Assessment of Phytochemicals and *in vitro* Antioxidant Activity of Aqueous Extract of Wesley Herbal Tea

RESEARCH ARTICLE

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This article is part of a special issue titled Sustainability, innovation, and development: A Festschrift in honour of Rt. Rev. Prof. Obeka Samuel Sunday.

ABSTRACT

Wesley herbal tea is a blend of three medicinal plants; moringa, turmeric, and ginger in equal ratio (1:1:1 w/w/w). Various parts of these medicinal plants are used locally in the management of different ailments. Despite the myriad uses of moringa, turmeric and ginger in folklore medicine, there is limited research on the composite content of these plants in tea form. Therefore, this study was designed to investigate the presence of phytochemicals such as flavonoids, saponins, steroids, cardiac glycosides, alkaloids, tannins, cardenolides, phenolics, terpenes, anthraquinones, and terpenoids in the aqueous extract of Wesley herbal tea. The *in vitro* antioxidant status of the aqueous extract of Wesley herbal tea was also evaluated using 2,2-diphenyl-1-picrylhydrazyl (DPPH), H_2O_2, nitric oxide (NO), 2,2'-azinobis-(3-ethylbenzthiazoline-6-sulphonate) (ABTS), total antioxidant capacity and ferric reducing antioxidant power (FRAP) models. The qualitative analysis of Wesley herbal tea shows the presence of flavonoids, saponins, steroids, cardiac glycosides, alkaloids, tannins, cardenolides, terpenoids, phenolics, and terpenes while the quantitative analysis of Wesley herbal tea gave the following values; flavonoids (11.220±0.006 µg/ml), saponins (10.473±0.007 µg/ml), steroids (10.011±0.032 µg/ml), cardiac glycosides (8.147±0.007 µg/ml), alkaloids (6.433±0.033 µg/ml), tannins (2.323±0.009 µg/ml), cardenolides (2.213±0.009 µg/ml), terpenoids (2.033±0.033 µg/ml), phenolics (1.210±0.006 µg/ml), and terpenes (1.163±0.003 µg/ml). The Wesley herbal tea showed higher antioxidant activity against ABTS and H_2O_2 than butylated hydroxytoluene, and scavenging potential against NO, DPPH, FRAP and TAC was less than that of butylated hydroxytoluene. The presence of these secondary metabolites in the aqueous extract of Wesley herbal tea and its antioxidant activities ascertain its health benefits and plausible effect reported in managing various ailments such as cardiovascular diseases and diabetes.

Herbal Components

1:1:1 ratio of moringa, turmeric, and ginger

Analysis Methods

Phytochemical screening and antioxidant testing

Health Benefits

Antioxidant properties for cardiovascular and diabetic conditions

Keywords: Wesley herbal tea, phytochemical, antioxidant, folklore medicine, health benefits.

INTRODUCTION

The World Health Organization has estimated that 80% of the global population relied on medicinal plants for their primary health care because of the significant role they play in maintaining human health and improving the quality of lives (WHO, 2013). Some plants possess medicinal properties, and their medicinal value is due to the presence of various complex chemical substances of differing composition which occur as secondary metabolites. Many of such plants are known to be used primitively to alleviate symptoms, produce definite physiological actions in the human body due to the presence of these bioactive compounds, also known as phytochemicals (Shaik *et al.*, 2017; Harborne, 1973). Some of these plants are considered as not only medicinally but also nutritionally important and, as such, are recommended by traditional medicine practitioners for their therapeutic uses (Yudharaj, 2016). Notable amongst these plants are ginger, moringa, and turmeric, whose blend has been used as active ingredients in the production of herbal tea (Yudharaj, 2016).

Wesley herbal tea is 100% natural, containing no caffeine, chemical additives, colours, flavours, sugars, or preservatives, produced at Wesley University, Ondo, Ondo State, Nigeria. It is a rich blend prepared from moringa leaf, ginger and turmeric corms at a 1:1:1 ratio, with an exuding taste, and a refreshing, relaxing feeling, and also gives a wide range of health benefits for prevention, relief and control of various ailments. *Moringa oleifera* has been studied for its health properties, attributed to the numerous bioactive components, including vitamins, phenolic acids, flavonoids, isothiocyanates, tannins and saponins, which are present in significant amounts in various components of the plant (Vergara-Jimenez *et al.*, 2017). In Nigeria, it is called *Ewe igbale* in Yoruba, *Zogale* in Hausa, and *odudu-oyibo* in Ibo (Stevens *et al.*, 2015). It is a multi-purpose herbal plant used as human food and as an alternative medicine. The most used parts of the plant are the leaves, which are rich in vitamins, carotenoids, polyphenols, phenolic acids, flavonoids, alkaloids, glucosinolates, isothiocyanates, tannins and saponins (Leone *et al.*, 2015). Turmeric (*Curcuma longa*), is a species of the *Zingiberaceae* family that is native to South and Southeast Asia, where it is collected for use in classical Indian Medicine (Nelson *et al.*, 2017), is now distributed throughout the tropical and sub-tropical regions of the world. It is a tuberous perennial with yellow flowers and broad leaves. Turmeric is the main spice in curry, and is commonly used in Asian foods as a colouring, flavouring, and medicine (Nelson *et al.*, 2017). It is known as *ata ile pupa* in Yoruba, *gagamau* in Hausa, and *Ohu boboch* in Enugu (Nwaekpe *et al.*, 2015). The rhizome, which is the portion of the plant used medicinally, yields a yellow powder. It has many names, such as *Curcum* in the Arab region, Indian *saffron*, *Haridra* (Sanskrit, Ayurvedic), *Jianghuang* (yellow ginger in Chinese), *Kyoo* or *Ukon* (Japanese) (Priyadarsini, 2014). Oral administration is the main route of administering turmeric; it is also used via inhalation (in the Ayurvedic tradition) or can be applied topically for the treatment of acne, wounds, boils, bruises, blistering, ulcers, eczema, insect bites, parasitic infections, haemorrhages and skin diseases like herpes zoster and pemphigus (Daily *et al.*, 2016). The medicinal values and antioxidant properties of some turmeric varieties have already been reported (Qader *et al.,* 2011; Denre, 2014).

Recent research has demonstrated a significant increase in global interest in herbal tea studies, with antioxidant activity, phenolic compounds, and functional properties being key areas of focus (Yuan & Liu, 2024). The growing scientific attention toward herbal tea's health benefits reflects the increasing consumer awareness of plant-based functional foods and their potential therapeutic applications (Ortiz-Islas & Espinosa-Leal, 2024). Dietary phytochemicals from herbal teas have shown promising results in health promotion and disease prevention through various mechanisms including antioxidant, anti-inflammatory, and metabolic regulatory effects (Hossain et al., 2025).

01

Traditional Medicine Foundation

80% of global population relies on medicinal plants for primary healthcare due to bioactive compounds and phytochemicals.

02

Wesley Tea Development

100% natural blend of moringa, turmeric, and ginger created at Wesley University for therapeutic benefits.

03

Scientific Validation

Research needed to validate phytochemical content and antioxidant properties of this tri-herbal blend.

Ginger, a tropical flowering plant native to Southeast Asia and a close relative of turmeric (*Zingiberaceae* family), is now widely grown globally (Viljoen *et al.*, 2014). It is used in diverse commercial products like cookies, teas, tinctures, and syrups. Abundant in active constituents such as phenolics and terpenes (Prasad *et al.*, 2015), ginger exhibits a wide range of biological activities (Ravindran and Nirmal, 2016). Its inflorescences bear pale yellow flowers with purple edges, arising directly from the rhizome. Used for treating inflammation, muscle pain, and severe indigestion (Ravindran and Nirmal, 2016), ginger's root or rhizome–which can be yellow, red, or white depending on the variety–is the medicinal part. Researchers have also studied its potential to reduce the risk of diabetes, cancer, and other health problems.

Extensive research highlights *Moringa oleifera*'s antioxidant activity due to numerous antioxidants in its leaves (Anwar *et al.*, 2007). These properties suggest its use in treating inflammatory conditions, including cancer, hypertension, and cardiovascular diseases. The overproduction of free radicals like reactive oxygen species (ROS) is crucial in many chronic diseases (Poprac *et al.*, 2017), and various natural products, including medicinal plants, possess antioxidant potential (Deng *et al.*, 2012).

Studies confirm ginger's effectiveness against oxidative stress, investigating underlying antioxidant mechanisms in cell models (Ji *et al.,* 2017). Ginger extract demonstrated antioxidant effects in human chondrocyte cells, mitigating oxidative stress mediated by interleukin-1β (IL-1β). It stimulated antioxidant enzyme expression, reducing ROS generation and lipid peroxidation (Hosseinzadeh *et al.*, 2017). Additionally, ginger extract lowered ROS production in human fibrosarcoma cells with H_2O_2-induced oxidative stress (Romero *et al.*, 2018).

Herbal tea, a commonly consumed beverage brewed from various plant parts, has been used medicinally for centuries. Increasing consumption has drawn attention to its health effects and bioactive compounds. While herbal teas composed of ginger, turmeric, and/or moringa exist, it is imperative to investigate the specific phytochemicals and antioxidant activity of Wesley herbal tea (a tri-herbal blend) to provide a scientific basis for its nutritional and medicinal benefits.

MATERIALS AND METHODS

Plant Materials

Materials

Wesley herbal tea was obtained from Wesley University Ondo, Ondo State, Nigeria.

Chemicals and Reagents

Mayer's reagent, Wagner's reagent, Dragendorff's reagent, hydrochloric acid, acetic acid anhydride, and chloroform were products of Sigma-Aldrich, Steinheim, Germany. Other chemicals and reagents used in this study were of analytical grade.

Methodology

Preparation of aqueous extract of Wesley herbal tea

Two hundred and fifty grams (250 g) of Wesley herbal tea was soaked in 2.5 L of distilled water for 48 hours at room temperature with constant shaking using an orbit shaker, after which the extract was filtered using Whatman No.1 filter paper into a conical flask and the water evaporated under reduced pressure in a rotary vacuum evaporator. The filtrate was dried at 40°C using Uniscope SM9053 Laboratory Oven (Surgifield Medicals, England) to obtain a yield of 46.25g which corresponded to a percentage yield of 18.5%.

Qualitative phytochemical analysis of aqueous extract of Wesley herbal tea

A known quantity (1.0 g) of the extract was extracted in 100 cm3 of distilled water (1% w/v) and used for phytochemical screening. A portion of the extract was subjected to standard chemical tests as described for alkaloid (Harborne, 2008); steroids, anthraquinones, cardenolides, and dienolides, phlobatannins (Trease and Evans, 1996); saponins (Wall *et al.*, 1954), phenolics and flavonoids (Awe and Sodipo, 2001), cardiac glycoside (Sofowora, 2006); tannins and terpenes (Odebiyi and Sofowora, 1990).

Quantitative phytochemical analysis of aqueous extract of Wesley herbal tea

The spectrophotometric method of Brunner (1984) was used for the quantification of saponins; phenolic content (Harborne, 1973); flavonoids (Boham and Kocipai, 1974); terpenes (Sofowora, 1993); terpenoids (Malik et al., 2017); cardenolides (Majaw and Moirangthem 2009); glycosides (Pasquel et al., 2000); and alkaloids using standard spectrophotometric methods.

Sample Preparation

250g Wesley herbal tea soaked in 2.5L distilled water for 48 hours, filtered and dried to 46.25g yield (18.5%)

Qualitative Analysis

Standard chemical tests for alkaloids, steroids, saponins, phenolics, flavonoids, and other phytochemicals

Quantitative Methods

Spectrophotometric analysis using established protocols for precise measurement of phytochemical concentrations

In vitro Antioxidant Studies of aqueous extract of Wesley herbal tea

The total antioxidant capacity of aqueous extract of Wesley herbal tea was evaluated using the phosphomolybdenum assay described by Prieto *et al.* (1999); the Ferric Ion Reducing Antioxidant Power Assay (FRAP) (Oyaizu 1986; and Nam *et al.* 2017); 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay (Sun *et al.*, 2014); Hydrogen radical-scavenging activity (Smirnoff and Cumbes 1989); Nitric Oxide (NO) scavenging activity (Fiorentino *et al.*, 2008) and 2,2'-azinobis (3-ethylthiazoline-6-sulphonic acid) di ammonium salt (ABTS) scavenging activity (Re *et al.*, 1999).

DPPH Assay

Measures radical scavenging activity against 2,2-diphenyl-1-picrylhydrazyl

FRAP Analysis

Evaluates ferric reducing antioxidant power capacity

ABTS Testing

Assesses antioxidant activity against ABTS radical cation

Data Analysis

Experimental data were expressed as the mean ± SEM, n = 3. Statistical analysis of data was performed using statistical package for social sciences (SPSS) version 20.0.

RESULTS

Phytochemical Composition of Aqueous Extract of Wesley Herbal Tea

Qualitative phytochemical analysis of aqueous extract of Wesley Herbal Tea

Qualitative phytochemical analysis of aqueous extract of Wesley Herbal Tea revealed the presence of ten (10) phytochemicals, which are: saponins, flavonoids, steroids, cardiac glycosides, tannins, phenolics, alkaloids, terpenes, terpenoids, and cardenolides, while anthraquinones and phlobatannins were not detected (Table 1).

Quantitative phytochemical analysis of aqueous extract of Wesley Herbal Tea

Quantitative phytochemical analysis of aqueous extract of Wesley herbal tea shown in table 2 revealed that flavonoids (11.220 ± 0.006 ug/ml) was the highest while the least was terpenes (1.163 ± 0.003 ug/ml). Saponins (10.473 ± 0.007 ug/ml), steroids (10.011±0.032 ug/ml), cardiac glycosides (8.147 ± 0.007 ug/ml), and alkaloids (6.433 ± 0.033 ug/ml) were also present in considerable amounts (Table 2).

In vitro antioxidant activities of aqueous extract of Wesley Herbal Tea

Aqueous extract of Wesley herbal tea did not exhibit a concentration-dependent scavenging effect on DPPH radicals, and its activity was lower than that of the reference compound, butylated hydroxytoluene (BHT). In contrast, the extract demonstrated a concentration-dependent scavenging effect on ABTS radicals, with substantial scavenging activity observed at 31.25 ug/ml. At this concentration, the antioxidant capacity of the extract was higher than that of the reference compound, BHT. At low concentration, the extract exhibited minimal ferric reducing antioxidant power, which was relatively lower than that of BHT.

Aqueous extract of Wesley herbal tea exhibited a concentration-dependent scavenging effect on H_2O_2 and NO radicals. Notably, at 15.625 ug/ml (H_2O_2) and 31.25 ug/ml (NO), the scavenging activity of the extract was higher than BHT.

The TAC result revealed minimal radical scavenging activity of the extract at all concentrations, which was significantly lower than that of BHT.

Table 1: Qualitative phytochemical analysis of aqueous extract of Wesley herbal tea

Phytochemicals	Results
Saponins	+++
Tannins	+
Phenolics	+
Anthraquinones	-
Flavonoids	+++
Alkaloids	+
Steroids	+++
Terpenes	+
Terpenoids	+
Phlobatannins	-
Cardiac glycosides	++
Cardenolides	+

Keys: (-) indicates below detectable level; (+) indicates presence; (++) indicates much presence; (+++) indicates very much presence

Table 1 shows the presence of ten phytochemicals: saponins, flavonoids, steroids, cardiac glycosides, tannins, phenolics, alkaloids, terpenes, terpenoids, and cardenolides.

Table 2: Quantitative phytochemical analysis of aqueous extract of Wesley herbal tea

Phytochemical	Concentration (µg/ml)
Saponins	10.473 ± 0.007
Tannins	2.323 ± 0.009
Phenolics	1.210 ± 0.006
Flavonoids	11.220 ± 0.006
Alkaloids	6.433 ± 0.033
Terpenes	1.163 ± 0.033
Terpenoids	2.033 ± 0.033
Cardiac glycosides	8.147 ± 0.007
Cardenolides	2.213 ± 0.009
Steroids	10.011±0.032

Table 2 reveals flavonoids (11.22 µg/ml) as the most abundant, followed by saponins (10.47 µg/ml) and steroids (10.01 µg/ml). Other compounds include cardiac glycosides, alkaloids, tannins, cardenolides, terpenoids, phenolics, and terpenes.

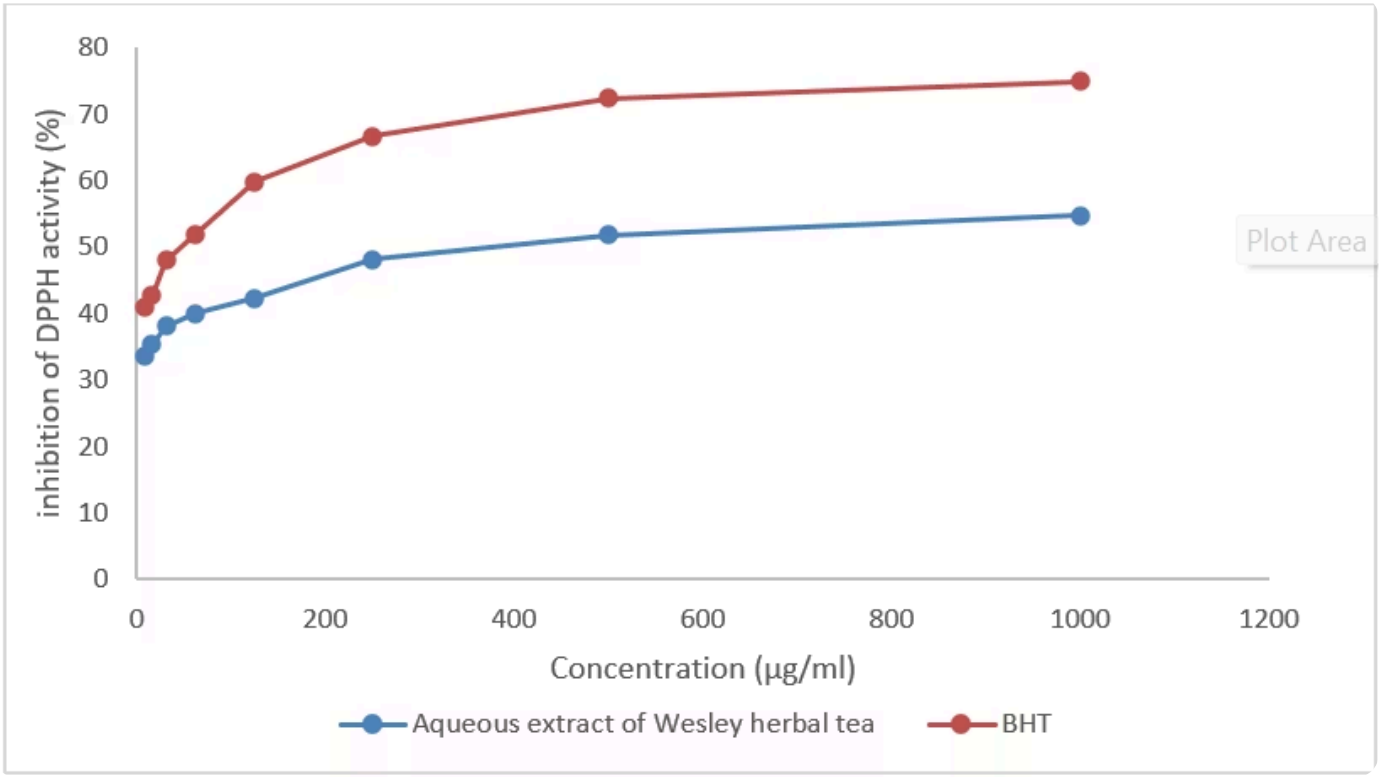

Figure 1: DPPH scavenging activity of aqueous Wesley herbal tea in comparison to the standard antioxidant

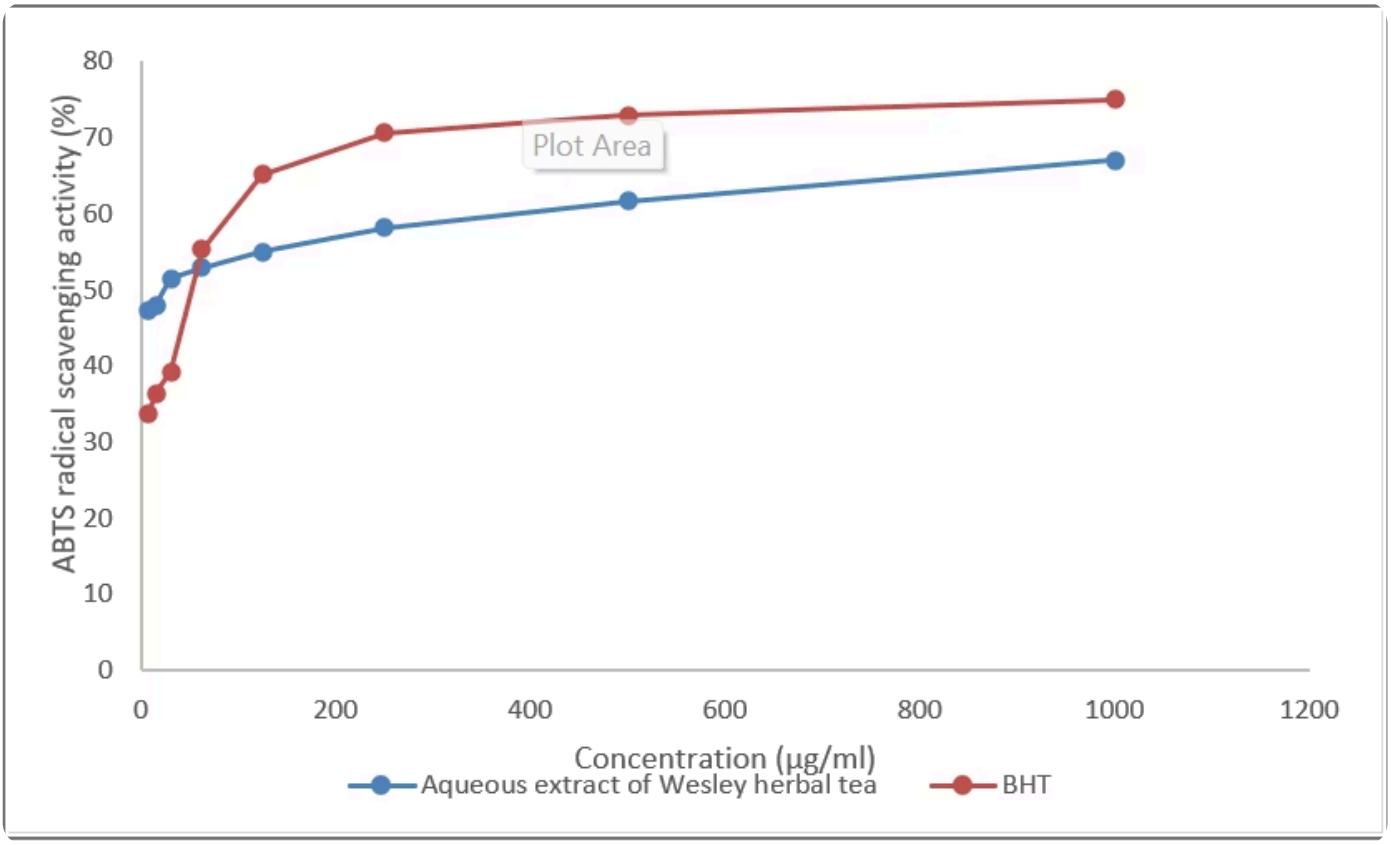

Figure 2: ABTS scavenging activity of aqueous Wesley herbal tea in comparison to the standard antioxidant

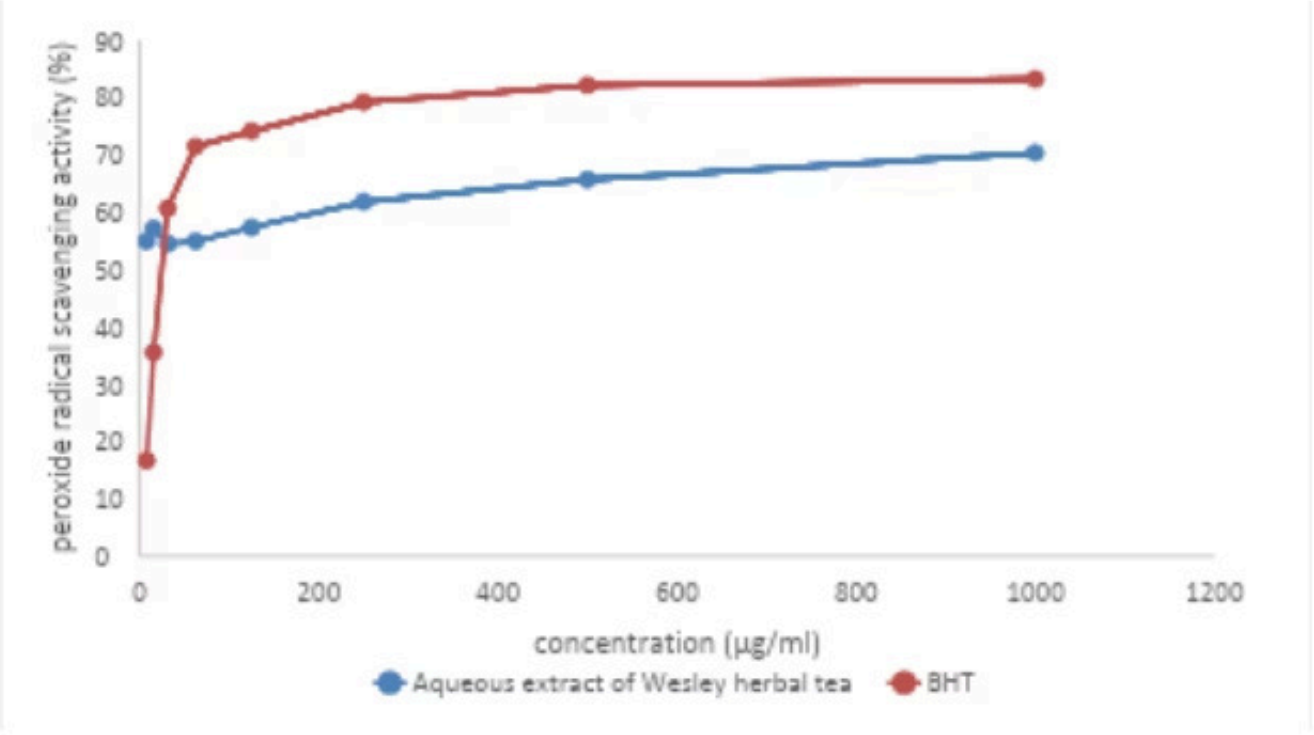

Figure 3: Hydrogen peroxide scavenging activity of aqueous Wesley herbal tea in comparison to the standard antioxidant

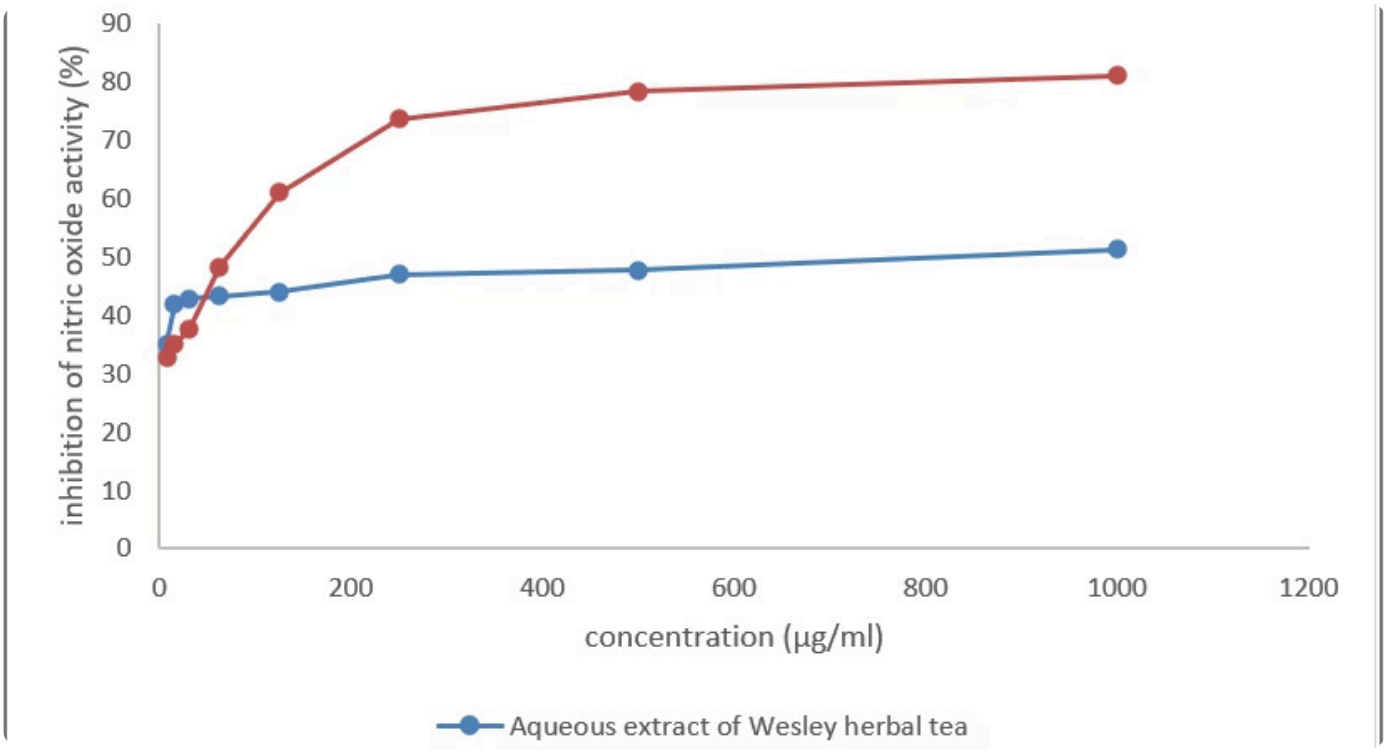

Figure 4: NO radical scavenging activity of aqueous Wesley herbal tea in comparison to the standard antioxidant

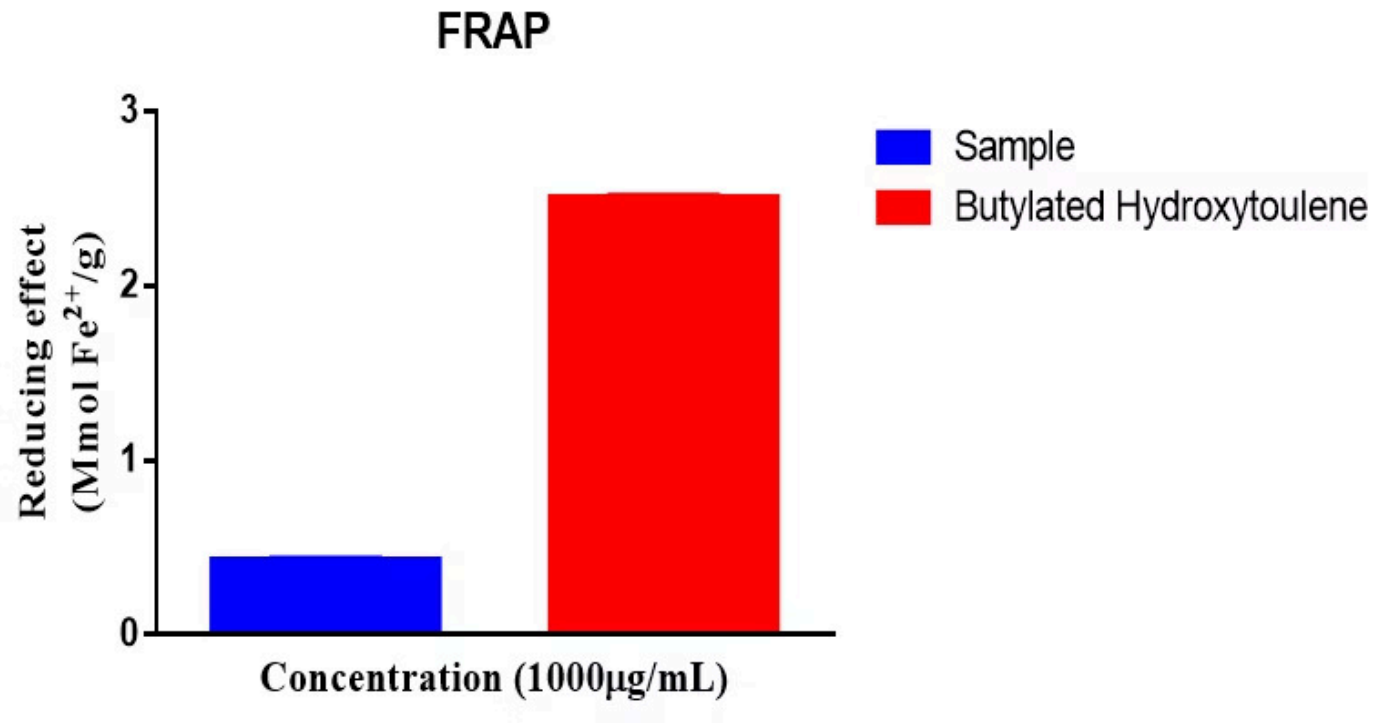

Figure 5: FRAP radical scavenging activity of aqueous Wesley herbal tea in comparison to the standard antioxidant

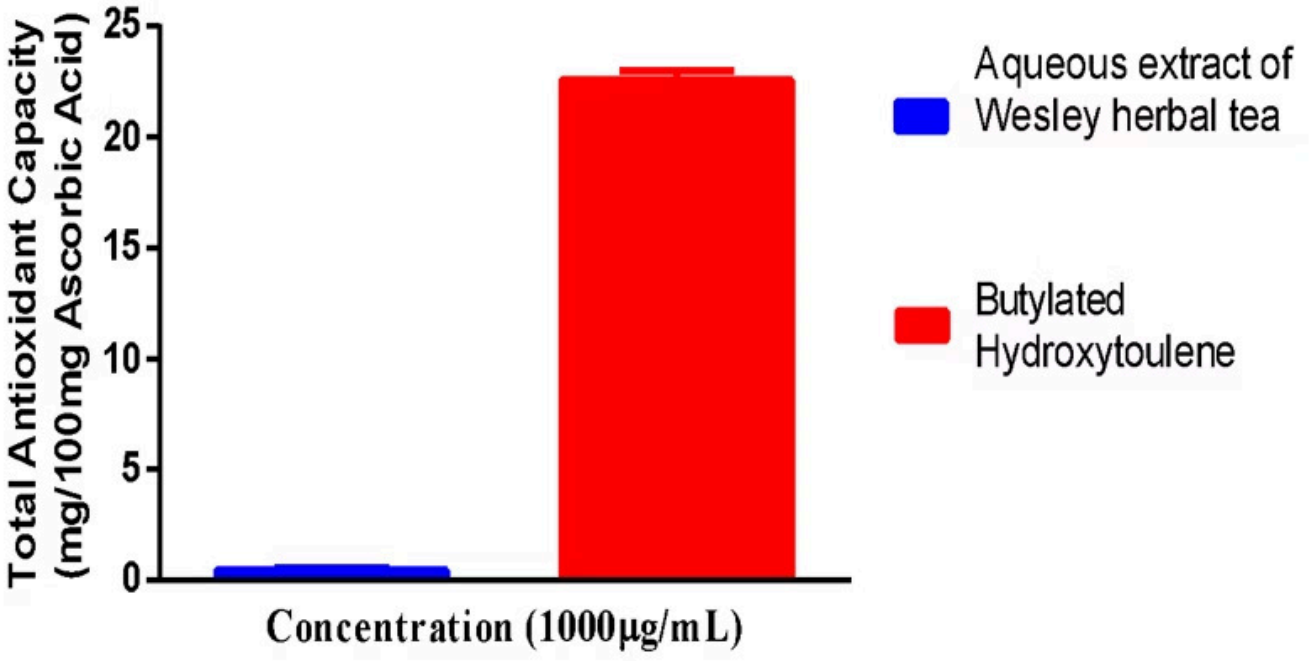

Figure 6: TAC scavenging activity of aqueous Wesley herbal tea compared to the standard antioxidant

DISCUSSION

The consumption of herbal teas has increased significantly over the years with most consumers' awareness of the health attributes of herbal teas (Mathivha *et al.*, 2019). As the interest in natural plant remedies in reducing health problems due to the presence of some phytochemicals of high medicinal value around the world becomes greater, the consumption of herbal teas will continue to increase and the market for herbal teas is expected to expand (Mathivha *et al.*, 2019). Phytochemicals have provided an important source of drugs since ancient times. More than half of the practical drugs used, are derived from plant sources, and many herbal preparations are widely prescribed for treating disease conditions (Gupta *et al.*, 2021).

The detection of some phytochemicals revealed the potential medicinal properties in the aqueous extract of Wesley herbal tea. The phytochemical screening of aqueous Wesley herbal tea extract revealed ten important phytochemicals: alkaloids, flavonoids, steroids, phenolics, tannins, terpenoids, terpenes, cardiac glycosides, cardenolides and saponins. The qualitative presence of phenolics, alkaloids, flavonoids, terpenes, saponins, tannins, sterols, and terpenoids in the aqueous extract can be accountable for its health benefits (Mathivha *et al.*, 2019).

Alkaloids

The presence of alkaloids in aqueous extract of Wesley herbal tea could be used to alleviate headache-associated with hypertension, manage cold, chronic catarrh, and migraine. Alkaloids possess anti-cancer, antimicrobial, antiviral, CNS-stimulatory, decongestive, anti-malarial, anti-nociceptive, vasodilatory, and anti-hypertensive activities.

Saponins

The herbal tea could be utilised in managing inflammation, improve sex hormone, lower blood cholesterol level, prevent accumulation of cytotoxins due to the presence of saponins. Saponins have anti-bacterial, anti-fungal, cholesterol-lowering, anti-cancer and immunomodulatory activities.

Flavonoids

Flavonoids constitute a large class of compounds with antioxidant, anti-inflammatory, neuroprotective, analgesic, anti-proliferative, anti-cancer, anti-angiogenic, antimicrobial, and antiviral activities. Helpful in treating angina pectoris, cervical lesions, venous insufficiency, dermatopathy, diabetes, gastrointestinal ailments, and lymphocytic leukaemia.

The conflicting results observed across different antioxidant assays (strong ABTS activity (see Figure 2) vs. weak DPPH activity (see Figure 1), hydrogen peroxide scavenging (see Figure 3), nitric oxide scavenging (see Figure 4), FRAP activity (see Figure 5), and TAC activity (see Figure 6)) highlight the complexity of antioxidant mechanisms in herbal teas. Different assays measure

distinct aspects of antioxidant capacity, and results may vary based on the specific compounds present and their interactions (Liang & Kitts, 2014). The therapeutic potential of Wesley herbal tea's phytochemicals depends on their bioavailability and synergistic effects when consumed as a complete extract rather than individual compounds (Kumar et al., 2023).

The herbal tea's potential to manage inflammation, improve sex hormone levels, lower blood cholesterol, prevent cytotoxin accumulation, and exhibit antioxidant properties is attributed to saponins and phenolics. These phytochemicals scavenge biological radicals (e.g., reactive oxygen and nitrogen species), promoting good health (Gills, 1992: Oloyede *et al.*, 2015). Saponins further demonstrate antibacterial, antifungal, cholesterol-lowering, anti-cancer, and immunomodulatory activities. Phenols possess free radical scavenging activity, while steroids stimulate muscles and sex organs and suppress inflammation and the immune system (Ikegwu *et al.*, 2023). Tannins, a heterogeneous group of plant polyphenolics responsible for taste and flavour, exhibit antioxidant, antimicrobial, anti-inflammatory, cardioprotective, antidiabetic, and anti-cancer activities (Cosme *et al.*, 2025).

Terpenoids offer antibacterial, antifungal, antiviral, cytotoxic, antidiabetic, anti-cancer, wound-healing, anti-scarring, anti-ageing, and stress-, anxiety-, and pain-relieving properties (Ikegwu *et al.*, 2023). Terpenes act as sedatives and antioxidants, effectively managing Alzheimer's disease (Kumar *et al.*, 2023). The presence of tannins, terpenoids, and terpenes suggests Wesley herbal tea can alleviate pain and manage cardiovascular diseases. Moreover, terpenoids and steroids in the aqueous extract imply potential antimicrobial, anti-inflammatory, sedative, insecticidal, and neurotoxic activities (Kumar *et al.*, 2023; Doughari, 2012; Doughari *et al.*, 2009).

Flavonoids, a large class of compounds, are known for antioxidant, anti-inflammatory, neuroprotective, analgesic, anti-proliferative, anti-cancer, anti-angiogenic, antimicrobial, and antiviral activities (Ullah *et al.*, 2020). They are beneficial in treating conditions such as angina pectoris, cervical lesions, venous insufficiency, dermatopathy, diabetes, gastrointestinal ailments, lymphocytic leukaemia, menopausal symptoms, and traumatic cerebral infarction (Kumar *et al.*, 2023). Cardiac glycosides, **specialised** plant secondary metabolites, inhibit Na+-K+ ATPase to elicit an inotropic effect on the heart. They treat heart failure and arrhythmia and have been suggested to possess anti-cancer activity (Botelho *et al.*, 2019), indicating Wesley herbal tea's potential anti-cancer and anti-inflammatory capacity.

The *in vitro* antioxidant activities of Wesley herbal tea were evaluated using DPPH, ABTS, FRAP, H_2O_2, and Nitric Oxide scavenging assays, and Total antioxidant capacity. Most phytochemicals are known to possess antioxidant properties, either by breaking free radical chains or inhibiting reactive oxygen and/or nitrogen species (Akpoveso *et al.*, 2023).

Reducing power is a significant indicator of antioxidant activity in medicinal plants (Cheng and Li, 2004). The slight increase in the reducing power of Wesley herbal tea's aqueous extract suggests its ability to reduce iron III (Fe^{3+}) to iron II (Fe^{2+}), thereby conferring antioxidant activity.

However, in this study, the extract's antioxidant capacity, as evidenced by its reducing power, is inferior to that of the reference drug, BHT.

The *in vitro* antioxidant properties of the aqueous extract of Wesley herbal tea may stem from the functional groups of its phytoconstituents, as phenolic compounds demonstrate synergistic effects on antioxidant capacity when combined (Liang and Kitts, 2014; Medina-Medrano *et al.*, 2015).

Due to the high concentrations of antioxidants present in *Moringa oleifera* leaves (Mensah *et al.*, 2012: Bamishaiye *et al.*, 2011), they can be used in patients with inflammatory conditions, including cancer, hypertension, and cardiovascular diseases (Posmontier, 2011). The carotene found in moringa leaves acts as an antioxidant. The antioxidants have the maximum effect on the damage caused by free radicals only when they are ingested in combination. A combination of antioxidants found in moringa leaves was proven to be more effective than a single antioxidant, possibly due to synergistic interactions and increased antioxidant cascade mechanisms (Mishra *et al.*, 2012; Tejas *et al.*, 2012).

2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) are stable free radicals used in assessing *in vitro* antioxidant activity of plant extracts. Also, metal ions, e.g., ferrous ions can trigger lipid peroxidation by initiating a chain reaction. Unchecked propagation of free radicals is linked with diseases such as diabetes, cancer, cataract, hypertension, arthritis, liver, and cardiovascular diseases (Engwa *et al.*, 2022). Wesley herbal tea demonstrated significant scavenging activity against the DPPH and ABTS radicals, suggesting its antioxidant capacity and potential in preventing and managing oxidative stress-associated illnesses such as diabetes, cancer and cardiovascular diseases. The scavenging activities of Wesley herbal tea on DPPH and ABTS could be attributed to the termination of free radical chain propagation. FRAP assay revealed the reductive ability of Wesley herbal tea by reducing ferric ions to ferrous ions. Wesley herbal tea exhibited further antioxidant activity by inhibiting hydrogen peroxide and nitric oxide and their radicals, possibly through its electron-donating potential. Inhibition of nitric oxide is a potential strategy for the treatment of migraine, vascular headaches, epilepsy, dementia and other neuroinflammatory diseases (Subedi *et al.*, 2021).

Other flavonoids-rich teas, like rooibos, green and black have been reported to exhibit cardio-protective, anti-inflammatory and antidiabetic capabilities. These teas have comparable antioxidant activities, and protective property against oxidative stress and its related diseases (Nyu, 2024).

The antioxidant activities observed in Wesley herbal tea may be due to the synergistic action of its phytochemicals. The presence of these phytochemicals in Wesley herbal tea gives credence to its medicinal property, suggesting its potential to manage ailments and diseases.

CONCLUSION

The aqueous extract of Wesley herbal tea contains ten metabolites in this order of concentration: Flavonoids > saponins > steroids > cardiac glycosides > alkaloids > tannins > cardenolides > terpenoids > phenolics > terpenes. The herbal tea demonstrated selective antioxidant activity, showing effectiveness in ABTS, H_2O_2, and NO radical scavenging assays, but limited activity in DPPH and TAC assays.

In addition, the study reveals that the presence of these metabolites in the aqueous Wesley herbal tea extract suggests potential therapeutic applications, though further *in vivo* studies and bioavailability assessments are needed to establish clinical efficacy, as well as its ability to scavenge free radicals. *In vivo* studies are recommended to validate bioavailability and actual health benefits of Wesley herbal tea.

01

Phytochemical Profile

Ten bioactive metabolites identified with flavonoids showing highest concentration at 11.220±0.006 µg/ml

02

Antioxidant Capacity

Superior performance against ABTS and H_2O_2 radicals compared to standard antioxidant BHT

03

Health Benefits

Potential for preventing and managing cardiovascular diseases, diabetes, and oxidative stress-related ailments

04

Future Research

In vivo studies needed to validate bioavailability and clinical health benefits

LIMITATIONS

However, these findings are based on *in vitro* assays, and the clinical relevance of the observed concentrations requires validation through bioavailability studies and human trials.

RECOMMENDATIONS

A further study is required to identify the particular bioactive constituents of the tea extract as well as *in silico* study of the key phytoconstituents' mechanistic role in combating specific disease conditions that the tea has been reported to alleviate.

ACKNOWLEDGEMENT

Not Applicable

CONFLICTS OF INTEREST

There was no conflict of interest in the course of the research work

FUNDING

This research received no funding from any agency.

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Received: June 30, 2025

Accepted: August 21, 2025

Published: November 19, 2025

Citation:

Agboola, A. O., Owoeye F. D., Onwuegbuchulam, C. H., Omotoyinbo, O. V., Dabesor, P. A., Akinyemi, A. A. & Adakole, O. (2025). Assessment of Phytochemicals and *In Vitro* Antioxidant Activity of Aqueous Extract of Wesley Herbal Tea. *SustainE, 3*(3), 261-283. In A. A. Atowoju, E. O. Oyekanmi, A. A. Akinsemolu, & D. M. Duyile (Eds.), *Sustainability, innovation, and development: A Festschrift in honour of Rt. Rev. Prof. Obeka Samuel Sunday* [Special issue]. https://doi.org/10.55366/suse.v3i3.13