

## **PP19. Improving the efficiency of essential-oil extraction from *Abies sachalinensis* with an underwater shockwave pretreatment**

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*Abies sachalinensis* (Sakhalin fir) is a conifer species belonging to the family Pinaceae that is native to and widely distributed throughout Sakhalin Island, the southern Kurils (Russia), and northern Hokkaido (Japan). The essential oil of *A. sachalinensis* has been found to be an active removal agent, similar to  $\gamma$ -terpinene, myrcene, and  $\beta$ -phellandrene, which effectively remove nitrogen dioxide. Essential oils provide a relaxing effect; the use of essential oils is expected to improve overall air quality.

Underwater shockwaves generate instantaneous high pressure that reaches the entire cell and causes multiple cracks along the tracheids, causing the pit membrane to flake off through spalling destruction. These cracks function as permeation pathways [1]; this application was expected to result in a more effective essential oil extraction by subsequent steam distillation [2]. We, herein, introduce a novel application of this pretreatment process aimed at improving the efficiency of essential-oil extraction from *A. sachalinensis* leaves and branches. *A. sachalinensis* leaves and branches were oven-dried (40-45 °C) to a moisture content of 10% or less, and were subjected to the shockwave pretreatment or left untreated before essential-oil extraction by steam distillation. Chemical analysis was performed using gas chromatography-mass spectrometry. The essential-oil yields of raw untreated and untreated dried leaves were 5.1 and 2.4 g/kg of leaf dry weight (DW), respectively. Upon application of a 3.0 kV, 3.6 kJ shockwave, the essential-oil yield increased with the number of shockwave cycles; the yield was 32.7 g/kg DW after 10 cycles, a 13.6-fold increase compared to that of the untreated dried leaves. In addition, sesquiterpenes increased by more than 30-fold in content compared to that of untreated dried leaves. Thus, these results suggest that instantaneous high-pressure treatment, as a pretreatment for conventional steam distillation, has a distinct advantage in increasing the essential-oil yield and extracting the bioactive components. Furthermore, this method also can be used for the pretreatment of microwave essential-oil extraction or steam distillation under reduced pressure.

### *References:*

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- [2] Kuraya, E. et al., 2013. Int. Symp. Essent. Oils (ISEO 2013), 8–11 Sep, 43–44.

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