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Qualitative phytochemical analysis of Cinnamomum zeylanicumbark extract

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ABSTRACT
Phytochemical analysis plays a vital role in evaluating the potential medicinal value of cinnamon bark extracts and identifying the essential active components responsible for the bioactivity of the plant.Therefore, in the current study, we attempted to elucidate these groups using standard phytochemical screening procedures. The results showed that alkaloids, glycosides, tannins, gums, resins, flavonoids, steroids, fixed oils, and proteins were all detected.However, phlobatannins were not noticeable. Anthraquinone glycosides and terpenoid content were suspicious. The results of the current studyrevealedthat Ceylon cinnamon extract is a rich source of phytochemicals, indicating prospective antioxidant activity.This mightbe attributed to the existence of potent antioxidants like flavonoids and various phenolic compounds, which serve as readily available natural sources of antioxidants. Hence, they could potentially be utilized as a dietary supplement within the pharmaceutical sector.Moreover, the findings of this research could offer valuable insights to assist in the practical implementation of this nutraceutical in various sectors such as food, cosmetics, and medicinal fields.

Keywords: alternative medicine, Cinnamomum zeylanicum bark, phytochemical analysis

I. INTRODUCTION

In the history of mankind, herbal remedy has been the primary form of healthcare. The resurgence of interest in plant-derived drugs can be attributed to a growing awareness of the limitations of pharmaceutical products for serious diseases, and a second reason is that most people believe 'green medicine' is safer, less expensive, and more accessible alternative to synthetic drugs, which often have a myriad of side effects (Behairy et al., 2023). So, A primary objective of the World Health Organization (WHO) is to promote and support the use of traditional medicine in healthcare programs around the world (Pandey and Tripathi, 2014). According to experimental evidence, the synergistic interactions between the numerous components of entire plant fractions lead to considerably superior pharmacological capabilities than those of their separate isolated elements (Vaou et al., 2022).

Plants provide a plethora of rich, highly diversified compounds of beneficial ingredients that may be difficult to be synthesized in a biosynthesis laboratory, and they also serve to supplement the body's natural antioxidant needs (Altemimi et al., 2017). Phytochemicals are secondary metabolites of plants, which are vital components of our diet as they have beneficial properties like antioxidant, anti-inflammatory, antimicrobial, immune-modulating, analgesic, antithrombotic, insecticidal, and fungicidal effects (Poonam Talwan et al., 2023). Researchers have found that antioxidants are useful for protecting the body against damage caused by reactive free radicals in atherosclerosis, ischemic heart disease, cancer, as well as aging (Ibrahim and Hussein, 2017). In the current era, phytochemistry has evolved as a distinct field of study. It has a crucial in identifying therapeutically relevant plant compounds as well as discovering new drug molecules for the pharmaceutical industry's development (Neelima et al., 2011;Rainsford and Alamgir, 2018).

Among spices, cinnamon, which is a well-known nutraceutical, is used as an herbal remedy, and it is widely used in the food and pharmaceutical sectors as a preservative and flavoring agent (Ribeiro et al., 2019; Goel and Mishra, 2020). Cinnamomum verum, often known as the "Ceylon cinnamon" tree, is a tiny evergreen tree from the Lauraceae family, indigenous to Sri Lanka and tropical southern India, growing from sea level to nine meters (Ranasinghe et al., 2013; Hameed et al., 2016). Cinnamon has a quill shape, and it is stripped of outer cork and underlying

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parenchyma. It is characterized by a dull yellowish-brown color (externally) and dark yellowish brown (internally). It has a characteristic sweetish taste and aromatic flavor whichis derived from cinnamaldehyde, the main ingredient, and its essential oil (Hameed et al., 2016; Suriyagoda et al., 2021).

Cinnamon bark majorly contains condensed tannins, flavonoids, coumarins, lignans, essential oils (up to 4%) and sterols(Trifan et al., 2021).Cinnamomum verum comprises a variety of resinous compounds primarily cinnamaldehyde, as well as other bioactive substances including cinnamic acid,cinnamyl acetate, eugenol,carvacrol,weitherhin, diterpenes, and proanthocyanidins,etc. (Hannan and Md.Muslim, 2018; Goel and Mishra, 2020).Processed cinnamon bark is one of the most favored spices used worldwide not only for cooking but also in various industrial entities, e.g., baked foods, confectionery,chewing gums, seasonings, drinks, candies, toothpaste, essence perfumes, cosmetics industries, toiletries, and disinfectants used in hospitals (Goel and Mishra, 2020; Trifan et al., 2021).

Cinnamon extracts are eliciting beneficial and health-promoting properties, particularly as an anti-inflammatory, anticancer(George et al., 2024), antioxidant, antibacterial(Nikam et al., 2023), antiviral, antidiabetic, and anti-hypertriglyceridemic agent(Muhammad et al., 2021)**,** antimycotic, cytotoxic and antimutagenic activities (Mathew and Abraham, 2006)**,** vasodilatory(Maruthamuthu and Ramanathan, 2016)**,** anti-diarrheal, anti-flatulent, stimulant, anti-termitic, mosquito larvicidal, nematocidal, hepatoprotective(Pratibha et al., 2018), neuroprotective, antidepressant (Trifan et al., 2021)**,** analgesic, antipyretic (Pandey et al., 2014)**,** stomachic and insulin-potentiating properties(Gurel et al., 2022)**.**Since time immemorial, people have used cinnamon to cure a variety of ailments, including headaches, fever, inflammatory conditions, gastrointestinal disturbances (anorexia, infantile diarrhea, andflatulent colic), respiratory diseases (bronchitis, common cold, and asthma)(Trifan et al., 2021), myalgia, arthralgia, amenorrhea(Gunawardena et al., 2015**;**Vakilwala et al., 2017), type II diabetes, and insulin resistance (Pandey et al., 2014)**.** Cinnamon has a plenty of antioxidants that aid in eliminating free radicals which have the potential to transform into cancerous cells (Pradhan and Bhadra, 2020).

Although plant compounds are analyzed nowadays using a wide range of techniques, classic qualitative tests remain important and extensively utilized.

However, systematic research is still required for further screening these phytochemicals and assessing how well they can protect against certain diseases (Rainsford and Alamgir, 2018). Consequently, the goal was to conduct a preliminary phytochemical investigation of the Cinnamomum bark extract.

II. MATERIALS AND METHODS

2.1. Collection of plant material

The CZB (Cinnamomum zeylanicum bark)is readily available in our local market; 500 grams of the dry bark was obtained from Harraz® company, which islocated in Shubra, Cairo, and then identified by a botany expert(Fig.1).

Figure (1): Cinnamomum zeylanicumbark was identified by a botany specialist.

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2.2. Sample Preparation

The bark of C. zeylanicum was rinsed thoroughly with running tap water to remove the adhering dust particles and then with sterile distilled water, air dried in a shaded place. After complete drying, barks were pulverized well using a mixer. Then the powdered material was weighed and kept in an airtight clean container and stored in a refrigerator until use.

2.3. Equipment

Beakers, test tubes, test tube holder, pipettes, measuring cylinder, hot flame, Whatman No. 1 filter papers, digital scale, glass rod, dropper, spatula, mixer, funnel, magnetic stirrer, ultrasonic, rotavapor.

2.4. Chemicals and reagents

All chemicals and reagents utilized in the study were of analytical grade.

Ethyl alcohol used for extraction (about 4 liters): 70% v/v (70ml absolute ethanol: 30ml distilled water).

The reagents used for detecting various phytochemical groups included Wagner's, Tannic acid, Dragendorff's, Hager's reagents (for Alkaloid detection), Benedict's, Fehling's, Molisch's reagents (for Glycosides), Vanillin (for Gallic acid), Hydrochloric acid regent (for Phlobatannins), Lead acetate, Gelatin, FeCl3 reagents (for Tannins/Phenols), Wilson's and Alkaline regents (for Flavonoids), Absolute alcohol (for Gum), Distilled water (for Resins), and Biuret regent (for Proteins).

2.5. Preparation of the plant extract

The extract was prepared by maceration, assisted by ultrasound, using ethanol(70%) as it ismore polar than pure ethanol.Additionally, Ethanol was recorded to be more effective in penetrating the cellular membrane and releasing intracellular components from plant material.As a result, 70% ethanol may extract more beneficial flavonoid molecules(Tiwari et al., 2011). Furthermore, a greater contact area between the liquid and solid phases is produced by ultrasound's disruption of cells and particle sizereduction(Muhammad et al., 2021).

A known amount (500 g) of the crushed bark soaked in a certain volume (5 Liters) of ethanol (70%) in tightly closed Erlenmeyer flasks. A constant agitation and/or stirring process was carried out during the 72-hour maceration period under refrigeration. The hydro-ethanolic extract waspurifiedby filter paper(Whatman No.1)and then concentrated using rotary evaporatorat 40-50°Cin a pre-weighed,cleanflask. The recovered semisolid extractwasweighed andstored at 4 °C in a refrigerator(Khalisyaseen and Mohammed, 2021).

ExtractionYieldwas calculated according to Kawi et al. (2021) as follows:

%Yield = (Weight of extract / Weight of initial plant powder) × 100%

2.6. Qualitative phytochemical analysis

Phytochemical examinations of CZB extract were performed for the hydro-ethanolic extract as per the standard methods for the detection of tannins, saponin, steroids, terpenoids, phenols, glycosides, alkaloids,flavonoids, gum, resins,proteins, and oils following the procedures of Neelima et al. (2011); El-Mahmoudy (2024).

2.6.1. Detection of alkaloids

Dragendorff's test: One milliliter of the extract was measured and put in a test tube. After that, 1 mL of Dragendorff's reagent (potassium bismuth iodide solution) was added and well mixed.Alkaloidswere indicated by the formation of an orange-red deposit.

Wagner's test: Equal volumes of the extract and Wagner's reagent (iodine in potassium iodide) were put in a clean dry test tube and agitated. The appearance of a reddish-brown precipitate revealed the presence of alkaloids.

Hager's test: Filtrate was treated with a saturated picric acid solution (Hager's reagent).The presence of alkaloids was evidenced by the production of a yellow precipitate.

Tannic acid test:When a 10% tannic acid solution was added to the extract, a buff-colored precipitate resulted.

2.6.2. Detection of glycosides/carbohydrates

The detection was performed according to the classical procedures with minor modifications, in the following tests:

Molisch's test: Filtrates were treated with 2 drops of alcoholic α-naphthol solution in a test tube. After adding 2 mL of sulphuric acid to the inside wall of the tube, a violet ring formed at the junction, indicating the presence of glycosides and carbohydrates.

Fehling's test: Equal parts of the concentrated extract and Fehling's reagent were combined and heated for a short while. The existence of specific glycones as a component of glycosides and

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carbswas elucidated by precipitation with color change ranging from yellow to reddish brown.
Benedict's test: In a dry, clean test tube, equal aliquots of the extract and Benedict's reagent were combined, and the mixture was heated slowly for several minutes. The existence of reducing sugar(s) as a component (or not) of glycosides and carbohydrates is indicated by precipitation, which changes in color from yellow to reddish brown.

The following tests were conducted to detect certain glycoside categories:

Killer-Killiani test:In a clean and dry test tube, two mL of glacial acetic acid and a drop of ferric chloride solution were mixed with five mL of cinnamon bark extract. A zone above the prepared mixture was formed by adding one mL of concentrated sulphuric acid. The development of a bluish-brown ring at the junction implies cardiac glycosides.

Modified Borntrager's Test:The extracts were boiled for approximately five minutes after being treated with a solution of ferric chloride. Equal amounts of benzene were added to the mixture once it had cooled. After being separated, an ammonia solution was applied to the benzene layer. The ammonical layer turns rose-pink, which confirms the presence of anthraquinone glycosides.

2.6.3. Detection of saponins

Foam (Froth) test:A few drops of distilled water were mixed with a small amount of the extract and vigorously shaken. The development of a one-centimeter layer of persistent foam revealed the presence of saponins. Then, a few drops of olive oil were added to the formed froth and agitated. Emulsion formation confirms the result.

2.6.4. Detection of tannins/phenols

About 2 g of the powdered bark was extracted in 20 mL of 70% ethanol by heating in a water bath for 10 minutes at 70 °C, and the Cinnamon bark extract was analyzed for tannins and other phenolic components using the following procedures.

Gelatin test:In a clean, dry test tube, equal parts extract and 1% gelatin solution in sodium chloride (0.85%) were combined. White/cloudy/buffy precipitate shows the presence of tanninsin the extract.

Lead acetate test:Two milliliters of 10% lead acetate were filtered, and then mixed with two milliliters of the extract. The presence of phenolic and tannin chemicals is indicated by a thick, bulky white precipitate.

Ferric Chloride test:An aliquot of two milliliters of the obtained extract was mixed with a few drops of 1% FeCl3 solution; the appearance of a greenish or bluish-black color denotes the existence of Gallo- or Catechu-tannins (hydrolysable or condensed), respectively.

Hydrochloric acid test:Phlobatannins were indicated by the emergence of a crimson precipitate when half a gram of the crushed powdered bark was heated for ten minutes in five milliliters of 1% HCl.

Vanillin test:The alcoholic bark extract was placed in an aliquot and mixed with five mL of vanillin-HCl reagent. Gallic acid, a hydrolysable tannin, is indicated by the production of a red or pink deposit.

2.6.5.Detection of flavonoids

Wilson's test:If any flavonoids are present in the bark extract, they turn a bright yellow with yellowish-green fluorescence when treated with Wilson's reagent.
Alkaline reagent test:After treating two milliliters of the bark extract with a 10% ammonium hydroxide solution, the presence of flavonoids is denoted by yellow fluorescence.

2.6.6. Detection of resins

Distilled water test:A white precipitate that forms when roughly 5 mL of distilled water is added to the ethanolic extract indicates the presence of resinous material.

2.6.7. Detection of Gums/Mucilage

In a dry, cleantest tube, absolute alcohol was gradually added to the cinnamon bark extract while it was continuously stirred. Gumsare indicated by the formation of a cloudy white precipitate.

2.6.8. Detection of Terpenoids/Steroids

Salkowski's test:Apply a few drops of concentrated sulfuric acid to the test tube wall after treating the extract in chloroform, shake thoroughly, and let stand for a while. The formation of a golden-yellow precipitate suggests triterpenoids, whereas the presence of steroids is confirmed by a reddish color at the lower layer.
Libermann-Burchard test:A few drops of acetic anhydride are added to the extract, which is then heated, cooled, and conc. sulfuric acid is added from the test tube's sides. The extract exhibits a

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brown ring at the intersection of two layers, and the upper layer turns green, signifying the presence of steroids, while the appearance of a deep red color indicates the presence of terpenoids.

2.6.9. Detection of Fixed oils

Spot (Stain) test:Between the folds of filter paper, a tiny amount of extract was compressed. The emergence of oil stains indicated fixed oil content in the extract.

2.6.10. Detection of Proteins/Amino acids

Tests for proteins and free amino acids were performed on the extract, including:
Biuret test:A small amount of Biuret reagent was added to a 2 mL filtrate. The presence of peptide bonds/proteins wasindicated by the change in color from light blue to violet/mauve.

2.7. Data presentation and analysis

For every active group, a triplicate ofeach qualitative screening test was conducted.Based on the intensity of the color or precipitate that formed,the positive results' strong to weak range arerepresented by the symbols(± to +++). Negative outcomes are denoted by a (-).

III. RESULTS

Yield percentage of the plant extract
This research used500 grams ofcinnamon bark. After the maceration and evaporation processes, the weight of the extract was 48.5 grams. So,the yield was calculated following the equation:

$$\text{Extraction yield (\%)} = \frac{\text{weight of extract (g)}}{\text{weight of initial plant material (g)}} \times 100\%$$

$$= \frac{48.5}{500} \times 100\% = 9.7\%$$

Qualitative phytochemical screening

Interesting bioactive compounds were detected in the CZB through Phyto-screening tests. These included Alkaloids,Glycosides,special Glycoside categories,tannins, Flavonoids, Saponins, Gums,Resins, Steroids, Proteins, and Fixed oils (Tables 1, 2, 3). Phlobatannins were not noticeable (Table 2). The presence of anthraquinones and terpenoids is suspicious (Table 1&3).

Table (1): Detection findings of Alkaloids,Carbohydrates, and particularGlycosidecategories screeningin the cinnamon bark.

Functional group	Test	Result
Alkaloids	Wagner's	+++
	Tannic acid	++
	Dragendorff's	++
	Hager's	+
Glycosides	Benedict's	+++
	Fehling's	++
	Molisch's	++
Anthraquinones	Modified Borntrager's Test	±
Cardiac Glycosides	Killer-Killiani	++

The table showed the presence ofAlkaloids, Glycosides, andspecial Glycoside groupsin the phytochemical analysis of Cinnamomum zeylanicum bark. However, it denotedthe suspicion of Anthraquinonesin its screening.

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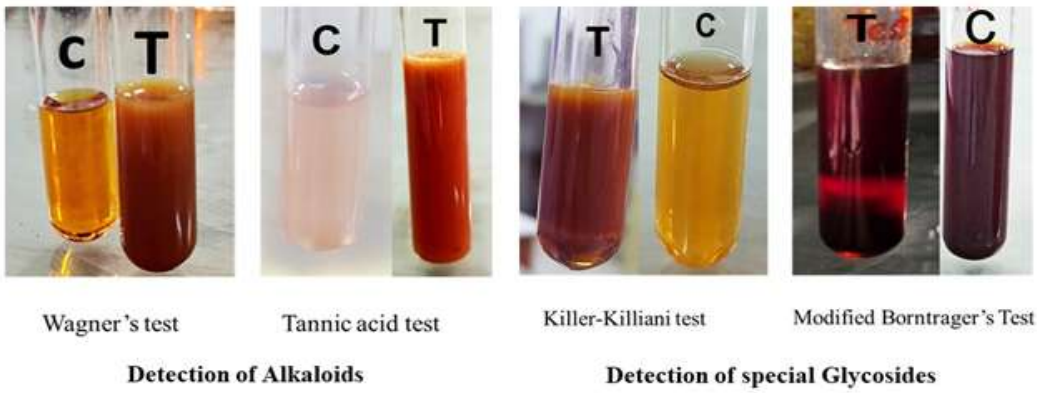

Figure (2)

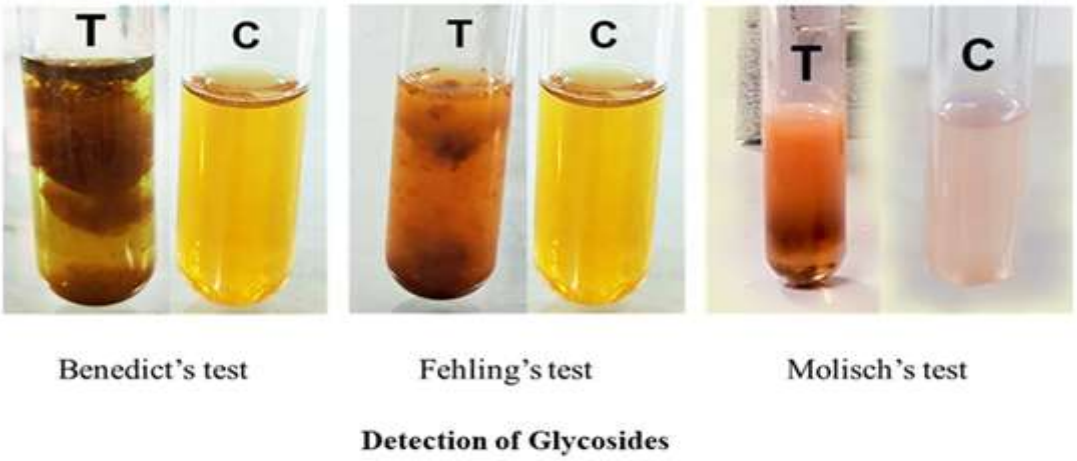

Figure (3)

Table (2): Detection findings ofPhenols/Tannins, specific Tannin groups,Saponins, and Flavonoid compounds screeningin the cinnamon bark.

Functional Group	Test	Result
Tannins/Phenols	Lead acetate	+++
	Gelatin	++
	Ferric chloride	+++
Gallic acid	Vanillin	+
Phlobatannins	Hydrochloric acid	-
Saponins	Foam (Froth)	++
Flavonoids	Alkaline reagent	++
	Wilson's	++
	Lead acetate	+++

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The table revealed thepositive detection ofCatechu-orGallo- tannins, gallic acid,Saponins, and Flavonoids in the phytochemical screeningof Ceylon cinnamon bark. On the other hand, itdetected the absence of Phlobatannincontent.

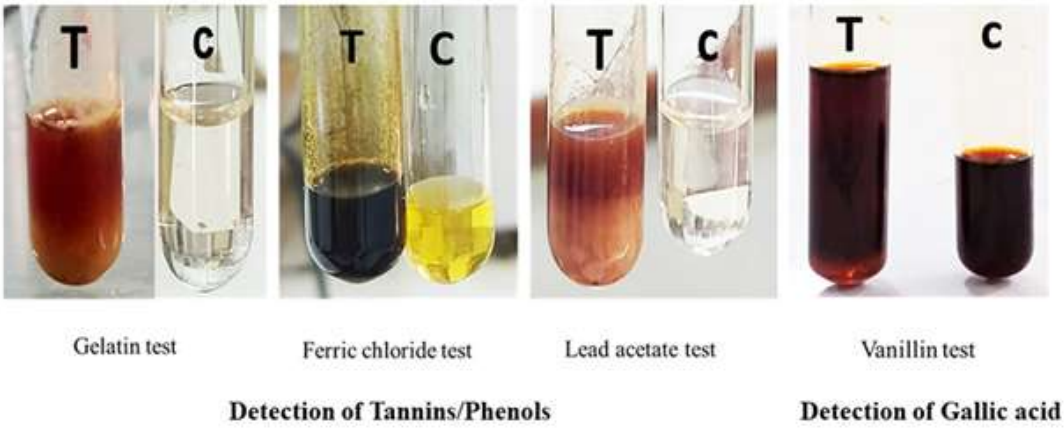

Figure (4)

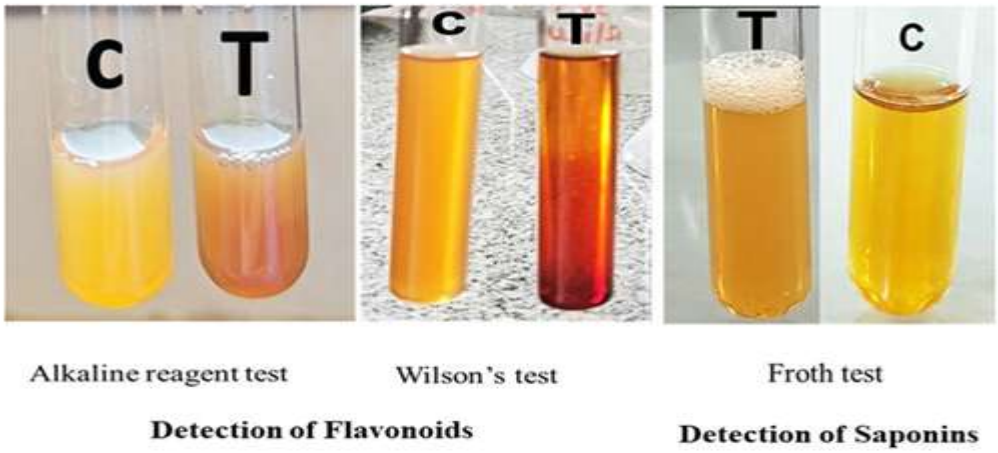

Figure (5)

Table (3): Detection findings ofMucilage, Resins, Steroids/Terpenoids, Fixed Oils, and Proteinscreeningin the cinnamon bark.

Functional Group	Test	Result
Mucilage	Absolute alcohol	+++
Resins	Distilled water	+++
Steroids/Terpenoids	Salkowski's test	++
	Libermann-Burchard	±
Fixed Oils	Stain	+
Protein	Biuret	+

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The table showed the presence ofGums,Resins, Steroids,Proteins, and Fixed oils in the Cinnamomum zeylanicumphytochemical investigationas well as the suspicion of Terpenoid content.

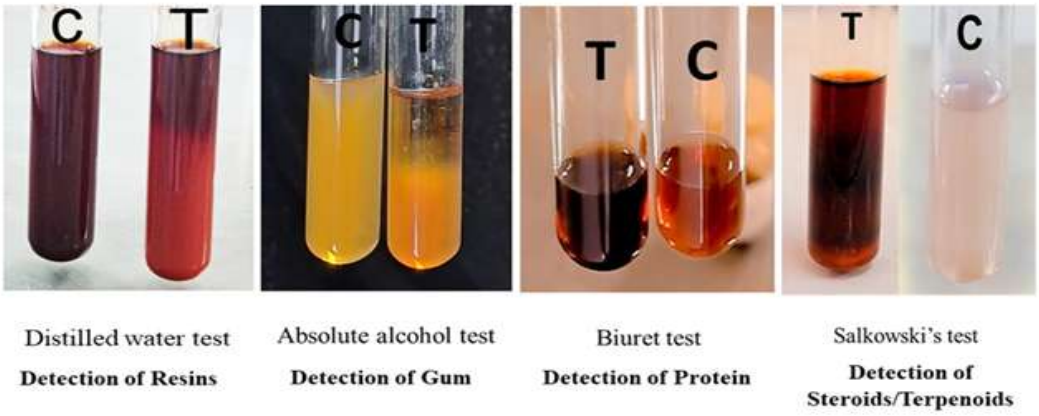

Figure (6)

IV. DISCUSSION

Traditional herbal medicine has attracted the interest of several global authorities. Remarkably, using medicinal plants has recently gained popularity in many countries, including those that heavily rely on chemical medications (Azizi and Keshavarzi, 2015).Medicinal plants used to treat various maladies and disorders are the most abundant natural reservoirs of phytochemicals. Plants' therapeutic qualities are determined by their phytochemical ingredients (Shaikh and Patil, 2020). They are a rich source of several antioxidants, which are necessary for leading a healthy life.Recently, there has been a renewed interest in antioxidants derived from natural sources to avoid the negative impact of synthetic antioxidants (Al-Tohamy et al.,2018). Furthermore, plant-based medicine may be a viable alternative in the event of drug resistance (Abubakar and Haque, 2020).Interestingly, almost 80% of people in affluent countries utilize herbalremedies.Therefore, the demand for such plant screening has grown in order to better understand their features, efficiency, and safety(Rajendran et al.,2017).Cinnamon is a valuable medicinal spice with multiple applications. Despite prior research on the phytochemical screening of CinnamomumZeylanicum bark extract, the current study is based on different bioactive ingredients of CZB associated with various environments and research strategies.

In the current study,CZB extract was revealed to have Alkaloids,Carbohydrates,and Cardiac Glycosideswith suspected detection of Anthraquinones (Table1). These findings are parallel with those of Ramaswamy et al. (2017) who discovered Glycoside and Alkaloid content in the ethanolic bark extract. Moreover,it was reported the existence of Cardiac Glycosides in the cinnamon bark, which is in harmony with the screening of Kawi et al. (2021). On the other hand, these yields are partially compatible with those ofAbdalla and Abdelgadir (2016) whostated thatAnthraquinones are missing in the CZB extract.

Alkaloids possess a crucial role in the immune status of animals and plants (Charjan et al.,2019).They are also used as pain relievers(Pratibha et al.,2018). Furthermore, they lower the risk of stress and exhibit beneficial antibacterial activity(Khalisyaseen and Mohammed, 2021). Some alkaloid compounds that have antioxidant properties include quinolones, caffeine, and indole (Sirait et al.,2023).Anthraquinones and coumarins are among plant glycosides that function as anti-hypertensive agents.They can also be applied to treat congestive heart failure(Kadam et al.,2015). Cardiac glycosides have lately been utilized to treat malignancies, as well as to manage atrial arrhythmia and cardiopathy(Prassas and Diamandis, 2008).

Our screening revealed positive detection of Saponins, Flavonoids, Phenolic compounds, and Tannins. However, a few active groups were absent, such as Phlobatannins (Table 2).These results are congruent with those obtained by KhalisYaseen and Mohammed (2023), who revealed the positive appearance of Phenols, Flavonoids, and Saponins in the cinnamon aqueous extract. These data were confirmed by Sirait et al.

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(2023) who reported the same findings in the cinnamon ethanolic extract.However, this partially conflicts with the screening of Ramaswamy et al. (2017) who also detected Phlobatannins besides Flavonoids, Saponins, Phenols, and Tannins in the bark ethanolic extract.

Tannins and Phenolic compounds act as antioxidantsthrough preventing molecule oxidation by donating hydrogen atoms to free radicals(Khalisyaseen and Mohammed, 2021). Remarkably,they havevarious biological properties likeanti-inflammatory, anti-neoplastic, cardiovascular protective (Kadam et al.,2015),anti-parasitic, antibacterial, antiviral and antiallergic activity(Ramaswamy et al.,2017)**.**It is anticipated that phenolic compounds will prevent a number of chronic ailments due to their ability to limit peroxidation processes(Varalakshmi et al.,2017).Tannins generally possess an astringent activity. As a result, they are taken orally to control internal bleedinganddiarrhea as well as an anti-poisoning medication(Charjan et al.,2019).Flavonoids are powerful antioxidants that have an essential role in lowering the risk of major chronic diseases in humans, including diabetes, cardiovascular, and renal disorders.Khalisyaseen and Mohammed (2021) stated thatthey werethe most likely substances inducingcytotoxic effects in vitro.Saponins have both anti-hypercholesterolemic and antibacterial effects(Suman et al.,2018). They act as scavengers in cancer and aging (Khalisyaseen and Mohammed, 2021).Saponins have traditionally been utilized as detergents and insecticides, as well as in industrial uses such as foaming, surfactants, and favorable health benefits(Jyothiprabha and Venkatachalam, 2016).

As shown in Table (3), Phyto-screening of CZB extract yielded the presence of Resinous compounds, mucilage, Steroids, Proteins, and oils. Also, it revealed suspiciousTerpenoid content in its screening. Our data agree with thoseobtained by Ramaswamy et al. (2017), whofound that the ethanolic extracts of CZB contain Steroids, Terpenoids, Proteins, and amino acids. Another screening was conducted by GAJBHIYE and KOYANDE (2022), which detected the presence of Mucilage in the Cinnamomum verum alcoholic extract. On the other hand, there is partial conflict recorded between our findings and those of KhalisYaseen and Mohammed (2023), who stated thatResins and Terpenoids are existing, but Steroids and Proteins are not noticeable in the aqueous extract of CZB.This variation may be related to research methodology and environment. In addition, the soil in which the plant has grown, that is the source of its chemical constituents, may be different.

Natural resinous compounds have been known for their antibacterial and antiseptic effects since the beginning of human civilization(Shuaib et al., 2013).Different types of mucilage are currently used as thickening, emulsifying, binding agents, and medication excipients in the pharmaceutical industry. Furthermore, mucilage has been included in drug formulations to treat gastrointestinal tract inflammation through masking mucous membranes to stop nerve terminals from being stimulated(Amiri et al., 2021).The antioxidant activity of terpenes as scavengers protects against diabetes, lowers hydrogen peroxide, and prevents cell injury (KhalisYaseen and Mohammed, 2023).Terpenoids have been reported to be applied to control asthma, coughs, and hay fever(Kadam et al., 2015).Steroids are vital to the pharmaceutical industry since they include molecules like sex hormones and can be used to manufacture drugs(Suman et al., 2018).Proteins and carbohydrates are required for maintenance of the animal body. Therefore, they are responsible for the nutritional power of the spice(Kadam et al., 2015).Extracted fixed oils are used for food flavoring, dessert preservatives, edible fat stabilization (e.g., cotton seed oil) as well astheir pharmaceutical applications(Mahboubi, 2018).

V. CONCLUSION

The current findings revealed thatthe Cinnamomum zeylanicumextract was a good source of phytochemicals, which may account for its antioxidant capacity. People's health can be greatly improved by consuming cinnamon on a daily basis.Therefore, further research should be done to develop a suitable form and route of administration for cinnamon to enhance its therapeutic effects.

REFERENCES

[1]. ABDALLA, R.M. and ABDELGADIR, A.E. (2016) Antibacterial Activity and Phytochemical Constituents of Cinnamomum verum and Matricaria chamomilla from Sudan. Bio Bulletin 2, 8–12.

[2]. ABUBAKAR, A.R. and HAQUE, M. (2020) Preparation of Medicinal Plants: Basic Extraction and Fractionation Procedures for Experimental Purposes. Journal of Pharmacy and Bioallied

International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 4 July-Aug 2024, pp: 946-957 www.ijprajournal.com ISSN: 2456-4494

Sciences 12, 1–10.

[3]. AL-TOHAMY, R., ALI, S.S., SAAD-ALLAH, K., FAREED, M., ALI, A., EL-BADRY, A., EL-ZAWAWY, N.A., WU, J., SUN, J., MAO, G.-H. and RUPANI, P.F. (2018) Phytochemical analysis and assessment of antioxidant and antimicrobial activities of some medicinal plant species from Egyptian flora. Journal of Applied Biomedicine 16, 289–300.

[4]. ALTEMIMI, A., LAKHSSASSI, N., BAHARLOUEI, A., WATSON, D. and LIGHTFOOT, D. (2017) Phytochemicals: Extraction, Isolation, and Identification of Bioactive Compounds from Plant Extracts. Plants 6, 1–23.

[5]. AMIRI, M.S., MOHAMMADZADEH, V., YAZDI, M.E.T., BARANI, M., RAHDAR, A. and KYZAS, G.Z. (2021) Plant-Based Gums and Mucilages Applications in Pharmacology and Nanomedicine: A Review. Molecules 26, 1770.

[6]. AZIZI, H. and KESHAVARZI, M. (2015) Ethnobotanical study of medicinal plants of Sardasht, Western Azerbaijan, northwestern Iran. J. of Herbal Drugs 6, 113–119.

[7]. BEHAIRY, A., ELKOMY, A., ELSAYED, F., GABALLA, M.M.S., SOLIMAN, A. and ABOUBAKR, M. (2023) Spirulina and Thymoquinone Protect Against Methotrexate-Induced Hepatic Injury in Rats. Revista Brasileira de Farmacognosia 34, 154–167.

[8]. CHARJAN, S.A., PAWAR, P.S., DASARI, P.S., PAWALE, P. and DESHMUKH, K. (2019) International phytochemical screening of market samples of tvak (cinnamomum zeylanicum breyn.). INTERNATIONAL AYURVEDIC MEDICAL JOURNAL 7, 1524–1530.

[9]. GAJBHIYE, N. and KOYANDE, A. (2022) Antimicrobial activity and phytochemical screening of methanolic extract of cinnamomum zeylanicum (commercial species). Asian Journal of Microbiology, Biotechnology and Environmental Sciences 23, 198–203.

[10]. GEORGE, T.M., M, P., PATIL, M.S., SAKSHI, S. and SHIFA (2024) Investigation of Anticancer Properties of Cinnamon Phytochemicals on Protein expression in Glioblastoma Multiforme Cell Lines (U87-MG). IP Indian Journal of Neurosciences 10, 30–39.

[11]. GOEL, B. and MISHRA, S. (2020) Medicinal and Nutritional Perspective of Cinnamon: A Mini-review. European Journal of Medicinal Plants 31, 10–16.

[12]. GUNAWARDENA, D., KARUNAWEERA, N., LEE, S., VAN DER KOOY, F., HARMAN, D.G., RAJU, R., BENNETT, L., GYENGESI, E., SUCHER, N.J. and MÜNCH, G. (2015) Anti-inflammatory activity of cinnamon (C. zeylanicum and C. cassia) extracts - Identification of E-cinnamaldehyde and o-methoxy cinnamaldehyde as the most potent bioactive compounds. Food and Function 6, 910–919.

[13]. GUREL, A., TURK, A., AYDIN, H., GENC, F. and YALCIN, A. (2022) Cinnamons effect on apoptosis, inflammation and trpm2 channels in methotrexate induced renal damage. International Journal of Advanced Research in Medicine 4, 06–10.

[14]. HAMEED, I.H., ALTAMEME, H.J. and MOHAMMED, G.J. (2016) Evaluation of antifungal and antibacterial activity and analysis of bioactive phytochemical compounds of Cinnamomum zeylanicum (Cinnamon bark) using gas chromatography-mass spectrometry. Oriental Journal of Chemistry 32, 1769–1788.

[15]. HANNAN, M. and MD.MUSLIM, A. (2018) Evaluation of Phytochemicals and Antioxidant Potential of Cinnamomum zeylanicum. Journal of Emerging Technologies and Innovative Research 5, 251–257.

[16]. IBRAHIM, D. and HUSSEIN, R. (2017) Phytochemical Screening and Nematicidal Activity of Cinnamon and Ginger Extracts Against Root-knot Nematode (Meloidogyne incognita) Infecting Tomato. Egyptian Journal of Agronematology 16, 63–84.

[17]. JYOTHIPRABHA, V. and VENKATACHALAM, P. (2016) Preliminary Phytochemical Screening of Different Solvent Extracts of Selected lndian Spices. International Journal of Current Microbiology and Applied Sciences 5, 116–122.

International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 4 July-Aug 2024, pp: 946-957 www.ijprajournal.com ISSN: 2456-4494

[18]. KADAM, D.D., MANE, P.C. and CHAUDHARI, R.D. (2015) Phytochemical Screening and Pharmacological Applications of Some Selected Indian Spices. International Journal of Science and Research 4, 704–706.

[19]. KAWI, J.S., YULIANTI, E., LIMANAN, D. and FERDINAL, F. (2021) Phytochemicals Profiling and Total Antioxidant Capacity of Cinnamon Bark Extract (Cinnamomum burmanii). Advances in Health Sciences Research 41, 33–38.

[20]. KHALISYASEEN, O. and MOHAMMED, M.T. (2023) Analytical Detection of Phytochemical Compounds In Cinnamomum Zeylanicum Bark Extract. Egyptian Journal of Chemistry 66, 265–273.

[21]. KHALISYASEEN, O. and MOHAMMED, M.T. (2021) Identification Of Some Antioxidant Active Compounds In True Cinnamon (Cinnamomm Zeylanicum) Bark Extract. Nveo-natural volatiles & essential oilsJournal| Nveo 8, 7565–7577.

[22]. MAHBOUBI, M. (2018) Natural therapeutic approach of Nigella sativa (Black seed) fixed oil in management of Sinusitis. Integrative Medicine Research 7, 27–32.

[23]. MARUTHAMUTHU, R. and RAMANATHAN, K. (2016) Phytochemical analysis of bark extract of Cinnamomum verum: A medicinal herb used for the treatment of coronary heart disease in Malayali tribes, Pachamalai hills, Tamil Nadu, India. International Journal of Pharmacognosy and Phytochemical Research 8, 1218–1222.

[24]. MATHEW, S. and ABRAHAM, T.E. (2006) Studies on the antioxidant activities of cinnamon (Cinnamomum verum) bark extracts, through various in vitro models. Food Chemistry 94, 520–528.

[25]. MUHAMMAD, D.R.A., TUENTER, E., PATRIA, G.D., FOUBERT, K., PIETERS, L. and DEWETTINCK, K. (2021) Phytochemical composition and antioxidant activity of Cinnamomum burmannii Blume extracts and their potential application in white chocolate. Food Chemistry 340, 127983.

[26]. NEELIMA, N., DEVIDAS, N.G., SUDHAKAR, M. and KIRAN, J. (2011) a Preliminary Phytochemical Investigation on the Leaves of Solanum Xanthocarpum. International Journal of Research in Ayurveda & Pharmacy 2, 845–850.

[27]. NIKAM, S.T., PATHAK, S.A. and KAPALE, M. (2023) Phytochemical And Pharmacological Actions Of Cardamom , Cinnamon , Stevia , And Shankhpushpi : A Review Of Their Therapeutic Activities. International Journal of Creative Research Thoughts (IJCRT) 11, 418–423.

[28]. PANDEY, A. and TRIPATHI, S. (2014) Concept of standardization, extraction and pre phytochemical screening strategies for herbal drug. Journal of Pharmacognosy and Phytochemistry 2, 115–119.

[29]. PANDEY, S., PANDEY, R. and SINGH, R. (2014) Phytochemical Screening of Selected Medicinal Plant Cinnamon Zeylanicum bark extract, Area of research; Uttarakhand, India. International Journal of Scientific and Research Publications 4, 1–6.

[30]. POONAM TALWAN, DARSH GAUTAM, DEEXA SHARMA, AKHIL KUMAR, SAKSHAM SHARMA, SAHIL DHIMAN and APARANA THAKUR (2023) Pharmacognostic Profile, Phytochemical and Antioxidant Activity Estimation of Bark Extracts of Cinnamonum Zeylanicum. Eur. Chem. Bull 12, 249–259.

[31]. PRADHAN, D. and BHADRA, P. (2020) Cinnamon: In silico Analysis as Targeted Therapy for Gastric Cancer. Indian Journal of Natural Sciences 10, 20662–20669.

[32]. PRASSAS, I. and DIAMANDIS, E.P. (2008) Novel therapeutic applications of cardiac glycosides. Nature Reviews Drug Discovery 7, 926–935.

[33]. PRATIBHA, YADAV, S.S., BHANDARI, U. and NAIK, G. (2018) Antioxidant properties and phytochemical screening of commercial cinnamon bark. European Journal of Biomedical and Pharmaceutical Sciences 5, 964–970.

[34]. RAINSFORD, K.D. and ALAMGIR, A.N.M. (2018) Phytochemistry and Bioactive Compounds. http://www.springer.com/series/4857.

International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 4 July-Aug 2024, pp: 946-957 www.ijprajournal.com ISSN: 2456-4494

[35]. RAJENDRAN, A., RAFIQKHAN, M., SELVAM, D. and THANGARAJ, V. (2017) Pharmacognostic Profile and Phytochemical Analysis of Cinnamonum Zeylanicum Bark Extracts. Nehru E-Journal 5, 33–39.

[36]. RAMASWAMY, L., MADHAN SHANKAR, S. and G, T. (2017) Analysis of consortium of spices: ginger, cinnamon and ajwain on their phytochemical content and anticancerous effect on lung Cancer cell lines. Journal of Pharmacognosy and Phytochemistry 6, 83–88.

[37]. RANASINGHE, P., PIGERA, S., PREMAKUMARA, G.S., GALAPPATHTHY, P., CONSTANTINE, G.R. and KATULANDA, P. (2013) Medicinal properties of 'true' cinnamon (Cinnamomum zeylanicum): a systematic review. BMC Complementary and Alternative Medicine 13, 275.

[38]. RIBEIRO, P.R.E., DE CARVALHO NETO, M.F., REIS DE MELO, A.C.G., CHAGAS, P.C., CHAGAS, E.A., FERRAZ, V.P., FERNANDEZ, I.M. and DE MELO FILHO, A.A. (2019) Phytochemical composition and physical-chemical properties of fatty acids from cinnamomun zeylanicum nees seed oil. Chemical Engineering Transactions 75, 397–402.

[39]. SHAIKH, J.R. and PATIL, M. (2020) Qualitative tests for preliminary phytochemical screening: An overview. International Journal of Chemical Studies 8, 603–608.

[40]. SHUAIB, M., ALI, A., ALI, M., PANDA, B. and AHMAD, M. (2013) Antibacterial activity of resin rich plant extracts. Journal of Pharmacy And Bioallied Sciences 5, 265–269.

[41]. SIRAIT, T.S., ARIANTO, A. and DALIMUNTHE, A. (2023) Phytochemical Screening of Cinnamon Bark (Cinnamomum burmanii) (C. Ness &T. Ness) C. Ness Ex Blume Ethanol Extract and Antioxidant Activity Test with DPPH (2,2-diphenyl-1-picrylhydrazyl) Method. International Journal of Science, Technology & Management 4, 254–259.

[42]. SUMAN, U., DIVYA, Y., RAM, C. and NAVEEN, A. (2018) Evaluation of antibacterial and phytochemical properties of different spice extracts. African Journal of Microbiology Research 12, 27–37.

[43]. SURIYAGODA, L., MOHOTTI, A.J., VIDANARACHCHI, J.K., KODITHUWAKKU, S.P., CHATHURIKA, M., BANDARANAYAKE, P.C.G., HETHERINGTON, A.M. and BENERAGAMA, C.K. (2021) "Ceylon cinnamon": Much more than just a spice. PLANTS, PEOPLE, PLANET 3, 319–336.

[44]. TIWARI, P., KUMAR, B., KAUR, M., KAUR, G. and KAUR, H. (2011) Phytochemical screening and Extraction: A Review. Internationale Pharmaceutica Sciencia 1, 98–106.

[45]. TRIFAN, A., ZENGIN, G., BREBU, M., SKALICKA-WOŹNIAK, K. and LUCA, S.V. (2021) Phytochemical characterization and evaluation of the antioxidant and anti-enzymatic activity of five common spices: Focus on their essential oils and spent material extractives. Plants 10, 1–23.

[46]. VAKILWALA, M., MACAN, K. and TANDEL, A. (2017) Phytochemical Analysis and Antimicrobial Activity of Cinnamomum Verum. International Journal of Research and Scientific Innovation IV, 69–74.

[47]. VAOU, N., STAVROPOULOU, E., VOIDAROU, C. (Chrysa), TSAKRIS, Z., ROZOS, G., TSIGALOU, C. and BEZIRTZOGLOU, E. (2022) Interactions between Medical Plant-Derived Bioactive Compounds: Focus on Antimicrobial Combination Effects. Antibiotics 11, 1014.

[48]. VARALAKSHMI, B., ANAND, V., KARPAGAM, T., SHANMUGAPRIYA, A., GOMATHI, S., SUGUNABAI, J., SUGANYA, V., GEETHA, S. and SATHIANACHIYAR, S. (2017) Phytochemical Analysis of Cinnamomum zeylanicum Bark and Molecular Docking of Procyanidin B2 against the Transcription Factor Nf- κB. Free Radicals and Antioxidants 7, 195–199.