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Nutraceuticals and Antimicrobial Properties of Jekomo Herbal Mixture

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Abstract*: Nutraceticals, and antimicrobial properties of Jekomo Herbal mixture were determined using standard analytical methods. Minerals analysis was determined using Atomic Absorption Spectrophotometer, Phytochemical and anti-oxidants were determined using standard analytical methods and the Agar well diffusion method was employed to test for antimicrobial activities of the sample under investigation. Results of the analysis showed appreciable mineral contents: low heavy metals contents, good phytochemical contents as well as anti-oxidants. Jekomo herbal mixture was able to inhibit the following selected bacteria: Salmonella typii, Erwinia carotovora, Streptococcus faecalis, E.coli, Staphylococcus aureus, Alealigins odorans and Serratia marcesceus with different level of zone of inhibitions. The results showed the potential of Jekomo as a source of antimicrobial agent against common human pathogens in combating diseases caused by these bacteria.*

Keywords: Anti-oxidants, Antimicrobial, Bactericidal, Jekomo herbal mixture, Minerals, Phytochemicals

1. INTRODUCTION

Herbal medicine is an integral part of "traditional medicine" (TM). TM has a broad range of characteristics and elements which earned it the working definition from the World Health Organization (WHO). Traditional medicines are diverse health practices, approaches, knowledge and beliefs that incorporate plant, animal and/or mineral based medicines, spiritual therapies, manual techniques and exercises which are applied singularly or in combination to maintain well-being, as well as to treat, diagnose or prevent illness. In the developed countries, TM has been adapted outside its indigenous culture to "Complementary" or "Alternative" medicine (CAM)(Evans, 2008). Globally, people developed unique indigenous healing traditions adapted and defined by their culture, beliefs and environment, which satisfied the health needs of their communities over centuries. The increasing widespread use of TM has prompted the WHO to promote the integration of TM and CAM into the national health care systems of some countries and to encourage the development of national policy and regulations as essential indicators of the level of integration of such medicine within a national health care system (Uraku and Nwankwo, 2015).

Herbal medicines, also called botanical medicines or phytomedicines, refer to herbs, herbal materials, herbal preparations, and finished herbal products that contain parts of plants or other plant materials as active ingredients. The plant materials include seeds, berries, roots, leaves, bark or flowers. Many drugs used in conventional medicine were originally derived from plants. Salicylic acid is a precursor of aspirin that was originally derived from white willow bark and the meadowsweet plant (*Filipendula ulmaria* (L.) Maxim.). Quinine and Artemesinin are antimalarial drugs derived from *Cinchona pubescens* Vahl bark and *Artemisia annua* L. plant, respectively. Vincristine is an anticancer drug derived from periwinkle (*Cantharnthus rosues* Linn. G. Donn). Morphine, codeine, and paregoric, derived from the opium poppy (*Papaver somniferum* L.), are used in the treatment of diarrhea and pain relief. Digitalis is a cardiac glycoside derived from foxglove plant (*Digitalis purpurea* L.); an herb in use since 1775 (Sofowora, 1980).

In folklore medicine in Nigeria *Rauwolfia vomitoria* (Afzel) is used for treating hypertension, stroke, insomnia and convulsion and *Ocimum gratissimum* L. is used for treating diarrheal diseases the seeds of *Citrus parasidi* Macfad are effective in treating urinary tract infections that are resistant to the conventional antibiotics; pure honey healed infected wounds faster than eusol; dried seeds of *Carica papaya* L. is effective in the treatment of intestinal parasitosis; the analgesic and inflammatory effects of *Garcinia kola* Heckel is known to enhance its use for osteoarthritis treatment; and *Aloe vera* Mill. gel is as effective as benzyl benzoate in the treatment of scabies. Similarly, in South Africa, plant extracts

with muscle relaxant properties are used by traditional birth attendants (TBAs) to assist in child deliveries (Adegoke and Akinsanya, 2002).

Over 80% of the populations in some Asian and African countries depend on traditional medicine for primary health care. The WHO estimates that in many developed countries, 70% to 80% of the population has used some form of alternative or complementary medicine including Ayurvedic, homeopathic, naturopathic, traditional oriental, and Native American Indian medicine. It is also recognised by the WHO that herbal medicines are the most popular form of traditional medicine, and are highly lucrative in the international medicine market (Evans, 2008)[1]. Annual revenues in Western Europe were estimated at US$ 5 billion in 2003-2004, in China the revenue was estimated as US$ 14 billion in 2005, and in Brazil it was US$ 160 million in 2007. Despite the widespread use of herbal medicines globally and their reported benefits, they are not completely harmless. The indiscriminate, irresponsible or non-regulated use of several herbal medicines may put the health of their users at risk of toxicity. Also, there is limited scientific evidence from studies done to evaluate the safety and effectiveness of traditional medicine products and practices. Adverse reactions have been reported to herbal medicines when used alone or concurrently with conventional or orthodox medicines. Despite the international diversity and adoption of TM in different cultures and regions, there is no parallel advance in international standards and methods for its evaluation. National policies and regulations also are lacking for TM in many countries and where these are available; it is difficult to fully regulate TM products, practices and practitioners due to variations in definitions and categorizations of TM therapies. Lack of knowledge of how to sustain and preserve the plant populations and how to use them for medicinal purposes is a potential threat to TM sustenance (Edeoga *et al.,* 2005).

Previous studies of herbal medicine use in Nigeria were focused on adults with various forms of chronic illnesses, pregnant women and children with chronic illnesses. The use of herbal medicines among a general population without chronic health conditions has never been evaluated in Nigeria or other African countries. In the recent times, traditional medicine is being used as medicine in the treatment of various ailments such as pile. Plant materials are primary sources of medicine which are the basis for the local production of herbal mixtures (Evans, 2008).

In developing countries like Nigeria, traditional Medicine is often the easy accessible and affordable treatment available in most of the car park or various joints in the Western region in Nigeria. This herbal mixture; Jekomo herbal mixtures are being consumed by all and sundry most especially, the NURTW (National Union of Road Transport Workers) workers, students, the Okada riders and even some educated individuals use it to treat some ailments such as pile and also used as source of energy. The rate at which people are demanding for this herbal mixture prompted this research. This study is aimed at assessing the nutraceuticals and antimicrobial properties and the general knowledge of the benefits and safety of Jekomo herbal medicine among residents of Ifelodun Local Government Area, Ikirun, Osun State, Nigeria.

2. MATERIALS AND METHODS

2.1 Collection of sample

The herbal mixture sample known as Jekomo was bought from a motor park joint; Alaminsi market, Ikirun on 5th March, 2021.

2.2 Minerals Analysis

The minerals contents of the sample were determined by dry ashing the sample 550ºC in a muffle furnace. Sodium and Potassium were determined using flame photometer (Jenway model) while the rest minerals, Ca, Mg, Fe, Zn, Mn, Cu, and Ni were determined by Atomic Absorption Spectrophotometer (Perkin-Elmer Model, Norwalk CT,USA).

2.3 Phytochemical Analysis

The phytochemicals; alkaloids, glycosides, steriods were determined by the method of Alimor (2008). Flavonoids, and saponins were determined by Edeoga et al. (2005). Oxalate, Tannin and Phytates were determined by the methods described by Eleazu et al. (2012).

2.4 Antimicrobial Analysis

The method of Oyewale (2012) was employed. The herbal mixture was concentrated to 25 mg/ml. After incubations at 37^0C for 24 hours, zones of inhibitions were measured for each microorganism.

2.5 Test Microorganisms

The various bacterial isolates*; Salmonella typii, Erwina carotorora, Streptococcus faecalis, Escherichia coli, Staphylococcus aureus, Alcalogins odorans, Serratia marcesceus* were obtained from the Microbiology Units, Department of Applied Sciences, Osun State Polytechnic, Iree, Nigeria. Stock cultures were maintained in Nutrient Agar slant.

2.6 Antioxidants Assay.

Spectrophotometric Analytical Methods of Analysis as described by Oyewale (2012) were used for the evaluation of the antioxidants capacity full of distant categories by colorimetric determination.

Antioxidant capacity Assay	**Spectrometry**
DPPH	Antioxidant reaction with an organic radicals
ABTS	Antioxidant reaction with an organic radicals
FRAP	Antioxidants reaction with a Fe(III) compounds

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2.7 Physicochemical properties Assay

The moisture content, ash contents, total solids, volatile matters were determined using the methods of AOAC (1990). The pH was measured using Hanna Checker pH meter (Model HI1270).

3. RESULTS AND DSICUSSION

Table 1: Mineral composition of Jekomo herbal mixture

Parameters	Composition
Sodium (Na)	Nil
Potassium (K)	Nil
Calcium (Ca)	2.80± 0.05
Magnessium (Mg)	0.72 ± 0.01
Iron (Fe)	0.02 ± 0.00
Zinc (Zn)	1.96 ± 0.03
Manganese (Mn)	0.02 ± 0.01
Copper (Cu)	0.02 ± 0.00
Nickel (Ni)	0.24 ± 0.01

Table 1 showed the mineral composition of Jekomo herbal mixtures. The results of the analysis indicated that the herbal mixtures do not contain Sodium and Potassium which indicated that the herbal mixture does not increase or affect blood pressure. However, the presence of Calcium and Magnesium in the herbal mixtures indicated that the herbal will be well suited for proper body metabolism. The Calcium is known to play a significant role in muscle contraction, bone and teeth formation as reported by Ganiyu (2005). In addition, the presence of Magnesium in the herbal mixture showed that the herbal mixture will contribute cofactor in enzyme catalysis in the body (Uraku and Nwankwo, 2015). However, the presence of Iron, Zinc, Manganese, Copper and Nickel in small amount indicated that the herbal mixture; Jekomo will have no adverse effect on the consumers.

Table 2: Phytochemical screening of Jekomo herbal mixture

Parameters	Constituents
Phytates	+ve
Tannins	+ve
Phenols	+ve
Oxalates	+ve
Alkaloids	+ve
Flavonoids	+ve
Terpenoids	-ve
Saponins	+ve
Glycosides	+ve
Steroids	+ve

Keys: +ve: presence of secondary metabolites; -ve: absence of secondary metabolites

Table 3: Phytochemical composition of Jekomo herbal mixture

Parameters	Composition
Phytates (mg/g)	4.727 ± 0.01
Oxalates (mg/g)	1.540 ± 0.05
Tannins (mg/g)	1.162 ± 0.02
Phenols (mg/g)	40.375 ± 0.01
Phytic Acid (mg/g)	1.324 ± 0.05
Flavanoids (%)	10.880 ± 0.02
Saponins (%)	10.880 ± 0.02
Glycosides (mg/kg)	23.645 ± 0.01
Alkaloids (%)	11.17 0.03

Table 2 and 3 showed the qualitative and quantitative phytochemical properties of Jekomo herbal mixtures. The presence of the aforementioned secondary metabolites such as saponins, tannins, flavonoids, glycosides in the herbal mixture contribute to its medicinal value. The presence of these secondary metabolites are well documented to exhibit hypoglycemic activity in animals (Schncider and Wolfling, 2004). The presence of flavonoids in the herbal mixture indicated that it has anti-inflammatory, anti-allergic and antiviral properties; free radicals scavenger which has the ability to lower the risk of arthritis and help to prevent atherosclerosis (Uraku and Nwankwo, 2015). However, the presence of tannins in the herbal mixture implies that the herbal mixture will have astringent properties and in addition could quicken the healing of wounds and burns (Eleazu *et al*., 2012). In addition, the presence of these secondary metabolites in the sample investigated is known for its antimicrobial activity as reported by Eleazu et al. (2012); suggesting the possible use of Jekomo herbal mixture for medicinal purposes (Alimor, 2008). The presence of phenols in very large amount (40.375 ± 0.01) indicated that Jekomo herbal mixture showed strong antibacterial, antioxidants, anti-inflammatory, antiseptic and antiviral properties. Phenols are secondary metabolites that ward off infection. Phenol containing herbs are often used as contributor to natural preservative system as well as the presence of Tannin in the herbal mixtures of Jekomo which are polyphenols compounds that have astringent properties making them useful for tightening tissue such as that which is found in varicose veins and for drying up secretions (Verla *et al*., 2014). The Saponins in the sample investigated also imparts medicinal value. High level of saponins has been reported to reduce body cholesterol by preventing rumen protozoa by reacting with cholesterol in the protozoan cell membrane thereby dissolving it (Ganiyu, 2005).

Table 4: Antibacteria activity of Jekomo herbal mixture after 24 hrs of incubation

Bacteria	Zones of Inhibition	
	Jekomo (mm)	***Standard Antibiotics (mm)***
S. typii	4.0	20.0
S. faecalis	8.0	14.0
E. carotovora	6.0	18.0
E. coli	7.0	20.0
S. aureus	8.0	32.0
A. odorans	10.0	30.0
S. marcesceus	5.0	22.0

Table 4 showed values of zones of inhibitions in milimitres (mm) after 24 hours of incubation against some selected pathogens organism and a standard antibiotics used was Amoxicillin of 250 mg.

The present investigation revealed that the Jekomo herbal mixture inhibit the selected bacteria at various zones of inhibition ranging from 4 mm- 10 mm*: A. odorans* > *S. aureus* > *E. carotovora* > *E. coli* >*S. faecalis* > *S. marcesceus* >*S. typii*. The investigation showed that all the selected bacteria were inhibited by the Amoxicillin. The outcomes indicated that the consumption of Jekomo herbal mixtures is more than what majority assumed it is used for but rather Jekomo herbal mixture can also perform antibacterial activity in the body system which is capable of inhibiting various diseases such as pelvic infections, abdominal infection caused by the various microorganisms.

Table 5: Antioxidants composition of Jekomo Herbal mixture

Parameters	Composition
FRAP (mg/g)	27.08 ± 4.01
DPPH (%)	22.11 ± 2.05
ABTS (mol/g)	0.03 ± 0.01
Fe $^{2+}$ chelation (%)	52.83 ± 8.05
OH- Radicals (%)	7.47 ± 0.02

Table 5 showed that Jekomo Herbal mixtures contained reasonable amount of various antioxidants such as FRAP, DPPH, ABTS, Fe^{2+} chelation and OH- Radicals. The presence of all the aforementioned antioxidants which may help to prevent oxidative stress related diseases caused by the attack of free radicals on the key biocomponents like lipids or nuclei acids can impact medicinal property on Jekomo herbal mixture (Pisoschi *et al.*,2009).

Table 6: Physicochemical properties of Jekomo herbal mixture

Parameters	Composition
pH	3.80
Electrical Conductivity (umhos)	8.5 x102
Total Solids (%)	0.50
Colour	Darkish
Odour	Unobjectionable
Taste	Bitter
Ash content (%)	0.51
Water content (%)	89.48
Volatile matter	10.52

Table 6: depicts the physicochemical properties of Jekomo herbal mixtures. The results of the analysis showed various values for acidity, total solids, unobjectionable odour, bitter taste and electrical conductivity. The moisture content of 89.484 % in Jekomo herbal mixture enables it to conveniently diffuse into the body system. All these properties impact reasonable properties on the herbal mixture.

4. CONCLUSION

The outcome of the study indicated the presence of various minerals, phytochemicals in the herbal mixture which may be responsible for the pharmacological activity. The mineral compositions, antioxidants activities as well as the antibacterial activity in the herbal mixture impact a medicinal value on Jekomo herbal mixture which is more than what the majority consumers assumed it work for. Jekomo herbal mixture is more than the energy source and pile removal herbal mixture but has a lot of medicinal values for proper maintenance of human body and it is safe for consumption.

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