

# FORMULATION AND EVALUATION ON HERBAL SYRUP OF GINGER WITH HONEY (TLC & HPLC)

<sup>1</sup>Dr.J.Bhavani, K.Kirubakaran, H.Subalakshmi, K.Ganesan, R.M.Karthick Balaji

<sup>1</sup>Associated Professor Pharmaceutics, <sup>2,3,4,5</sup>Students  
Department of Pharmaceutics, P.S.V College of Pharmaceutical Science and Research.

## ABSTRACT

In the current research it was tried to isolate some novel compound from *Zingiber officinalis* root but on account of lack of progressed methods and natural drug as supply it was not achieved and a few flavonoids and phenolic compound was removed and formulated into syrup. The syrup had been characterized through the use of sure parameters. After the completion of formulation of herbal syrup physical parameters are analyzed and reports are tabulated further the syrup is analyzed with the help of TLC and HPLC methods. The plant is belonging to family *Zingiberaceae*. Pharmacognostic also phytochemical as well as pharmacological standards about root were examined. Honey is a species of *apis dorsata* belongs to the family of *apidae*, sweet viscous food substance made by honey bees and some other bees.

**KEYWORDS:** Honey, Ginger (*Zingiber.officinale*),Herbal material preparation, Preparation of ginger essential oil extract, decoction, TLC analysis & HPLC analysis

## INTRODUCTION

### HERBAL SYRUP

Herbal syrup is prepared by combining a concentrated decoction with either honey or sugar, and sometimes alcohol. The base of such syrup is a strong herbal decoction. Mixing a decoction with honey or sugar helps to thicken and preserve the decoction. This increases the shelf life of the decoction and often creates a soothing application that benefits situations such as sore throat, cough, dry irritated tissues, and digestive issues. The added sweetener can also help to increase the palatability of some herbs. Many folks, including children, and syrups to be delicious.

Herbal syrups make a yummy addition to beverages and food! Combine a spoonful of syrup with carbonated water to create a tasty and healthful herbal soda. You can also make a quick cup of tea by adding a spoonful of syrup to hot water. Enjoy your syrup by drizzling it on foods like yogurt, oatmeal, biscuits and ice creams or just enjoy by the spoonful.

The basic proportions you want to use are 2 parts herbal decoction to 1 part honey or sugar. This is called a 2:1 ratio. This means that if you start with your herbs added to 4 cups of water and simmer down the liquid to 2 cups of decoction, then you will want to add 1 cup of honey or sugar to create and adequately preserve your syrup.

Some herbalists like to use a 1:1 ratio of decoction to honey/sugar while others and a 1:1 ratio to result in syrup that is too sweet. The increased amount of honey/sugar relative to decoction in a 1:1 ratio will be better preserved and hence last longer.

Experiment and see which ratio works best, you can further enhance and preserve your herbal syrup with the optional addition of alcohol. Herbal tinctures selected for their beneficial properties can be included in syrup formulas as well. Brandy is another popular addition to syrups. The alcohol helps to further preserve the syrup and can also aid in calming the recipient. The addition of alcohol is completely optional and may not be the best choice when making syrups for children.

Adverse events reported to the regulatory authorities in relation to the use of herbal products are often attributable to poor quality of source material and manufacturing and processing factors, among others. Correct identification of source plant species and the selection of appropriate parts for use in herbal medicines are basic and essential steps for ensuring safety, quality and efficacy of herbal medicines. Hence, the safety and quality of herbal medicines at every stage of the production process have become a major concern to health authorities, health care providers, the herbal industries and the public. The safety and efficacy of herbal medicines largely depend on their quality. Unlike pharmaceutical products formulated from single-molecule chemicals produced synthetically or by isolation from natural source materials employing reproducible methods, herbal medicines consist of simple processed herbs or finished herbal products prepared from source materials containing a multiplicity of chemical constituents, the quality and quantity of which can vary from batch to batch due to intrinsic and extrinsic factors.

## PROCESSING OF HERBAL MATERIALS INTO HERBAL PREPARATIONS

The herbal materials intended for direct therapeutic use should be produced under GACP and GMP conditions. In many other cases, herbal materials will undergo further “processing” treatment procedures before being used to manufacture the finished herbal products. The active ingredients are usually processed together with other components of the herbal materials. Sometimes these active ingredients are further concentrated by the removal of inactive and/or undesirable substances. The herbal preparations

thus obtained include extracts, decoctions, tinctures, essential oils and others. The processes involved include extraction, distillation, fractionation, concentration, fermentation, or other chemical or biological methods. General guidelines for good practices in the production of herbal preparations and/or finished herbal dosage forms as set out in the GMP requirements prescribed by WHO guidelines (4–6, 8) should be followed. Technical information on the key processes is supplemented in the present GHPP guidelines.

### AIM OF THE STUDY

The aim of the presented work is “Formulation and evaluation of herbal syrup with ginger and honey.”

### OBJECTIVE OF THE STUDY

- To formulate the potential herbal syrup of aqueous extract of ginger individual herb into syrup using honey as a excipient.
- Characterization of developed herbal syrup.
- To demonstrate the safety and efficacy of formulation prepared for different age group of people.
- To evaluate and improve upon the pre-formulation parameters of the most effective constituent.

### DRUG PROFILE

#### GINGER



Ginger (*Zingiber.officinale*) is a flowering plant whose rhizome, ginger root or ginger, is widely used as a spice and a folk medicine. It is an herbaceous perennial which grows annual pseudo-stems (false stems made of the rolled bases of leaves) about one meter tall bearing narrow leaf blades. The inflorescences bear flowers having pale yellow petals with purple edges, and arise directly from the rhizome on separate shoots

Rhizome of *Zingiber.officinalis* is widely used in both of medicinal and culinary purpose. The plant is mostly investigated for the antimicrobial, anticancer, antioxidant, antidiabetic, nephroprotective, hepato-protective, larvicidal, analgesic, anti-inflammatory, and immunomodulatory activities.

In Ayurveda literature ginger is mostly recommended for enhancement of appetite(Deepani), alleviate constipation (Bhedini), appetizer(Ruchya), clear the tongue and throat(jihwakantavishodhanam), balancing circulation (Anulomana), cardio-protective (Hrudya), enhance digestion (Pachana), dissolve calculi (Ashmadoshahara), nutritious(Vrishya), improve voice (Swarya), alleviate cough (Kasahara),alleviate asthma (Swasahara) analgesic (Sulahara), absorption of water through alimentary channel (Grahi), alleviate coldness (SheetaPrashamana), nerve stimulation (NadiUttejaka),appetizing (Rochana), alleviate thirst (Truptighna), restoration of proper circulation (Vatanulomana), alleviate pains (ShoolaPrashamma), alleviate hemorrhoids (Arshoghna), anti-pyretic(Jwaraghna), and alleviate stagnate mucous (Sleshma Hara).

The current study focuses on formulation and evaluation of *Zingiber.officinalis* and honey.

#### TAXONOMICAL CLASSIFICATION

- Kingdom : Plantae.
- Division : Magnoliophyta.
- Class : Liliopsida.
- Order : Zingiberales.
- Family : Zingiberaceae.
- Genus : Zingiber.
- Species : *Zingiber officinale*.

#### MORPHOLOGY:

Colour : The flesh may be yellow, white and pale red depending on variety.

Odour : Citrus or spicy, but woody and floral notes determine aroma of ginger

Taste : Sweet and slightly peppery, with pungent and spicy aroma.

Extra features: Ginger is a perennial creeping plant, with thick tuberous rhizome producing an erect stem 30-100cm tall. The lance-shaped leaves are bright green 15-20 cm long, with a prominent longitudinal rib, enclosing conical cluster of small yellow-green flowers marked with purple speckles.

## HONEY

Honey is a sweet, viscous food substance made by honey bees and some other bees. Bees produce honey from the sugary secretions of plants (floral nectar) or from secretions of other insects (such as honeydew), by regurgitation, enzymatic activity and water evaporation. Honey bees store honey in wax structures called honeycombs, whereas stingless bees store honey in pots made of wax and resin. The variety of honey produced by honey bees (the genus *Apis*) is the best-known, due to its worldwide commercial production and human consumption. Honey is collected from wild bee colonies, or from hives of domesticated bees, a practice known as beekeeping or apiculture (meliponiculture in the case of stingless bees).

Honey gets its sweetness from the monosaccharides fructose and glucose, and has about the same relative sweetness as sucrose (table sugar). Fifteen millilitres (1 US tablespoon) of honey provides around 190 kilojoules (46 kilocalories) of food energy. It has attractive chemical properties for baking and a distinctive flavour when used as a sweetener. Most microorganisms do not grow in honey, so sealed honey does not spoil, even after thousands of years.

### TAXONOMICAL CLASSIFICATION OF HONEY

- Kingdom : animalia
- Phylum : arthropoda
- Class : insecta
- Order : hymenoptera
- Family : apidae
- Genus : apis
- Species : *Apis dorsata*

### MORPHOLOGY:

Colour : pale yellow to reddish brown viscous fluid.

Odour : pleasant and characteristic.

Taste : sweet, slightly acid.

Extra features: however, the taste and odour of honey solely depends upon the availability of surrounding flower from which nectar is collected on prolonged storage it usually turns opaque and granular due to crystallization of dextrose and is termed as granulated honey.

### CHEMICAL CONSTITUENTS OF GINGER

Most of the secondary metabolites of herbs are commercially important and find use in a number of pharmaceutical compounds. Flavonoids and phenolics are the most important groups of secondary metabolites and bioactive compounds in plants.

*Z. officinale* rhizome contains 1–4% essential oil and oleoresin, but the chief constituent is terpenes (53.57%). Several compounds have been identified in the essential oil, it's estimated that there are 28 compounds. The most content were eudesmol (8.19%),  $\gamma$ -terpinene (7.88%),  $\alpha$ -curcumene (7.28%), zingiberene (6.06%), alloaromadendrene (6.56%),  $\alpha$ -pinene (5.76%),  $\delta$ -cadinene (3.84%), elemol (3.39%), farnesal (3.45%), E- $\beta$ -farnesene (3.57%), nerilacetate (2.8%) and  $\beta$ -myrcene (2.94%).

Elements responsible for ginger's spicy flavour have been identified as the gingerols. The composition of the volatile fraction consists mainly of sesquiterpene derivatives, responsible for the aroma. Such compounds include (-)-zingiberene, (+)-curcumene, (-)- $\beta$ -sesquiphellandrene and  $\beta$ -bisabolene. The monoterpene derivatives are also a part of this essential oil.

The ginger oils are the primary active constituents, 5-hydroxy-1-(4-hydroxy-3-methoxyphenyl) decan-3-one is the most abundant in this constituent. Some other active compounds are mono and sesquiterpenes; camphene, betaphellandrene, curcumene, cineole, geranylacetate, terpineol terpenes, borneol, geraniol, limonene, linalool, alpha-zingiberene (30-70%), sesquiphellandrene (15-20%), betabisabolene (10-15%) and alpha-farnesene. Its bulb is widely used because it contains gingerol, ethanol as active chemical compound. It also contains amadaldehyde, paradols, gingerdiols, gingerdiacetates, gingerdiones, 6-gingersulfonic acid, gingerenones.

Chemical analysis of ginger shows that it contains over 400 different compounds. Ginger, ginger rhizome, and its major active components: 6-gingerol, 6-shogaol, and 6-paradol. The aromatic constituents include zingiberene and bisabolene, while the pungent constituents are known as gingerols and shogaols. Ginger extract reduces biofilm formation for various bacteria including some Gram-positive (e.g., *Staphylococcus aureus* and *Bacillus megaterium*) and Gram-negative bacteria (e.g., *Escherichia coli* and

*Pseudomonas aeruginosa*). Ginger extract reduces biofilm formation for various bacteria including some Gram-positive (e.g., *Staphylococcus aureus* and *Bacillus megaterium*) and Gram-negative bacteria (e.g., *Escherichia coli* and *Pseudomonas aeruginosa*). The major constituents in ginger rhizomes are carbohydrates (50–70%), lipids (3–8%), terpenes, and phenolic compounds. Terpene components of ginger include zingiberene,  $\beta$ -bisabolene,  $\alpha$ -farnesene,  $\beta$ -sesquiphellandrene, and  $\alpha$ -curcumene, while phenolic compounds include gingerol, paradols, and shogaol.

### CHEMICAL CONSTITUENTS OF HONEY

The average composition of honey is as follows: Moisture 14–24%, Dextrose 23–36%, Levulose (Fructose) 30–47%, Sucrose 0.4–6%, Dextrin and Gums 0–7% and Ash 0.1–0.8%. Besides, it is found to contain small amounts of essential oil, beeswax, pollen grains, formic acid, acetic acid, succinic acid, maltose, dextrin, colouring pigments, vitamins and an admixture of enzymes, for example, diastase, invertase and inulase. Interestingly, the sugar contents in honey varies widely from one country to another as it is exclusively governed by the source of the nectar (availability of fragment flowers in the region) and also the enzymatic activity solely controlling the conversion into honey.

Honey consists of over 180 components, including sugars, water and non-sugar components. The sugar components in honey are mainly monosaccharides, particularly fructose (to 40%) and glucose (35.0%) in some honey types from Asia, Europe and Turkey, followed by a small quantity of disaccharides and higher sugars (<10%). Fructose and glucose in honey are derived from the chemical conversion of disaccharides in floral nectar by bee-secreted enzymes, where fructose is the highest proportion of any sugars in almost every honey type. Sugars determine the physicochemical properties of honey such as viscosity, crystallization, thermal and rheological behaviour. Sugars in honey provide an energy value of 300 kcal/100 gram honey, which is equivalent to 15% of recommended daily intake of energy. Significantly, fructose contributes the highest proportion in almost every honey types (up to 45.0%) and it is a sweetest sugar among the natural sugars. However, fructose has a lower glycaemic index (GI), compared to sucrose and glucose (GI at 15, 65 and 100, respectively).

The non-sugar components are at minor quantities, but they define a particular type of honey and bioactives, depending on the level of vitamins, minerals, antibiotic-rich inhibine, carotenoids, free amino acids, enzymes, proteins, Maillard reaction products and phenolic compounds present in honey composition. Enzymes including invertase (saccharase), diastase (amylase), glucose oxidase and catalase play a critical role in honey formation. Particularly, invertase converts sucrose into monosaccharides, glucose oxidase catalyses hydrogen peroxide formation and catalase (CAT) supports the oxygen

Flavonoids (apigenin, chrysin, galangin, hesperetin, kaempferol, luteolin, myricetin and quercetin) consist of two aromatic rings A and B, joined by a 3-carbon link, usually in the form of a heterocyclic ring C. Variations in the ring C result in different flavonoid classes, including flavonols, flavones, flavanones, flavanols, isoflavones, flavanonols and anthocyanidins. Substitutions in rings A and B generate diverse compounds in each flavonoid class. Depending on the molecular structures, phenolic compounds exert antioxidant capacity (AOC) in different action modes such as metal chelators, free-radical scavengers or gene modulators of enzymatic and non-enzymatic systems regulating cellular redox balance. The presence of a specific phytochemical or combination thereof in honey may potentially serve as a marker for geographical and botanical origin of honey. For examples, methylglyoxal is in honey, hesperetin in citrus honey, quercetin in sunflower honey and luteolin in lavender honey.



**Fig: 1 Preliminary analysis of ginger and honey.****Fig:2 Preliminary analysis of ginger and honey**

## NUTRITIONAL INFORMATION

Raw ginger is composed of 79% water, 18% carbohydrates, 2% protein, and 1% fat (table). In 100 grams (a standard amount used to compare with other foods), raw ginger supplies 333 kilojoules (80 kilocalories) of food energy and contains moderate amounts of vitamin B<sub>6</sub> (12% of the Daily Value, DV) and the dietary minerals, magnesium (12% DV) and manganese (11% DV), but otherwise is low in nutrient content.

When used as a spice powder in a common serving amount of one US tablespoon (5 grams), ground dried ginger (9% water) provides negligible content of essential nutrients, with the exception of manganese (70% DV). Honey is composed of sugar (about 76%), water (18%) and other ingredients that make up about 6%. Sugar gives the main characteristics of honey (sweetness), water follows (the liquid), and components that are found in small quantities determine the differences between various types of honey. These differences are the colour, aroma and taste.

### Sugars

Sugar in honey is not a single species, but consists of three kinds of sugar. These are the fruit sugar (fructose), which has among the highest (41%), grape sugar (glucose), which has about 34% of ordinary sugar (sucrose) which is between 1 and 2%. The ratio of one type of sugar to other depends of the source, i.e flower pasture, and to some extent on enzyme invertase, which breaks down regular sugar in grape and fruit. This enzyme is located in the flower from which the bees collect nectar, but it is also present in the bees body.

Other ingredients include: minerals, proteins, acids and undetermined matter. The ratio of these components varies from one type of honey to another.

### Proteins

Proteins come in honey from nectar and pollen as an integral parts of plants. Proteins in honey may be in the form of a very complex structure or in the form of simple compounds, i.e amino acids.

### Acids

Acids are also components of honey. Before it was believed that bees by stomach insert bee venom into the cell honeycomb with honey and make it so conserved. Given that one of the main components of bee venom is formic acid, it was thought that the honey has a formic acid. Even some people urged to other not to use honey because of that. Studies have shown that they are completely different acids that are composed in honey, mostly apple and lemon acid.

### Vitamins

Vitamins in honey have very modest quantities, insufficient for the needs of the organism. In between are vitamin C and some B complex vitamins (riboflavin, pantothenic acid, pyridoxine, biotin, nicotinic acid).

### Essential Oil

Essential oils give the characteristic aroma of honey. These substances are very unstable and quickly evaporate by heating honey.

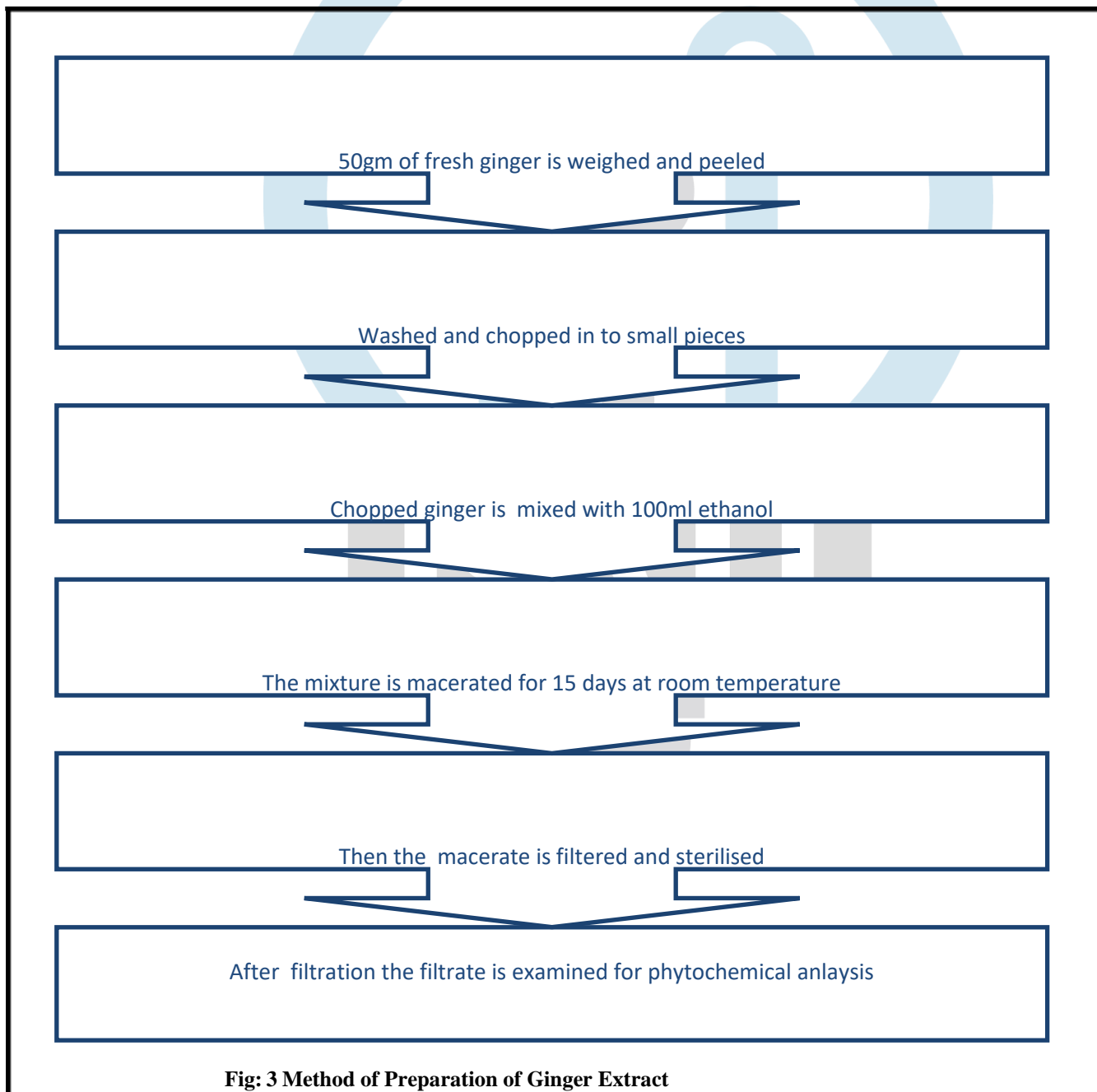
## MATERIALS AND METHODS

### Collection of Ginger Rhizome and Honey

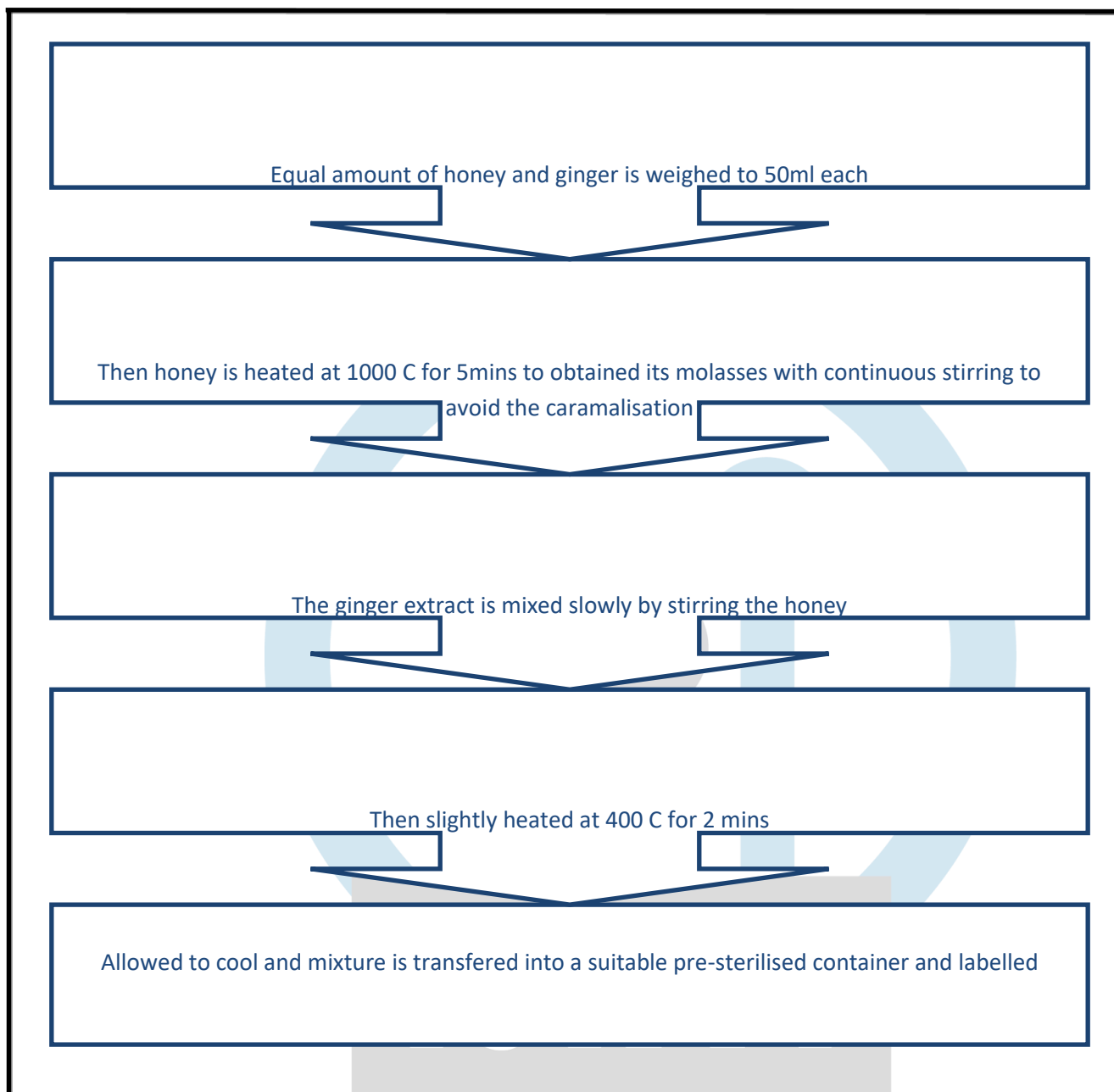
Both fresh and dry ginger was purchased from the local market was selected for this experiment. The ginger rhizome washed with the tap water removing stone, dust and other waste matter. The cleaned fresh ginger rhizome chopped in to 1 mm sized pieces, and dry ginger were powered in electric mixer was used. The chopped and powered ginger rhizomes were kept at 4°C to avoid contamination till further use. The honey of commerce is heated to 80°C and allowed to stand. The impurities which float over the surface are skimmed off and the liquid is diluted with water to produce honey of 1.35 densities. Natural honey has the density of 1.47. Many-a-time, honey is extracted from the comb by centrifugation. It must be free from foreign substances. Honey is liable to fermentation, unless it is suitably processed. Honey is heated to 80°C before it is sent to the market, so as to avoid fermentation. It should be cooled rapidly or else it darkens in colour on keeping. If necessary (and if not prepared by centrifugation method), honey is required to be filtered through wet cloth or funnel.

### Preparation of ginger essential oil extract:

Fresh and dry ginger rhizome was taken, and the essential oil was extracted by using soxhlet extractor or maceration technique with optimal conditions. 50g of fresh and dry ginger was used with 200ml of different solvents such as, acetone, ethyl acetate, ethanol, methanol, chloroform, aqueous. The operating temperature for this experiment is carried out varied from 30 to 40°C. The obtained sample distilled to recover solvent at 10 until all the solvents were collected in the thimble and leaving behind ginger essential oil in the distillation flask. The obtained ginger essential oil was collected and stored in the room temperature for further use. The extraction done for all the six solvents and their yields were noted.



**Fig: 3 Method of Preparation of Ginger Extract**



**Fig: 7 Method of Preparation of Syrup**

#### **THIN LAYER CHROMATOGRAPHY ANALYSIS (TLC):**

- Test solution: to 1.0gm of the sample add 5ml of methanol shake for 15mins and filter.
- Reference solution: dissolve 10 $\mu$ l of citral and 10 mg of resorcinol in 10ml of methanol. Prepare the solution immediately before use.
- TLC plate : silica gel plate
- Mobile phase : hexane , ether , ethanol ,methanol(40:60v/v)
- Application: 20 $\mu$ l as bands.
- Development: in an unsaturated tank, over a path of 15cm dry in air.
- Detection spray: spray with a 10 g/L solution of vanillin/ sulphuric acid /iodine crystal and examine in day light while heating at 100-105 $^{\circ}$ c for 10 mins.

#### **HIGH PERFORMANCE LIQUID CHROMATOGRAPHY**

#### **-ANALYSIS (HPLC):**

##### **Instrumentation:**

Liquid chromatographic separation was performed on a binary HPLC (Waters) separation 2998 series equipped with variable wavelength photodiode array (PDA) detector module, auto sampler 2707 with injection volume of 20 $\mu$ l and 1525 pump. The column used was C<sub>18</sub> Sun fire (150  $\times$  4.6 mm, 5  $\mu$  particle size), and data was recorded using Empower 3 software.

### Preparation of Standard Solution:

Standard stock solutions of 6-gingerol, 8-gingerol, 10- gingerol, and 6- shogaol were prepared by dissolving 10 mg of respective standards in 10 ml of methanol to get a stock solution containing 1000 µg/ml. From the stock solution, different aliquots were prepared to get known concentrations from 25 to 500 µg/mL. Calibration curves were constructed individually for 6, 8, 10 gingerols, and 6- shogaol by plotting the peak areas versus the concentrations of each analyte.

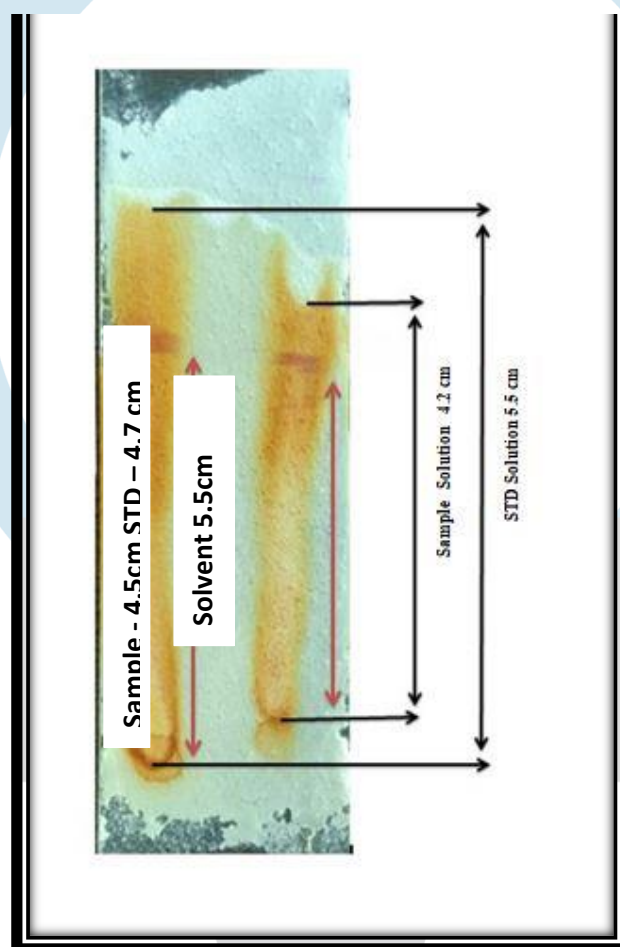
### Preparation of Sample Solution:

125 mg of powdered ginger extract was weighed into a 25 ml volumetric flask and dissolved in methanol by sonication for 1 min. The solution was filtered through 0.2 µm syringe filter and injected directly into HPLC.

## RESULT AND DISCUSSION

### TLC REPORT:

The chromatogram obtained with a reference solution shows in the lower half an intense reddish brown zone (iodine) and in the upper half brownish zones citral; the chromatogram obtained with test solution shows below the zone due to the iodine in the chromatogram obtained with a reference solution intense zone (gingerols) and in the middle, between the zones due to iodine and citral in the chromatogram obtained with reference solution, other less intense brownish zones (shogaols); other zones may be present.



**Fig: 8** TLC analysis of herbal syrup

### 6.2 Calculation of thin layer chromatography:

#### A. R<sub>f</sub> Sample solution:

$R_f = \frac{\text{Distance travelled by solute}}{\text{Distance travelled by solvent}}$

$$R_f = 4.55.5$$

$$R_f = 0.818$$

#### B. R<sub>f</sub> Standard solution:

$R_f = \frac{\text{Distance travelled by solute}}{\text{Distance travelled by solvent}}$

$R_f = 4.755$

$R_f = 0.854$

### C. $R_x$ value of standard and sample :

$R_x = \frac{\text{Distance travelled by sample(unknown)}}{\text{Distance travelled by standard (known)}}$

$R_x = 0.818$  0.854

$R_x = 0.957$

### Extraction and HPLC Analysis:

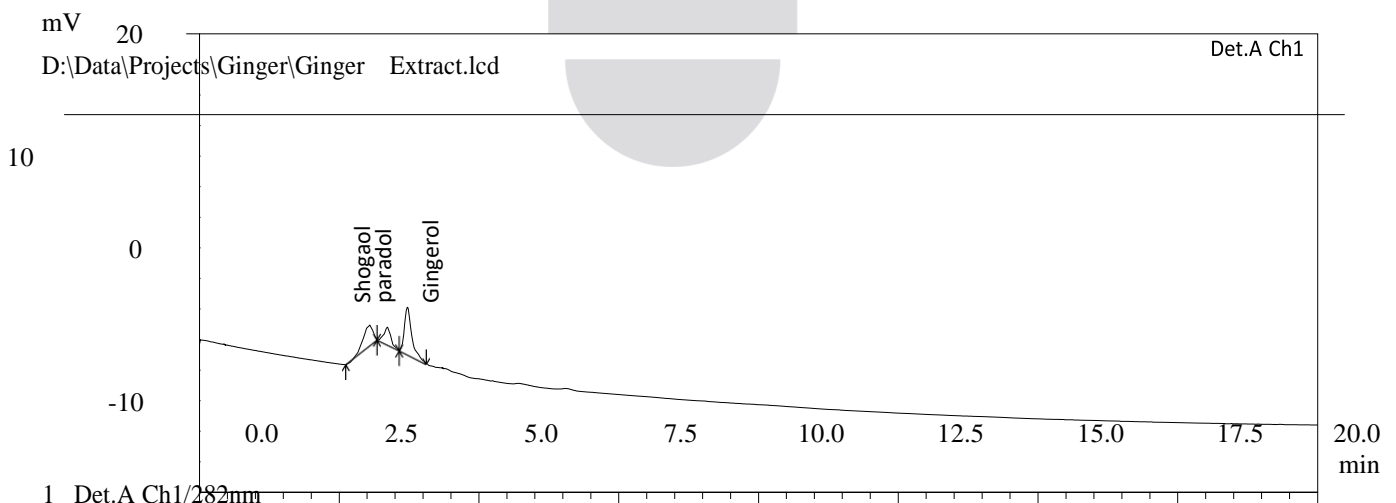
The yield of the ethanolic extract was about 10%. It was obtained as a viscous liquid extract, and total active ginger components in this extract were about 16-18%. The yield of enriched extract was about 34%, and the total gingerols content of the enriched extract was about 36%-43%. The dried ginger extract used in the toxicity studies had total gingerols 8.27% (6-gingerol = 6.41%; 8-gingerol = 0.86%; 10-gingerol = 1.00%) and 6-shogaol 0.76%.

Based on the chromatographic data as shows **the 90:10 methanol:water has the shortest retention time for [6]shogaol observed at 3.03 min, and moderate retention time for [6]- paradol observed at 3.36 min, and long [6]- gingerol observed at 3.72 min.** The reports on HPLC analyses of [6]-gingerol in ginger favor the use of octadecylsilane (ODS) column. For the HPLC analyses of many natural products which employs ODS column, methanol is a common mobile phase being used. In this study, methanol was chosen as the mobile phase for HPLC of [6]-gingerol. Optimization was first performed to determine the right concentration of methanol. The criteria for selecting the best concentration are: 1) the ability to elute [6]-gingerol in distinct, narrow peak, and 2) the ability to elute [6]-gingerol with the shortest retention time possible. Methanol:water with volume ratios of 65:35, 70:30, 80:20 and 90:10 were used. It has also the highest detection for the compound by having the largest peak area. Hence, the optimum methanol:water ratio was chosen to be 90:10 (v/v).

### LC-solution Analysis Report

Acquired by : Admin  
 Sample Name : Ginger  
 Sample ID : Ginger Extract  
 Data File Name : Ginger

Extract.lcd Method File Name: Project.lcm



Detector A Ch1 282nm

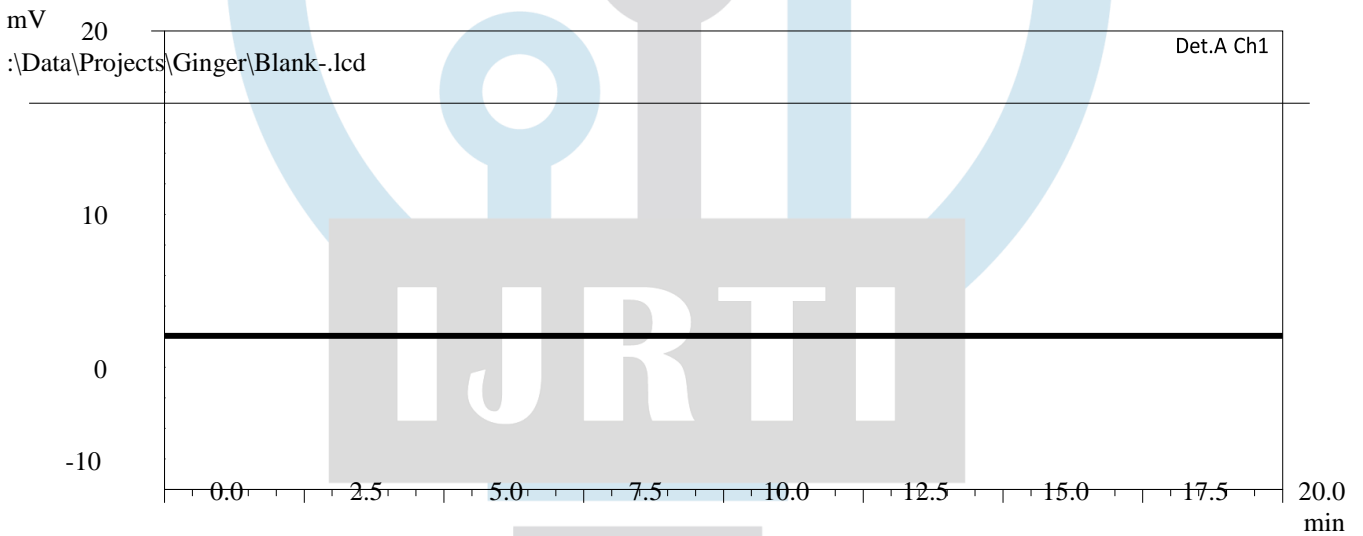
**Peak Table**

Name	Ret. Time	Area	Area %	Tailing Factor
Shogaol	3.03	17333	31.35	0.80
Gingerol	3.36	9485	17.16	0.96
Paradol	3.72	28464	51.49	1.67
		55282	100.00	

**LC-solution Analysis Report**

:\Data\Projects\Ginger\Blank-.lcd

Acquired by : Admin  
 Sample Name : Ginger  
 Sample ID : Blank  
 Data File Name Method File Name  
 : Blank-.lcd  
 : Project.lcm



1 Det.A Ch1/282nm

**Peak Table**

Detector A Ch1 282nm  
 1 Det.A Ch1/282nm

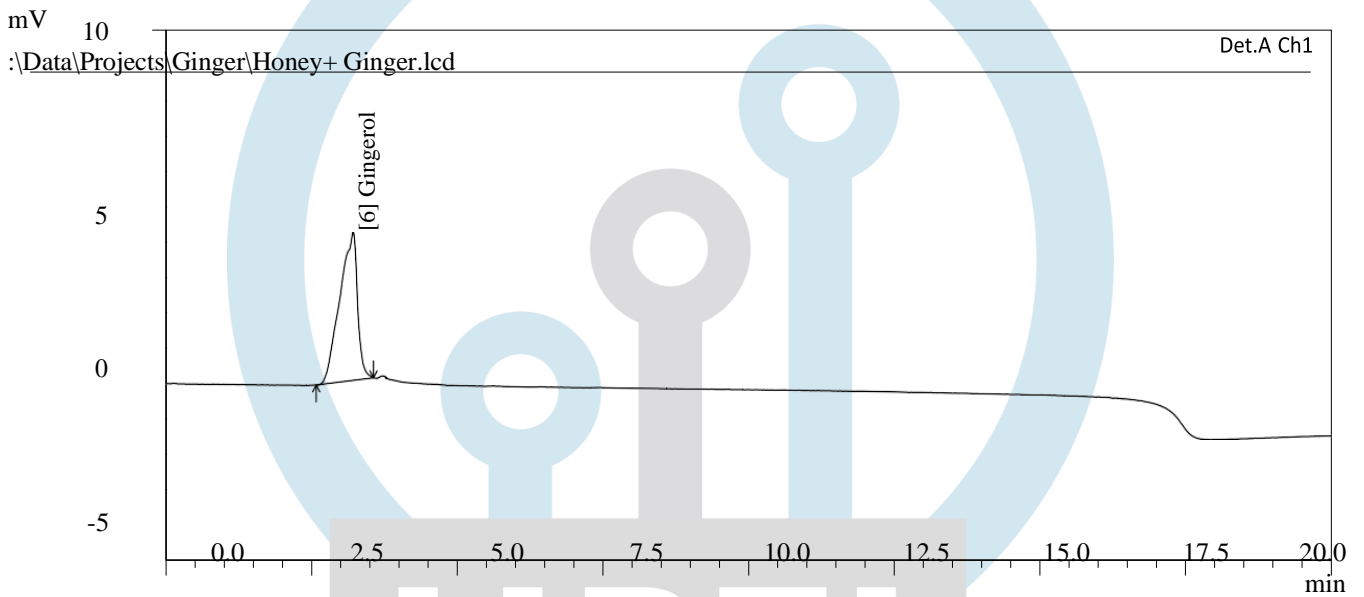
Name	Ret. Time	Area	Area %	Tailing Factor
Blank solution	0.00	0.00	0.00	0.00
		0.00	0.00	

**LC-solution Analysis Report**

**==== Shimadzu LCsolution Analysis Report ====**

Acquired by

: Admin  
 D:\Data\Projects\Ginger\Honey+ Ginger.lcd  
 Sample Name : Ginger  
 Sample ID : Honey + Ginger  
 Data File Name Method File Name  
 : Honey+ Ginger. lcd  
 : Project. lcm



1 Det.A Ch1/282nm  
 Detector A Ch1 282nm

**Peak Table**

Name	Ret. Time	Area	Area %	Tailing Factor
[6] Gingerol	3.22	88028	100.00	0.74
		88028	100.00	

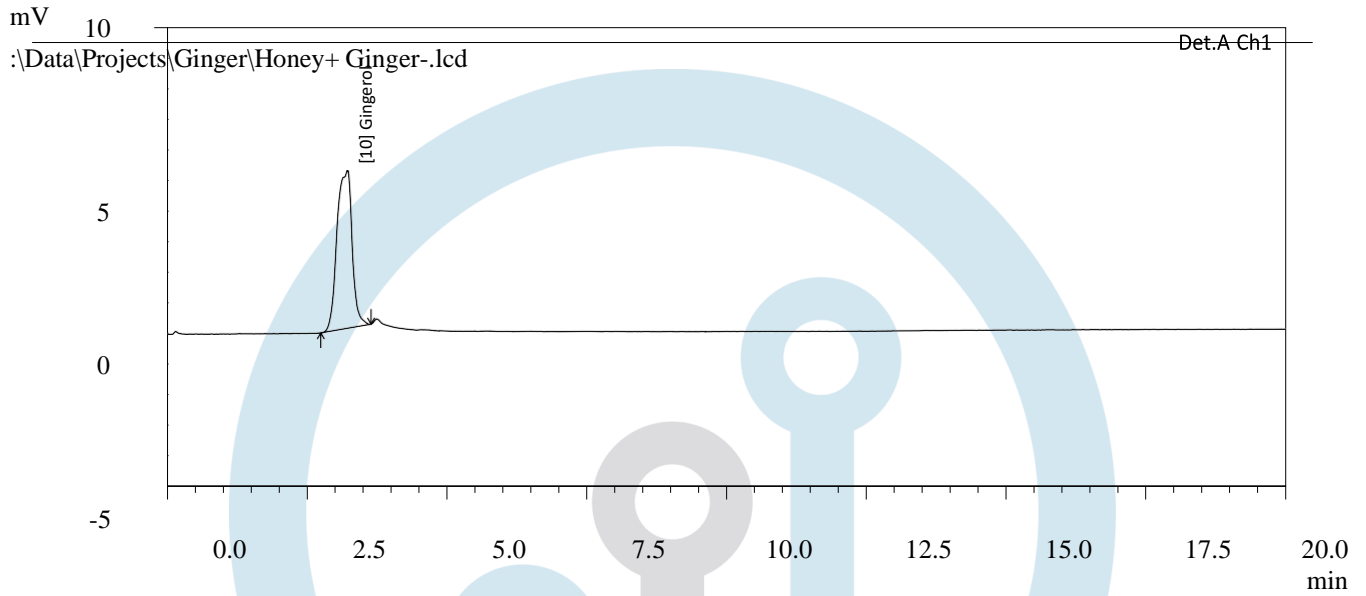
**LC-solution Analysis Report**

**==== Shimadzu LCsolution Analysis Report ====**

Acquired by

: Admin

D:\Data\Projects\Ginger\Honey+ Ginger-.lcd  
 Sample Name : Ginger  
 Sample ID : Honey + Ginger  
 Data File Name Method File Name  
 Honey+ Ginger-.lcd  
 : Project. lcm



Peak Table

1 Det.A Ch1/282nm  
 Detector A Ch1 282nm

Name	Ret. Time	Area	Area %	Tailing Factor
[10] gingerol	3.22	96136	100.00	0.97
		96136	100.00	

**SHELF LIFE:**

The prepared herbal syrup as a self-life for up to 3 years while it is kept without opening, because the concentration of honey creates a high osmotic pressure and it inhibits the growth of micro-organisms. So there are not any other preservatives required. But when the bottle is opened it should be used within 5-6 weeks.

**CONCLUSION**

The present investigation was under taken to prepare herbal syrup analogues using natural honey and ginger extract. The selected ingredients are ginger and honey. Ginger possesses an antimicrobial, anticancer, antioxidant, antidiabetic, nephroprotective, hepato-protective, larvicidal, analgesic, anti-inflammatory and immune-modulatory activities. Honey used to treat throat infection, bronchial asthma, tuberculosis, hiccups, thirst, dizziness, ulcer, used as nutrition and better preservative.

Syrup can be potentially used as food supplements. The pre-formulation studies of the herbal syrup were within specification.

Also the physicochemical properties of prepared syrup like colour, odour, pH, taste, were satisfactory. It has proper concentration of honey as per IP. The present study helps to develop effective and safe herbal syrup with honey as a base. A simple, high and reliable HPLC and TLC method developed for the quantitative analysis of ginger – honey syrup.

Ginger is a spice which is used in our food source, which expresses its medicinal property upon consumption. For many years Ayurveda has mentioned that ginger has the capacity to cure cold, indigestion and some other gastro-intestinal disorders. As it is used in our daily life it can increase our immune and health aspects. Its anti-inflammatory properties can be a boon for many people which inhibits the pro-inflammatory molecules can reduce the pain it can be a major medication for joint pain disorders, along with all this benefits ginger can boost our body immune system and increase the rate of metabolism by decreasing the triglycerides and low density cholesterol. Thus, ginger is an herb having minimal known side effects can be used for various health conditions.

*Zingiber officinalis* shows difference in the composition of crude extracts is likely due to the varying degree of solubility of active constituents in the solvents used. Different solvents have been reported to have the capacity to extract different phytochemicals depending on their solubility or polarity in the solvents. Acetone extract shows maximum presence of phytochemicals whereas ethanol and aqueous extract shows vary few phytochemicals.

Honey composition is a mixture of saturated sugar and non-sugar constituents, varying accordingly to the environment, botanical and geographical origin. Dominant sugars are fructose followed by glucose, so honey is a lower GI product compared to table sugars. The non-sugar constituents such as enzymes, amino acids, vitamins, minerals, phenolic compounds are at minor quantities, but they define health benefits of honey. Each of them has its own nutritional and functional value(s) and they work together to contribute to the biological and physicochemical properties of honey, making honey a unique sweetener.

Atherosclerosis is a damaging chronic disease globally. Interestingly, several studies have emphasized the role of honey in attenuating the aforementioned risks in the pathogenesis of atherosclerosis. The beneficial effects are mainly attributed to phenolic compounds in honey composition. The mechanisms through which honey elicit the protection are associated with scavenging radical species, suppressing lipid peroxidation, strengthening enzymatic and non-enzymatic antioxidant systems and stimulating/inhibiting pro-inflammatory markers. However, further research in particular clinical translations will progress to better management strategies of the chronic disease, with concomitant expanded applications of honey in food and pharmaceutical industries. In addition due to possible microbial and non-microbial contaminations, honey quality should be complied with safety regulations and international standards.

**BIBLIOGRAPHY**

1. Langner E, Greifenberg S, Gruenewald J. Ginger: history and use. *Adv Ther.* 1998;15:25Y44.
2. Schwertner H, Rios D. High performance liquid chromatographic analysis of 6-gingerol, 8-gingerol,
3. 10-gingerol and 6-shogaol in ginger-containing dietary supplements, spices, teas, and beverages. *Chromatogr B Anal Technol Biomed Life Sci.* 2008;856:41Y47.
4. Tapsell LC, Hemphill I. Health benefits of herbs and spices: the past, the present, the future. *Med J Aust.* 2006;185(4 suppl):S4YS24.
5. Yoshikawa M, Hatakayama S, Chantani N, Nishino Y, Yamahara J. Qualitative and quantitative analysis of bioactive principles in *Zingiberis rhizoma* by means of high performance liquid chromatography and gas liquid chromatography: on the evaluation of *Zingiberis rhizoma* and chemical change of constituents during *Zingiberis* rhizome processing. *Yakugaku-Zasshi.* 1993;113:307Y315.
6. Jiang H, Xie Z, Kou H, McLaughlin S, Timmerman B, Gang D. Metabolic profiling and phylogenetic analysis of medicinal *Zingiber* species: tools for authentication of ginger (*Zingiber officinale* Rosc.). *Phytochem.* 2006;67: 1673Y1685.
7. Nakazawa T, Ohsawa K. Metabolism of [6]-gingerol in rats. *Life Sci.* 2002;70:2165Y2175.

8. Gonlachanvit S, Chen Y, Hasler W, Sun W, Owyang C. Ginger reduces hyperglycemia-evoked gastric dysrhythmias in healthy humans: possible role of endogenous prostaglandins. *Pharmacol Exp Ther.* 2003;307:1098Y1103.
9. Z. N. Amiri, G.D. Najafpour, M. Mohammadi, A.A. Moghadamnia. Subcritical water extraction of bioactive compounds from ginger (*Zingiber officinale* Roscoe). *International journal of engineering.* 2018; 31(12):1991-2000.
10. V, Jyothiprabha, P. Venkatachalam. Preliminary phytochemical screening of different solvent extracts of selected Indian species. *Int. J. Curr. Microbiol. Sci.* 2016; 5(2):116-122.
11. Ammar Mohammad A.A, Mawahib ElAmin M.E, Sakina Mohamed Y. Total phenolic and flavonoid contents and antioxidant activity of ginger (*Zingiber officinale* Rosc.) rhizome, callus and callus treated with some elicitors. *Journal of genetic engineering and biotechnology.* 2018; 01-06. DOI: 10.1016/j.jgeb.2018.03.003
12. Bhargava S, Dhabhai K, Batra A, Sharma A, Malhotra B, Zingiber officinale: Chemical and phytochemical screening and evaluation of its antimicrobial activities, *Journal of Chemical and Pharmaceutical Research.* 2012; 4(1):360-364.
13. Z. Kamaliroosta, L. Kamaliroosta, A.H. Elhamirad, Isolation and identification of ginger essential oil. *Journal of Food Biosciences and Technology,* 2013 July 10; 73-80.
14. Cragg G.M, Newman D.J, medicinal for the millennia. *Annals of the New York Academy of sciences.* 2001; 9(53):03-25.
15. Jyotsna Dhanik, Neelam Arya, Viveka Nand, A review on *Zingiber officinale*. *Journal of Pharmacognosy and phytochemistry.* 2017; 6(3):174-184.
16. Kottarapat Jeena, Vijayastelter B. Liju, Ramadasan Kuttan, Antioxidant, anti-inflammatory and antinociceptive activities of essential oil from ginger. *Indian J Physiol Pharmacol.* 2013; 57(1):51-62.
17. Julie L. Ryan, Gary R. Morrow, Ginger. *Oncology nurse edition.* 2010; 24(2):46-49.
18. Badreldin H. Ali, Gerald Blunden, Musbah O. Tanira, Abderrahim Nemmar, Some phytochemical, pharmacological and toxicological properties of ginger (*Zinger officinale* Roscoe): A review of recent research. *Food and Chemical Toxicology.* 2008; 46(2):409-420.
19. Paini S.W, Tarsisius Dwi W.B, Fenny A.K, Evelyn L.W. Difference of solvent polarity to phytochemical content and antioxidant activity of *Pluchea indica* Less leaves extracts. *International journal of pharmacognosy and phytochemical research.* 2014; 6(4):850-855
20. Dissanayake K.G. C., Waliwita W. A. L. C., Liyanage R. P.: A review on medicinal uses of *Zingiber officinale* (Ginger): *IJHSR;* 10(6), 2020.
21. Marx W., McKavanagh D., [...]: The effect of ginger (*Zingiber officinale*) on platelet aggregation: A systematic literature review; *PLOS ONE ;* 21(2015).
22. Bardsley K. : Ginger (*Zingiber officinale*): Antioxidants and their use in stabilizing lemon oil; May 2013.
23. Syafitri D. M., Levita J., Mutakin M., Diantini A.: A review: Is ginger (*Zingiber officinale* var. Roscoe) potential for future phytomedicine? : *IJAS,* 8(2018).
24. Jakribettu R. P., Bolor R. [...]: Ginger (*Zingiber officinale* Roscoe) oil: December 2016.
25. Bhatt N., Waly M. I., Essa M. M., & Ali A.: Ginger: A functional herb; Page no. 2-30; January 2013.
26. <https://en.wikipedia.org/w/index.php?title=Ginger&oldid=996429861>.
27. Roufogalis B. D.: *Zingiber officinale* (Ginger): A future outlook on its potential in prevention and treatment of diabetes and prediabetic states: *New Journal of Science;* 2014.
28. Marx W. M., Teleni L., McCarthy A. L., [...]: Ginger (*Zingiber officinale*) and chemotherapy-induced nausea and vomiting: a systematic literature review; *Nutrition reviews;* 71(4).
29. Standard of ASEAN herbal medicine, Vol. I. Jakarta, ASEAN Countries, 1993.
30. Pharmacopoeia of the People's Republic of China (English ed.). Guangzhou, Guangdong Science and Technology Press, 1992.
31. British pharmacopoeia. London, Her Majesty's Stationery Office, 1993.
32. African pharmacopoeia, Vol. 1. 1st ed. Lagos, Organization of African Unity, Scientific, Technical & Research Commission, 1985.
33. The Japanese pharmacopoeia XIII. Tokyo, Ministry of Health and Welfare, 1996.
34. Yoshikawa M et al. Qualitative and quantitative analysis of bioactive principles in *Zingiberis rhizoma* by means of high performance liquid chromatography and gas liquid chromatography. *Yakugaku zasshi,* 1993, 113:307–315.
35. Yamahara J et al. Cholagogic effect of ginger and its active constituents. *Journal of ethnopharmacology,* 1985, 13:217–225.
36. Bhattarai S., Tran V. H., and Duke C. C. (2001): The Stability of Gingerol and Shogaol in Aqueous Solutions. *Journal of Pharmaceutical Sciences.* Vol. 90, 1658–1664
37. Garace S., Sankari M., and Gopi. (2017): Antimicrobial Activity of Ethanolic Extract of *Zingiber Officinale* – An *in vitro* Study. *U. Santo Grace et al / J. Pharm. Sci. & Res.* Vol. 9(9), 1417- 1419
38. J.-R. Liu, Y.-L. Ye, T.-Y. Lin, Y.-W. Wang, and C.-C. Peng, "Effect of floral sources on the antioxidant, antimicrobial, and anti-inflammatory activities of honeys in Taiwan," *Food Chemistry,* vol. 139, no. 1-4, pp. 938–943, 2013.
39. A. Guler, A. Bakan, C. Nisbet, and O. Yavuz, "Determination of important biochemical properties of honey to discriminate pure and adulterated honey with sucrose (*Saccharum officinarum* L.) syrup," *Food Chemistry,* vol. 105, no. 3, pp. 1119–1125, 2007.
40. H. M. Kumar Manu, A. P. Ananda, D. Vishwanathan, and Siddagangaiah., "Study of Physicochemical parameters and Antioxidant in Honey collected from different locations of India," *International Journal of Pharmacy and Life Sciences,* vol.4, no. 12, pp. 3159–3165, 2013.
41. S. Bogdanov, K. Ruoff, and L. P. Oddo, "Physico—chemical methods for the characterisation of unifloral honeys: a review," *Apidologie,* vol. 35, supplement 1, pp. S4–S17, 2004.

42. S. Gomes, L. G. Dias, L. L. Moreira, P. Rodrigues, and L. Estevinho, "Physicochemical, microbiological and antimicrobial properties of commercial honeys from Portugal," *Food and Chemical Toxicology*, vol. 48, no. 2, pp. 544–548, 2010.
43. S. H. Zerrouk, B. G. Fallico, E. N. Arena, G. F. Ballistreri, and L. A. boughediri, "Quality evaluation of some honey from the central region of Algeria," *Jordan Journal of. Biology Science*, vol.4, no. 4, pp. 243–248, 2011.
44. V. Nanda, B. C. Sarkar, H. K. Sharma, and A. S. Bawa, "Physico-chemical properties and estimation of mineral content in honey produced from different plants in Northern India," *Journal of Food Composition and Analysis*, vol. 16, no. 5, pp. 613–619, 2003.
45. S. Saxena, S. Gautam, and A. Sharma, "Physical, biochemical and antioxidant properties of some Indian honeys," *Food Chemistry*, vol. 118, no. 2, pp. 391–397, 2010.
46. M. L. Al, D. Daniel, A. Moise, O. Bobis, L. Laslo, and S. Bogdanov, "Physico-chemical and bioactive properties of different floral origin honeys from Romania," *Food Chemistry*, vol. 112, no. 4, pp. 863–867, 2009.
47. Poljsak, B. Strategies for Reducing or Preventing the Generation of Oxidative Stress. *Oxid. Med. Cell. Longev.* **2011**, 2011, 194586.
48. Hoffmann, D. *Healthy Heart: Strengthen Your Cardiovascular System Naturally*; Storey Publishing: North Adams, MA, USA, 2017.
49. Ajibola, A.; Chamunorwa, J.P.; Erlwanger, K.H. Nutraceutical values of natural honey and its contribution to human health and wealth. *Nutr. Metab. (Lond.)* **2012**, 9, 61.
50. Machado De-Melo, A.A.; Almeida-Muradian, L.B.D.; Sancho, M.T.; Pascual-Maté, A. Composition and properties of *Apis mellifera* honey: A review. *J. Apic. Res.* **2018**, 57, 5–37.
51. Bogdanov, S.; Jurendic, T.; Sieber, R.; Gallmann, P. Honey for Nutrition and Health: A Review. *J. Am. Coll. Nutr.* **2013**, 27, 677–689.
52. Anklam, E. A review of the analytical methods to determine the geographical and botanical origin of honey. *Food Chem.* **1998**, 63, 549–562.



IJRTI