



IJPPR

INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH  
An official Publication of Human Journals

ISSN 2349-7203




Human Journals

Research Article


August 2019 Vol.:16, Issue:1

© All rights are reserved by Piyush Mehra et al.

## Extraction of Fennel Oil Using Different Methods and Effect of Solvent and Time to Maximize Yield



IJPPR  
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH  
An official Publication of Human Journals



ISSN 2349-7203

**Piyush Mehra<sup>\*a</sup>, Mohammad Mukim<sup>a</sup>, Suresh Roy<sup>a</sup>,  
Uttam Singh Baghel<sup>a</sup>, Pratishtha Sharma<sup>a</sup>, Abhay  
Sharma<sup>a</sup>, Noorul Hasan<sup>b</sup>**

<sup>a</sup> Kota College of Pharmacy, Kota, Rajasthan-India-  
324003

<sup>b</sup> Department of Pharmacology, SPER, Jamia Hamdard,  
New Delhi-India-110062

**Submission:** 23 July 2019  
**Accepted:** 28 July 2019  
**Published:** 30 August 2019

**Keywords:** Fennel Oil, Solvent, Soxhlet Extraction, Effect of Temperature.

### ABSTRACT

**Background:** The aim of this study was to determine the extractive differentiation using different solvents and extractive methodologies in reference to the yield obtained by them and preparation of an integrated report on the extractive yields in references to the factors which can influence them. **Methods:** Fennel can be extracted using a variety of methods such as Soxhlet Extraction, Simple Maceration and Percolation. **Results:** This study applied that acetone is better solvent and soxhlet extraction is better method to determine optimum extraction conditions for dry fennel seeds to produce a high yield of fennel oil. The factors included reaction time and effect of solvents. **Conclusion:** As per experimental work soxhlet extraction is better method for extraction than other methods. Soxhlet extraction is shown to be a promising technique for the operation, because of its high recovery, process simplicity, thermal stability and low energy requirement. This study might as well discover potential savings in its operational cost and also environmental friendly.



[www.ijppr.humanjournals.com](http://www.ijppr.humanjournals.com)

## INTRODUCTION

Nature is full of numerous supernatural fragrances, which have their magical and are pleasant to our senses. Fennel is one of them, generally known as Saunf (*Foeniculum vulgare* Mill) family Apiaceae (Umbelliferae) [1] is a group of annual, biennial or perennial herb. It is widely cultivated all over India up to 1830 m and sometimes found wild[2,3]. Fennel is used as spices and also as an important ingredient in various folklore medicines throughout the world. Moreover, this plant has been investigated extensively for several medicinal and therapeutic activities and has been reported for possessing carminative, flavouring, antioxidant, antibacterial, antifungal and mosquito repellent properties[4-6].

An analysis of fennel shows it to consist of moisture 6.3%, protein 9.5%, fat 10%, minerals 13.4%, fiber 18.5% and carbohydrates 42.3%. Its mineral and vitamin contents are sodium, calcium, phosphorous, iron, potassium, thiamine, riboflavin, niacin and vitamin C. Its calorific value is 370[7]. Fennel volatile oil is a mixture of at least a dozen of different chemicals and the main ingredients are anethole (40 - 70%)[8], fenchone (1 - 20%)[9] and estragole (2 - 9%)[10].

Fennel oil is an essential oil that has several applications in various industries. Fennel oil is produced from fennel seed by using soxhlet extraction. Its widespread use necessitates its cost-effective extraction and separation. In this work various extraction methods, that is distillation, Soxhlet extraction, Simple maceration and Percolation have been used for this purpose; however soxhlet extraction, shown to be a promising technique for the operation, because of its high recovery, process simplicity, thermal stability and low energy requirement. The applicability of soxhlet extraction for extraction of fennel oil by using acetone, methanol, n-hexane, water, ethanol as solvent have been studied. The experimental data have been presented in terms of effect of different methods, effect of solvent and effect of time on extraction of fennel oil.

## MATERIALS AND METHODS

### *Collection of Sample*

The dry fennel seed used in this research was purchased from local market of Kota (Rajasthan). All fennel seed were collected from the month of December (2018). Dry fennel seed was assessed to obtain fennel oil. The ripe fruits were ground into fine powder.

### *Chemical & Reagent*

Solvents used: Acetone, Ethanol, Methanol, N-hexane. Solvents used for lab are of AR grade. Solvents used for this research were taken from Kota College of Pharmacy (Department Of Pharmacognosy), Kota.

### *Methods*

Fennel can be extracted using a variety of methods such as Soxhlet Extraction, simple maceration and percolation.

#### *Simple Maceration[11]*

#### *Alcohol Maceration*

In this process, the fennel (25g) is placed with the whole of the solvent (100ml) in a closed vessel for 7 days. During this period shaking is done occasionally. After 7days the liquid is strained and marc is pressed.

#### *Water Maceration*

This method is similar to alcohol maceration where water is used instead of alcohol.

#### *Percolation*

- Comminution of fennel (powder 25g)
- Imbibition of fennel (4 hours at room temp.)
- Packing (a filter paper is placed on the bottom to support the column of drug and over the moistened drug another filter paper is placed having weight on it).

- Maceration (percolator is set aside for 48 hours)
- Percolation (extraction was carried out)

### *Soxhlet Extraction[12]*

- The operational conditions include optimized sample, temperature, extraction time, and ratio of fennel to solvent.
- Temperature: The operating temperature for experiments carried out was varied from 70°C to 75°C.
- Extraction time: The term extraction time is used for the duration of time it took for experiment to run. In this research, the experiments were carried out from 2, 4 and 6 hours of extraction time.
- Ratio of fennel to solvent: The experiments being carried out using the equipment set up. The ratio of fennel to solvent was 25 gm. Fennel sample to 100ml of solvent was used.

### *Percentage Yield*

The following formula was used to determine the essential oils yield:

$$\text{Essential oils yield (\%)} = W_1 (\text{extraction}) (\text{g}) / W_2 (\text{sample}) (\text{g}) \times (100) \%$$

Where

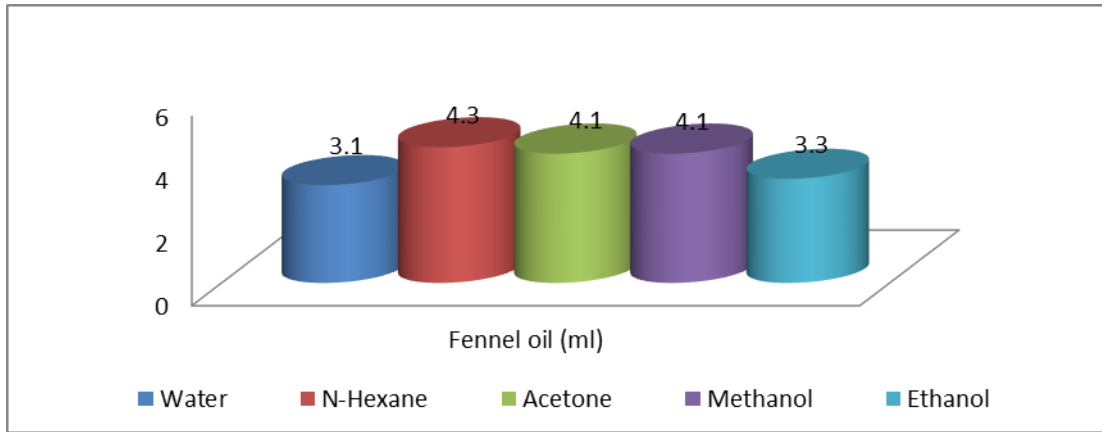
$W_1$  = (extraction) net weight of oils (grams)

$W_2$  = total weight of fennel (grams)

## **RESULT**

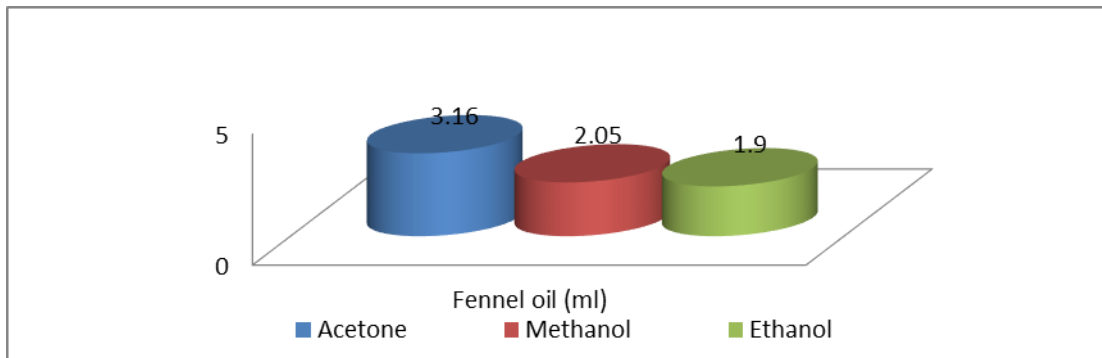
### *Simple Maceration Result*

Highest fennel oil was founded in solvent n-hexane (4.3ml).



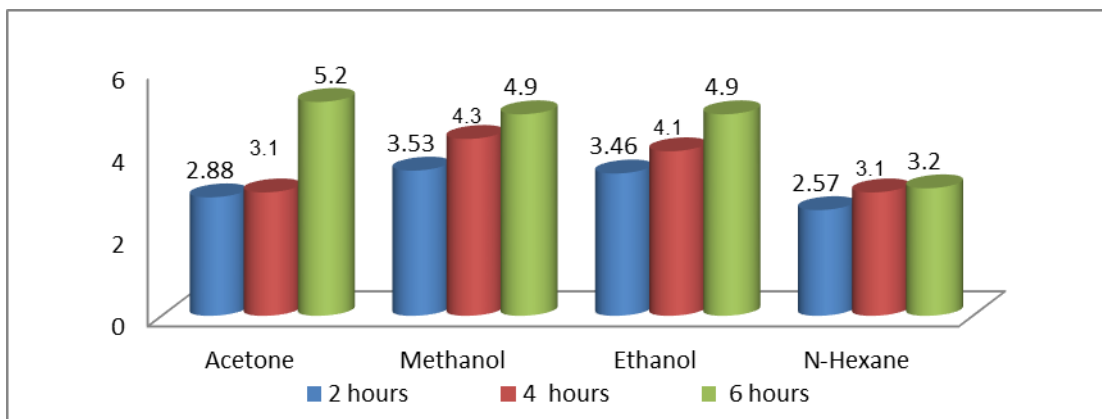
**Percolation Result**

Highest fennel oil was founded in solvent acetone (3.16ml).



**Soxhlet Extraction**

Highest fennel oil was founded in solvent acetone (5.2 ml) in 6 hours.



**Effect of Solvent**

Table 1 shows the fennel oil collected using different solvents with the help of soxhlet extraction. The table shows that there was fennel oil collected during 75 degree celsius temperature in this extraction process. Fennel oil can be seen extracted after the first hour of extraction time. So from table acetone is good solvent for extraction of fennel oil as compared to other. So for further process acetone is used.

**Table No. 1: Effect of solvents Effect of Time**

Solvent	Temperature (degree Celsius)	Fennel oil collected
Acetone	75°C	5.2
Methanol	75°C	4.9
Ethanol	75°C	4.9
n-hexane	75°C	3.1

Table 2 shows the fennel oil collected during the 2, 4 and 6 hours of soxhlet extraction. The table shows that with increasing time interval, extraction of fennel oil is also increased. Acetone as solvent is used. Prolonging the extraction time will achieve a better value of the fennel oil collected.

**Table No. 2: Effect of Time Ash Value [13]**

Time	Fennel Oil Collected
6	5.2ml
4	3.0ml
2	2.88ml

**Table No. 3: Determination of ash value by muffle furnace**

Ash value	Total Ash value	Acid- insoluble value
	9.13%	0.10gm

## DISCUSSION

- The result of present work showed that the highest yield of essential oil by use of different solvents and methods, the highest yield of essential oil given by acetone solvent and soxhlet extraction as compare to other methods.
- Fennel volatile oil is a mixture of at least a dozen of different chemicals and the main ingredients are: anethole, fenchone and estragole.
- The effects of solvent in essential oil extraction were 5.2 ml, 4.9 ml, 4.9 ml and 3.1 ml by acetone, methanol, ethanol and n-hexane respectively.
- The effects of time in essential oil extraction were 6, 4 and 2 hours gave 5.2 ml, 3.0 ml and 2.8 ml fennel oil collected by soxhlet extraction method.
- The total Ash value and acid-insoluble ash value were found as 9.13% and 0.10gm.
- The soxhlet extraction method is best for industrial purpose because it gives high yield, high quality oil, cost and environmental friendly.

## CONCLUSION

Study on extraction of fennel oil by soxhlet extraction, simple maceration extraction, and percolation extraction using different solvents like acetone, methanol, ethanol, water, n-hexane were done. From the experimental results it was concluded that acetone gives more yield compared to other solvents. Therefore, with increasing time extraction quantity increases. Prolonging the extraction time will achieve a constant value of the fennel oil collected. 75°C was the optimum temperature of extraction from the experimental work. Highest yield obtained by soxhlet extraction for acetone as solvent were 20.8%.

## ACKNOWLEDGEMENT

The authors want to express their sincere gratitude to Mr. Siddhartha Gupta, honorable Director of Kota College of Pharmacy and standard laboratory for providing excellent facilities and well-equipped laboratories for the successful completion of the project.

## REFERENCES

1. Arzoo and Parle M. Fennel: A Brief Review. Euro J Pharmaceutical and Med Research. 2017; 4(2):668-675.
2. Anonymous Indian Herbal Pharmacopoeia Revised new ed. Published by Indian Drug Manufacturer Association (IDMA): Mumbai and Jammu; 2002.
3. Farooq S. Medicinal Plants: Field and Laboratory Manual, (Identification with its Phytochemical and *in-vitro* studies data), Int Book Distributors: Dehradun; 2005.
4. WHO. Global Atlas of Traditional, Complementary and Alternative Medicine: World Health Organization: Geneva; 2005.
5. Bisset NG. Herbal Drugs and Phytopharmaceuticals. CRC Press Boca Raton: FL; 1994.
6. Baytop T. Therapy with medicinal plants in Turkey. Publication of Istanbul University Istanbul: Turkey; 1999.
7. Bakhru HK, Herbs that heal- Natural remedies for good health Oriental Paperback: Vision Books Pvt. Ltd. New Delhi; 1992.
8. Bernath J, Nemeth E, Kattaa A, Hethelyi E. Morphological and chemical evaluation of Fennel (*Foeniculum vulgare* Mill.) population of different origin. J Essent Oil Res. 1996; 8: 247-253.
9. Cosge B, Kiralan M, Gurbuz B. Characteristics of fatty acids and essential oil from sweet fennel (*Foeniculum vulgare* Mill. var. dulce) and bitter fennel fruits (*F. vulgare* Mill. var. vulgare) growing in turkey. Nat Prod Res. 2008; 22:1011-1016.
10. Raghavan S. Handbook of spices, seasoning and flavourings. CRC Press Taylor and Francis group, Boca Raton: New York; 2006.
11. Subrahmanyam CVS, Settee JT and Devi VK. Textbook of Pharmaceutical Engineering – Unit operations-II. Principles and Practice. 2<sup>nd</sup> ed. Vallabh Prakashan: Delhi; 2011.
12. Kanadea R, Bhatkhandeb DS. Extraction of Fennel Oil Using Different Methods and Effect of Solvents, Time, Temperature to Maximize Yield. Int J Advances in Science Engineering and Technology. 2016; 4(3): 241-244.
13. Gupta MK, Sharma PK. A Text of Pharmacognosy. 1st ed. Pragati Prakashan: Meerut; 2009.

