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1: **Toxicon.** 2001 Oct;39(10):1601-5.

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### Seasonal changes in the composition of the essential oil extract of East Mediterranean sage (*Salvia libanotica*) and its toxicity in mice.

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Sage (*Salvia libanotica*) is an East Mediterranean plant, the extract of which is used for the treatment of colds, coughs, and stomach ache. Experimental studies on the toxicity of its oil are scarce despite its wide use in traditional medicine. This study aims to provide data on its acute toxicity and to investigate the relationship between seasonal changes in oil composition and toxicity. The composition of the oil extract from the leaves of this plant was determined at four different times of the year; August (summer), October (fall), January (winter) and April (spring). The toxicity of each fraction was investigated following intraperitoneal (i.p.) injection into mice. Distillations of oils from plants and GC analyses revealed that the main constituent of sage oil is 1,8-cineole. Other components included ketones such as camphor and alpha,beta-thujone, terpenes such as limonene and alpha,beta-pinene, and alcohols such as borneol and linalool. Major seasonal changes were found in the composition of the oil. Essential oil extracted from plants collected in the winter season (January) contained higher levels of camphor (12.3%), alpha,beta-thujone (1.9%), and camphene (4.8%). The winter extract was found to be the most toxic, (LD(50): 839 mg/kg body weight) and exhibited powerful convulsant properties. This indicates a strong correlation between the contents of camphor, thujones and camphene and the oils' toxicity. The spring extract was the least toxic (LD(50): 1200 mg/kg body weight) and contained lower levels of camphor (7.7%), alpha,beta-thujone (1.3%) and camphene (3.1%). Thus, we recommend that oil extracts of sage marketed for use in certain unconventional medicines be prepared from spring plants.

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