

Formulation Of Plant Based Cooling Agent From Peppermint Oil

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Abstract: Cooling agent helps to give cooling and fresh sensation and specific sensory toward human's skin. It is related with menthol act as a cooling sensation. Menthol are derived from peppermint because it has a high menthol content. In this project, the combination of organic plants that is cucumber, aloevera and peppermint are used in the formulation of cooling agent. The extraction using steam distillation process toward 5000 g fresh peppermint leaves to produce peppermint oil. Aloe vera are extract directly from their inner gel and cucumber are extract using boiling process. By using Gas Chromatography, peppermint oil composition is determined. The formulation solution of cooling agent then are tested to analyse the cooling and refreshing effect to fifteen respondents. Sample A consist of peppermint oil, cucumber extract and aloevera gel, sample B consist of aloevera and cucumber and sample C consists of peppermint only. From the result of Gas Chromatography indicated peak of menthol in peppermint oil at retention time 11.1 minutes. It shows that the present of menthol compound. The feedback form resulted the time taken for cold effect last on skin and time taken needed for sample starts to cold on skin for sample A are 31.93 minutes and 4.73 minutes, 3.8 minutes and 13.6 minutes for sample B and 28.6 minutes and 8.4 minutes for sample C respectively. As the conclusion, the combination of peppermint oil, cucumber extract and aloevera from sample A gives the best result as a cooling agent.

Keywords : Cooling Agent, Peppermint Oil, Gas Chromatography, Steam Distillation, Aloe vera, Cucumber

1.0 Introduction

Basically, menthol is a vital material that always found inside the hair product such as hair mist, shampoo and many more. Menthol is a material that are used as a cooling agent. Menthol normally use in many products to attract the consumer especially in cosmetic products because it helps consumer feel comfortable when used it because it have cooling effect. Menthol is an organic compound that obtained from the oils of corn mint, peppermint and other mint [1]. Menthol is widely used in products ranging

from common cold medication like toothpaste or cosmetics [2]. Menthol are usually extracted from peppermint as a major active constituent and it have been used for centuries as traditional medicines [3].

Cooling agent help to extend the cool fresh feeling and gives certain sensory experiences toward human's skin. Cooling agent are usually related with menthol as menthol are the only compound that can exerts as cooling sensation when applied to skin and mucosal surfaces [4]. The intensity of heat present is not caused by evaporation of menthol or due to vasodilation but is due to a specific action of menthol on sensory nerve endings [5]. The sensation of cold or warmth is determined by the activity of thermoreceptors in the human's skin and mucosal surfaces. These cold and warm receptors are considered to be free nerve endings without any specialized end organ [5].

In this project, extraction of peppermint oil and formulation solution that could act as cooling agent will be produced. Organic plant such as aloe vera, cucumber and peppermint oil are use to test the effectiveness of cold sensation towards humans skin. The best solution of cooling agent shows the time taken cold effect last on skin is the longest and the time taken needed for sample starts to cold on skin is shortest.

2.0 Materials and Methods

Main substances of producing formulation of solution from organic plants are, aloe vera, peppermint, and peppermint. These three plants are very significance with cooling agent. The other materials needed are analytical balance, beaker, steam distillation, Gas Chromatography and hot plate.

2.1 Extraction of Menthol from Peppermint Leaves

From the steam distillation process, 100 g of the plant raw material was being placed in the chamber of the essential oil distillation still, and steam passed through the plant matter. The steam will passed through the plant matter it picked up the oils and moved into another chamber where it is cooled and condensed. Then, essential oil was separated from the water and stored before further steps for used .

A 5000 g of peppermint leaves to produce 50 mL fresh peppermint oil The used of ethanol in the purification step to remove water is irrelevant as the boiling point of water is 100 °C where as the boiling point of water in 78.37 °C. The peppermint oil have high boiling at 125 °C. Heating method works because the peppermint oil has a much higher boiling point than the ethanol. When the solution is heated, ethanol evaporates from the solution. The gas moves away and peppermint oil are collected. To separate oil and water in the solution of peppermint by using Ethanol from heating method. The purpose of this process is to get the pure oil from peppermint solution.

2.2 Chromatographic Analysis of Menthol from Peppermint Oil

A 0.009 g peppermint oil was measured using electronic balance mix with 100 mL of Ethanol as initial mass (M_1) to produce 3 types of sample with different concentration and amount of solvent using 20 mg of oil in 1L ethanol. Blank also used as sample, consist only ethanol. Samples are put inside GC vials. Different concentration of sample are used to compare the consistency result from Chromatograms at the larger peak area with the same retention times for each sample.

Compounds were separated on a fused-silica capillary column (30 m, 0.25 mm i.d.) with a film thickness of 0.25 μm (Phenomenex ZB-5 MS). The oven temperature program initiated at 50°C, held for 3 min, then increased at 8–250°C min⁻¹, and held for 2 min. The spectrometer was operated in electron impact mode, the scan range was 40–500 amu, the ionization energy was 70 eV, and the scan rate was 0.20 s per scan. The injector, interface, and ion source were kept at 250, 250, and 220°C,

respectively. Split injection (1 μL) was conducted with a split ratio of 1:20 and 1.0 mL min⁻¹ helium was the carrier gas. Retention indices were determined by comparison [11].

2.3 Extraction of Aloe vera Gel

Inner most of aloe vera leaves are collected using spatula. Filter the aloe vera gel to collect the pure water from aloe vera gel. A 100 g aloe vera leaves produced 500 mL pure water aloe vera.

2.4 Extraction Cucumber

Cucumber are extract using boiling method, amount of cucumber are boil inside beaker until the cucumber turns brownish and the solution are filtered and cooled.

2.5 Formulation of Plant Based Cooling Agent

Table 1 below shows the amount of organic plant for a formulation of the cooling agent.

Table 1: Formulation of organic plant of cooling agent

A	B	C
Aloe vera 15mL	Aloe vera 17.5mL	Peppermint 15mL
Cucumber 5mL	Cucumber 17.5mL	-
Peppermint 15mL	-	-

2.6 Cooling Sensation Sensory Evaluation

Fifteen respondents from five males and ten females of the age of nineteen years old fill the question form. The question form consist of the cold sensation of solutions A, B and C. Respondents need to test one drop of sample on their skin. The duration of cold effect of each sample and the most fastest feeling cold after application it on respondent's skin are recorded.

3.0 Results and Discussion

The qualitative analysis report from Gas Chromatography are used to indicate the present of menthol inside peppermint oil solution. Based on previous research, the chemical composition of the essential oil from peppermint was analyzed by using GC/FID and GC-MS. The main constituents were menthol (40.7%) and menthone (23.4%) [8]. The higher percentage of main constituents (menthol) will produce greater peak area in Chromatograms result.

Based on data base in software of MassHunter GC/MS compound that are related with chemical structure of Menthol known as Cyclohexanol, 5-methyl-2-(1-methylethyl) as shown in **Figure 1**. Both compound have same chemical structure.

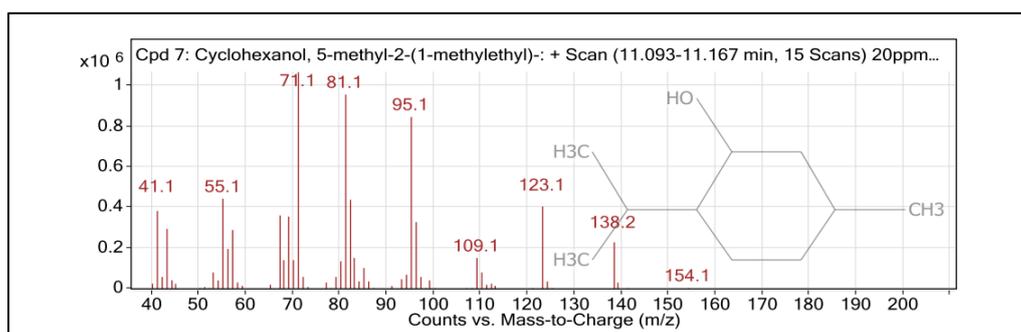


Figure 1: Present of Cyclohexanol, 5-methyl-2-(1-methylethyl) (Menthol) in peppermint

The survey form filled by fifteen respondents to get the feedback about the effectiveness of formulation solution of cooling agent. Average time taken cold effect last on skin and time taken needed for sample starts to cold on skin shows in **Table 2**. The combination of peppermint oil, cucumber extract and aloe vera gel from sample A gives the best result as a cooling agent because time taken cold effect last on skin is longest and time taken needed for sample starts to cold on skin is shortest among the other samples.

Table 2: Average Average time taken cold effect last on skin and time taken needed for sample starts to cold on skin

	A	B	C
Time taken cold effect last on skin.	31.93 minutes	3.8 minutes	28.6 minutes
Time taken needed for sample starts to cold on skin	4.73 minutes	13.6 minutes	8.4 minutes

4.0 Conclusion

Process of extraction peppermint oil from fresh peppermint leaves was done using steam distillation method and the qualitative analysis composition of menthol inside peppermint oil was done by gas chromatography. Different concentration of sample are used and result shows consistency of the larger peak area at the same retention time 11.1 minutes for each sample. Besides, the chemical structure of menthol had shown in the result from data base MassHunter GC/MS. This chemical structure is same as menthol chemical structure. Lastly, from the peppermint oil that had been extract, formulation of cooling agent from peppermint oil, cucumber and aloe vera had be done. Samples are tested toward fifteen respondents and formulation of cooling agent from sample A consist of peppermint, aloe vera and cucumber could gives last cold effect on skin and the most fastest gives cold effect on skin. The feedback form resulted the time taken for cold effect last on skin and time taken needed for sample starts to cold on skin for sample A are 31.93 minutes and 4.73 minutes respectively. This can be the best solution of cooling agent.

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References

- [1] B. Siddeeg, A. Z. Salih, M. E. Rabab, E. Mukhtar and O. Ali, 'Extraction and Characterization of Peppermint (*Mentha piperita*) Essential Oil and its Assessment as Antioxidant and Antibacterial', *Gezira Journal of Engineering and Applied Sciences* vol 13 (1), 2018.
- [2] R. Eccles, 'Menthol and Related Cooling Compounds Common Cold and Nasal Research', Department of Physiology, University of Wales College of Cardiff, Cardiff CF1 1SS, UK *J. Pharm. Pharmacol.* 1994,46: 618-630, 1994.

- [3] J. A Farco and O. Grundmann, 'Menthol—pharmacology of an important naturally medicinal cool', Department of Medicinal Chemistry, College of Pharmacy, University of Florida, Gainesville, FL 32610, USA, 2013.
- [4] H. R. Watson, R. Hems, D. G. Rowsell and D. J. Spring, 'New compounds with the menthol cooling effect', J. SOC. Cosmet. Chem. 29: 185-200, 1978.
- [5] H. Hensel and K. Schafer, 'Effects of calcium on warm and cold receptors', Pflugers Arch, 352: 87-90, 1974.
- [6] A. Y. Leung, ' Encyclopedia of Common Natural Ingredients used in food, drugs and cosmetics', New York: John Wiley & Sons. p. 231, 1980
- [7] Thomson Healthcare, ' PDR for Herbal Medicines (4th ed.)', p. 640. ISBN 978-1-56363-678-3, 2007.
- [8] E. Schmidt, S. Bail, G. Buchbauer, L. Stoilova, T. Atanasova, A. Stoyanova, A. Krastanov and L. Jirovetz, "Chemical composition, olfactory evaluation and antioxidant effects of essential oil from *Mentha x piperita*", Natural Product Communications, 4 (8): 1107–1112, 2019.
- [9] F. Hanbali, M. Akssira, A. Ezoubeiri, F. Mellouki, 'Chemical composition and antibacterial activity of essential oil of *Pulicaria odora* L', Journal of Ethnopharmacology, 99: 399-401, 2015.
- [10] K.W. Skalicka and M. Walasek, 'Preparative separation of menthol and pulegone from peppermint oil (*Mentha piperita* L.) by high-performance counter-current chromatography', Phytochem. Lett., 10, 94 – 98, 2014.