International Journal of Medical Science and Health Research

Vol.9, No. 02; 2025

ISSN: 2581-3366

Quality Assessment of Some Selected Herbal Teas in Port Harcourt Metropolitan

[1]Mikailu Suleiman* and [2]Chidera Calistus Okoye

[1,2]Department of Pharmacognosy and Phytotherapy, Faculty of Pharmaceutical Sciences, University of Port Harcourt, Choba, Rivers State, Nigeria

*Corresponding author: Mikailu Suleiman

Phone number: +2348033920993

doi: 10.51505/ijmshr.2025.9208 URL: http://dx.doi.org/10.51505/ijmshr.2025.9208

Received: Feb 28, 2025 Accepted: Mar 12, 2025 Online Published: Apr 05, 2025

Abstract

In recent years, the production, sales and use of herbal teas is on the rise because of its potential and perceived health benefits. They are teas not made from *Camellia sinensis* (Linnaeus) Kuntze but from other plants, herbs, roots, and plant extracts. This study therefore, aimed at evaluating the quality and standards of four selected herbal teas in Port Harcourt market which includes WinsTown Fertility Tea®, Ijele Lemon and Ginger Tea™, Twinnings Blood Pressure Regulating Tea™ and Korean Ginseng Tea®. They were assessed for their weight uniformity and variations, physiochemical properties which includes moisture content, ash values, extractive values, foaming index, phytochemical constituents, heavy metals and microbial contaminations following standard procedures. From the result of the weight uniformity and variation, all the products showed inconsistent weight uniformity that varies from the stated weights. Phytochemical screening results showed that flavonoids, carbohydrates and saponins were common in the four teas. The teas have moisture content above the permissible limit except Korean Ginseng Tea. The ash values also showed that only Korean Ginseng Tea is free from impurities. WinsTown Fertility Tea® and Twinnings Blood Pressure Regulating Tea™ showed the presence of high cadmium. Korean Ginseng Tea® showed very high presence of Chromium. The microbial quality evaluation showed that all the four teas contain microbial contamination above permissible limit. In conclusion, this study has underscored the lack of adequate quality and standards of these products and serves as an important contribution to the regulatory bodies', producer's and consumer's knowledge of the herbal teas.

Keywords: Herbal tea, quality evaluation, physiochemical parameters, phytochemical constituents, heavy metal, microbial contamination.

Vol.9, No. 02; 2025

ISSN: 2581-3366

1. Introduction

Tea is popularly known as infusion of the leaves of *Camellia sinensis*. It is one of the major non-alcoholic beverages in the world, and is consumed by millions of people from dawn to dusk (Victor, 2013). However, the name tea has evolved to become an infusion of herb(s) either in bags or without bags taken for the well-being of humans. This is because teas are now produced from many herbs different from *Camellia sinensis* and people derive savoury flavour fulfilling feelings from taking them. No doubt, this is due to the degree of acceptability of herbal medicine in the modern life style. The allure of herbal teas lies not only in their ability to provide a soothing beverage but also in their perceived therapeutic properties, which encompass a wide range of wellness and health-promoting attributes. Herbal teas are renowned for their potential health-promoting properties (McKay & Blumberg, 2006). Many herbal infusions, such as chamomile, peppermint, and ginger, contain antioxidants that help combat oxidative stress in the body. Antioxidants play a crucial role in neutralizing free radicals, reducing inflammation, and supporting overall well-being. Moreover, certain herbal teas are believed to have immune-boosting effects, contributing to the body's natural defense mechanisms (McKay & Blumberg, 2006). Beyond their physical benefits, herbal teas also offer psychological advantages.

Natural bioactive substances including carotenoids, phenolic acids, flavonoids, coumarins, alkaloids, polyacetylenes, saponins, and terpenoids are abundant in herbal teas and beverages. Based on scientific evidence, these bioactive chemicals have a wide range of biological effects, including antimutagenicity, anticarcinogenicity, antiaging, antiviral, antibacterial, antiviral, antiinflammatory, antiallergic, and vasodilatory function (Chandrasekara *et al*., 2018). As the global interest in holistic health and natural remedies continues to grow, so too does the demand for herbal teas. Consequently, the booming herbal tea market is not without its challenges. The diverse array of botanical sources, regional variations, and artisanal processing methods have led to significant variations in the composition and quality of herbal teas available to consumers. This variability poses a concern for both consumers and producers, as it can impact the safety, efficacy, and sensory experience of these popular beverages.

To address these challenges and ensure the reliability and consistency of herbal teas, the standardization and evaluation of these products have emerged as crucial areas of research and development. Standardization involves establishing uniform criteria for factors such as botanical sourcing, cultivation practices, harvesting methods, and processing techniques, all of which profoundly affect the final tea product. Evaluation, on the other hand, encompasses the rigorous assessment of herbal teas' sensory attributes, safety profiles, and potential health benefits, often requiring the development of specialized methodologies tailored to the unique characteristics of these beverages. This evaluation seeks to delve deeply into the intricate world of herbal teas. It recognizes the necessity of achieving product consistency and quality assurance while respecting the rich cultural and regional diversity that defines herbal tea traditions. Moreover, it acknowledges the need for innovation and collaboration among herbalists, tea producers, regulatory authorities, and scientific researchers to advance the field and empower consumers with safe and informed choices.

Vol.9, No. 02; 2025

ISSN: 2581-3366

2. Materials and Methods

2.1 Source of Herbal Products

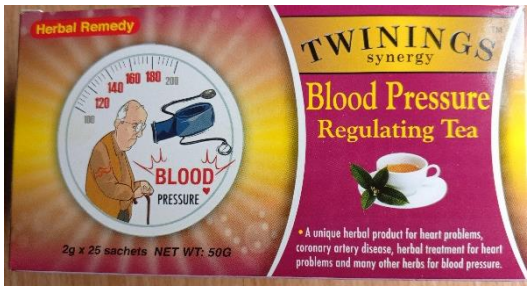
Unexpired and sound samples (Ijele Lemon and Ginger Tea™, Twinings Blood Pressure Regulating Tea™, Winstown Fertility Tea® and Korean Ginseng Tea®) used for this study were selected randomly from major shopping malls in Port Harcourt, Rivers State due to their availability and abundance. The products were taken to the laboratory for investigation.

Sample Name	Korean Ginseng Tea®	Sample Name	Ijele Lemon and Ginger Tea™
Manufacturer	Prince of Peace ent., inc.	Manufacturers	Obinwugo Farms Enterprise
Country of manufacture	Republic of Korea	Country of manufacture	Nigeria
Batch Number	i4706	Batch Number	BN-19
NAFDAC Number	-	NAFDAC Number	A8-2520L
Expiry date	21-04-2026	Expiry date	12-09-2025
Manufacturing date	-	Manufacturing date	05-01-2023
Listed Constituents	Korean Ginseng	Listed Constituents	Lemon, Ginger

Vol.9, No. 02; 2025

ISSN: 2581-3366

Sample Name	WinsTown Fertility Tea®
Manufacturer	-
Country of manufacture	-
Batch Number	-
NAFDAC Number	-
Expiry date	02-05-2025
Manufacturing date	-
Listed Constituents	Natto, Agaricus, Klep, Black fungus, Poria, Cassia seed, Lycopene, Yam, Grape seed extract, Yeast extract.



Sample Name	Twinings Blood Pressure Regulating Tea™
Manufacturer	Twining and Agro Limited
Country of manufacture	-
Batch Number	NG2001
NAFDAC Number	-
Expiry date	27-05-2025
Manufacturing date	-
Listed Constituents	Hawthorn, Garlic, Mistletoe, Stevia, Barberry, Angelica, Olive leaf.

Vol.9, No. 02; 2025

ISSN: 2581-3366

2.2 Phytochemical Screening

The Herbal teas were screened for the presence or absence of secondary metabolites using described standard methods (Herborne, 1999)

2.3 Weight / Content Uniformity and Variations

20 Sachets of the samples were selected randomly from different packs and individual content weights of each sachet weighed by pouring out the contents from the bags before weighing. The weight of each sachet was taken. Average weight and standard deviated was recorded for each product.

2.4 Loss of drying (Gravimetric method)

Using the analytical weighing balance, 2g of the tea was accurately weighed into a previously tarred flat-bottom glass dish and the weight, W1 was noted of the glass dish and the weighed crude drug. The glass dish containing the tea was placed in an oven at 100-105^{0}C for 1 hour. It was allowed to cool in a desiccator and weighed. This was later replaced in the oven at the same temperature for another hour. It was allowed to cool and weighed. The drying, cooling and weighing was repeated until there was no further loss in weight (or of a difference of not more than 0.005g) and this was noted as final weight W2

The moisture content of the crude drug was calculated using the formula:

Moisture content = $\frac{100\ (W1-W2)}{W1-Wd}$

Where Wd= weight of the empty dish.

The parameters determined for proximate analysis include ash value, moisture content, extractive value, total solid content and crude fiber content of the drug

2.5 Determination of Ash values

The Ash remaining following ignition of herbal material is determined by three different methods which measure total ash, acid-insoluble ash and water-soluble ash.

2.6 Extractive Values

A 10 g of each sample was weighed and transferred to a stoppered flask containing 100 ml of water. The mixture was placed on a magnetic stirrer for 4 hours. The mixture was filtered and 50ml of the filtrate was transferred into a tarred flat-bottomed crucible and placed in a water bath, evaporated to dryness and weighed, the water-soluble extractive value was calculated from the weight of the residue as a percentage of the tea sample. This protocol was repeated using absolute Ethanol and chloroform respectively (WHO, 2011).

Vol.9, No. 02; 2025

ISSN: 2581-3366

2.7 Determination of Foaming index

A 1g of the tea was transferred to 500 ml conical flask containing 100 ml of boiling water maintain at moderate boiling at 80- 90 C for about 30 min. It was filtered into a volumetric flask and added sufficient water through the filter to make the volume up to 100 ml (V1). Cleaned ten (10) stopper test tubes were taken and marked with 1 to 10. Successive portions of 1 ml, 2 ml up to 10 ml drug was put into the separate tubes and their remaining volumes were adjusted with the liquid up to 10 ml in each test tube. After closing the tubes with stoppers, they were shaken for 15 seconds and allowed to stand for 15 minutes, then their heights were measured. If the height of the foam in each tube is less than 1cm, the foaming index is less than 100 (not significant). Here, if the foam is more than 1cm height after the dilution of plant material in the sixth tube, then corresponding number of the test tube is the index sought. If the height of the foam in every tube is more than 1 cm, the foaming index is more than 1000. In this case, 10 ml of the first decoction of the plant material needs to be measured and transferred to a volumetric flask of 100 ml capacity (V2) and volume is to be maintained up to 100 ml and follow the same procedure. Foaming index is calculated by using the following formula

Foaming index = 1000/a in case of V1

Foaming index = 1000 × 10/a in case of V2

Where, a = Volume (ml) of decoction used for preparing the dilution in the tube where exactly 1 cm or more foam is observed.

2.8 Determination of Heavy Metals

The digestion of the tea samples was carried out according to the standard procedure described by Okalebo *et al.,* (2002). One gram of the tea samples was digested with 5 mL of 16 M HNO_3 in the covered beakers to near dryness, and another 5 mL essential portion of 16 M HNO_3 was further added until the sample solutions became clear. 5 ml of 12 M HCl was then added to ensure complete digestion and then cooled to room temperature. The digested solutions were diluted to 100 mL with deionized water. The samples were analyzed using atomic absorption spectrophotometer (AAS) for the concentrations of lead, chromium and cadmium.

2.9 Spread Plate Method for bacteria and fungi count

A 0.1 ml from the appropriate desired dilution series was pipetted onto the center of the surface of an agar plate. The L-shaped glass spreader was dipped into alcohol. The glass spreader (hockey stick) was flamed over a Bunsen burner. The sample was spread evenly over the surface of agar using the sterile glass spreader, carefully rotating the Petri dish underneath at the same time. The plate was incubated plate at 37°C for 24 hours. The coliform forming units (CFU) value of the sample counted. The counted colonies are multiplied by the appropriate dilution factor to determine the number of CFU/mL in the original sample.

Vol.9, No. 02; 2025

ISSN: 2581-3366

3. Results

Table 1: Weight Uniformity and Percentage variation of selected herbal teas in Port Harcourt

Samples	Average weight (g) ± Standard deviation	Company's Stated weight (g)	Percentage Variation from stated weight (%)
WinsTown Fertility Tea®	2.560 ±0.030	3	-14.65
Ijele Lemon and Ginger Tea™	2.980 ±0.114	2.5	+19.23
Twinnings Blood Pressure Regulating Tea™	2.038 ±0.052	2	+1.91
Korean Ginseng Tea®	1.653 ±0.026	2	-17.35

Table 2: Phytochemical screening of selected herbal teas in Port Harcourt

Phytochemicals	WinsTown Fertility Tea®	Ijele Lemon and Ginger Tea™	Twinnings Blood Pressure regulating Tea™	Korean Ginseng Tea®
Alkaloids	-	-	-	+
Flavonoids	+	+	+	+
Carbohydrates	+	+	+	+
Saponins	+	+	+	+
Tannins	+	-	+	-
Phlobatannins	-	+	-	-
Cardiac Glycosides	-	+	-	-
Phytosterols	+	+	-	+
Free Anthraquinone	-	-	-	-

Key: + denotes presence - denotes absence

Table 3: Some physiochemical properties of selected herbal teas in Port Harcourt

Parameters		WinsTown Fertility Tea®	Ijele Lemon and Ginger Tea™	Twinnings Blood Pressure Regulating Tea™	Korean Ginseng Tea®
Moisture content (%)		21.5	22.0	20.0	9.0
Ash values (%)	Total ash	7.5	10.0	8.5	1.0
	Water soluble ash	3.0	6.5	5.5	0.0
	Acid insoluble ash	3.5	2.5	3.0	0.0
Extractive values (%)	Water	11.0	14.0	10.0	12.0
	Alcohol	6.0	10.0	5.0	7.0

Vol.9, No. 02; 2025

ISSN: 2581-3366

	Chloroform	6.0	4.0	2.0	12.0
Foaming index		333.33	<100.00	125.00	166.67

Table 4: Heavy metals analysis of selected herbal teas in Port Harcourt

Herbal Teas	**Lead (Pb) 10.0mg/kg***	**Cadmium (Cd) 0.3mg/kg***	**Chromium (Cr) 2.0mg/kg****
WinsTown Fertility Tea®	5.16	2.30	-
Ijele Lemon and Ginger Tea™	8.65	0.35	-
Twinnings Blood Pressure Regulating Tea™	4.30	1.90	-
Korean Ginseng Tea®	-	-	61.30

Key:* denotes WHO stipulated limits for herbal products, ** denotes Canadian Natural Health Products limits for food and health products, - denotes absence

Table 5: Total microbial counts in the selected Herbal teas.

Herbal Teas	**Average Bacteria colony count (CFU/mL)**	**Total Fungal Count (CFU/mL)**
WinsTown Fertility Tea®	1.165×10^9	7.0×10^7
Ijele Lemon and Ginger Tea™	1.60×10^9	-
Twinnings Blood Pressure Regulating Tea™	1.28×10^9	6.0×10^7
Korean Ginseng Tea®	2.60×10^9	-

Key*:- denotes absence*

4. Discussion

The use of drugs of herbal origin is on the rise due to their perceived safety compared to synthetic drugs, their availability, and economical values (Chanda, 2014). Herbal teas which are teas made from the infusions or decoctions of herbs, spices, flowers or other plants materials excluding the leaves of *Camellia sinensis* are not an exception to this tremendous rise in the uses and sales. Notwithstanding this, there are still question marks on the quality and safety of these products (Ekor, 2014). This underlines the need for quality evaluation of commercially available products to ensure the safety and efficacy of these products and maintain consumer confidence in the industry.

From the assessment of the teas in this study, the weight uniformity and variation result as shown in table 1 shows the inconsistency in in the weight declared and the actual weight of the content. The underdosing observed in Winstowns Fertility Tea® and Korean Ginsemg Tea as well as the

Vol.9, No. 02; 2025

ISSN: 2581-3366

overdosing record for Twinnings Blood Pressure Regulating Tea™ and Ijele Lemon and Ginger Tea™ underscore their quality.

The Phytochemical screening results as shown in table 2 revealed that the teas are rich in phenolic contents due to the presence of flavonoids and, tannins. These class of compounds are reputed for their antioxidant properties. Carbohydrates and saponins are polar constituents with varied pharmacological activities, also present in all the teas. Phytosterols was observed to be present in all except Twisannings Blood Pressure Regulating Tea™. Cardiac Glycosides was observed in WinsTown Fertility Tea® and Ijele Lemon Tea™ but absent in the other tea brands. The presence of phenolics, carbohydrates and saponins in the four teas emphasized their richness in secondary metabolites since they are meant to be prepared in hot water.

From the physiochemical analysis, the moisture content of all the tea were above the permissible limit except Korean ginseng that had 9% which is within the limit. Low moisture content is always desirable for better stability of drugs. The moisture content of herbal products should not be more than 14% as recommended by pharmacopea (Mikailu & Onyekachi, 2023). The ash values give an indication of physiological and non-physiological component of the tea. The total ash result for the four teas as presented in table 3 showed that they contain organic matter while the acid insoluble ash indicates the presence and quantity of silica or sand content of the teas. The mineral contents and inorganic matters present in a herbal product which can vary depending on the type of herb used (Kaume & Gbur, 2012). The results therefore, indicates that Ijele Lemon Tea™, Twinnings Blood Pressure Regulating Tea™, WinsTown Fertility Tea® contain impurities while the Korean Ginseng Tea® did not. The extractive values of the teas showed that their contents are mostly soluble in water than alcohol and choloroform. This corroborates the presence of saponins and phenolic constituents observed in the phytochemical screening result in table 2. The foaming index showed a trend of Ijele Lemon Tea™ < Twinnings Blood Pressure Regulating Tea™ < Korean Ginseng Tea® < WinsTown Fertility Tea®. Foaming index is an indication of the level of saponin content present in a sample.

The heavy metal analysis results as shown in table 4 showed the presence of Lead and Cadmium in all the tea brands except Korean Ginseng Tea®. The Lead contents of the products were within the permissible range stipulated by WHO for herbal products while Cadmium was higher than the permissible limit of 0.3mg/kg in WinsTown Fertility Tea® and Twinnings Blood Pressure Regulating Tea™. Presence of Chromium was observed in Korean Ginseng Tea® only and at a very high level of 61.30mg/kg which is significantly higher than the 2.0mg/kg limit stipulated by the Canadian Natural Health Products limits for food and health products (WHO, 2007). The presence these heavy metals in high concentration can be of detrimental effects on human health (Tchounwou *et al*., 2014).

The microbial quality evaluation of the teas in table 4 showed that all the four teas assessed exceeded the WHO limit for microbial contaminations that stipulated not be more than 10^7 and 10^4 per gram for bacteria and fungi respectively (WHO, 2007). Although Ijele Lemon and

Vol.9, No. 02; 2025

ISSN: 2581-3366

Ginger Tea and the Korean Ginseng Tea are devoid of fungal colony forming units. The microbial contamination could be from the raw materials, poor hygienic practices during the manufacturing and storage of the products. This beckons on the need for proper regulatory measures in the production of these herbal products.

5. Conclusion

This study has underscored richness in phytoconstituents, the lack of adequate quality and standards of these products and serves as an important contribution to the regulatory bodies, producers and consumers knowledge of herbal teas.

Conflict of interest

The authors declare no conflict of interest.

Reference

Chanda, S. (2014). Importance of pharmacognostic study of medicinal plants: An overview. *Journal of Pharmacognosy and Phytochemistry.*

Chandrasekara, A., & Shahidi, F. (2018). Herbal beverages: Bioactive compounds and their role in disease risk reduction - A review. *Journal of Traditional and Complementary Medicine*, *8*(4), 451–458.

Ekor, M. (2014). The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. *Frontiers in Pharmacology*, *4*(177).

Harbone, J. B. (1998). *Phytochemical methods*. Chapman and Hall London. Third Edition, 61

Kaume, L., Foote, J. C., & Gbur, E. E. (2012). Microbial contamination of herbs marketed to HIV-infected people in Nairobi (Kenya). *South African Journal of Science*, *108*(9/10).

McKay, D.L. and Blumberg, J.B. (2006) A Review of the Bioactivity and Potential Health Benefits of Peppermint Tea (Mentha piperita L.). Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives, 20, 619-633.https://doi.org/10.1002/ptr.1936

Mikailu S. and Onyekachi K. O. O. (2023). Pharmacognostic evaluation of *Maesobotrya barteri* (Baill) Hutch and *Mesobotrya dusenii* Pax (Eupharbiaceae) Leaves. *Research Journal of Pharmacognosy*, 10(1): 1-4.

Okalebo, J.R., Gathua, K.W. and Woomer, P.L. (2002). *Laboratory Methods for Soil and Plant Analysis*: A Working Manual. TSBF, Nairobi.

Tchounwou, P. B., Yedjou, C. G., Patlolla, A. K., & Sutton, D. J. (2014). Heavy Metal Toxicity and the Environment. *Experientia Supplementum*, *101*(1), 133–164.

Victor. R. P. (2013). Tea in health and disease prevention. Elsevier, Academic Press

WHO. (2007). WHO guidelines for assessing quality of herbal medicines with reference to contaminants and residues.

WHO (2011) Quality control methods for herbal materials pp: 9-36.