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RESEARCH ARTICLE

FORMULATION AND SPECTRAL ANALYSIS OF NEW POLY HERBAL TOOTHPASTE

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ABSTRACT

Toothpaste is an agent used as an effective home care system. It is a paste or gel dentifrice used with a toothbrush as an accessory to clean and maintain the aesthetics and health of teeth by the patients to enhance oral hygiene. What many people don't know is that most brand-name toothpaste contains a number of ingredients that are not healthy. Herbal toothpaste does not contain the artificial colors, flavours or fluoride that many of the artificial products do contain. For the present study the extracts of apple peel, lemon peel, orange peel, banana peel, clove oil were used to formulate a polyherbal toothpaste and studied by phytochemical tests and spectral analysis using UV/VIS, IR spectroscopy. These studies have revealed the presence of vital constituents which shall be responsible for anti-microbial activity and useful in tooth decay problems.

Keywords: Toothpaste, polyherbal toothpaste, antimicrobial activity

INTRODUCTION

Toothpaste is a common product in our families and people hardly care to know about the product which 'they are using**.** Toothpaste is an agent used as an effective home care system. It is a paste or gel dentifrice used with a toothbrush as an accessory to clean and maintain the aesthetics and health of teeth by the patients to enhance oral hygiene. Toothpaste is used to promote oral hygiene. Although, brushing teeth twice a day and daily flossing is highly effective in plaque reduction, over 50% of adults have gingivitis on an average of 3 to 4 teeth. Bacteria in dental plaque are one of the main factors causing periodontal inflammation therefore, careful plaque control is very important. However, mechanical plaque removal is inadequately performed by most members of the population. The need for additional help in controlling bacterial plaque provides the rationale for patients to use antimicrobial dentifrices in addition to their mechanical oral hygiene regimens.[1]

What many people don't know is that most of the branded toothpastes contains a number of ingredients that are not healthy for the people or the environment. Bleach and peroxide are commonly used as whitening agents in commercial toothpastes. But both bleach and peroxide can be an irritant to the mouth and skin in small doses and are considered to be hazardous materials because they can cause severe chemical burns in large doses. Artificial flavorings and scents are commonly made from synthetic chemicals derived from petrochemicals or coal tar.. Commercial toothpaste ingredients also affect the environment. EDTA (ethylenediaminetetraacetic acid) and formaldehyde are commonly used a preservatives in toothpaste and many other cosmetics and personal care products. They are known environmental pollutants (Wolfgang W, 2005)[2].

Most of the toothpastes contain sodium Lauryl Sulfate (SLS) which is an anionic compound in the toothpaste it can deactivate cationic agents present in the tooth paste. Abrasives constitute at least 50% of typical toothpaste. These insoluble particles help remove plaque from the teeth. They remove plaque and helps to minimize cavities and periodontal disease. Representative abrasives include particles of aluminum hydroxide ($Al(OH)_3$), calcium carbonate ($CaCO_3$), various calcium hydrogen phosphates, various silicas and zeolites, and hydroxyapatite ($Ca_5(PO_4)_3OH$) (Perlich, et al., 1995) [3].

Fluoride in various forms is the most popular active ingredient in toothpaste to prevent cavities. Fluoride occurs in small amounts in plants, animals, and some natural water sources. The additional fluoride in toothpaste has beneficial effects on the formation of dental enamel and bones. Sodium fluoride (NaF) is the most common source of fluoride, but stannous fluoride (SnF_2), olaflur (an organic salt of fluoride), and sodium monofluorophosphate (Na_2PO_3F) are also used. Stannous fluoride has been shown to be more effective than sodium fluoride in reducing the incidence of dental caries and controlling gingivitis(Debjit b, et al., 2012) (George O et al., 1997)(Kozisek F, 2004) (Diankov S, 2011) (Zia-ur-Rehman, 2006)[4,5,6,7,8,9].

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India is a country which has medicines dating back to more than three thousand years and perhaps combinations of herbs must have been known since then, but now people have all along been using synthetic medicines. The age old techniques have been forgotten. After studying the drawbacks mentioned above, people are now more aware and inclined towards the use of non-alcoholic or herbal formulations. Herbal toothpaste do not contain the artificial colors, flavours or fluoride that many of the artificial products contain

MATERIALS AND METHOD

Ingredients: Apple peel, Lemon peel, Orange peel, Banana peel, Peppermint oil, Demineralised water.

Apple peel- Apple fruit is botanically known as *Malus domestica* belonging to the family Rosaceae. The fruit was procured from local market.

Orange peel-Orange fruit is botanically known as *citrus arranticum. L.* belonging to the family Rutaceae. It was collected from local market.

Lemon peel-Lemon fruit is botanically known as *Citrus aurantifolia (christam& panz) swing*. belonging to the family Rutaceae. It was procured from local market.

Banana peel- Banana fruit is botanically known as *M. acuminate* belonging to the family *Musaceae*. It was collected from local market.

General Procedure for Extraction-The crude powder of the above peel was defatted with pet ether ($40\text{-}60^0$) and then the defatted material was subjected to extraction with hydroalochol using a soxhlet apparatus. The extract was concentrated with the help of a rotavapour. The excess solvent present was evaporated (Kokate C K, 2004) .

Formulation:-

Based on the sensitivity and the resistance observed by MIC of the extracts formulation was prepared by using the standard formula.

Composition

Apple peel extract	: 5.0gms
Lemon peel extract	: 5.0gms
Orange peel extract	: 5.0gms
Banana peel extract	: 5.0gms
Carbopol 934	: 5%
Tween - 80	: 2%
Glycerine	: 1%
Sodium benzoate	: 1%
Sodium hydroxide	: 1% sol
Clove oil	: 0.5 %
Demineralised water	: 80ml.

Procedure:

5 gms of the apple peel extract, 5gms of orange peel extract, 5gms of banana peel extract , 5 gms of lemon peel extract were triturated with 5gms of capbopol 934 and 1 grm of sodium benzoate (as a preservative) in a motar-pestel . To it 2 ml of tween 80 was added to remove the stickiness. Further 1 ml of glycerine was added, triturated well and to it 80 ml of demineralized water was added to make up the to 100gm. P^H is adjusted with a solution of sodium hydroxide. Clove oil is added to mask the bitter taste.

RESULTS

Phyto chemical tests of the extracts were carried out and the following results were observed. (table no-1) [14]

TABLE 1: Results of preliminary phytochemical tests

PHYTOCONSTITUENTS	APPLE PEEPL	BANANA PEEL	ORANGE PEEL	LEMON PEEL
Tests for Flavanoids				
Flavanoids:- Shinoda test Alkaline reagent test Lead acetate test d)Ferric chloride test	+	+	+	+
Tests for Glycosides				
Tests for Cardiac Glycosides Baljet test Legal test Keller-Killiani test Liebermann's test	–	–	–	–
Tests for Anthraquinone				
glycosides Borntrager's test Modified Borntrager's test	–	–	–	–
Test for Saponins				
Foam test Haemolysis test	+	–	+	+

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PHYTOCONSTITUENTS	APPLE PEEPL	BANANA PEEL	ORANGE PEEL	LEMON PEEL
Test for Terpines				
a) Salkowski test Libermann–Burchard test	+	+	+	+
Test for Alkaloids				
Vitali-Morin's test Gerrard's test	+	_	+	+
Test for tannins				
KOH test Ferric chloride ($FeCl_3$) test	+	+	+	+

SPECTRAL ANALYSIS OF THE EXTRACTS (Katta V, 2005)

The extracts were studied by UV-VIS spectroscopy and FT-IR. The results are mentioned below (table 2 and 3)**.**

TABLE 2: Results of Ultra Violet Spectroscopy

EXTRACT	CONCENTRATION in mg/ml	ABSORBANCE in nm
Apple peel	1mg	250

TABLE 3: Results of Infra Red Spectroscopy

Extracts	Absorbance Values in cm-1	Groups present
Apple peel	2900 2250	Aromatic CH gp Vinyl gr C=C
Lemon peel	3400 2950 1650	Alcohol OH Aromatic CH gp Carbonyl gr C=O
Orange peel	3350	Alcohol OH
Banana peel	3400 2950 1700	Alcohol OH Aromatic CH gp Carbonyl gr C=O

Ultra-Violet spectroscopy

UV spectrum was carried out by UV-SICAN 2301 for the apple peel extract by dissolving the extract 1mg/1ml in ethanol and the spectrum has shown characteristic absorption peaks between (λmax) 200-400 nm and spectrum was interpreted for the presence of characteristic groups and conjugation system (picture 1).

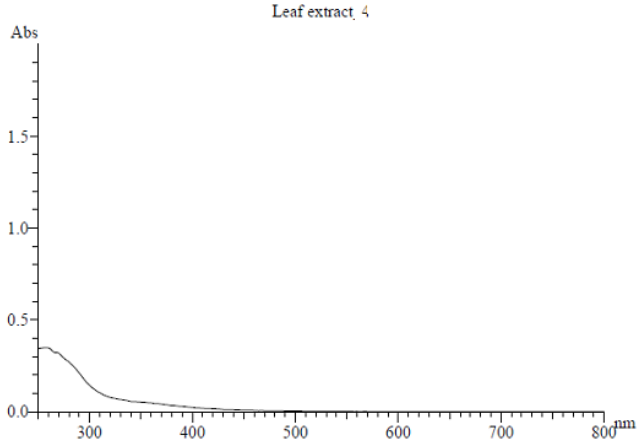

Figure 1: Ultra-Violet spectroscopy

Infra Red spectroscopy

Analysis of the I.R spectra was carried out by IR-SHIMADZU using 1gm/ml of extract and the extracts showed the presence of the following groups. (Picture- 2, 3, 4, 5)

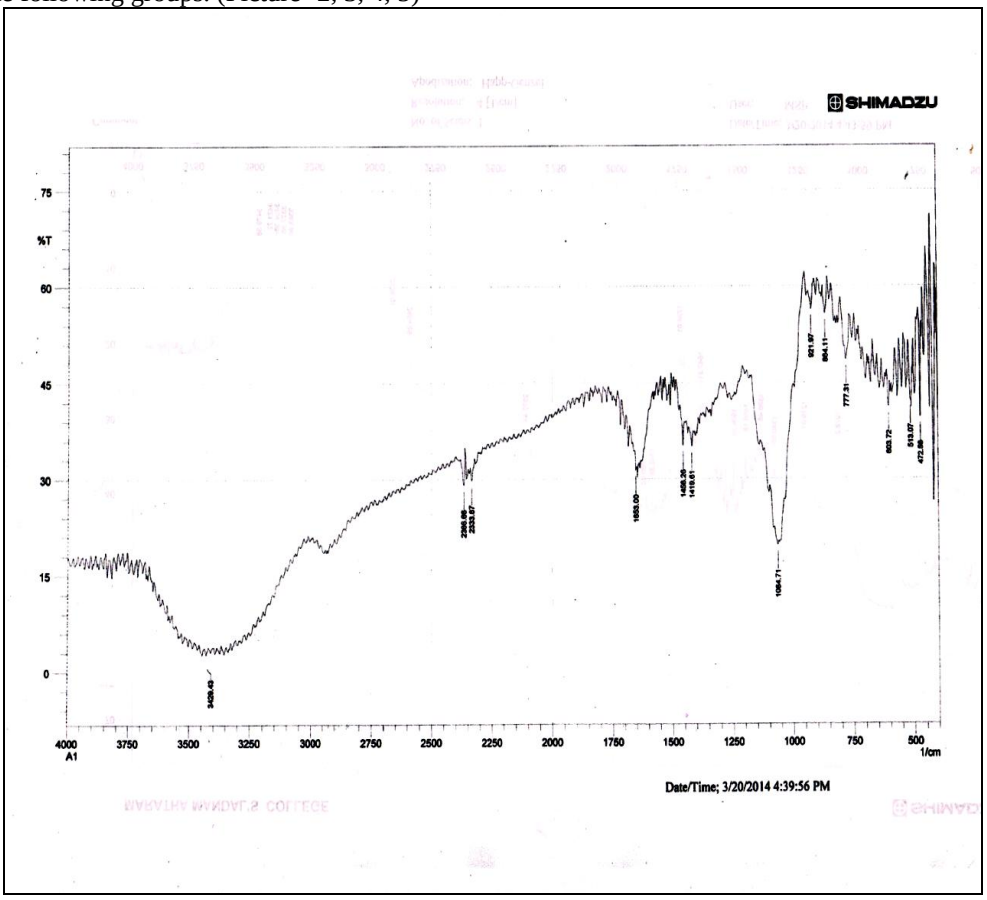

FIGURE 2: IR Spectrum of Apple peel extract

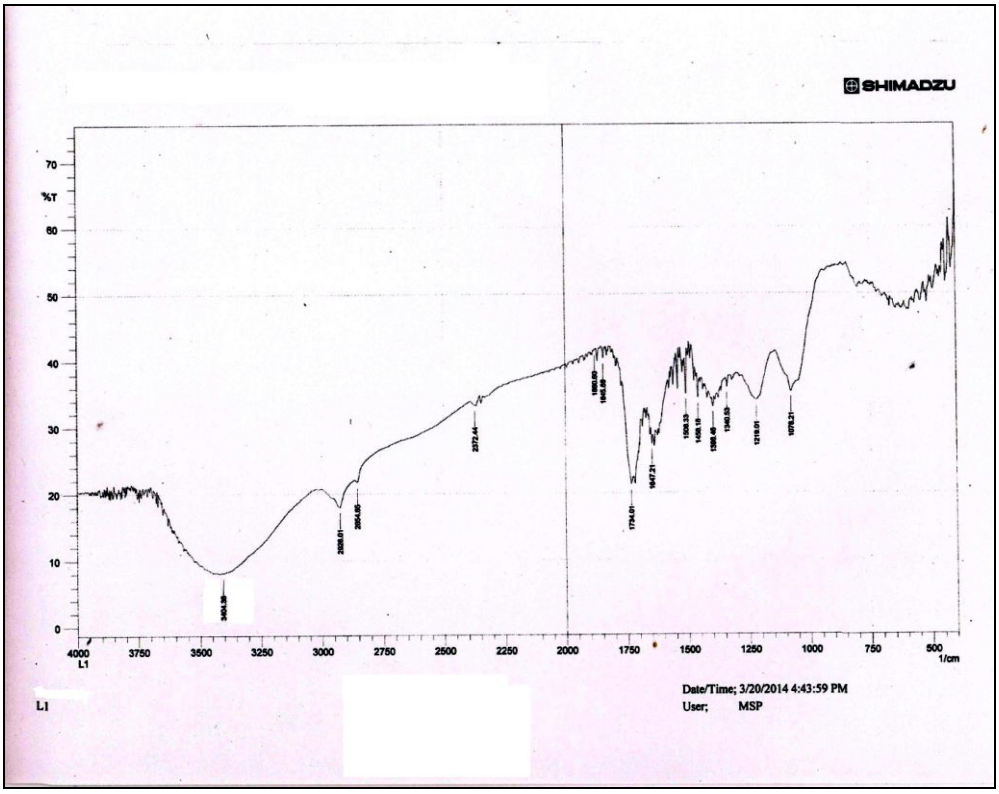

FIGURE 3: IR Spectrum of Lemon peel extract

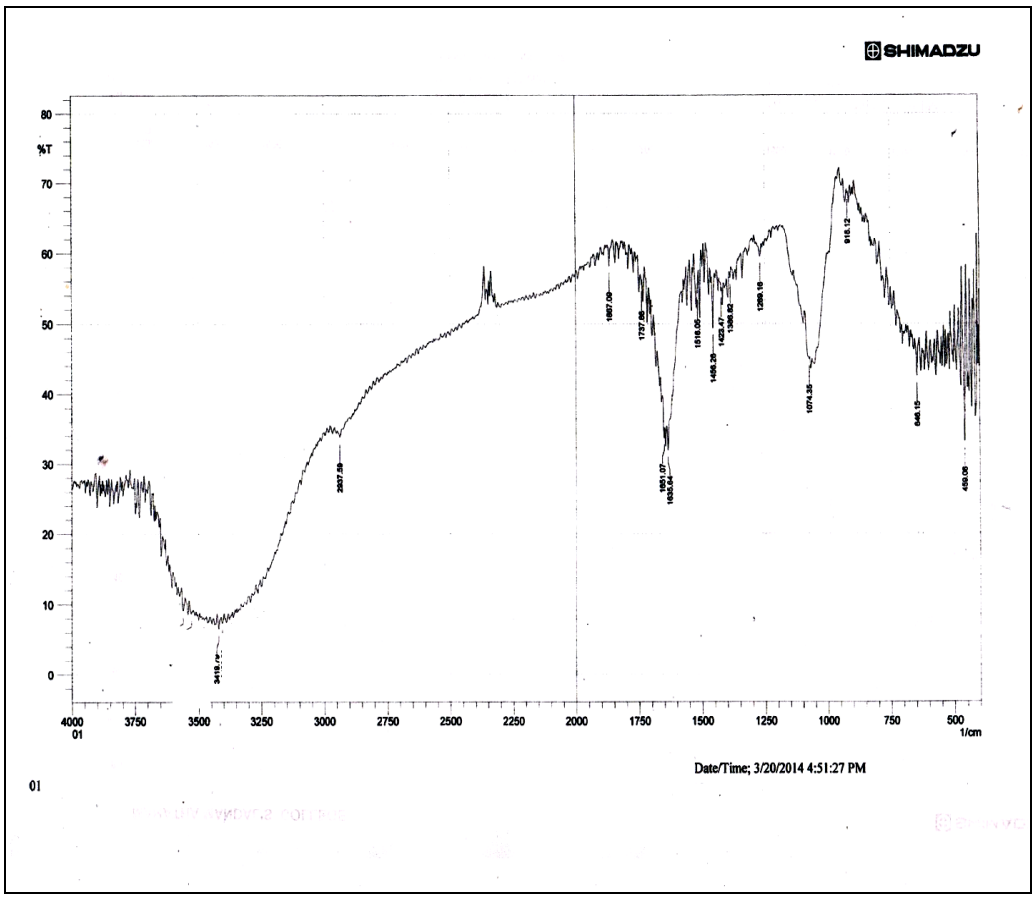

FIGURE 4: **IR Spectrum of Orange peel**

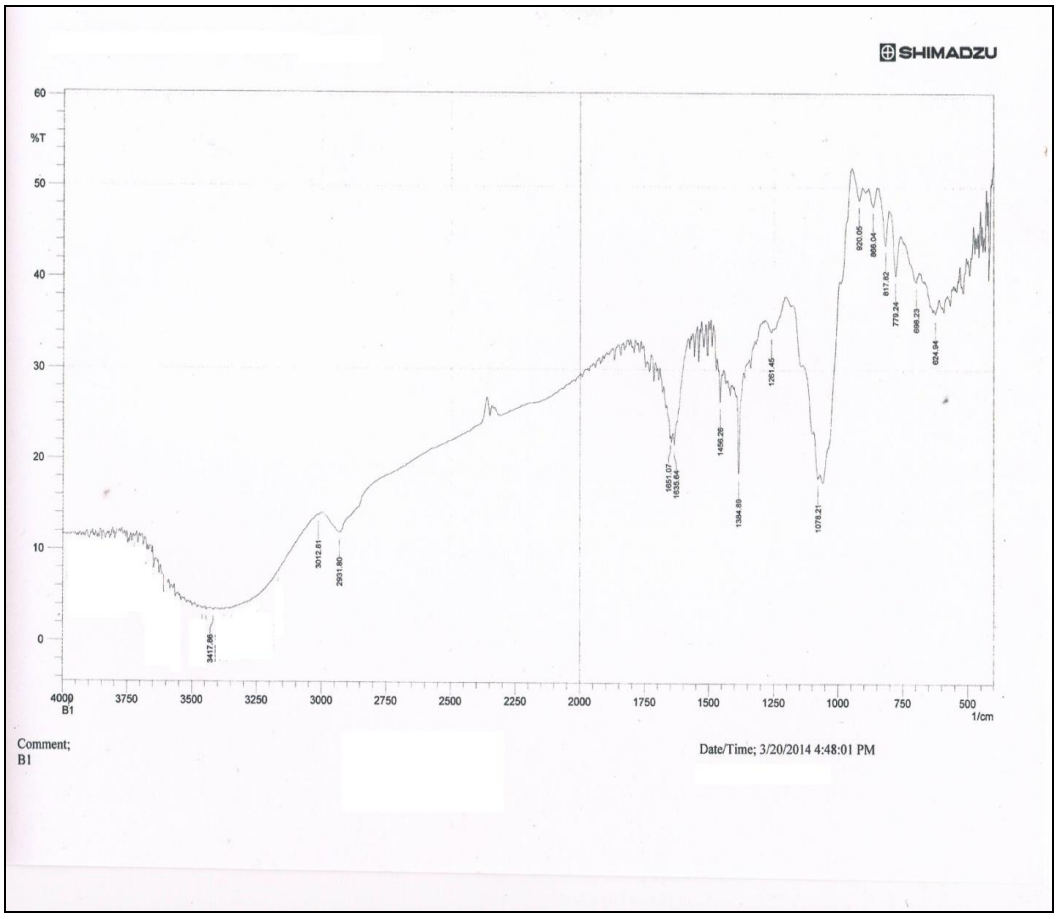

FIGURE 5: IR Spectrum of Banana peel

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HPTLC study of extract

High-performance thin-layer chromatographic (HPTLC) analysis of the apple peel extract was carried out using Anchrom-HPTLC with CAMAG Scanner. The separation was carried out on a TLC aluminium plates precoated with silica gel 60F-254 as the stationary phase, eluted with chloroform–ethylacetate–formic acid (2.5 : 1 : 0.1) as mobile phase. This system was found to give compact spot for *trans*-resveratrol (*Rf* value of 0.40_0.03) (Fig 6).

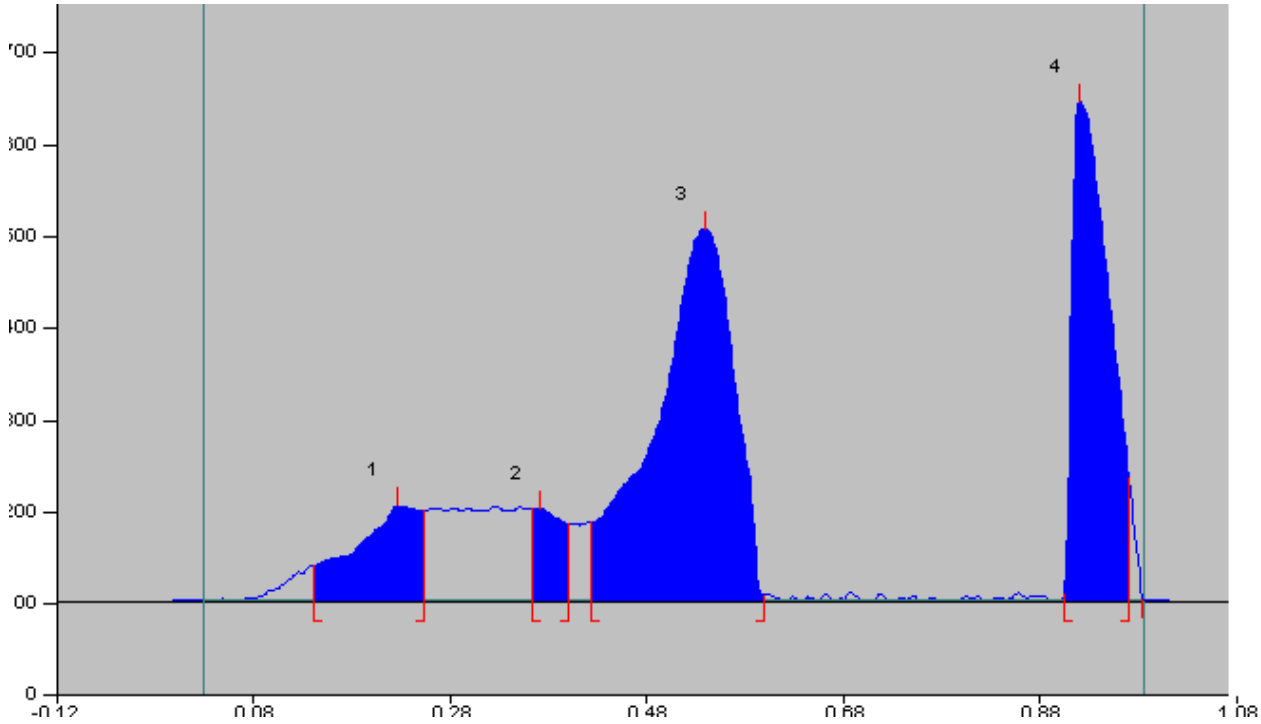
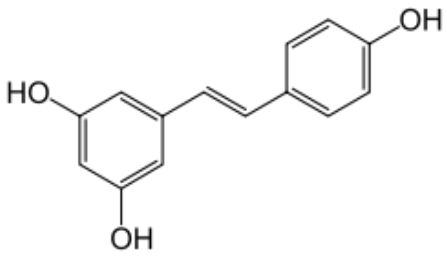


FIGURE 6: High-performance thin-layer chromatographic (HPTLC) analysis of the apple peel extract

Linear ascending development was carried out in 20 cm_10 cm twin trough glass chamber (Camag Muttenz, Switzerland) using mobile phase consists of chloroform–ethylacetate–formic acid (2.5 : 1 : 0.1). The length of chromatogram run was 8 cm. Subsequent to the scanning, TLC plates were air dried and scanning was performed on a Camag TLC scanner III in absorbance mode at 313 nm and operated by Cats software 4.03 version. Evaluation was via peak areas with linear regression (Katta VK, 2005).



resveratrol

DISCUSSION

The preliminary Phytochemical investigations of the extracts have revealed the presence of important groups (Table 1) such as steroids, alkaloids, terpenoids, flavanoids, tannins and saponins. The spectral data carried out by UV-VIS spectroscopy and FT-IR also has confirmed the presence of these active constituents in the extracts. The UV-VIS spectra of extracts shown characteristic absorption peaks between λmax- 200 nm and 400 nm (picture (1) (table no-2) . These correspond to conjugated dienes present in the extracts. Later, the IR spectra of the extracts have shown the presence of alcoholic OH groups, carbonyl groups and CH-aliphatic groups and vinyl group (C=C) in them at their characteristic values (fig -2,3,4 and 5)(table 3). HPTLC analysis of the apple peel extract has also shown the presence of vital constituents. As these Polyphenolic compounds are found to be present in these plant extracts, they may be responsible for the activity.

CONCLUSION

A study effort has been made for preparing a new Polyherbal toothpaste by combining the active constituents of the different extracts to for tooth decay.

For the present study, apple, lemon, banana, orange were subjected for extraction and these extracts were used for the a new polyherbal toothpaste with anti-microbial efficacy. The extracts of apple, lemon, and banana, orange, peels were studied for the phyto constituents present in them by phytochemical tests followed by spectral study like UV, IR and HPTLC study.

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