

Comparison of Geranium essential Oil Production from different leaf sizes at constant Power through Solvent Free Microwave Extraction Method

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Abstract: Solvent- free microwave extraction is a newly developed technique for the solid-liquid extraction with microwave as the energy source. Solvent- free microwave extraction method was reported to be an efficient extraction method in terms of selectivity, yield and speed. The development in microwave techniques has occurred because of a need for a rapid, safe and cheap method. Solvent-free microwave extraction (SFME) is a combination of microwave heating and dry distillation, performed at atmospheric pressure without added any solvent or water. Isolation and concentration of volatile compounds are performed by a single stage. The essential oils extracted by SFME for 60 min were quantitatively (yield) and qualitatively (aromatic profile) similar to those obtained by conventional hydro-distillation for 4.5 h. Essential oils provided by SFME are dominated by the oxygenated fraction which is the more valuable and composed of highly odoriferous aromatic compounds and allows substantial savings of costs, in terms of time, energy and plant material. The in situ microwave heating is safe and versatile; it presents time and energy saving advantages, and therefore it can be considered useful also for industrial applications.

Key words: Solvent free microwave extraction technique, Geranium (*Pelargonium graveolens*)

I. Experimental:

A. Plant Raw Material:

Geranium herbs:

Geranium is a bushy plant upto one meter tall. Stem is cylindrical, woody at base, pubescent, green when young, turning brown with age. Leaves alternate, stipulate, simple, broadly cordate, ovate to nearly circular, deeply 5-7 lobed, each segment again lobed, toothed; pubescent on both surfaces, highly aromatic.

B. Procedure:

In the experiment Geranium leaves were taken in different sizes. In the experiment 100 gm of fresh plant material was heated using a power of 200 watt for minimum of 25 minute and maximum of 60 minutes time. Without adding any solvent or water (H₂O). A cooling system outside the microwave cavity condensed the distillate continuously. Condensed water was refluxed to extraction vessel in order to provide the uniform condition of temperature and humidity for extraction. The extraction was continued at 80° C until no more essential oil was obtained. The essential oil was collected dried under anhydrous Sodium Sulphate and stored at 0 ° C until used. After extracting the geranium oil from solvent free microwave extraction technique, the oil is extracted through steam distillation process (conventional method) and we get the results in terms of yield obtained , effect of different leaf sizes on oil yield, effect of increase in power input on extraction time of oil and oil yield.

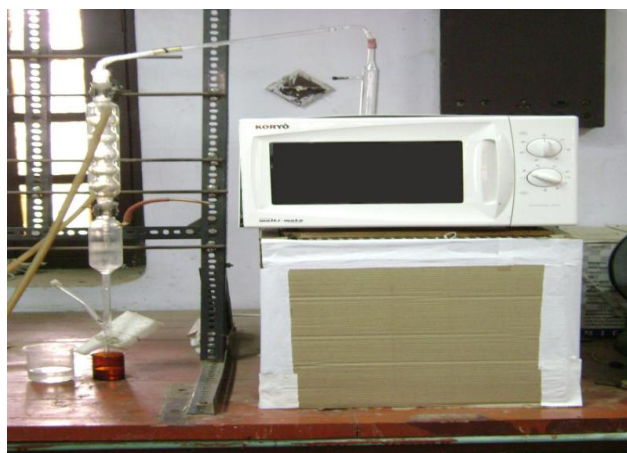


Figure: Experimental set up for Microwave Extraction of essential oil

II. RESULTS

Solvent Free Microwave Extraction

Power- 200 Watt. (Constant)

Table 1: Effect of time on oil obtained from leaf size (4 cm = Full leaf)

Wt of sample = 100gm

Geranium (<i>Pelargonium graveolens</i>)			
S.No.	Sample No.	Time(min)	Oil Obtained(ml)
1	S1	25	0.032
2	S2	30	0.055
3	S3	40	0.096
4	S4	50	0.123
5	S5	60	0.123

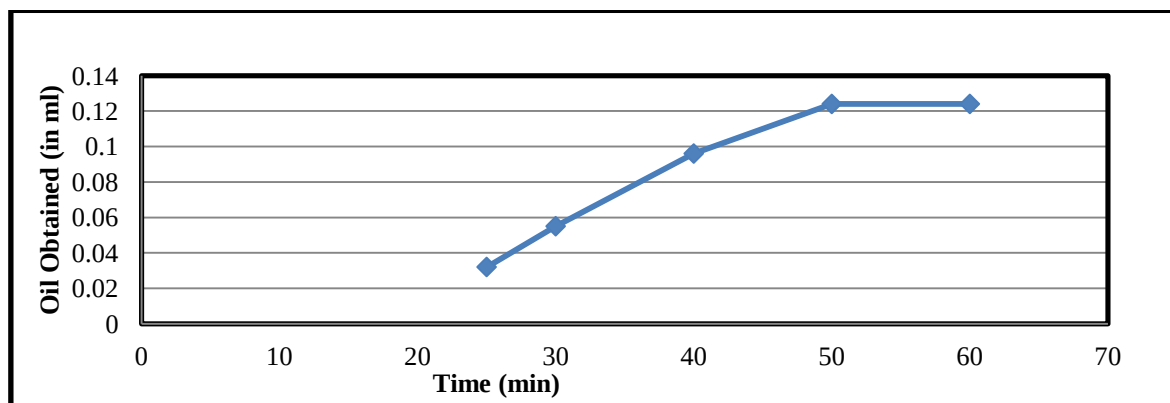


Table -2 Effect of time on oil obtained from leaves (3.0 cm).

Wt of sample = 100gm

Geranium (<i>Pelargonium graveolens</i>)			
S.No.	Sample No.	Time(min)	Oil Obtained(ml)
1	S6	25	0.043
2	S7	30	0.066
3	S8	40	0.108
4	S9	50	0.132
5	S10	60	0.132

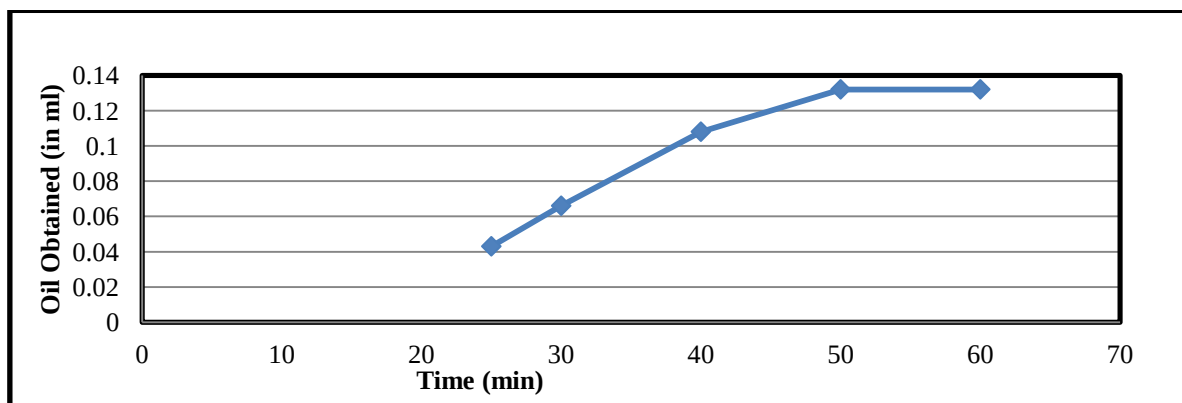


Table -3: Effect of time on oil Obtained from leaf size (2.0 cm).

Wt of sample = 100gm

Geranium (<i>Pelargonium graveolens</i>)			
S.No.	Sample No.	Time(min)	Oil Obtained(ml)
1	S11	25	0.045
2	S12	30	0.068
3	S13	40	0.109
4	S14	50	0.138
5	S15	60	0.138

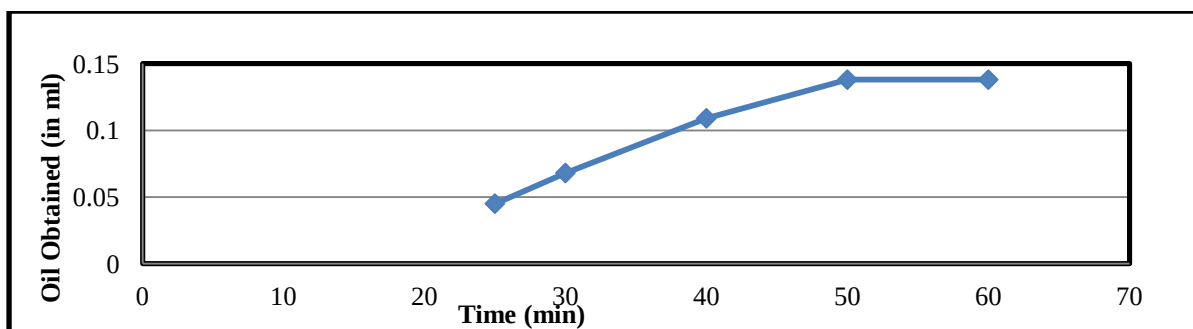


Table -4 Effect of time on oil obtained from leaf size (1 cm)

Wt of sample = 100gm Geranium (<i>Pelargonium graveolens</i>)			
S.No.	Sample No.	Time(min)	Oil Obtained(ml)
1	S16	25	0.054
2	S17	30	0.077
3	S18	40	0.118
4	S19	50	0.144
5	S20	60	0.144

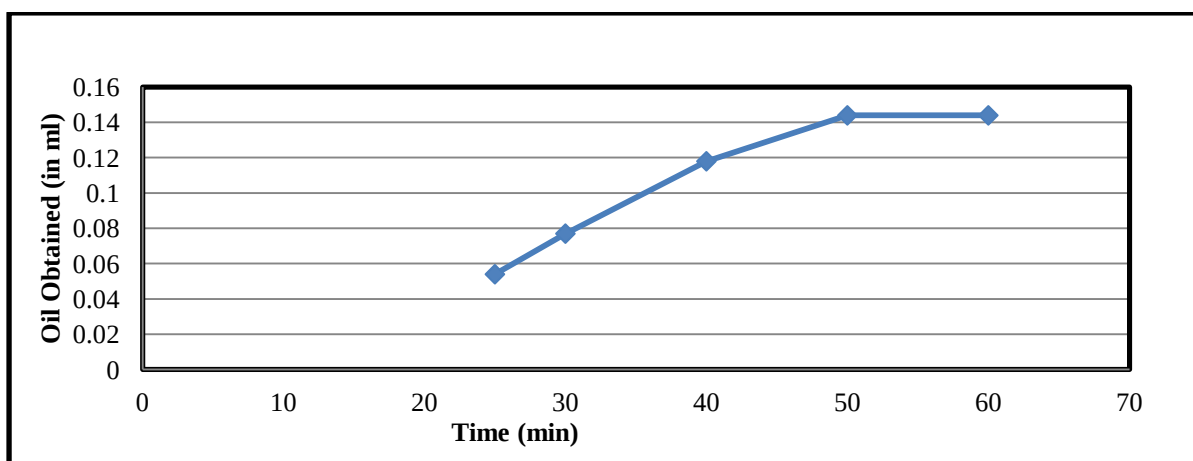


Table -5 Effect of time on oil obtained from leaf size (5 mm).

Wt of sample = 100gm Geranium (<i>Pelargonium graveolens</i>)			
S.No.	Sample No.	Time(min)	Oil Obtained(ml)
1	S21	25	0.057
2	S22	30	0.074
3	S23	40	0.123
4	S24	50	0.145
5	S25	60	0.145

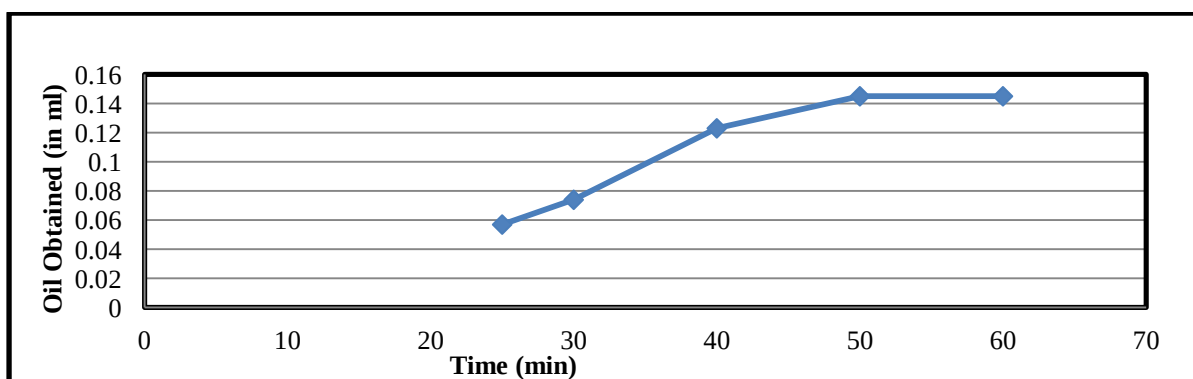


Table -6 Effect of Time on oil obtained from Leaves (Mixed/ Random).
Wt of sample = 100gm

Geranium (<i>Pelargonium graveolens</i>)			
S.No.	Sample No.	Time(min)	Oil Obtained(ml)
1	S26	25	0.057
2	S27	30	0.074
3	S28	40	0.123
4	S29	50	0.145
5	S30	60	0.145

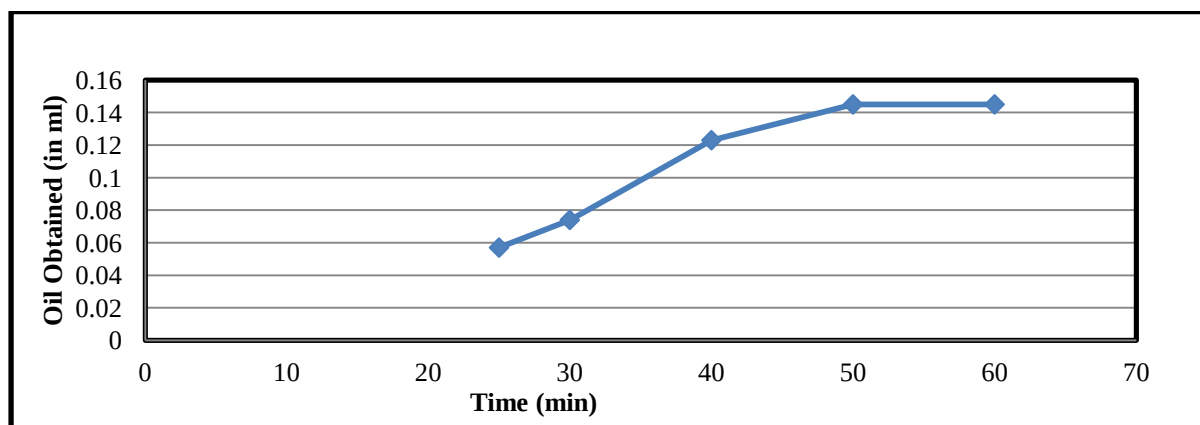
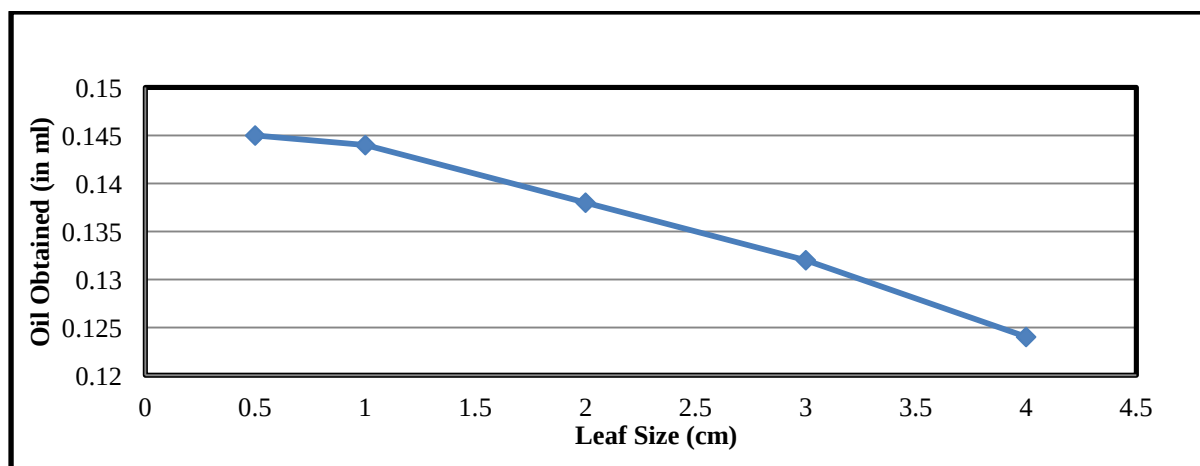


Table -7 Effects of leaf sizes on oil obtained (*Pelargonium Graveolens*).
Wt of sample = 100gm.
Time = 60min.

Geranium (<i>Pelargonium graveolens</i>)			
S.No.	Sample No.	Size(cm.)	Oil Obtained(ml.)
1	S31	4.0(Full)	0.123
2	S32	3.0	0.132
3	S33	2.0	0.138
4	S34	1.0	0.144
5	S35	0.5	0.145
6	S36	Mixed	0.145



III. DISCUSSION

From the results shown above we can see as the leaf size reduces from 4.5 cm (full leaf) to 0.5 cm, the yield of geranium essential oil varied from 0.123 ml to 0.145 ml at Constant Power of 200 Watt.

REFERENCES:

- [1]. M.E. Lucchesi, Farid Chemat, J. Smadja (2004). “ An Oroginal Solvent Free Microwave Extraction of Essential Oils From Spices.” *Flavour anf Fragrance Journal*, Volume 19, Issue 2, Pages : 134- 138.
- [2]. A. Koedam, *Capillary Gas Chromatography in Essential Oil Analysis*, P. Sandra, C. Bicchi (eds.) , Huething, New York, 1987.
- [3]. Vivekananda Mandal, Yogesh Mohan, S. Hemalatha; *Pharmacognosy Reviews*, Vol 1, Issue 1, Jan-May (2007).
- [4]. Jianming Dai; M.Sc thesis, 1999 Department of Agricultural & Biosystems Engineering Macdonald Campus of McGill University Montreal, QC, Canada.
- [5]. Marie E. Lucchesi, Farid Chemat, Jacqueline Smadja; *Journal of Chromatography A*, 1043 (2004) 323–327.