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# SAVORY (*SATUREJA HORTENSIS*) AS A NATURAL ANTIOXIDANT

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AED-PIPARROHI (*SATUREJA HORTENSIS*) KUI LOODUSLIK ANTIOKSÜDANT. Raivo VOKK

ЧАБЕР САДОВЫЙ (*SATUREJA HORTENSIS*) КАК ПРИРОДНЫЙ АНТИОКИСЛИТЕЛЬ. Райво ВОКК

**Key words:** antioxidant, savory, essential oils, BHA, oxygen consumption.

## INTRODUCTION

Antioxidants commonly used in meat products, cereal-based snack foods, soups and broths, preserved fish products, etc. are butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT). In recent decades there has been an increasing concern over the safety of artificial food additives including the possible toxicity of the synthetic chemicals used as antioxidants. As a result, the U.S. Food and Drug Administration has shown its concern in this matter by removing BHT from the GRAS (Generally Recognized As Safe) List. It has also been expressed in the EC Directive 94/34 on food additives other than colours and sweeteners, where BHA (E320) and BHT (E321) have not been included into Generally Permitted Food Additives (Official Journal..., 1994).

It is also important to note that there is an increasing preference among consumers for foodstuffs with as few additives as possible, or with natural aroma and flavour compounds like herb materials.

In the present study we paid particular attention to the essential oils fraction obtained from savory (*Satureja hortensis* L.), which is widely used as a flavouring herb in different foods. Our aim was to evaluate the possible role of savory in the prevention of oxidative changes during food processing and to compare its effect with antioxidative properties of BHA.

## MATERIAL AND METHODS

Plant material was grown and harvested in Estonia, and dried at room temperature. Essential oils were prepared from dried plant material by Clevenger distillation (Food Chemicals Codex, 1990) on a laboratory scale, and the yield of oils was calculated per dry weight. In our experiments different dilutions of essential oils for oxygen consumption measurements were prepared with ethanol and air-saturated phosphate buffer, pH 5.8.

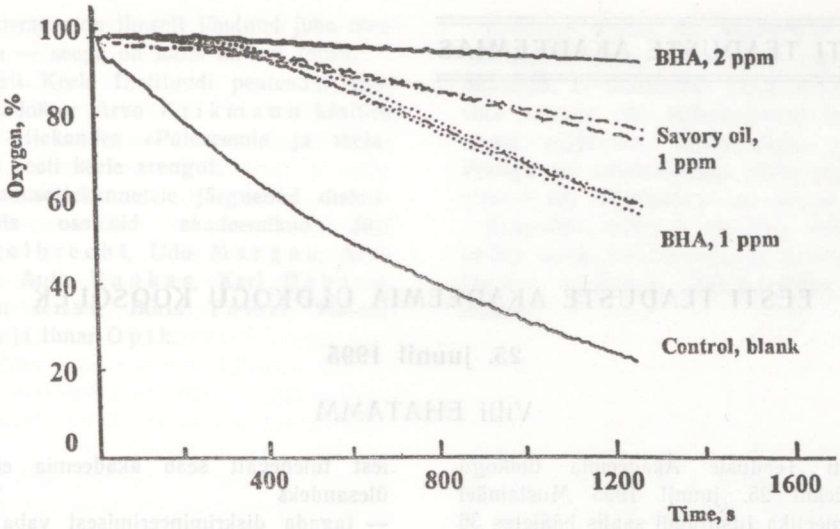
The standard system used for oxygen consumption measurements (Mikkelsen et al., 1992) consisted of 100 µl linoleic acid emulsion (21 mmol/l), 100 µl 0.2 mmol/l metmyoglobin (Mmg), and 4.8 ml air-saturated phosphate buffer thermostatted at 25 °C, pH 5.8. Immediately after mixing, a sample (with or without diluted savory essential oils or BHA) was injected into a thermostatted 75 µl measuring cell (Chemiware, Viby J., Denmark). Oxygen consumption was measured with a Clarke electrode (Radiometer, Copenhagen, Denmark) in conjugation with a multichannel analyser and a computer-based data-collecting system with the software written at The Royal Veterinary and Agriculture University (Frederiksberg C., Denmark). The electrode was calibrated with a thermostatted air-saturated buffer, and the relative oxygen concentration was recorded at time intervals of 10 s. At least three parallels of each measurement were made. In our experiments 0.3 mmol/l BHA ethanol stock solution diluted in air-saturated phosphate buffer, pH 5.8, was used.

## RESULTS AND DISCUSSION

The antioxidative activity of an artificial antioxidant BHA in a model system was estimated at different concentration levels (0.4—50 ppm), which are most widely used in food products. At higher concentration levels BHA showed its antioxidative properties preventing linoleic acid against oxidation in a model system. The results of two experiments with 1 ppm and 2 ppm of BHA are given in the Figure. It was shown that at the lower concentration level (1 ppm) oxidation of linoleic acid was prevented only during the first 5 min due to the insufficient antioxidative capacity of BHA.

In our study on plant material the essential oil fraction (yield 2.6% w/w) stored in nitrogen atmosphere was investigated as an antioxidant at the same concentration levels and the results obtained with 1 ppm of savory essential oil in comparison with BHA are given in the Figure. Savory oil exhibited significant antioxidative properties. During the first 5 min its effect was similar to that of BHA, during the next 15 min even better than BHA at the same concentration level. The oxygen consumption rate was about 21% in the case of savory whereas the linoleic acid model system with BHA led to 40% of oxygen consumption within 20 min. The rate of oxygen consumption for the blank (linoleic acid emulsion with Mmg without any antioxidant) was 50% within 10 min, and 77% within 20 min.

Savory belongs to the family Labiatae and herbs belonging to this family are known for their strong antioxidative activity due to the aromatic compounds of different chemical nature they contain (Schwarz & Ternes, 1992a). The most widespread antioxidative constituents in plant extracts are usually phenolic diterpenes like rosmanol, epirosmanol, carnosol, etc. (Schwarz & Ternes, 1992b). The study on the chemical nature of antioxidative compounds found in essential oils obtained from savory by Clevenger distillation is in progress.




Effect of butylated hydroxyanisole (BHA, 1 ppm) and savory essential oils (1 ppm) on the rate of oxygen consumption recorded as a function of time for linoleic acid emulsion with metmyoglobin. The results of parallel measurements are given to show the dispersion of data.

Considering that natural antioxidants of plant origin like savory exhibit significant antioxidative activity they should be recommended to be used in oils or lipid-containing food products to prevent their oxidative deterioration.

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