



# Investigation of optimal thermal parameters during distillation of essential oils from herbs

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## Introduction

Essential oils and aromatic plants have long been used throughout the world in foods, fragrances, perfumery, cosmetics and especially in medicines. Essential oil extraction from herbs is one of the medium temperature agro-based industries that can play a vital role in promoting agriculture and farmer's living standard. One ounce of various essential oils has worth thousands of Dollars. Out of all extraction methods, distillation methods have advantages of extracting pure and refine essence of the plant materials. Due to sensitive thermal processes, distillation techniques are only limited at commercial scale. The main object of the paper is to investigate optimal thermal parameters and to develop simple methodologies for easy adaptation of these techniques.



## Material and Methods

The laboratory apparatus comprises of insulated electric heaters (0-500 W), round glass boilers having 2 liters capacity, glass still tubes, condenser units and Florentine flasks. The energy consumptions and temperatures were recorded under identical conditions for different herbs. Experiments were carried out with both hydro and steam distillation units.



Hydro distillation unit



Florentine flask



Steam distillation unit

## Results and discussion

Process lines were drawn to record distillation time, energy requirement, contents of oil and quantity of steam needed in the sensible and latent heat phase

### Optimum energy requirement

Energy consumptions to process 100 grams of Cloves buds, Fennel, Cumin, Melissa, Patchuli, Cassia, Orange barks, Lavender and Peppermint were found to be 1.02, 0.59, 0.85, 0.24, 0.65, 0.66, 0.56, 0.62 and 0.54 kWh respectively. Fresh herbs were easily processed and found less energy consuming. Steam distillation gave better results than hydro distillation.

### Energy per ml of essential oil

The heat energies required to extract one ml of Cloves buds, Fennel, Cumin, Melissa, Patchouli, Cassia, Orange barks, Lavender, Peppermint were found to be 0.19, 0.75, 0.50, 4.44, 4.01, 2.22, 4.15, 2.95, 3.33 kWh respectively. It provides decision making for the farmers in adopting different farming practices

