

Hepatotoxicity of an Essential Oil of *Salvia officinalis* L. An InVitro Study Using Freshly Isolated Rat Hepatocytes

Lima C.¹, Carvalho F.², Fernandes E.^{2,3}, Bastos M.L.²,
Santos-Gomes P.C.¹, Fernandes-Ferreira M.¹, Pereira C.¹

¹Departamento de Biologia, Centro de Ciências do Ambiente, Universidade do Minho, 4710-057 Braga, Portugal

²ICETA/CEQUP, Serviço de Toxicologia, Faculdade de Farmácia, Universidade do Porto, 4050-047 Porto, Portugal

³Instituto Superior de Ciências de Saúde – Norte, 4580 Gandra, Portugal

Sage (*Salvia officinalis* L.) is a popular Mediterranean aromatic herb that is cultivated worldwide. It is used since ancient times as a medicinal herb for treating a variety of ailments and has a reputation for memory enhancement [1,2]. It is also commonly used for flavouring and seasoning of foods, most of their properties being due to essential oils [1,3]. Sage extracts have also been reported to have an antioxidant effects and excellent properties in inhibiting lipid peroxidation [1]. Sage derivatives continue to be important components of contemporary phytopharmaceuticals, although their potentially toxic effects have not received much attention.

In this study, the hepatotoxicity of an essential oil obtained by hydrodistilled aerial parts of *Salvia officinalis* L. plants (12 mg/g dry weight) harvested in April 2000, cultivated in Arouca experimental farms in northern Portugal, was investigated in freshly isolated rat hepatocytes. The studied concentrations (0 µl/ml, 0.08 µl/ml, 0.4 µl/ml, 2 µl/ml, and 10 µl/ml) did not induce lipid peroxidation measured by the thiobarbituric acid reactive substances (TBARS) assay. However, it was observed a concentration dependent increase of lactate dehydrogenase leakage of 30 min of incubation with the essential oil (18.1%, 21.4%, 28.0%, 29.4%, and 51.6%). Values of reduced and oxidized glutathione will also be discussed. *Tert*-butylhydroperoxide (1.0 mM, 30 min), a well-known toxic compound, was used as positive control for cell damage.

Our results show that care should be taken when applying essential oils in the food industry or as alternative medicines because of their potentially toxic effects on the liver.

1. Lu, Yinrong; Foo, L. Yeap (1999), *Phytochemistry*, 51: 91-94.

2. Perry, E.K.; Pickering, A.T.; Wang, W.W.; Houghton, P.J.; Perry, N.S.L. (1999), *J. Pharm. Pharmacol.*, 51: 527-534.

3. Adam, K.; Sivropoulou, A.; Kokkini, S.; Lanaras T.; Arsenakis, M. (1998), *J. Agric. Food Chem.*, 46: 1739-1745.