

EVALUATION OF ANTIBIOTIC PROPERTIES OF HERB ESSENTIAL OILS WITH POTENTIAL USING IN ANIMAL NUTRITION

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Abstract

Plant secondary products, especially essential oils and tannins, are nowadays good choice for alternative using as animal production improving instead of banned antibiotics. Lemon myrtle, tea-tree and thyme essential oil as well as grape seeds and mimosa tannins were tested to eliminate activity and growth of *Clostridium perfringens* strain 100. This pathogen causing necrotic enteritis was chosen as representative of microorganism eliminated by antibiotic in last years. All of used additives have eliminated the growth of *C. p.* culture during the *in vitro* experiment. The absolute elimination was ensured by approx. 0.1% concentration of tannins or by 0.01 – 0.03% concentration of essential oils.

Introduction

The plants have developed large range of low-molecular secondary metabolites. In general these matters can make able plants to interact with environment and can be active in the defense processes against physiologic and environmental stresses as well as against predators and pathogenic organism. Some of plants metabolites are toxic for animals however there are chemical substances in herbs extracts which have potential properties to increase animal efficiency, whereas there is few mechanism to due this. Herbs and their extracts are able to increase efficiency by following ways: increasing of feed intake by improving of taste qualities or dependence creation, improving of immunity as well as by antibacterial, coccidiostatic, anti-helminthic, antiviral, antiinflammatory on partly antioxidative properties. Most of active secondary plant metabolites become to flavonoids and glucosinolates.

Material and methods

The testing of herbs extracts *in vitro* run in Hungate-tubes in three repetitions. Tubes prepared in anaerobic chamber were filled in by cultivating medium (2.3 ml of TGB - Oxoid). To the medium was added the same volume of herbs extract solution but with different concentration. There were used water solutions of tannins obtained from grapefruit and mimosa as well as ethanol solutions of essential oils of thyme (*Thymus vulgaris*), lemon myrtle (*Backhousia citriodora*) and tea-tree (*Melaleuca alternifolia*).

Medium was inoculated by 0.1 ml of *Clostridium perfringens* culture (strain 100) and the tubes were closed in anaerobic chamber. Cultures were cultivated in water bath with temperature 37 °C.

The microbial activity was monitored exactly at 2, 4, 6, 8, 10, 20 hours after inoculation through gas production (using laboratory pressure gage). The gas production is directly dependent on bacterial culture activity.

Results and discussion

The results of *in vitro* experiment show antibiotic properties of herbs extracts used. The effective concentration were in case of tannins (grapefruit and mimosa) approximately ten time higher comparing with essential oils, on the second hand the tannins production is much more cheaper and expanded and also with higher concentration of fiber. Tannin extracted from grapefruit seeds eliminated the *Clostridium* growth with 99% effectivity in concentration 0.1% of tannin in all solution. The mimosa tannin showed slightly lower antibiotic activity comparing with grapefruit tannin. However in this case the efficiency of *C. p.* growth elimination was on level of 94%. Mentioned results come from measurement at 10 hours after inoculation. As mentioned, essential oils prevent from *Clostridium* growth already in concentration 0.01% in cultivating medium. Essential oil from tea-tree (*Melaleuca alternifolia*) absolutely eliminated microbial activity, thyme oil and lemon myrtle oil reduced the activity in 51.8 and 73.5% respectively. Higher content of these additives was more effective and stopped the microorganism growth as mentioned in graph. To analyze interaction between active compounds contained in extracts and physical and chemical substances occurred in digestive system as parts of feeding, digestive substances and other is necessarily in relation with presented effects of experimental additives. The estimated concentration in feedstuffs will be higher however according to some research works the effect of essential oil will remain also in monogastric digestive system

