International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 2 Mar–Apr 2025, pp: 1412-1422www.ijprajournal.com ISSN: 2456-4494

“Formulation and Evaluation on Herbal Syrupof Ginger with Honey”

Abhishek Kumar, Anshu Patel*,Dr.Shailesh Jain
Institution:SAM college of pharmacy, SAM Global University Raisen, Madhya Pradesh

Date of Submission: 05-04-2025 Date of Acceptance: 15-04-2025

ABSTRACT:
Honey syrup, a sweet and viscous preparation made by combining honey with water or other aqueous solvents, has garnered significant attention due to its medicinal and nutritional properties. It has been used across cultures for centuries, both as a natural sweetener and a therapeutic agent. The interest in honey syrup lies in its bioactive compounds such as flavonoids, phenolic acids, and enzymes, which provide antibacterial, anti-inflammatory, and antioxidant benefits. The natural composition of honey varies depending on its botanical and geographical source, affecting the syrup's properties. Traditional methods of honey syrup preparation typically involve dilution with warm water, which helps preserve the active ingredients while making it easier to administer. Modern techniques may involve controlled heating and filtration processes to maintain hygiene and stability. This review presents a detailed exploration of the history, sources, synthesis, preparation methodologies, and benefits of honey syrup. A special emphasis is placed on its application in health and wellness, particularly for respiratory and digestive ailments. Additionally, concentration curves and dosage optimization are discussed to provide a scientific foundation for its therapeutic use. The outcomes highlight the significance of honey syrup as a functional food with potential in natural medicine. This comprehensive review provides valuable insights for researchers, healthcare professionals, and consumers interested in utilizing honey syrup for health-promoting purposes. In the present study, efforts were made to isolate novel compounds from the root of Zingiberofficinale. However, due to limitations in advanced extraction techniques and the availability of natural drug sources, complete isolation was not achieved. Nevertheless, a few flavonoids and phenolic compounds were successfully extracted and formulated into a herbal syrup.The formulated syrup was evaluated based on specific physical parameters, and the findings were systematically tabulated. Further analysis of the syrup was conducted using Thin Layer Chromatography (TLC) and High-Performance Liquid Chromatography (HPLC) techniques.Zingiberofficinale, a member of the Zingiberaceae family, was also subjected to pharmacognostic, phytochemical, and pharmacological evaluations of its root. In addition, honey, a natural sweet and viscous substance produced by Apisdorsata (belonging to the family Apidae), was included as an ingredient due to its known medicinal and therapeutic properties.

KEY WORDS: Honey syrup, natural sweetener, flavonoids, antioxidants, antibacterial, preparation method, therapeutic agent, herbal medicine, functional food, health benefits.

I. INTRODUCTION:

Herbal syrups are traditionally made by combining a concentrated herbal decoction with natural sweeteners such as honey or sugar, and occasionally with alcohol. The foundation of these syrups is a potent decoction prepared by simmering herbs in water. The incorporation of honey or sugar not only enhances the taste but also thickens and preserves the preparation, thereby extending its shelf life. These syrups are often used for their soothing effects in conditions like sore throat, cough, digestive discomfort, and dryness of mucosal tissues. Additionally, the sweeteners improve the flavor, making the syrup more palatable—especially for children and those sensitive to the taste of certain herbs.[1]Herbal syrups are versatile and can be enjoyed in various ways. A spoonful can be mixed with sparkling water for a refreshing herbal soda or stirred into hot water for a quick tea. They also pair well with foods such as yogurt, oatmeal, biscuits, and even desserts like ice cream. Many prefer to take them directly by the spoonful for both taste and therapeutic benefit.[5] The standard formulation ratio is typically 2 parts decoction to 1 part sweetener (a 2:1 ratio). For instance, if herbs are simmered in 4 cups of water and reduced to 2 cups, adding 1 cup of honey or sugar will yield a well-preserved syrup. Some practitioners prefer a 1:1 ratio for longer shelf life, though this may result in a sweeter product. The ideal ratio depends on personal preference and the intended use.[9] To further enhance preservation, alcohol may be added. Herbal tinctures, chosen for their specific therapeutic properties, or small amounts of brandy are commonly used. Besides improving shelf life, alcohol may offer calming effects, but its use should be avoided in syrups intended for children.[21] Regarding safety and quality, adverse effects associated with herbal products are often linked to poor-quality raw materials or inadequate manufacturing practices. Ensuring the correct identification of plant species and the appropriate selection of plant parts is critical for the efficacy and safety of herbal medicines. Therefore, quality assurance must be prioritized throughout the entire production process—from sourcing and processing to formulation and packaging. Unlike pharmaceutical drugs, which are composed of well-defined chemical compounds, herbal medicines are complex mixtures of bioactive components. Their chemical profile can vary significantly depending on environmental, genetic, and processing factors, making quality control a critical aspect of herbal product development. Honey is a naturally sweet and viscous substance primarily produced by honey bees and, to some extent, by other bee species. Bees create honey by transforming the sugary secretions of plants—mainly floral nectar—or the excretions of other insects such as honeydew. This transformation occurs through a combination of regurgitation, enzymatic processing, and the evaporation of water.[29] Honey bees (genus Apis) store the honey they produce in hexagonal wax structures known as honeycombs. In contrast, stingless bees preserve their honey in small containers made of a mixture of wax and resin. The honey produced by Apis species is the most widely recognized and commercially utilized across the globe due to its palatability and broad availability.Harvesting of honey can be carried out either from wild bee colonies or through domesticated hives in managed environments—a practice referred to as beekeeping or apiculture. When involving stingless bees, this practice is known as meliponiculture.[22]The sweetness of honey is primarily attributed to its content of simple sugars, particularly fructose and glucose. Its relative sweetness is comparable to that of sucrose (table sugar). A tablespoon (approximately 15 milliliters) of honey provides about 190 kilojoules (46 kilocalories) of energy. Owing to its unique chemical composition and moisture-reducing properties, honey serves as an excellent ingredient in baking, imparting both sweetness and a distinctive flavor.[14]One of honey's remarkable features is its natural preservation capacity. Its low moisture content and high acidity inhibit the growth of most microorganisms, allowing properly sealed honey to remain unspoiled for extended periods—even thousands of years under suitable conditions.

1.HISTORY OF HONEY SYRUP:

Honey syrup has a long-standing history that dates back to ancient civilizations. From ancient Egypt to traditional Chinese medicine, honey has been revered not only as a sweetener but also as a remedy. In Egyptian tombs, honey was found sealed in jars, perfectly preserved even after thousands of years. Egyptians used honey syrup as a preservative for embalming and also applied it for wound healing. The ancient Greeks and Romans described honey syrup as a medicinal preparation, often combined with vinegar, herbs, or wine to treat various ailments. Hippocrates, the father of medicine, recommended honey syrup for fever, wounds, and digestive problems.In Ayurveda, the traditional Indian system of medicine, honey syrup—known as Madhu—is utilized as a carrier (anupana) to enhance the efficacy of herbal formulations. It is also prescribed for respiratory issues, sore throat, and to balance doshas. In Traditional Chinese Medicine (TCM), honey syrup is used as a tonic for nourishing the spleen and lungs. Honey is also a staple in Islamic medicine. Prophet Muhammad is said to have advocated the use of honey for healing, and it is mentioned in the Quran as a source of healing.[25] During the Middle Ages, honey syrup gained popularity in European herbalism. Physicians and herbalists used it as a base for electuaries and syrups to make bitter herbs palatable. In early pharmacopoeias, honey syrup was considered a standard medium for delivering medicinal substances.[14] The Industrial Revolution marked a shift in honey syrup production, with technological advancements allowing for mass production and better preservation. Despite the rise of synthetic sweeteners and refined sugars, honey syrup maintained its role in alternative medicine and natural health practices. The resurgence of interest in organic and holistic remedies in the 20th and 21st centuries has renewed focus on honey syrup's traditional wisdom and therapeutic benefits.Modern science has validated many of the historical uses of honey syrup, recognizing its antimicrobial, antioxidant, and anti-inflammatory properties. Today, it is incorporated into syrups for cough, cold, sore throat, and gastrointestinal ailments. It is also gaining traction as a wellness supplement and functional food.

2.CHEMICAL COMPOSITION OF HONEY:

Honey is a complex natural product composed of over 180 constituents, primarily sugars, water, and a variety of biologically active compounds. Its precise chemical profile can vary significantly based on floral sources, geographic region, and bee species involved in its production.

2.1.PRIMARY COMPONENTS:

On average, honey contains:

- Moisture: 14–24%
- Dextrose (Glucose): 23–36%
- Levulose (Fructose): 30–47%
- Sucrose: 0.4–6%
- Dextrins and Gums: 0–7%
- Ash (Mineral content): 0.1–0.8%

In addition to these, honey includes trace elements such as essential oils, beeswax, pollen grains, coloring agents, organic acids (formic, acetic, and succinic acids), maltose, vitamins, and a mixture of enzymes including **diastase, invertase**, and **inulase**.

3.SUGAR COMPOSITION AND FUNCTIONAL PROPERTIES:

The sugar content of honey predominantly consists of monosaccharides, especially fructose (up to 45%) and glucose (around 35%), with minor contributions from disaccharides and oligosaccharides. These sugars are formed via enzymatic breakdown of nectar-derived sucrose by bee-secreted enzymes. The specific sugar profile, including the fructose-to-glucose ratio, largely influences the physical properties of honey such as viscosity, crystallization tendency, and thermal behavior.

Fructose, being the most abundant sugar in honey, not only contributes significantly to its sweetness but also has a lower glycemic index (GI of 15) compared to glucose (GI of 100) and sucrose (GI of 65). A 100-gram portion of honey delivers approximately 300 kcal, covering around 15% of the daily recommended energy intake.

4.NON-SUGAR COMPONENTS AND BIOACTIVE COMPOUNDS

Though present in smaller quantities, non-sugar constituents in honey are critical for defining its biological activity, quality, and origin. These include:

- Vitamins and minerals
- Proteins and amino acids
- Phenolic compounds and flavonoids
- Enzymes: such as invertase, diastase (amylase), glucose oxidase, and catalase

These enzymes have specific roles:

- Invertase breaks down sucrose into glucose and fructose.
- Glucose oxidase is responsible for generating hydrogen peroxide, a known antimicrobial agent.
- Catalase assists in the breakdown of hydrogen peroxide to prevent cellular damage.

5.FLAVONOIDS AND PHENOLICS

Flavonoids present in honey—such as apigenin, chrysin, galangin, hesperetin, kaempferol, luteolin, myricetin, and quercetin—are made up of two aromatic rings (A and B) linked by a three-carbon bridge, often forming a heterocyclic ring (C). Variations in ring structures lead to different classes: flavonols, flavones, flavanones, flavanonols, isoflavones, flavanols, and anthocyanidins. Structural differences and substitutions across the rings result in unique biochemical properties.

These phenolic compounds contribute to honey's antioxidant potential, acting via multiple mechanisms such as metal ion chelation, free radical neutralization, or modulation of gene expression linked to cellular oxidative balance.

Moreover, some phytochemicals serve as botanical or geographical markers. For instance:

- Methylglyoxal in manuka honey
- Hesperetin in citrus honey
- Quercetin in sunflower honey
- Luteolin in lavender honey

6.SOURCE OF HONEY:

Honey originates from the nectar of flowers, collected and enzymatically transformed by bees. It is composed of natural sugars (mainly fructose and glucose), water, enzymes, amino acids, vitamins, and minerals. The composition depends on the floral source and environmental factors, making each type of honey unique.

6.1 NATURAL SOURCE:

Natural honey is sourced directly from bee hives, where bees collect nectar and convert it into honey through a process of enzymatic activity and evaporation. Wild honey harvesting involves minimal human intervention and is practiced in many indigenous cultures. Beekeeping, or apiculture, is a more controlled method, involving the use of man-made hives to collect honey from domesticated bees. Natural sources are rich in nutrients and active enzymes that are responsible for honey's medicinal properties. The flora visited by the bees impacts the taste, color, and therapeutic value of the honey.

6.2 SYNTHESIS HONEY:

Synthetically produced honey involves the use of sugar syrups and additives to mimic the taste and viscosity of natural honey. While not recommended for therapeutic uses, synthetic honey is sometimes used as an inexpensive alternative in commercial products. The synthesis process typically involves the hydrolysis of starch or sugarcane to glucose and fructose, followed by mixing and heating. Synthetic honey lacks the enzymes, antioxidants, and antibacterial properties of natural honey. It can be used for sweetening purposes but is not suitable for medicinal applications.

7.METHODOLOGY:

Herbal materials intended for direct therapeutic application must be cultivated, harvested, and processed in accordance with Good Agricultural and Collection Practices (GACP) and Good Manufacturing Practices (GMP). In many instances, these raw herbal materials undergo additional processing before being used to formulate the final herbal products.[12]During processing, the active compounds are typically handled alongside other constituents of the herbal material. In some cases, these active substances are further refined by eliminating inactive or unwanted components to increase concentration and potency. The resulting herbal preparations may include extracts, decoctions, tinctures, essential oils, and similar forms.[22] Various processing techniques are employed in the production of these preparations, such as extraction, distillation, fractionation, concentration, fermentation, and other chemical or biological methods. To ensure quality, safety, and efficacy, the entire production process should align with the standards outlined in the World Health Organization (WHO) guidelines on GMP. Additionally, the current GHPP (Good Herbal Processing Practices) guidelines provide further technical details regarding critical procedures used in the manufacturing of herbal preparations and finished dosage forms.[8]The methodology of honey syrup preparation and analysis involves both traditional and scientific approaches. Traditional methods include manual extraction of honey, filtration, and mixing with water or herbal decoctions. Modern scientific techniques involve physicochemical analysis, microbial testing, and stability assessment.[33] Sample collection starts with the harvesting of honey from beehives, followed by filtration to remove impurities. The honey is then diluted using purified or distilled water at a specific ratio (usually 1:1 or 1:2), depending on the desired viscosity. Heating is performed under controlled conditions to avoid destroying active compounds.[22]Laboratory analysis includes pH measurement, sugar profile (using HPLC), moisture content (by refractometry), and microbial count. These parameters help determine the quality, safety, and shelf-life of the honey syrup. Phytochemical screening may also be conducted to identify bioactive compounds like flavonoids and phenols. This helps correlate the chemical composition with biological activity.

8.PREPARATION OF HONEY SYRUP: GINGER (ZINGIBER OFFICINALE): MEDICINAL AND CULINARY SIGNIFICANCE:

Zingiberofficinale, commonly known as ginger, is a flowering plant valued globally for its culinary uses and therapeutic properties in traditional medicine systems. The plant is herbaceous and perennial, producing annual pseudo-stems—formed by tightly rolled leaf bases—that grow up to one meter in height and carry slender leaf blades. Its inflorescences emerge directly from the rhizome on separate shoots, showcasing flowers with pale yellow petals and purple margins.[15] The rhizome, commonly referred to as ginger root, is the primary part utilized for both medicinal and culinary purposes. Zingiberofficinale has been extensively studied for a broad spectrum of pharmacological activities, including antimicrobial, antioxidant, anticancer, antidiabetic, nephroprotective, hepatoprotective, larvicidal, analgesic, anti-inflammatory, and immunomodulatory properties.

In Ayurvedic medicine, ginger is praised for its wide range of therapeutic actions. It is traditionally used to stimulate appetite (Deepani), relieve constipation (Bhedini), enhance taste perception (Ruchya), purify the tongue and throat (Jihwakantavishodhanam), regulate circulation (Anulomana), protect the heart (Hrudya), support

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 2 Mar–Apr 2025, pp: 1412-1422www.ijprajournal.com ISSN: 2456-4494

digestion (Pachana), dissolve urinary calculi (Ashmadoshahara), nourish the body (Vrishya), improve vocal quality (Swarya), and relieve respiratory issues such as cough (Kasahara) and asthma (Swasahara). Additionally, it is recognized for pain relief (Sulahara), aiding water absorption in the digestive tract (Grahi), reducing sensations of cold (Sheetaprashamana), stimulating the nervous system (Nadiuttejaka), quenching thirst (Truptighna), correcting circulatory imbalances (Vatanulomana), relieving general body pain (Shoolaprashamana), treating hemorrhoids (Arshoghna), acting as an antipyretic (Jwaraghna), and clearing excess mucus (Sleshmahara).

9.CURRENT RESEARCH FOCUS:
The present study emphasizes the formulation and evaluation of a herbal preparation composed of Zingiberofficinale and honey, aiming to explore their combined therapeutic potential.

TAXONOMICAL CLASSIFICATION OF ZINGIBER OFFICINALE:

- Kingdom: Plantae
- Division: Magnoliophyta
- Class: Liliopsida
- Order: Zingiberales
- Family: Zingiberaceae
- Genus: Zingiber
- Species: Zingiberofficinale

10.MORPHOLOGICAL CHARACTERISTICS:

- **Color**: The rhizome flesh varies in color—yellow, white, or pale red—depending on the cultivar.
- **Odor**: Typically citrusy or spicy, with underlying woody and floral notes that define its aromatic profile.
- **Taste**: Characteristically sweet and mildly peppery, accompanied by a pungent and spicy aroma.

Ingredient	Quantity	Description
Natural Honey	100 ml	Base sweetener and therapeutic agent
Distilled Water	100 ml	Solvent to dilute honey
Lemon Juice	5 ml	For flavor and vitamin C enrichment
Ginger Extract	10 ml	Anti-inflammatory and soothing agent
Herbal Extract (e.g., Tulsi)	5 ml	Antimicrobial and adaptogenic

11.PREPARATION STEPS:

1. Filter honey to remove impurities.
2. Mix distilled water with lemon juice, ginger, and herbal extracts.
3. Warm the mixture mildly (not exceeding 40°C).
4. Add honey slowly while stirring.
5. Ensure uniform mixing.
6. Store in sterilized glass bottles.
7. Label with date and ingredients.

This preparation ensures that the active compounds in honey and herbal extracts are preserved. It is recommended to store the syrup in a cool, dark place.

FIG .1.PRELIMINARYANALYSISOFGINGERAND HONEY

12.BASIC COMPOSITION OF HONEY:
Honey mainly consists of:

- Sugars: ~76%
- Water: ~18%
- Other Components: ~6%

The sugar content is responsible for honey's characteristic sweetness, while the remaining components influence its flavor, color, and aroma. The relative proportions of these components can vary depending on the floral origin and geographical source of the honey.

Raw ginger (Zingiberofficinale) comprises approximately 79% water, 18% carbohydrates, 2% protein, and 1% fat. A 100-gram portion provides about 80 kilocalories (333 kJ) and serves as a moderate source of vitamin B6 (12% of the Daily Value - DV), magnesium (12% DV), and manganese (11% DV), although other nutrients are present in minimal quantities.

When used in its powdered form, a typical 5-gram (1 tablespoon) serving of dried ginger (which contains only 9% moisture) contributes very little to the daily nutritional requirements, except for manganese, which is available in significant amounts (approximately 70% DV).

13.SUGAR TYPES IN HONEY:

Honey contains a mix of three main sugars:

- Fructose (fruit sugar): ~41%
- Glucose (grape sugar): ~34%
- Sucrose (table sugar): 1–2%

The proportion of these sugars is affected by the floral nectar and enzymatic action—primarily from invertase, which is present both in the flowers and in the bee's salivary glands. This enzyme facilitates the conversion of sucrose into glucose and fructose.

14.ADDITIONAL CONSTITUENTS IN HONEY:

- Proteins: These originate from the nectar and pollen and exist either as simple amino acids or complex protein structures.
- Acids: Honey contains organic acids, primarily malic and citric acids. Although there was once a misconception that honey contains formic acid due to bee venom, modern research confirms otherwise.
- Vitamins: Honey has small amounts of vitamin C and some B-complex vitamins (e.g., riboflavin, pantothenic acid, pyridoxine, biotin, and niacin), though these are insufficient to meet daily nutritional needs.
- Essential Oils: These volatile compounds are responsible for the distinctive aroma of honey but can degrade quickly when honey is heated.

15.MATERIALS AND METHODS:

Fresh and dried ginger rhizomes were sourced from the local market. The fresh rhizomes were thoroughly washed with tap water to remove dust, stones, and other debris. They were then chopped into 1 mm pieces. The dried rhizomes were pulverized using an electric mixer. Both forms were stored at 4°C to prevent contamination prior to use.

Commercial honey was processed by heating to 80°C, allowing it to stand so that floating impurities could be removed. For further refinement, honey was diluted with water to reach a specific gravity of 1.35, compared to the natural density of 1.47. In some cases, honey was extracted by centrifugation, followed by filtration (if required) using a wet cloth or funnel. Honey must be properly treated to prevent fermentation, hence the necessity for thermal processing and rapid cooling, as prolonged exposure to heat can lead to color changes and nutrient degradation.

16.EXTRACTION OF GINGER ESSENTIAL OIL:

To extract essential oil, both fresh and dried ginger rhizomes (50 grams each) were subjected to soxhlet extraction or maceration techniques using various solvents—acetone, ethyl acetate, ethanol, methanol, chloroform, and water (aqueous). The extraction process was carried out at temperatures ranging from 30°C to 40°C.

Post-extraction, the solvent was evaporated using distillation until all solvent content was recovered, leaving the essential oil in the flask. The extracted oils were then stored at roomtemperature for further evaluation. Each solvent's extraction yield was recorded for comparative analysis

17..BENEFITS OF HONEY SYRUP:

Honey syrup offers a wide range of benefits, including antimicrobial, antioxidant, and anti-inflammatory properties. It is effective in relieving sore throats, cough, and respiratory infections. Its soothing properties help calm irritated mucous membranes.

Digestively, honey syrup aids in improving appetite, digestion, and bowel movement. It acts as a prebiotic, supporting the growth of beneficial gut flora. The antioxidants present help neutralize free radicals and reduce oxidative stress.

In skincare, honey syrup can be applied topically for wounds, burns, and acne due to its healing properties. It is also used in hair care to improve shine and strength.

Regular consumption boosts immunity and provides quick energy due to its natural sugars. It is safe for all age groups (except infants under 1 year due to risk of botulism).

THIN LAYER CHROMATOGRAPHY (TLC) CALCULATIONS:

A. Rf Value – Sample Solution

The **retention factor (Rf)** is calculated using the formula:

Rf=Distance traveled by soluteDistance traveled by solvent\text{Rf} = \frac{\text{Distance traveled by solute}}{\text{Distance traveled by solvent}}Rf=Distance traveled by solventDistance traveled by solute

For the sample:

Rfsample=4.55.5=0.818\text{Rf}_{\text{sample}} = \frac{4.5}{5.5} = 0.818Rfsample=5.54.5=0.818

B. Rf Value – Standard Solution

Rfstandard=4.75.5=0.854\text{Rf}_{\text{standard}} = \frac{4.7}{5.5} = 0.854Rfstandard=5.54.7=0.854

C. Rx Value (Relative Migration Factor)

The Rx value compares the sample's movement to that of a known standard:

Rx=Distance traveled by sampleDistance traveled by standard=0.8180.854=0.957\text{Rx} = \frac{\text{Distance traveled by sample}}{\text{Distance traveled by standard}} = \frac{0.818}{0.854} = 0.957Rx=Distance traveled by standardDistance traveled by sample=0.8540.818=0.957

18.EXTRACTION AND HPLC ANALYSIS:

The ethanolic extraction process yielded approximately 10% of a thick liquid extract, with an estimated 16–18% of total active ginger constituents. Further enrichment increased the extract yield to 34%, with the gingerols content rising to about 36–43%. The dried ginger extract used in the toxicity studies showed the following composition:

- Total gingerols: 8.27%
  - 6-gingerol: 6.41%
  - 8-gingerol: 0.86%
  - 10-gingerol: 1.00%
- 6-shogaol: 0.76%

19.HPLC RETENTION TIMES AND OPTIMIZATION:

In the chromatographic analysis, using a methanol:water mobile phase (90:10 v/v) yielded the following retention times:

- 6-shogaol: 3.03 minutes (shortest retention)
- 6-paradol: 3.36 minutes
- 6-gingerol: 3.72 minutes (longest retention)

An ODS (octadecylsilane) column was used for separation, which is a common choice for analyzing natural products like ginger constituents. Methanol was selected as the mobile phase for its compatibility and effectiveness.

To determine the optimal mobile phase ratio, several combinations of methanol and water were tested: 65:35, 70:30, 80:20, and 90:10. The 90:10 ratio demonstrated:

1. Efficient peak separation with narrow, well-defined peaks
2. Reduced retention time for [6]-gingerol
3. Higher peak area, indicating enhanced detection sensitivity

Therefore, methanol:water (90:10, v/v) was selected as the optimal mobile phase for HPLC analysis of gingerols.

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 2 Mar–Apr 2025, pp: 1412-1422www.ijprajournal.com ISSN: 2456-4494

20.RESULT:

High Performance Liquid Chromatography (HPLC):

The chromatographic separation was conducted using a binary HPLC system (Waters 2998 series) equipped with a photodiode array (PDA) detector, and an auto-sampler model 2707 with an injection capacity of 20 µL. A 1525 dual-piston pump ensured consistent flow. The chromatographic column employed was a C18 SunFire column (dimensions: 150 mm × 4.6 mm, particle size: 5 µm). Data acquisition and processing were carried out using Empower 3 software.

21.STANDARD SOLUTION PREPARATION:

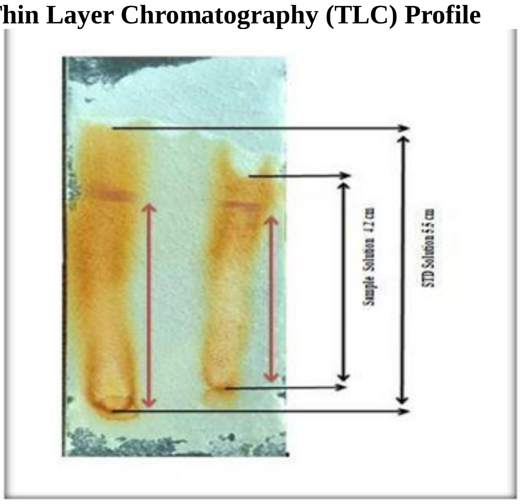
Stock solutions of reference compounds—6-gingerol, 8-gingerol, 10-gingerol, and 6-shogaol—were prepared by dissolving 10 mg of each compound in 10 mL of methanol, resulting in a concentration of 1000 µg/mL. Serial dilutions were performed to obtain working standards ranging from 25 µg/mL to 500 µg/mL. For each compound, calibration curves were developed by plotting peak area versus analyte concentration to assess linearity and quantification.

22.SAMPLE SOLUTION PREPARATION:

A 125 mg sample of powdered ginger extract was accurately weighed and transferred into a 25 mL volumetric flask. Methanol was added, and the mixture was sonicated for 1 minute to ensure complete dissolution. The resulting solution was filtered using a 0.2 µm syringe filter and subsequently injected into the HPLC system for analysis.

II. RESULTS AND DISCUSSION:

Thin Layer Chromatography (TLC) Profile



The TLC chromatogram of the reference standard revealed a prominent reddish-brown spot (indicative of iodine) in the lower region and brownish zones corresponding to citral in the upper section.

III. CONCLUSION:

The current study was conducted to formulate and evaluate a herbal syrup using natural honey as the base and ginger extract (Zingiberofficinale) as the active phytochemical ingredient. The selected natural ingredients—ginger and honey—are both known for their extensive therapeutic properties. Ginger exhibits a wide spectrum of biological activities including antimicrobial, anticancer, antioxidant, antidiabetic, nephroprotective, hepatoprotective, larvicidal, analgesic, anti-inflammatory, and immunomodulatory effects. Honey has traditionally been used in the treatment of throat infections, bronchial asthma, tuberculosis, hiccups, ulcers, dizziness, and thirst, and also serves as a nutritional agent and natural preservative.The formulated herbal syrup shows potential as a dietary supplement, combining both therapeutic and nutritional benefits. Pre-formulation studies confirmed that all tested parameters of the syrup were within acceptable pharmacopoeial specifications. The physicochemical characteristics such as color, odor, pH, and taste were satisfactory and met the standard quality requirements. Importantly, the honey content was in accordance with Indian Pharmacopoeia (IP) standards.A simple, sensitive, and reliable High-Performance Liquid Chromatography (HPLC) and Thin Layer Chromatography (TLC) method was developed for the quantitative evaluation of ginger content in the syrup formulation.Ginger, a commonly used culinary spice, demonstrates potent medicinal properties upon regular consumption. In Ayurvedic medicine, ginger has long been recognized for its ability to alleviate cold, indigestion, and various gastrointestinal ailments. Due to its daily use in the diet, ginger contributes to improved immunity and metabolic health. Its anti-inflammatory action is attributed to its ability to inhibit pro-inflammatory mediators, making it potentially beneficial in managing joint pain and arthritis. Furthermore, ginger enhances immune responses and metabolic rates by lowering triglycerides and LDL cholesterol levels, offering protection against metabolic disorders.The phytochemical composition of Zingiberofficinale varies depending on the solvent used for extraction. This variation arises due to the differing solubility and polarity of active constituents in various solvents. Among tested solvents, acetone extracts yielded the highest concentration of phytochemicals, whereas ethanol and aqueous extracts showed relatively fewer active compounds.Honey is composed primarily of sugars (mainly fructose and glucose) and minor but bioactive non-sugar components such as enzymes, amino acids, vitamins, minerals, and phenolic compounds. These minor constituents play crucial roles in defining honey's nutritional and therapeutic profile, contributing to its antioxidant, antimicrobial, and anti-inflammatory effects. Notably, honey has a lower glycemic index (GI) than refined sugars, making it a healthier sweetening option.In relation to chronic diseases such as atherosclerosis, numerous studies have highlighted honey's potential in reducing associated risk factors. Its protective effects are largely due to its rich content of phenolic antioxidants, which act by scavenging free radicals, inhibiting lipid peroxidation, enhancing both enzymatic and non-enzymatic antioxidant defenses, and modulating pro-inflammatory biomarkers. While preliminary evidence is promising, further clinical research is essential for translating these findings into effective treatment strategies and to expand the role of honey in the pharmaceutical and nutraceutical industries. Given honey's natural origin, quality control and safety compliance with international standards are imperative, especially in view of potential microbial and environmental contaminants.The findings from the review show that honey syrup is a versatile, safe, and effective natural formulation. The combination of honey with herbal extracts enhances its therapeutic potential. Physicochemical and microbial studies validate its stability and effectiveness. Honey syrup demonstrates significant potential as a functional food and alternative medicine.Honey syrup represents an intersection of traditional wisdom and modern science. Its preparation is simple yet effective, and its benefits are wide-ranging—from respiratory health to digestive aid and wound healing. With growing interest in natural remedies, honey syrup has found a renewed relevance. The use of natural, high-quality honey, combined with proper preparation techniques, ensures its efficacy and safety. Further research and standardization can pave the way for its wider acceptance in clinical and commercial applications.

REFERENCES:

[1]. 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.

[2]. Al, M.L., Daniel, D., Moise, A., Bobis, O., Laslo, L., and Bogdanov, S. Physico-chemical and bioactive properties of different floral origin honeys from Romania. Food Chemistry. 2009, 112(4): 863–867.

[3]. Amiri, Z. N., Najafpour, G.D., Mohammadi, M., Moghadamnia, A.A. Subcritical water extraction of bioactive compounds from ginger (Zingiberofficinale Roscoe). International Journal of Engineering. 2018, 31(12): 1991–2000.

[4]. Ammar Mohammad A.A., MawahibElAmin M.E., Sakina Mohamed Y. Total phenolic and flavonoid contents and antioxidant activity of ginger (ZingiberofficinaleRosc.) 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.

[5]. Anklam, E. A review of the analytical methods to determine the geographical and botanical origin of honey. Food Chem. 1998, 63, 549–562.

[6]. Badreldin, H. Ali, Gerald, Blunden, Tanira, M.O., Nemmar, A. 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.

[7]. Bardsley, K. Ginger (Zingiberofficinale): Antioxidants and their use in stabilizing lemon oil. May 2013.

[8]. Bhargava, S., Dhabhai, K., Batra, A., Sharma, A., Malhotra, B. Zingiberofficinale: Chemical and phytochemical screening and evaluation of its antimicrobial activities. Journal of Chemical and Pharmaceutical Research. 2012, 4(1): 360–364.

[9]. Bhatt, N., Waly, M.I., Essa, M.M., Ali, A. Ginger: A functional herb. January 2013, Page no. 2–30.

[10]. Bhattarai, S., Tran, V.H., and Duke, C.C. The Stability of Gingerol and Shogaol in Aqueous Solutions. Journal of

Pharmaceutical Sciences. 2001, 90: 1658–1664.
[11]. Bogdanov, S., Jurendic, T., Sieber, R., Gallmann, P. Honey for Nutrition and Health: A Review. J. Am. Coll. Nutr. 2013, 27, 677–689.
[12]. Bogdanov, S., Ruoff, K., Oddo, L.P. Physico–chemical methods for the characterisation of unifloral honeys: a review. Apidologie. 2004, 35(Suppl 1): S4–S17.
[13]. British Pharmacopoeia. London, Her Majesty's Stationery Office, 1993.
[14]. Cragg, G.M., Newman, D.J. Medicinal for the millennia. Annals of the New York Academy of Sciences. 2001, 953: 3–25.
[15]. Dhanik, J., Arya, N., Nand, V. A review on Zingiberofficinale. Journal of Pharmacognosy and Phytochemistry. 2017, 6(3): 174–184.
[16]. Dissanayake, K.G.C., Waliwita, W.A.L.C., Liyanage, R.P. A review on medicinal uses of Zingiberofficinale (Ginger). IJHSR. 2020, 10(6).
[17]. Garace, S., Sankari, M., Gopi. Antimicrobial Activity of Ethanolic Extract of Zingiberofficinale – An in vitro Study. J. Pharm. Sci. & Res. 2017, 9(9): 1417–1419.
[18]. Gomes, S., Dias, L.G., Moreira, L.L., Rodrigues, P., Estevinho, L. Physicochemical, microbiological and antimicrobial properties of commercial honeys from Portugal. Food and Chemical Toxicology. 2010, 48(2): 544–548.
[19]. Gonlachanvit, S., Chen, Y., Hasler, W., Sun, W., Owyang, C. Ginger reduces hyperglycemia-evoked gastric dysrhythmias in healthy humans: possible role of endogenous prostaglandins. PharmacolExpTher. 2003, 307: 1098–1103.
[20]. Hoffmann, D. Healthy Heart: Strengthen Your Cardiovascular System Naturally; Storey Publishing: North Adams, MA, USA, 2017.
[21]. https://en.wikipedia.org/w/index.php?title=Ginger&oldid=996429861
[22]. Jakribettu, R.P., Boloor, R. Ginger (Zingiberofficinale Roscoe) oil. December 2016.
[23]. Jeena, K., Liju, V.B., Kuttan, R. Antioxidant, anti-inflammatory and antinociceptive activities of essential oil from ginger. Indian J PhysiolPharmacol. 2013, 57(1): 51–62.
[24]. 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 (ZingiberofficinaleRosc.). Phytochemistry. 2006, 67: 1673–1685.
[25]. Jyothiprabha, V., Venkatachalam, P. Preliminary phytochemical screening of different solvent extracts of selected Indian species. Int. J. Curr. Microbiol. Sci. 2016, 5(2): 116–122.
[26]. Kamaliroosta, Z., Kamaliroosta, L., Elhamirad, A.H. Isolation and identification of ginger essential oil. Journal of Food Biosciences and Technology. 2013, July 10: 73–80.
[27]. Kumar Manu, H.M., Ananda, A.P., Vishwanathan, D., Siddagangaiah. Study of Physicochemical parameters and Antioxidant in Honey collected from different locations of India. International Journal of Pharmacy and Life Sciences. 2013, 4(12): 3159–3165.
[28]. Langner, E., Greifenberg, S., Gruenewald, J. Ginger: history and use. AdvTher. 1998, 15: 25–44.
[29]. Liu, J.-R., Ye, Y.-L., Lin, T.-Y., Wang, Y.-W., Peng, C.-C. Effect of floral sources on the antioxidant, antimicrobial, and anti-inflammatory activities of honeys in Taiwan. Food Chemistry. 2013, 139(1–4): 938–943.
[30]. Machado De-Melo, A.A., Almeida-Muradian, L.B.D., Sancho, M.T., Pascual-Maté, A. Composition and properties of Apismellifera honey: A review. J. Apic. Res. 2018, 57: 5–37.
[31]. Marx, W., McKavanagh, D., et al. The effect of ginger (Zingiberofficinale) on platelet aggregation: A systematic literature review. PLOS ONE. 2015.
[32]. Marx, W.M., Teleni, L., McCarthy, A.L., et al. Ginger (Zingiberofficinale) and chemotherapy-induced nausea and vomiting: a systematic literature review. Nutrition Reviews. 2013, 71(4).
[33]. Nakazawa, T., Ohsawa, K. Metabolism of [6]-gingerol in rats. Life Sci. 2002, 70: 2165–2175.
[34]. Nanda, V., Sarkar, B.C., Sharma, H.K., Bawa, A.S. Physico-chemical properties

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 2 Mar–Apr 2025, pp: 1412-1422www.ijprajournal.com ISSN: 2456-4494

and estimation of mineral content in honey produced from different plants in Northern India. Journal of Food Composition and Analysis. 2003, 16(5): 613–619.
[35]. Paini, S.W., TarsisiusDwi, W.B., Fenny, A.K., Evelyn, L.W. Difference of solvent polarity to phytochemical content and antioxidant activity of Plucheaindica Less leaves extracts. International Journal of Pharmacognosy and Phytochemical Research. 2014, 6(4): 850–855.
[36]. Pharmacopoeia of the People's Republic of China (English ed.). Guangzhou, Guangdong Science and Technology Press, 1992.
[37]. Poljsak, B. Strategies for Reducing or Preventing the Generation of Oxidative Stress. Oxid. Med. Cell. Longev. 2011, 2011, 194586.
[38]. Roufogalis, B.D. Zingiberofficinale (Ginger): A future outlook on its potential in prevention and treatment of diabetes and prediabetic states. New Journal of Science. 2014.
[39]. Ryan, J.L., Morrow, G.R. Ginger. Oncology Nurse Edition. 2010, 24(2): 46–49.
[40]. Saxena, S., Gautam, S., Sharma, A. Physical, biochemical and antioxidant properties of some Indian honeys. Food Chemistry. 2010, 118(2): 391–397.
[41]. Schwertner, H., Rios, D. High performance liquid chromatographic analysis of 6-gingerol, 8-gingerol, 10-gingerol and 6-shogaol in ginger-containing dietary supplements, spices, teas, and beverages. J Chromatogr B Anal Technol Biomed Life Sci. 2008, 856: 41–47.
[42]. Standard of ASEAN Herbal Medicine, Vol. I. Jakarta, ASEAN Countries, 1993.
[43]. Syafitri, D.M., Levita, J., Mutakin, M., Diantini, A. A review: Is ginger (Zingiberofficinale var. Roscoe) potential for future phytomedicine? IJAS. 2018, 8.
[44]. Tapsell, L.C., Hemphill, I. Health benefits of herbs and spices: the past, the present, the future. Med J Aust. 2006, 185(4 Suppl): S4–S24.
[45]. The Japanese Pharmacopoeia XIII. Tokyo, Ministry of Health and Welfare, 1996.
[46]. 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.
[47]. Yoshikawa, M., Hatakayema, S., Chantani, N., Nishino, Y., Yamahara, J. Qualitative and quantitative analysis of bioactive principles in Zingiberisrhizoma by means of high performance liquid chromatography and gas liquid chromatography. Yakugaku-Zasshi. 1993, 113: 307–315.
[48]. Yamahara, J. et al. Cholagogic effect of ginger and its active constituents. Journal of Ethnopharmacology. 1985, 13: 217–225.
[49]. Zerrouk, S.H., Fallico, B.G., Arena, E.N., Ballistreri, G.F., Boughediri, L.A. Quality evaluation of some honey from the central region of Algeria. Jordan Journal of Biology Science. 2011, 4(4): 243–248.