurium.* Using the broth microdilution method, all the essential oils showed an MIC ≥ 2% (v/v) for the two strains of *E. coli.* The essential oil that showed the highest antimicrobial activity against the four strains of *Salmonella* was *Origanum vulgare* (MIC ≤ 1% v/v), followed by *Thymus zygis* (MIC ≤2% v/v). *Thymus mastichina* inhibited all the microorganisms at the highest concentration, 4% (v/v), while the rest of the essential oils showed highly variable results. By chemotyping, higher inhibitory capacity was observed in the oils with a higher percentage of phenolic components (carvacrol and thymol) in comparison with oils containing the monoterpenic alcohol linalool. The results of this work confirm the antimicrobial activity of some essential oils, as well as their potential application in the treatment and prevention of poultry and pig diseases caused by salmonella.

Key words: *Escherichia coli*; Salmonella species; essential oils; chemotype; animal strains.

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The infectious diseases that affect the digestive tract of pigs and broilers have traditionally been, and are still today, one of the main causes of economic losses. Since the incorporation of Spain into the European Union, the high level of competitiveness that affects Spanish livestock production has led to the evolution of production systems tending towards intensive methods and demands for higher productivity. Because animals are produced under these conditions this has led to decreased resistance to disease and ability to adapt, and thus increased risk of infection. Faced with this situation, production systems have largely been based on the control of infectious diseases through the use of antibiotic growth promoters (AGP) with the capacity to control certain intestinal bacteria harmful for the animal metabolism. Meanwhile, most authors are in agreement that use of these antibiotics should be limited and rationalized in view of the increased risk of bacterial resistance which could interfere with human and animal treatment (1).

Medicinal plants have been used for thousands of years because their active components are effective in the treatment of diseases. Robert Koch in 1881 (2) carried out a scientific assay to measure the antiseptic effect of turpentine oil against *Bacillus anthracis.* Since then, several re-

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