

ANALYSIS OF THE BIOACTIVE AND MICROBIOLOGICAL CONTENTS OF HERBAL MIXTURES SOLD IN ANAMBRA STATE, NIGERIA

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Abstract

Over the years, medicinal plants have played a significant role in traditional medicine practice. The ever-increasing health-related difficulties and the search for possible treatments and likely cures have led to the increasing patronage of herbal drugs in Nigeria. There is an overwhelming increase in the production and distribution of herbal medications, and the trend has instigated concern about the quality of the products being sold in Anambra State, Nigeria. Thus, the primary purpose of the current study is to analyze the microbiological and phytochemical constituents of okanga powder, goko cleanser, and deep root herbal mixtures popularly sold in Nigeria. The phytochemical tests conducted on the herbal products revealed that the herbal products contain alkaloids, flavonoids, glycosides, anthraquinones, tannins, and saponins. The result of the microbial count indicates the presence of varying microorganisms such as *S. aureus*, *E. coli*, *Salmonella*, and *Klebsiella* spp in the herbal products. The study concludes that herbal products possess active phytochemicals. However, the presence of pathogenic organisms was discovered in the herbal drugs.

Keywords: Okanga powder, goko cleanser, deep root, microorganism, phytochemical

Introduction

Presently, the use of herbal medicine as complementary and alternative medicine in treating ailments is increasing worldwide (el Hajj & Holst, 2020; Huie, 2002; Kennedy et al., 2016; Liu et al., 2016; Mohamad et al., 2019; Rezaeian et al., 2020; Sen & Chakraborty, 2015; Welz et al., 2018). Herbal medicines or phytomedicine, or botanical medicines, refer to plant parts, including roots, seeds, barks, flavor, or berries for medicinal purposes. The prevalence of herbal medicine use has primarily attracted scholarly attention in recent years (Alkhamaiseh & Aljofan, 2020; James et al., 2018; Kaadaaga et al., 2014; Laelago et al., 2016; Nsibirwa et al., 2020; Picking et al., 2011; Posadzki & Ernst, 2013; Rashrash et al., 2017). In Nigeria, the trend is currently receiving attention from the scientific and industrial community (Falodun & Imieje, 2013). The rise in health-related complications and the search for possible treatments and possible cures has led to the patronage of herbal drugs (Ogunsola & Egbewale, 2018). It has been dependent on treating many diseases (Ogbole & Ajaiyeoba, 2010; Okwu & Nnamdi, 2008; Ukwubile et al., 2019).

Over the years, herbal mixtures relating to medicine have received overwhelming patronage from people across the states of Nigeria. Herbal mixtures refer to the combination of various medicinal plant

materials, including barks, roots, aqueous extracts, seeds, flowers, and leaves. They are herbal preparations comprising complex mixtures of several medicinal plants (Ndhlala et al., 2011). The use of plant parts for treating diseases is universal and often perceived as cheap and more effective than conventional drugs (Adeyemi & Owoseni, 2015; Elufioye & Mada, 2018; Josephine & Antoinette, 2019; Thomford et al., 2015).

Herbal mixtures have long been a cornerstone of traditional medicine in Nigeria, particularly in regions like Anambra State, where they are widely patronized for their perceived therapeutic benefits. These mixtures, often sold by roadside vendors and local dealers, are derived from medicinal plants and marketed for various health conditions. However, growing concerns about their quality, safety, and efficacy have prompted scientific investigations into their bioactive (phytochemical) and microbiological contents. Nigeria's most common herbal mixtures include Goko cleanser, Yoyo Bitters, Swedish Bitters, Osa herbal mixtures, Osomo, Alomo, Oroki, Okanga Powder, and Deep root, among others. However, this study is concerned with Okanga powder, deep root herbal mixture, and Goko cleanser. Okanga powder is a popular plant product used for various purposes, including detoxification, laxative functions, and treatment of infections. The bioactive compounds in herbal mixtures are primarily phytochemicals, natural chemicals produced by plants that confer therapeutic properties. Studies conducted on herbal mixtures sold in Anambra State, such as Okanga powder, Goko Cleanser, and Deep Root herbal mixtures reveal various phytochemicals contributing to their medicinal claims. The primary active ingredients include alkaloids, which are nitrogen-containing compounds known for their pharmacological effects, including analgesic, anti-inflammatory, and antimicrobial activities. Research indicates that alkaloids are present in varying concentrations across these mixtures, with moderate levels in Okanga powder and Deep Root, and lower levels in Goko Cleanser. Their presence suggests potential efficacy against infections and pain relief, common uses in traditional medicine. Flavonoids are detected in all three mixtures, with moderate amounts in Deep Root and lower levels in Okanga and Goko Cleanser. These compounds may support immune boosting and disease prevention claims, aligning with their widespread use in managing chronic conditions.

Glycosides, which can have cardiac and antimicrobial effects, are found in moderate amounts in Deep Root and lower amounts in Goko Cleanser, but are absent in Okanga powder. Their presence could indicate potential cardiovascular benefits or antibacterial activity, though specific effects depend on the type of glycoside. Similarly, anthraquinones, known for their laxative and antimicrobial properties, are notably abundant in Goko Cleanser and Deep Root, but present in lower amounts in Okanga powder. This suggests these mixtures might be used for digestive issues or as purgatives, a typical traditional application. Additionally, tannins are moderately present in Okanga powder but absent in Goko Cleanser and Deep Root. Their presence in some mixtures could contribute to wound healing or infection control. However, saponins, which have expectorant and immune-modulating effects, are absent in all three mixtures studied. Their lack may limit the mixtures' utility for respiratory conditions or immune enhancement, despite such claims by sellers.

The demand for these herbal products is increasing, and their prevalence of use has been reported (Amaeze et al., 2018; Fakeye et al., 2009). Although the demand for herbal mixtures is high, research has pointed out the harmful effects (Akande-Sholabi et al., 2020; Dadzie et al., 2020; Oreagba et al., 2011). Thus, research suggests a continuous scientific evaluation of the herbal mixtures commonly sold in Nigeria's market (Oluyomi et al., 2012; Ezejiofor et al., 2008; Ogbonnia et al., 2010). Nevertheless, there is little or no mechanism available to checkmate the production and bacteriological contents of

these herbal medicines being sold nationwide. Hence, it can pose a threat to human health. The current study aims to ascertain the microbiological status and phytochemical constituents of some selected herbal products (Okanga powder, Deep root herbal mixture, and Goko cleanser) sold by roadside herbal merchants.

Material and Method

Collection of Samples

Goko cleanser, Okanga Powder, and Deep root herbal mixtures were collected from the local dealers around Awka, Anambra State.

Microbiological analysis

The determination of the microbial loads of the selected herbal products was conducted in accordance with the method outlined in (Esimone et al., 2001).

Phytochemical analysis

The phytochemical analysis of okanga powder, deep root herbal mixture, and goko cleanser, including tests for alkaloids, tannins, saponin, anthraquinones, flavonoids, and glycosides, was carried out using the procedure outlined in (Agbo & Mbotto, 2012).

Result

Table 1:

Table showing the phytochemical composition of okanga powder, deep root herbal mixture and goko cleanser.

S/No	Chemical Constituents	A	B	C
1.	Alkaloids	++	+	++
2.	Glycosides	-	+	++
3.	Saponins	-	-	-
4.	Tannins	++	+	-
5.	Flavonoids	+	+	++
8.	Anthraquinones	+	+++	+++

Key: += present, ++ = moderately present, +++ = highly present, - = absent. A = okanga powder, B = goko cleanser, C = deep root

Table 2:

Table showing the microbial content of okanga powder, goko cleanser and deep root herbal mixtures

Product	Viable count (cfu/ml or g)			
	<i>S. aureus</i>	<i>E.coli</i>	<i>Salmonella</i>	<i>Klebsiella spp</i>
Okanga powder	-	1.0 x10 ³	-	4.0 x 10 ³
Goko cleanser	-	1.4 x 10 ⁴	-	7.0 x 10 ³
Deep root	7.5 x 10 ³	2.0 x 10 ³	3.0 x 10 ³	-

Key: - = No growth Cfu/ml = Colony forming unit per ml

Discussion

The current study was aimed to analyze the microbiological and phytochemical constituents of some selected herbal mixtures sold in Nigeria. The phytochemical tests revealed that the herbal products contain alkaloids, flavonoids, glycosides, anthraquinones, tannins, and saponins. The result showed that in okanga powder, alkaloids and tannins were moderately present (+ +), flavonoids and anthraquinones were present (+), while saponins glycosides were absent (-). In the goko cleanser, the presence of anthraquinones was much higher (+ + +), alkaloids, glycosides, tannins, and flavonoids were present (+) while saponins were absent (-). In the deep root, herbal mixture, the presence of anthraquinones was also very high (+ + +), alkaloids, glycosides, and flavonoids were moderately present (+ +), while saponins and tannins were absent (-). Indeed, the active constituents of herbal mixtures comprise more than one plant or active component, and their therapeutic efficacy is not guaranteed by a single group of compounds (Okunlola et al., 2007). The combination of different plants is essential in boosting the therapeutic efficacy of herbal products. The phytochemical revelation of the herbal products is consistent with previous studies (Agbo & Mbotto, 2012; Okunlola et al., 2007). Most of the phytochemical compounds associated with herbal drugs such as alkaloids, flavonoids, anthraquinones, tannins, saponins, and many others constitute the secondary metabolites of plants that function to protect against many microorganisms. Alkaloids, one of the commonly found phytochemicals in the plant, have been shown to possess antibacterial functions. Flavonoids, glycosides, anthraquinones, tannins, and saponins exhibit various biological activities such as antioxidant, antimicrobial, antioxidants, and antibacterial properties.

Furthermore, the result of the microbial count indicates the presence of varying microorganisms such as *S. aureus*, *E. coli*, *Salmonella*, and *Klebsiella spp* in the herbal products ranging from 1.0×10^3 to 1.4×10^4 . All the herbal products were contaminated with *E. coli* which is implicated in intestinal sickness typically caused by unhygienic situations. Okanga powder and goko cleanser are free of *S. aureus* and *Salmonella* but are contaminated with *Klebsiella spp*. Deep root herbal mixture is contaminated with *S. aureus*, *E. coli*, and *Salmonella* and is free from *Klebsiella spp*. The presence of pathogenic organisms in herbal medicine products can lower or inactivate the therapeutic efficacy of the products and has the potential to affect the consumers adversely. The presence of the microorganisms indicates a high level of exposure and carelessness at any production level (Brooks et al., 2004). All the isolated organisms in the study have been linked with health concerns. Nevertheless, these pathogenic organisms may find their way into the herbal mixtures due to inadequate hygienic practices and insufficient decontamination and materials.

Conclusion

The result of the study indicates that the herbal mixtures under investigation that are widely sold in every area in the Anambra state contain certain phytochemicals responsible for the therapeutic effectiveness of the drugs. However, there is a concern about microbial contamination associated with these herbal medicines. The microbial analysis conducted on the selected herbal drugs shows that the products contain a varying level of pathogenic organisms capable of undermining the drugs' efficacy and the consumers' well-being. Due to the high patronage of these products and the concern of substandard herbal medicines, the current study recommends continuous scientific assessment of the herbal products sold in the market. Additionally, adequate precaution in production and storage hygiene should be encouraged. The present study contributes to traditional medicine literature by affirming the therapeutic efficacy and prevalence of consuming harmful herbal drugs in Nigeria.

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