A STUDY ON ANTI-HYPERLIPIDEMIC ACTIVITY OF INDIAN MEDICINAL PLANTS

Mr. Vinay Kumar N
Research Scholar
Department of Pharmacy
GLOCAL University

Dr. Balla Ramakrishna
Research Guide
Department of Pharmacy
Glocal University

Abstract

Anti- Hyperlipidemia is a prevalent global health issue that has been linked to a variety of cardiovascular diseases. Because of the adverse effects of today's lipid-lowering medicines, more people are turning to conventional and alternative treatments. In the herbal sector, developing highly standardized Polyherbal formulations in terms of chemical composition and therapeutic efficacy is seen as a viable technique. Traditional medicine is noted for its multicomponent therapies and polyhedral content. The current study focuses on the documentation of information on local health traditions employed by traditional healers in the Malabar region of Kerala to treat hyperlipidaemia. Standardization is critical for maintaining and monitoring the quality as well as safety of traditional drugs to validate scientifically.

Key words: *Polyhedral formulation, Standardization, Hyperlipidaemia, HPLC & HPTLC, Medicinal Plants.*

Introduction

Hyperlipidemia is a condition in which there are a lot of lipoproteins in the plasma that carry triglycerides. Lipoprotein builds up in the space between the cells of arteries that lead from the aorta. This makes it harder for blood to get to the heart. Hyperlipidemia makes heart diseases much worse. One of the long-term effects of hyperlipidemia was diabetes, which can cause illness and death because of its effects. When there are more lipoproteins in the blood, the blood supply to the heart is cut off completely. This is called a myocardial infarction, or heart attack2. Heart problems are often treated with statins and other man-made drugs. But taking statins for a long time slows the growth of atherosclerotic plaques and hurts the kidneys and liver. Statins aren't likely to be used to treat atherosclerosis in its early stages because the side effects are so bad. Herbal medicines are becoming more popular as a way to treat different kinds of illnesses. People are especially interested in phytomedicines because they have few side effects. A lot of research is being done on plant-based chemicals to protect heart health and lower the cost of therapy with synthetic drugs. Effective anti-atherosclerosis drugs made from plant-based ingredients might be a better choice. In addition to their direct anti-atherosclerosis effects at the cellular level, natural remedies may also have indirect anti-atherosclerosis effects by affecting a number of atherosclerosis risk factors (e.g., cholesterol-lowering and blood pressure regulation). For pharmaceutical and non-pharmaceutical therapies to be used to prevent atherosclerosis, they should be based on the pathogenetic mechanism of action and the effectiveness shown in clinical research. Natural products should be used to prevent atherosclerosis because they have the potential to stop cholesterol from being made in arterial wall cells, which could stop atherogenesis4 at the

cellular level. Flavonoids and phenolic chemicals are found in plants. Research on atherosclerosis has shown that these chemicals have a number of biological effects, such as fighting free radicals, reducing inflammation, and fighting cancer. Free radical oxidation makes flavonoids more toxic, which in turn makes less active and more stable radicals that make the disease worse5. Catechin, quercetin, kaempferol, apigenin, and vitexin are all polyphenols that have been shown to lower the risk of cardiovascular disease by stopping oxidative stress, inflammation, and endothelial dysfunction6. The main goal of the paper was to give a quick overview of some medicinal plants used to treat atherosclerosis caused by hyperlipidemia. Ayurveda is a part of the Indian subcontinent's long history of medicine. Ayurveda's main goals are to get rid of unnecessary pain and help people live long, healthy lives. Ayurveda uses natural ingredients to get rid of the root cause of an illness by restoring balance. At the same time, it promotes a healthy way of life to stop imbalance from happening again. Herbal treatments have been around for a long time and have been known about all over the world. They were used in ancient Chinese, Greek, Egyptian, and Indian medicine for a variety of treatment purposes. The World Health Organization says that traditional medicine is the main source of health care for about 80% of the world's population. With more than 45,000 plant species, the Indian subcontinent is known to be one of the most important places for biodiversity. India has about 15,000 known medicinal plants. Between 7,000 and 7,500 of these plants are used to treat a wide range of illnesses. In Ayurveda, the treatment can use either one herb or a combination of herbs. The Ayurvedic book Sarangdhar Samhita emphasised the idea of using multiple herbs to make medicines that work better. Some plants don't have enough of the active phytochemical compounds to have the necessary healing effects. When the right amounts of several herbs are mixed together, the medicinal effect is increased and the toxicity is decreased. This review is mostly about how important polyherbalism is and what it means for clinical practise. Ayurveda is thought to be one of the oldest traditional medical systems (TSMs) that are used all over the world. This traditional way of healing is still being carefully looked into to find out what its old wisdom is. By putting together the knowledge from many traditional medical systems, new ways to find herbal drugs can be found. The biggest thing stopping these systems from coming together is that people don't understand how they are different and how they are the same. This is in addition to the other things that make it hard to find medicines made from plants. This article will explain the basics of Ayurveda and talk about its long and interesting history. This will help young scholars, researchers, and practitioners understand traditional systems of medicine better. It will also help strengthen the similarities between them and get rid of barriers to their global acceptance and harmonisation.

Methodology

Herbal formulations can be standardised so that raw materials from different places can be used to make medicines and the chemical effectiveness of different formulations can be studied.

Focus needs to be put on finding the formulations that work best in clinical settings. Physical, chemical, and pharmacological parameter checks are done on all batches so that the final finished product can be chosen and the whole production process can be validated. Since polyhedral formulations often contain many different herbs, they need to be standardised so that their quality and safety can be evaluated.

Goals and aspirations:

Ayurvedic PHFs have been used well for hundreds of years. Based on the Ayurvedic principles of the Panchamahabhutas and the Tridoshas, PHFs offer a complete way to treat illness. As science has progressed, Ayurvedic formulations of PHFs have gotten better as a result of the study of different phytoconstituents and the discovery of effective herb combinations that work together to produce the desired effect. Today, Ayurvedic PHFs are experiencing a "renaissance" all over the world. This is because they work just as well as allopathic medicines but have fewer side effects and are more widely accepted. Because of how well they work and how safe they are, they are some of the most sought-after medicines. But if people aren't told the truth about how safe PHFs are, toxicity and unintended interactions can happen. Because there isn't as much oversight and producers aren't as careful as they used to be, PHFs on the market aren't up to the same high standards as they used to be and may pose serious health risks to people who use them. This makes it important to take preventative and corrective steps, like putting in place strict regulations and teaching people how to use PHFs properly, to lessen the effects that could be very bad. The health benefits of Ayurvedic PHFs might only be fully realised if they are used correctly and with care.

AIM AND OBJECTIVE OR PLAN OF WORK

- to Evaluate the optimized PHF
- to study significance of ayurvedic medicinal usage.
- to identify the Antihyperlipidemic effect of some medicinal plants
- to identify the mechanism action of ANTI-HYPERLIPIDEMICactivity with reference to medicinal plants
- Overview of Effective Traditional Medicinal Plants.

Methodology

The method followed to collect the information on medicinal plants was based on the search engines like PubMed, science direct, Google Scholar, and Scopus. The information gathered using search engines uses the search phrases such as anti hyperlipidemia, atherosclerosis, and the medicinal plants selected. After the papers have been collected, eligible papers are selected for analysis, and done the revision to get an overview.

Plan of work

- **Selection of plants**
- **Plants Authentication**
- **Washing of plants**
- **Drying under room temperature**
- **Coarse Powder making**
- **Extraction with soxhlet apparatus**
- **Phytochemical Screening**
- **Standardization of various parameters**

- **Extraction**
- **Formulation of herbal plants**
- **Hyperlipidemia activity**

We aimed to provide a high-level overview of the selected medicinal plants that shown anti-hyperlipidemic effect in this review. The reviewed plants all have impressive lipid-lowering effects on their own. It's possible that the therapeutic efficacy of the combined medicinal plants will be greater than that of the individual plants, according to the synergistic effects seen when formulations are constructed using combinations of these plants. It's possible that this is because of the synergistic effects of combinations of plant-derived substances like Resveratrol, catechin, arjunin, arjunic acid, arjunetin, rubiadin, Hydroxy citric acid, E, Z Guggulosterone, etc., that are clinically more successful than single-compound medications.

Materials and Methods

As a necessary consequence, chemical makers and their selection have become important for quality control aspect of herbal medicines, like authentication of species, evaluating post-harvesting handling, harvesting the best quality herbal raw materials, assessing intermediates and finished products, and detecting harmful ingredients, among other things. (Pulok K. Mukherjee et al., 2006). By this, HPTLC allows for the identification of phytochemical components in formulations, as well as the assurance of efficacy, safety, and quality. Chemical finger printing has been proved to be a good way to confirm the quality of herbal medicine. (Bhutani et al.,2000). So, the chapter in the current research works on polyhedral formulation involves the standardization physical means, toxicity studies and quantification of selected biomarkers having the specified pharmacological activity (antilipidemic activity).

Plant materials:

Collection

The whole plant of *Amla.Acacia ,Gymnemasilvestra and* **Murraya koenigii**, *Linn*, Was collected from vicinity of Cherlapally rural area, Hyderabad road, Nalgonda district of Telangana in the month of oct- 2022.

Identification

Plant material was identified and authenticated by Prof. Badraiah, Botany Department, Osmania university, Hyderabad.

Preparation of Herbarium Specimens

Herbarium specimen was prepared as per Jain and Rao[74]. Specimens collected from field were dried using blotting paper and uniform pressure was exerted on blotting papers by placing them in a plant press. Blotting paper was changed every day (15 days), so that moisture from the specimen is removed completely. After demoisturising, specimens were treated with a solution of HgCl2 in Formalin for about 2 min. They were again dried in dryers and mounted on herbarium sheet using fevicol.

The powdered polyherbal formulationswere preferred according their smaller particle size. Greater absorption rate of GIT (gastrointestinal tract) depends

upon smaller particle size of powdered polyherbal formulations

1. PHF 1-Ingredients was collected from, Dist.,Ranga reddy dist, Hyderabad India, during summer season (March-April2015).

2. PHF 2-Ingredients was collected from Srisylam , kurnool, A.P, India, during monsoon season (July- August 2015)

. PHF 3-Ingredients was collected from,Nallmala forest , A.P, India during summer season (March-April 2015)

4. PHF 4-Ingredients was collected from Eturu Nagaram ,Warangal Dist, Telangana , during Monsoon season (July-August 2015)

Phytochemical Evaluation of the PHFs:

Alkaloids test

Dragendrofft's test:

A small quantity of sample solution was treated with Dragendroff's reagent (solution of Potassium Bismuth Iodide). Formation of red colour precipitate was visible which indicated the presence of alkaloids.

Amino acid test:

Ninhydrine test:

A small quantity of sample solution was treated with 2-5 drops of Ninhydrine solution placed in a boiling water bath for few minutes and observed for the formation of blue to purple colour. Formation of the colour indicates the presence of amino acid.

Carbohydrates test:

Molisch test:

A sample solution was mixed with 2-3 drops of 1% alcoholic alpha Napthol and along the sides of the test tube; 2ml of concentrated Sulphuric acid was added and appearance of purple colour ring at the junction of two liquids.

Volatile oil test:

Sudan III test:

0.5 ml chloroform was taken in a test tube; add little quantity of sample was added drop by drop till the sample was observed fully dissolved. Then again one drop of Sudan III reagent was added which produced the red color indicates the presence volatile oil.

Tannins test

Ferric chloride test:

A small quantity of sample solution was treated with 3-4 drops of Ferric chloride solution. Formation of bluish black colour has indicated the presence of Phenols in the test.

Test for Phytosterols

Salkowski reaction:

A small quantity of sample solution in the test tube, 1ml of Conc. H_2SO_4 was added along the sides of the test tube; with the sudden appearance of reddish brown color in the chloroform layer indicate the presence of Phytosterols.

Glycosides Saponins test:

Foam test:

A small quantity of sample solution was diluted with 2 ml distilled water and shaken in a graduated cylinder for 15 minutes; development of stable foam suggests the presence of Saponins.

Anthroquinones glycoside test

A little quantity of sample solution was taken then magnesium metal piece was added to this, followed by Lead acetate solution .It produced a green precipitate and indicating the presence of Anthroquinones glycoside.

Phenol test:

A small quantity of sample solution was treated with 3-4 drops of Ferric Chloride solution. Formation of bluish black colour indicates the presence of phenols

Flavanoids test

Shinoda test

Various extracts were dissolved individually in Alcohol, and then mixed with a portion of Magnesium along with concentrated Hydrochloric acid drop wise. Magenta color appeared which indicates the presence of Flavanoids.

Results and discussion:

Phytochemical Evaluation of the optimized PHFs

The optimized PHFs were subjected to morphological evaluation (table 2.4) and phytochemical investigation in order to determine the nature of phytochemicals resent in the different churna. The PHFs contain all the essential phytochemicals like glycosides, alkaloids tannins saponins and flavonoids as reported in table 2.5. The presence of tannins, ascorbic acid and gallic acid (emblicanin) indicates it can act against oxidative stress leading to dyslipidemia and atherosclerosis.

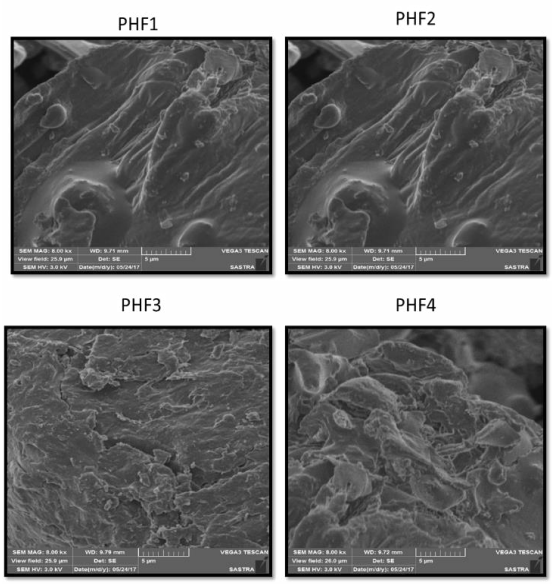


Figure - 1 Particle size evaluation

Toxicological evaluation -Evaluation of heavy metal content in PHFs

Presence of heavy metals in the formulations, they will give a negative impact on the body's organs, particularly the kidneys, resulting in renal toxicity. As a result, evaluating heavy metals plays a crucial function. Arsenic, iron, lead, and mercury are examples of heavy metals. Minor exposure to arsenic may lead to nausea and vomiting, reduced white blood and red blood cells, disturbance in cardiac rhythm, injury to bloodvessels and tingling effect in the hands and feet. Extended exposure to arsenic may produce blackening of the skin, and formation of tiny corns on the soles, palms and torso. Arsenic is one of major causes of hypertension. Severe consequences related to the cardiovascular system and hepatic impairment were also observed at higher doses (Milani R *et al.*, 2018). Studies have been reported where herbal products may have produced arsenic toxicities because of the toxic level of arsenic. It was also found that the herbal medicines sold through internet contained high levels of

heavy metals (SaperR *et al.,* 2008). Lead, mercury, cadmium and arsenic are considered as the most toxic heavy metals The present study evaluation of heavy metals, revealed that the arsenic concentration in PHFs were 0.00 pm.

Toxicological evaluation- Microbial content evaluation:

Medicinal plants that include bacteria and moulds typically come from soil and the atmosphere, which sheds information on harvesting and production procedures. Analysis of the limits of *E. coli* and A substance known as Aflatoxin produces seriousside-effects if consumed along with the crude drugs. In the present study, the PHFs were studied for the presence of microbes. The results were observed to be within the limit

Toxicological evaluation- Aflatoxin content determination:

Aflatoxins are highly poisonous mycotoxins from fungi or mould, found naturally, it's a serious health threat to humans as it may cause hepatica carcinoma in human being. The aflatoxin levels in PHFs were analyzed and found to be with in the limit.

Toxicological evaluation- Pesticide content evaluation

Pesticides, which are commonly found in herbs, are regulated by the WHO and FAO (Food and Agricultural Organization). During the cultivation process, these insecticides are blended in with the herbs. When pesticides like DDT, BHC, toxaphene, and aldrin are combined with crude pharmaceuticals, they create substantial negative effects in humans. The result of the pesticide content was found to be wthin the limit in PHFs formulated in this research work.

Qualitative and quantitative determination of the four major biomarkers in polyherbal formulation byHPTLC analysis

First and foremost, selection and purchase were done in order to obtain the highest standards. Selection is based on medicinal efficacy and the content of the marker which is present in the plant portion in question. During the time of purchase, phytochemical screening and estimation of phytoconstituentswere done side by side. Chromatographic methods are also utilized to assess the quality of herbal formulations. Methods for standardization of plant material with reference to marker compounds, such as HPTLC,HPLC and LC-MS, and GC-MS, are critical. After the preliminary studies using specific markers, effort was taken to develop best possible TLC solvent systems. Finally best developed TLC solvent systems used in HPTLC. In this study polyherbal formulations were studied by using four selected markers. The biomarkers like Gallic acid, Quercetin, Gymnemic acid and Mahanine. By comparing the Rf value as well as absorption spectra of bands in extracts of sample with their respective standards, the identity of the bands in the sample was confirmed. By overlaying the absorption spectra recorded at the start, middle, and end positions of the band in the sample tracks, the purity of the bands due to marker components in the sample extracts were validated. The HPTLC densitogram for the standard biomarkers shown in figure 3.2 (a to d). Forall four formulations, HPTLC fingerprints were

created, which will serve as an authentication and quality control tool. The following biomarkers, Gallic acid, Quercetin, Gymnemic acid and Mahanine were selected for the study.

Gallic Acid

The samples PHF1, PHF2, PHF3 and PHF4 were subjected to HPTLC analysis using Gallic acid standard with Rf value 0.43 (figure 3.2 a) and sample with corresponding). The formulations showed Rf values 0.47,0.49,0.45 and 0.44 (HPTLC plate in figure 3.3 and 3.4) with % area of 68.89%, 83.20%, 57.48% and 59.54% as shown in densitogram of PHF 1-4 in figure 3.5 a-d. The HPTLC analysis presented a % area of 83.20 Gallic acid for PHF2. Thus, it can be stated that out of the four formulations, PHF2 has greateramount of Gallic acid.

Quercetin

The samples PHF1, PHF2, PHF3 and PHF4 were subjected to HPTLC analysis using Quercetin standard (Figure 3.2 b) with Rf value 0.60. The formulations PHF1-4 presented Rf values of 0.61, 0. 66, 0.62 and 0.60 with % area of 10.93, 10.60, 15.88 and 16.07 respectively for quercetin as indicated in the HPTLC densitograms in figure 3.5 a,b,c & d for all the four formulations respectively. The HPTLC analysis presented a % area of 16.07 Quercetin equivalents for PHF4. Thus, it can be stated that out of the four formulations, PHF4 has greater amount of Quercetin

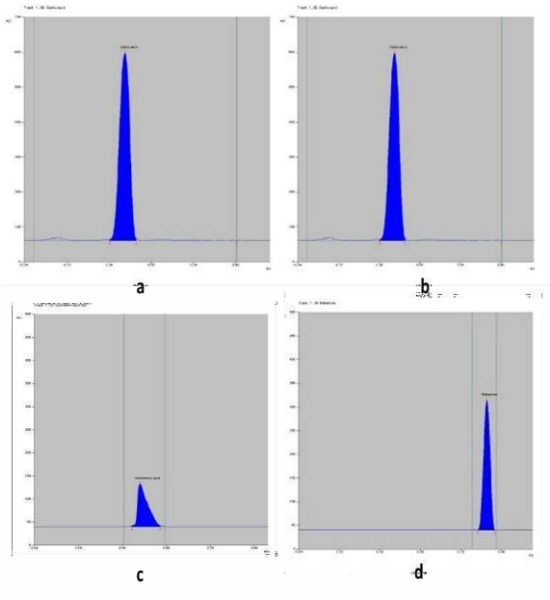


Figure - 2 HPTLC finger printing of standard biomarkers

(a) StandardGallic Acid solution, (b) Standard Quercetin, solution

(c) Standard GymnemicAcid, (d) Standard Mahanine solution

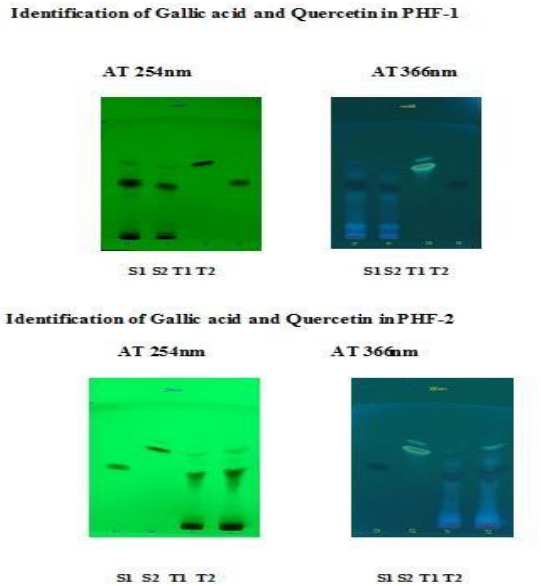


Figure - 3 Picture of HPTLC plate – Identification of gallic acid and quercetin in PHF 3 & 4

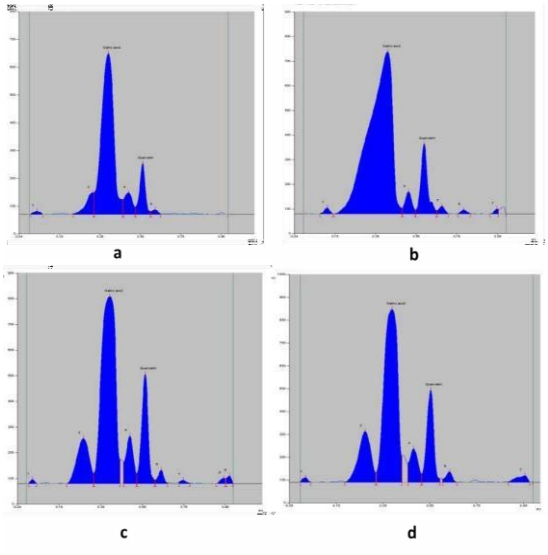


Figure 4 - HPTLC densitogram of quercetin and gallic acid in PHFs

(a) PHF1, (b) PHF2, (c) PHF3, (d) PHF4

Gymnemic Acid:

There was a band at Rf value at 0.44 corresponding to standard Gymnemic acid (Figure3.2c) can be seen to be visible in test solution tracks (PHF1 to PHF4) as shown in figure

On comparing with standard Gymnemic acid, PHF2 (Figure 3.7 b) has got significant amount of Gymnemic acid (23.15%) while other samples displayed veryless amount o gymnemic acid i.e., PHF1 (6.46%), PHF3 (7.39%) and PHF4 (11.34%) (Figure 3.7 a, c and d) respectively. Thus, the formulation prepared by using herbals collected during monsoon season (PHF2) contains more amount of Gymnemic acid.

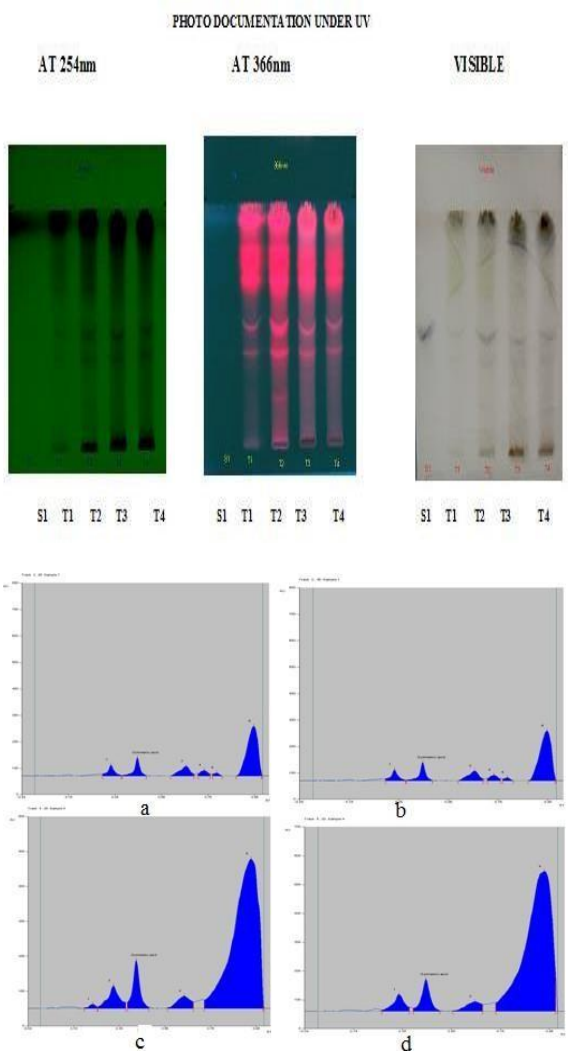


Figure 5 - HPTLC densitogram of Gymnemic acid in PHFs PHF1, (b) PHF2, (c) PHF3, (d) PHF4

Mahanine

As can be seen in Figure 3.8, the test solution track exhibits a band in an Rf value range of 0.89 almost corresponding to Mahanine. When compared to pure Mahanine (Figure 3.2 d), PHF1 (Figure 3.9a) was discovered to possess a much higher percentage of Mahanine (58.30%) than PHF2 (Figure 3.9b) and PHF3 (Figure 3.9c), which only contain 12.78% and 13.56%, respectively. Since summer (PHF 1) herbals have the highest concentration of Mahanine, this season's harvest is used in the preparation of the herbal remedy.

Compared to summer, the concentration of markers was found to be highest during the rainy season (except in the case of curry leaves). Quercetin was found in higher concentrations in PHF2 for both Amla and Acacia (16.07%), whereas Gallic acid was found in higher concentrations in PHF4 (83.20%). Both of these items were gathered at Malappuram and Gudallore during the monsoons. In the instance of Gymnema Formulation, PHF2 and PHF4 both had quite high concentrations of gymnemic acid (23.15 and 11.34 percent, respectively), whereas the other samples had much lower concentrations. Therefore, there were significantly higher concentrations of active components in amla acacia and gymnema that had been harvested during the monsoon season. HPTLC examination, however, showed that the level of Mahanine in Curry leaves was highest in the summer and lowest in the winter, with PHF1 having the highest amount (58.30%) and PHF3 having the second-highest content (13.56%) compared to the other two formulations (PHF2 and PHF4). That's why it makes sense that PHFs made from raw materials gathered during wet seasons would have a higher concentration of their active ingredient. Consequently, PHF2 may be superior to other formulations from a therapeutic standpoint.

Comparative IR Spectroscopic study of four polyherbal formulation:

The phytochemical analysis of the PHFs indicated the presence of phenols, flavonoids. Saponins Alkaloids, Terpenoids etc. The presence of different functional groups like aromatics, alkyl halides, aliphatic amines, alcohols, alkanes also phenols has been reported for various activities are hypolipidemic, antitumor, anti-inflammatory, antiulcer and antimicrobial (Pravin Kumar Patchiappan et al.,2015). The spectral data of the PHFs have also confirmed the presence of these components as shown in fig.

IR Spectrum of PHF 1 IR Spectrum of PHF 1 IR Spectrum of PHF 1 IR Spectrum of PHF 1

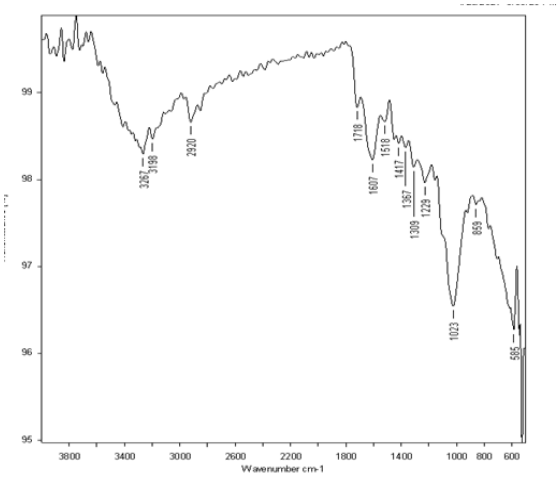


Figure - 6 IR Spectrum of PHF 1

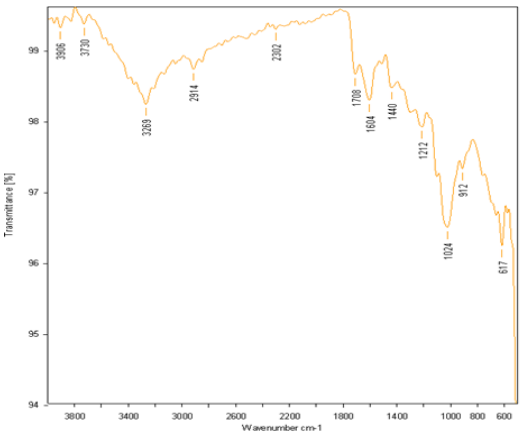


Figure 7 -IR - Spectrum of PHF2

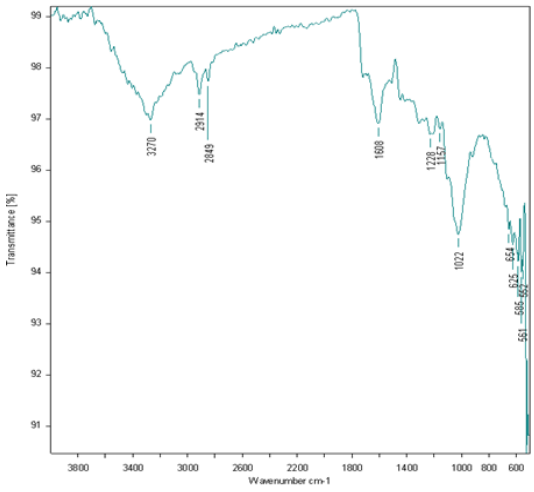
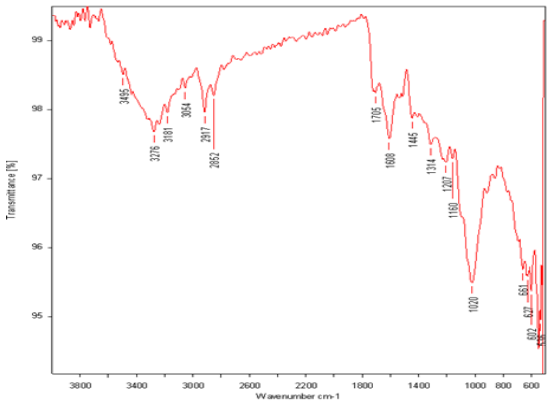


Figure 8 - IR Spectrum of PHF 3



The safety of herbal medicines has become a top priority problem in the setting of rising herbal medicine use and a lack of efficient regulatory supervision. The four prepared formulations were evaluated for its physicochemical properties as per WHO and AYUSH guidelines. The formulations shows a very slight variations in its physicochemical characteristics. It indicates the seasonal and geographical variations produced certain impacts and changes on its physicochemical properties. The comparative toxicological evaluation of four formulations shows, the formulations were devoid of heavy metals, aflatoxin content, microbial contamination and pesticide content.

The HPTLC analysis showed a % area of 16.07 Quercetin equivalents for PHF4. (PHF4 has greater amount of Quercetin), a % area of 83.20 Gallic acid equivalent for PHF2. (PHF2 has greater amount of Gallic acid), a % area of 23.11 Gymnemic acid equivalent for PHF2 and a % area of 58.30 Mahanine equivalent for PHF1. Thus, the formulation prepared by using herbals collected during monsoon season (PHF2 &PHF4) has contains more amount of Gallic acid, Quercetin and Gymnemic acid. On comparing with standard Mahanine found to have more Mahanine content (58.30%) followed by PHF3that is 13.56% and PHF2 (12.78%) respectively. PHF4 not contain significant amount of Mahanine. Thus, the formulation prepared by using herbals collected during, summer season (PHF 1) having maximum Mahanine content. HPTLC analysis shows the chemical constituents are maximum in rainy season except in case of Mahanine in curry leaves.

IR spectrum for all the prepared formulations have been carried out, the spectrumshows the characteristic peaks of Carboxylic acid, Alkenes (=CH stretch), Conjugated alkenes, Ether (C-O stretch), Vinyl Ether, NH Stretch, Phenols, Alkenes (5-ring), Ketone and Alkanes. These functional groups are present in the selected herbs for formulations. Due to the seasonal and geographical changes, formulations showed slight variations the presence of certain functional groups. The study reveals that there is a change in quantity of phyto-constituents of same herbal drug, collected from different areas and in different seasons. This variation also affects its therapeutic efficacy.

In-vitro Antilipidemic Assays-Cholesterol enzymatic end point

method and HMG Co A reductase inhibition method

According to the findings, rising activity can be observed for up to 20 minutes, with a maximum percent of inhibition of 92.660.57%. (PHF1). Simvastatin was found as positive control and 94.33±0.57 % of inhibition observed after 30 minutes. At the end of the study the maximum% inhibition for various polyherbal formulations were found to be 92.66±0.57, 88.66±1.52, 84.33±0.57 and 85.66±1.15 for PHF1, PHF2, PHF3 and PHF4 respectively as presented in table 4.6. The percentage inhibition of PHF1 (92.66% ±0.57) was found to near or approximately similar to that of standard drug simvastatin (94.33 %±0.57). So it is concluded that PHF1 is having significant antihyperlipidemic activity.

Conclusion

Herbal or natural medicines have been used to treat a wide range of illnesses for a very long time. Many of these herbal medicines are starting to be sold around the world as alternatives to the prescription drugs that are already used to treat a wide range of disorders and illnesses. Hyperlipidemia makes atherosclerosis and coronary heart disease much more likely to show up and get worse (CHD). The number of people with hyperlipidemia kept going up every year. This meant that drugs that could lower blood lipids were needed to reduce death and illness from cardiovascular problems. Synthetic lipid-lowering drugs can help treat hyperlipidemia, but they also have a number of bad effects. So, the current interest has made people look for new lipid-lowering agents that come from natural sources and have few side effects. The goal of this review is to show the current antihyperlipidemic drugs and what they are used for, as well as the natural agents that lower cholesterol and how they work, as well as experimental models of assessment. The above formulations, FD and FB, can be used in clinical trials if they follow standard protocols and rules. After a drug has been tested in a clinical setting, it can be sold by pharmaceutical companies. All of the plant materials in the FD and FB groups are very common in nature, so it won't be hard to get hold of them for commercial use.

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