Aromatherapy Review

ANTIBACTERIAL ACTIVITY OF SOME PLANT ESSENTIAL OILS

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Why Was This Study Conducted?
This study was conducted to assess 21 essential oils as antibacterial agents against 6 bacterial species.

What Were The Parameters Of This Study?
The essential oils were tested against *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Bacillus subtilis* and *Staphylococcus aureus*.

The 21 essential oils tested were: aniseed (*Pimpinella anisum*), calamus (*Acorus calamus*), camphor (*Cinnamomum camphora*), cedarwood (*Cedrus atlantica*), cinnamon (*Cinnamomum zeylanicum*), citronella (*Cymbopogon nardus*), clove (*Eugenia caryophyllus*), eucalyptus (*Eucalyptus globulus*), geranium (*Pelargonium graveolens*), lavender (*Lavandula angustifolia*), lemon (*Citrus limon*), lemongrass (*Cymbopogon citratus*), lime (*Citrus aurantium*), nutmeg (*Myristica fragrans*), orange (*Citrus sinensis*), palmarosa (*Cymbopogon martini*), peppermint (*Mentha piperita*), rosemary (*Rosmarinus officinalis*) basil (*Ocimum sanctum*), vetiver (*Vetiveria zizanioides*) and wintergreen (*Gaultheria fragrantissima*).

How Were The Measurements Taken?
The bacterial strains were spread over plates containing agar for 18 hours at 37°C. Agar is a gelatinous substance used as a culture for microbiological work.

The essential oils were dissolved in a solvent solution and sterilised before being examined using the disk diffusion method. This method involved using a filter paper disc that was impregnated with the respective essential oil solution at 4 different concentrations. The discs were then placed onto the agar cultures.

The solvent used for the essential oils was also placed by itself onto one of each cultured bacterial strains. These discs formed the vehicle control. A reference control was established using streptomycin, a well-known antibiotic.

All the test sample plates were sealed with sterile laboratory parafilm to avoid evaporation. They were initially left for 30 minutes at room temperature to allow for the diffusion of essentials oils into the cultures. They were then incubated at 37°C for 18 hours. Once the incubation period was complete, the area of no bacterial growth on the disc was measured using a caliper.

The 7 most effective essential oils were tested further to establish their minimum inhibitory concentrations (MIC). A range of dilutions from 0.2 to 25.6 mg per mL were tested against blank controls.

In this test the diluted oils were placed directly onto the agar solution in plates. The plates were dried at room temperature for 30 minutes before being spot inoculated with the cultured bacterial organisms.

These inoculated plates were placed in incubation at 37°C for 18 hours. The bacterial growth after incubation was measured against the blank control plates. These experiments were conducted in triplicate.

What Were The Results?
The results showed that 19 of the 21 essential oils showed antibacterial activity of varying degrees against one or more bacteria. *Pseudomonas aeruginosa* and *Proteus vulgaris* were inhibited by 19 essential oils, followed by *Bacillus subtilis* (18 oils), *Staphylococcus aureus* (14 oils), *Escherichia coli* (12 oils) and *Klebsiella pneumoniae* (9 oils).

Cinnamon oil was found to be the most effective essential oil against all 6 bacterial strains. Lime, lemon, geranium, orange, rosemary and clove essential oils also showed significant inhibitory effects.

Camphor, eucalyptus and aniseed essential oils were revealed to be the least active against sample bacteria. The vehicle control showed no inhibition growth in the bacteria.

The results of the MIC test showed that the 2 most effective oils showed maximum inhibitory activity at dilutions of 0.8 and 3.2 mg per mL (cinnamon oil) and 1.6 to 6.4 mg per mL (clove oil).

What Did The Researchers Conclude?
The researchers concluded that ‘many essential oils possess antibacterial activity. Cinnamon oil has the most potential bactericidal properties’.

What Were The Limitations Of This Study?
The limitation of this study is that it was conducted as a laboratory experiment. Further studies using human beings would give us more information about the true potential of essential oils in treating bacterial infections.