



## GCMS analysis and identifications of chemical constituents of *Syzygium aromaticum*, *Brassica compestris* and cow ghee

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### ABSTRACT

Mustard oil contains about 64% monounsaturated fatty acid, 26% polyunsaturated fats acid and about 15% saturated fatty acids, low acid value impart its commercial and domestic importance. It is active for free radical scavenging and microbial activity, making immune system strong and to stay away from coronary heart diseases. Cloves are the aromatic dried flower buds of *Syzygium aromaticum* having higher percentage of eugenol followed by caryophyllene as least concentration component. Animal oil() containing 65% saturated fatty acid, 32% monounsaturated fatty acid and 3% polyunsaturated fatty acids, mostly used in ayurveda in various forms for numerous medical applications including, treatment of allergy, skin and respiratory diseases.

**Key words:** clove, mustard and animal oil, GCMS, acid value and saponification value.

### INTRODUCTION

Seeds of *Brassica compestris* is a rich source of mustard oil, has about 64% monounsaturated fatty acid, 26% polyunsaturated fats acid and about 15% saturated fatty acids. The characteristic pungent flavour of mustard oil is due to the compound ally isothiocyanate[1-2]. It also shows inhibitory effects on growth of food poisoning causing bacteria and fungi[3-5]. Special attention was given to fatty acids, glucosinolates and essential oils[6].

Cloves are the aromatic dried flower buds of a tree *Syzygium aromaticum*, native to the Maluku islands in Indonesia and used as a spice in cuisines all over the world. Clove oil has germicidal properties and is frequently used in the dental care due to its germicidal properties. The smell of clove oil helps in removing bad breath thus clove oil is used in various dental products and medications including mouth washes and tooth pastes. It also has antiseptic properties and useful in wounds, cuts and athlete foot fungal infections[7]. Clove oil shown effectiveness in stomach related problem such as hiccups, indigestion, motion sickness and flatulence. Hence, clove is one of the important spices added in Indian dishes[8-14]. The antimicrobial activity of the essential oils from clove and rosemary (*Rosmarinus officinalis* L.) has been tested alone and in combination[15]. The antioxidant activity of commercial clove leaf essential oil and the main constituent eugenol was tested[16]. It helps in reducing dental pain and mouth ulcers.

Ayurveda has traditionally considered ghee is the best or healthiest source of edible fat having many beneficial properties. According to ayurveda ghee helps in longevity and protects the body from different disease[17]. Ghee acts as an outstanding vehicle for transporting the herbs to deeper tissue layer of the body[18] and an important ingredient of everyday food. It improves the digestive system, absorption and assimilation. Ghee is considered sacred and used in religious rituals as well as in the diet in India[19]. According to ayurveda it sharpens the memory and strengthens the brain and the nervous system. It helps in lubricating the nervous tissues therefore makes the body more flexible[18]. Free radicals and reactive oxygen species have been linked to many chronic diseases as well

as the aging process[20–22]. Lipid peroxidation, a free radical-mediated reaction, has been implicated in various disorders such as post-ischemic conditions[23], inflammation[24], head injury[25], stroke[26], carcinogenesis[27], cardiovascular disease[28], and aging[29]. Ghee contains 65% saturated fatty acid, 32% monounsaturated fatty acid and 3% polyunsaturated fatty acids So overdose of ghee will cause or increased the risk of cardiovascular diseases as it contains large number of fatty acids which leads to increased synthesis cholesterol.

### EXPERIMENTAL SECTION

The clove buds were purchased from the authentic seed shop, the dried buds were collected in polythene bags from the area near to Jalandhar District and brought to the laboratory, identified by Dr. Gurdev Singh in Botany Deptt. LPU. Seeds were separated from the fruit pod and stored in airtight amber colored glass bottles and kept in a refrigerator prior to analysis and animal oil (ghee) is prepared from the cream of cow's milk.

#### Extraction of essential oil:

Clove oil is extracted from the buds of *syzygium aromaticum* by hydro-distillation for 3 hour using a Clevenger-apparatus. And a known weight of *Brassica campestris* seeds were grinded into powder with high speed blender and dried in an air circulating oven at 50°C for 1 h. Oil was extracted from the seeds powder with petroleum ether (boiling point 60-80°C) using a Soxhlet extractor. The solvent was distilled off at 80°C and oil was dried over anhydrous sodium sulphate[30].

#### Gas chromatography–mass spectrometry analysis:

The GC–MS analyses were performed on a Thermo Scientific TSQ 8000 Gas Chromatograph - Mass Spectrometer. This mass spectrometer comes paired with the TRACE 1300 GC along with auto-sampler for automated sample handling.

The analytes were separated in RT: 3.00 30.10 SM: 15G. The split/ splitless injector temperature was set at 400 °C and volume was 1.0 µl.

#### Acid Value:

Take 0.1 g of *Syzygium aromaticum*, *Brassica campestris* and animal oil in conical flask, add 50-100 ml of 95% ethyl alcohol to it and 2-3 drops of phenolphthalein indicator. Then boil the mixture for 5-10 minutes on water bath and titrate it with 0.1N KOH solution. Calculate the acid value with the help of given formula.

$$\text{Acid value} = 56.1VN/W$$

V = Volume of KOH used, N = Normality of KOH, W = Weight in gram of sample and titrate it with 0.1N KOH solution.

#### Saponification Value

Take 0.1g of mustard oil in a conical flask and add 25 ml of 0.5M alcoholic KOH to it. Boil the mixture on water bath until the clear solution appears. Cool the mixture and add 2-3 drops of phenolphthalein indicator. Then titrate it with 0.5N HCL solution. Conducts the blank titration along with the sample add all the reagents except the sample.

$$\text{Saponification value} = 56.1(B-S) N/W$$

B= Volume of HCL require for blank, S =Volume of HCL require for sample, N=normality of HCL, W = Weight in gm of the oil/fat taken.

### RESULTS AND DISCUSSION

#### Chemical composition of the essential oil:

The chemical components of *Syzygium aromaticum*, *Brassica campestris* and animal oil(Ghee) that were isolated are listed in **Table 1, 2 and 3**.

**Table 4** defining acid value of mustard oil is 2.24 and animal oil is 5.61, which falls within the recommended codex of 0.6 and 10 for virgin and non–virgin edible fats and oil, respectively[31].

Table-1 Chemical constituents of *Syzygium aromaticum*

S. No	Chemical components	%
1	Eugenol	77.81
2	$\beta$ -caryophyllene	8.44
3	$\alpha$ -humulene	1.04
4	Eugenylacetate	21.3
5	Caryophyllene oxide	0.37
6	$\alpha$ -copaene	0.27
7	Methyl eugenol	0.8
8	Iso eugenol	0.24
9	Chavicol	0.24
10	Methyl Salicylate	0.24

Table-2 Chemical constituents of Mustard Oil

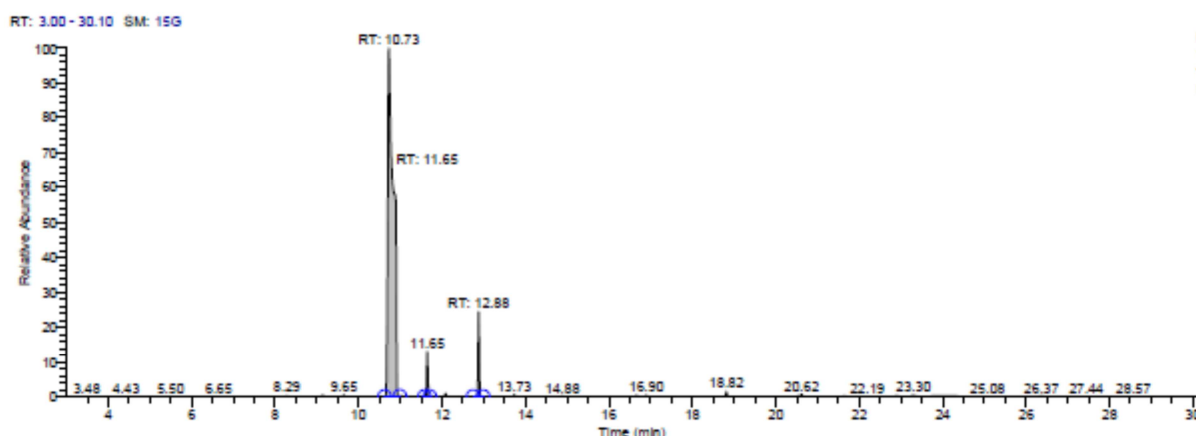
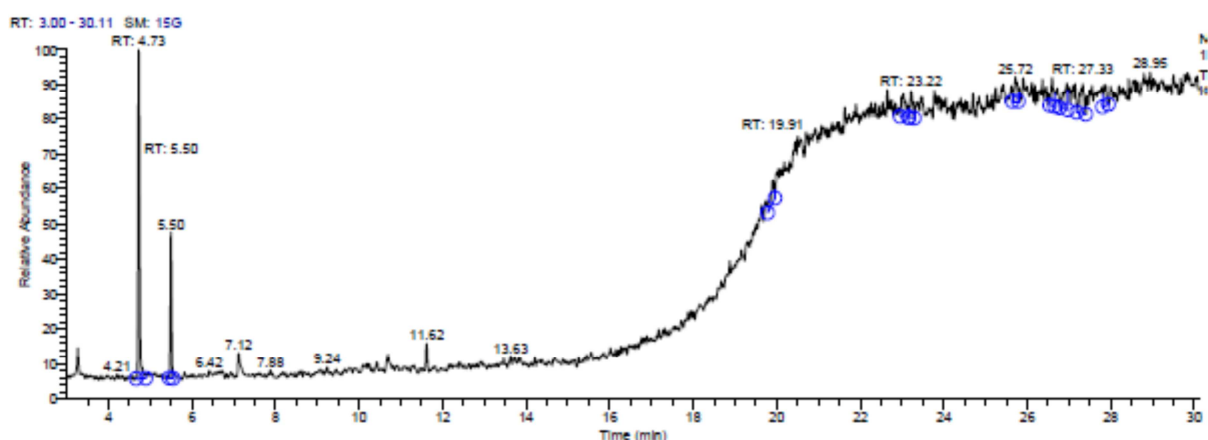
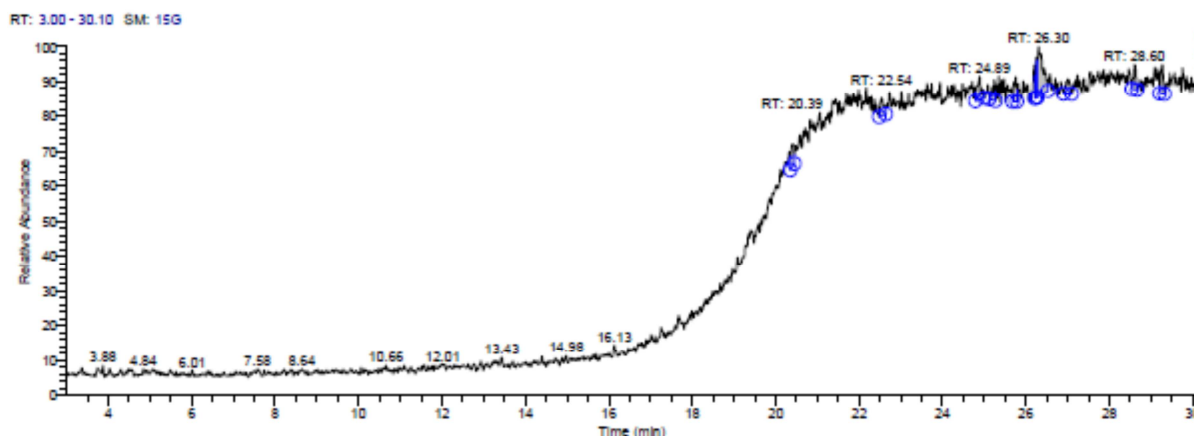
S. No	Chemical components	%
A	<b>Saturated Fatty Acids</b>	
1	Myristic Acid (C14:0)	ND
2	Palmitic Acid (C16:0)	2.58
3	Stearic Acid (C18:0)	1.13
4	Arachidic Acid (C20:0)	1.04
5	Behenic Acid (C22:0)	2.23
6	Lignoceric Acid (C24:0)	8.45
B	<b>Monosaturated Fatty Acids</b>	
1	Palmitoleic Acid (C16:1)	0.32
2	Oleic Acid (C18:1)	18.08
3	Gadoleic Acid (C20:1)	5.89
4	Erucic Acid (C22:1)	35.89
C	<b>Polysaturated Fatty Acids</b>	
1	Linoleic Acid (C18:2)	12.37
2	Linolenic Acid (C18:3)	12
3	Arachidonic Acid (C20:4)	0.84
4	Eicosapentaenoic Acid (C20:5)	0.19
5	Docosapentaenoic Acid (C22:5)	0.94

Table-3 Chemical constituents of Cow's Ghee

S. No	Chemical components	%
A	<b>Saturated Fatty Acids</b>	
1	Butyric Acid (C4:0)	0.70
2	Caproic Acid (C6:0)	2.20
3	Caprylic Acid (C8:0)	1.20
4	Lauric Acid (C12:0)	3.10
5	Myristic Acid (C14:0)	11.20
6	Palmitic Acid (C16:0)	30.60
7	Stearic Acid (C18:0)	13.80
B	<b>Monosaturated Fatty Acids</b>	
1	Palmitoleic Acid (C16:1)	1.50
2	Oleic Acid (C18:1)	28.70
3	Gadoleic Acid (C20:1)	1.20
4	Erucic Acid (C22:1)	0.20
C	<b>Polysaturated Fatty Acids</b>	3

Table-4 Acid and Saponification Value of *Syzygium aromaticum*, *Brassicacompestris* and Animal oil

S. No	Name of oil	Acid value	Saponification value
1.	Clove oil	2.80	42.07
2.	Mustard oil	2.24	182.54
3.	Animal oil	5.61	112.2

GC-MS spectra of *Syzygium aromaticum*, *Brassica campestris* and Animal oil(A). GC-MS spectra of *Syzygium aromaticum* bud oil(B). GC-MS spectra of *Brassica campestris* seed oil

(C). GC-MS spectra of Animal oil

## CONCLUSION

In conclusion, the chemical analysis of essential oil extracted from *Syzygium aromaticum*, *Brassica campestris* and animal oil reveals that clove oil contains the highest % of eugenol which is responsible for the characteristic fragrance of clove oil. In mustard oil highest % of saturated fatty acid Lignoceric Acid (C24:0) is found 8.45%, monosaturated fatty acid Erucic Acid (C22:1) is 35.89% and polysaturated fatty acid Linoleic Acid (C18:2) is 12.37% in mustard oil whereas saturated fatty acid Palmitic Acid (C16:0) is found 30.60%, monosaturated fatty acid Oleic Acid (C18:1) is 28.70% and polysaturated fatty acid is observed only 3% in animal oil. The results of our study showed that moderate acid value of mustard and animal oil making it good for food whereas effective low saponification value of clove oil is supporting its versatile medicinal property.

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