



Optimization of processing parameters for extraction of essential oil from *Foeniculum vulgare*

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Background and objectives: It is necessary to specify the best conditions of essential oils production to get more major compound(s) and higher yield oil. The fennel oil is useful in pharmaceutical industry as flavor. The main component of fennel oil is anethole (55-75%). The objective of this work was to identify the effect of particle size, pH of water, method of distillation and using ultrasound on extraction of fennel essential oil (and its major constituent, anethole). **Methods:** We used a statistical method called D-optimal Design that appointed pH, particle size and method for each assay. Fennel seeds were purchased, then milled and passed from different meshes. In the first series, the seeds powder was distilled directly. In the second series the seeds were placed in an ultrasonic apparatus for 30 min. The essential oils were subsequently isolated by two methods, hydro distillation and steam distillation, in different sizes (25, 30, 40, 50) and pH (5.5, 5.8, 7, 7.4, 8.5). Fifty g of dry seeds were used in each distillation (for 3 h). Analytical gas chromatography (GC) was used to determine the essential oil composition. **Results:** In the steam distillation, the volume of essential oils and the concentration of anethole, whatever the plant became smaller, was less. However, in the water distillation, it was more and by comparing the two steps, without and with ultrasound, it increased 20% after the ultrasound. **Conclusion:** optimum conditions according to the statistical results were steam distillation, mesh size 50 and using ultrasonic device.

Keywords: anethole, distillation, essential oil, fennel