

## The possibility of use of some essential oils in rodenticidal baits

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### Abstract

The effect of essential oils of ten different plant species, at rates of one and two ml per kg of plain bait, on bait acceptance and palatability in choice feeding tests for Swiss mice was studied under controlled laboratory conditions. Our aim was to determine the possibility of use of the tested essential oils in rodenticidal baits as potential attractants at rates which prevent mould development and which are applicable in humane medicine. Also, the use of these oils would be to prolong utility value of baits and reduce the use of antifungal ingredients, which usually reduce bait acceptance. Cinnamon and anise essential oils, commonly used as attractants, and clove oil, showed the best effects, because that they did not negatively affect bait acceptance and palatability, while fenchel and bergamot oils showed repellent action which became more pronounced as the content of oil in baits increased.

Keywords: bait acceptance, essential oil, palatability, Swiss mice

### Introduction

In human medicine, differently applied essential oils, alone or in combination, show insecticidal, antifungal, antibacterial, antioxidant, antimutagenic and antitrombotic activity. Likewise, in protection of food and raw materials, particularly cereal products, essential oils prevent the development of *Aspergillus flavus*, *Penicillium spp.* and *Fusarium graminearum*, which produce aflatoxin and mycotoxin. Being widely available and important dietary elements for the majority of rodent species, cereals are commonly used as base materials in rodenticide baits. Depending on conditions at the place of exposure, and particularly under conditions of increased humidity and temperature, mould growth occurs and can significantly reduce bait acceptance.

### Materials and methods

Adult males and females of Swiss mice (Institute for Medical Research, Military Medical Academy, Belgrade, Serbia), weighing from 20 to 25 g were used in the study. The animals were housed in plastic cages, under standard laboratory conditions, 21-24 °C, 12/24-hours light/dark cycle, controlled 45-70% relative humidity, and water available *ad libitum*. The effect of essential oils from ten plant species was investigated: bergamot orange (*Citrus aurantium* ssp. *bergamia*), scots pine (*Pinus silvestris*), eucalyptus (*Eucalyptus globulus*), clove (*Eugenia caryophyllata*), lavender (*Lavandula officinalis*), fenchel (*Foeniculum vulgare*), rosemary (*Rosmarinus officinalis*), thyme (*Thymus vulgaris*), cinnamon (*Cinnamomi zeylanicum*) and anise (*Pimpinella anisum*). Plain baits were prepared according to EPPO standard (EPPO/OEPP, 1999), by mixing 90% of coarsely-cut cereal, 5% of corn oil and 5% of medium-ground oatmeal, and 25 ml/kg of pure alcohol was added as a solvent for essential oils, while oil baits were obtained by adding one or two ml of diluted essential oil in alcohol per one kilogram of plain bait. Bait acceptance and palatability were determined according to Johnson and Prescott (1994), in choice feeding test.

### Results

The cinnamon, anise and clove oils showed the highest level of acceptance. With the increase in cinnamon oil content, the growing trend of bait acceptance was recorded from 51.1% to 59.0%, as the growing trend of palatability also, from 1.04 to 1.44, while with the increase in anise oil content, the level of bait acceptance decreased from 49.5% to 41.6%, as did palatability, from 0.98 to 0.71. Also, by the increase in content of clove oil in baits from one to two ml/kg of plain bait, the growing trend of bait acceptance, from 47.0 to 50.4, and palatability, from 0.88 to 1.01, was recorded. The lowest level and

declining trend of bait acceptance and palatability with an increased content of oil in the baits, was recorded for fenchel from 26.2% to 8.0%, and from 0.35 to 0.08 and bergamot from 9.0% to 2.6%, and from 0.09 to 0.03.

### Discussion

The amount of essential oils in the baits applied in this study was similar to the quantity of attractants which are added during the preparation of rodenticide bait. It is known that in rodenticidal bait preparation process, the addition of cinnamon and aniseed can improve bait acceptance by rodents (Buckle, 1994; Marsh, 1988). The results of our study show that cinnamon, anis and essential oils in tested quantities do not act as attractants, but also do not negatively affect bait acceptance and palatability for Swiss mice. For now, antifungal activity of cinnamon and clove essential oils on *Aspergillus flavus*, *Fusarium graminearum* and *Penicillium ssp.* (Aldred et al., 2008; Bluma and Etcheverry, 2008; Marin et al., 2004; Salmeran and Pozo, 1991) and of anise oil (Bluma and Etcheverry, 2008) on *Aspergillus flavus* has been confirmed. Likewise, it is known that by adding paranitrophenol and dehydroacetic acid or paraffin, it is possible to postpone or absolutely prevent mould development, but at the same time, frequently, reduce bait acceptance by rodents (Buckle, 1994).

Based on the results of our study, we believe that cinnamon, anise and clove essential oils at tested application rates will not have a negative impact on acceptance and palatability of cereal-based baits. Also, based on the findings of other authors, we believe that by adding these oils, mould development on baits can be delayed or prevented.

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