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MICROBIOLOGICAL QUALITY OF SELECTED HERBAL PREPARATIONS USED IN THE TREATMENT OF TYPHOID FEVER SOLD IN GOMBE METROPOLIS NIGERIA

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Abstract

Microbiological quality of selected herbal preparation used in the treatment of typhoid fever sold in Gombe metropolis, Gombe State, Nigeria was determined. The herbal Preparation were selected based on the interview with some people of the community and also the producers of the preparations. Five (5) herbal preparations were selected and tested namely; Med-bunch, Al-muwafaqa, Mau'shifa, Yellow cassia, and Addawau'l humma and compare with the standard drug Ciprofloxacin using standard disc diffusion method. Phytochemical Screening reveals the presence of metabolite such alkaloid, tannin, flavonoid, glycoside, saponin and steroid. There is no significance difference between Addawa'ul humma and the standard drug Ciproflxacin ($P<0.05$), and between the Addawa'ul humma when compared with the rest of the four herbal preparation. Addawa'ul humma was recorded to have much anti-typhoid activity. The physicochemical analysis result of Addawa'ul humma shows that it has the highest concentration of phosphate and sulphate (0.72 mg/kg and 0.2 mg/kg respectively) while Al-mufaqa has the least concentrations (0.09 mg/kg and 1.09 mg/kg). The Organoleptic result shows that only Ma'u Shifa has the offensive odour but the rest are fruity in smell, all the samples are bitter with only Med Bunch and Yellow cassia that are not turbid. Results of FT-IR indicated that the preparations have several functional such as alkanol and carboxyl group. The result of this studies advocate for continuous use of these preparations in the treatment of typhoid, but with extra care for dosage and purity

Keywords: Herbal preparation, treatment, typhoid fever, functional groups, medicine

INTRODUCTIONS

Herbal preparations are comminuting or powdered plant material, extracts, tinctures, fatty or essential oils, expressed juices, processed resins or gums and so forth prepared from different plant parts such as roots, bark, stems, leaves, and fruits whose production involves a fractional, purification, or concentration process (Evans, 1989; Evans, 1996). Based on the European Medicine Evaluation Agency (EMEA), Nigeria Agency for Food and Drugs Administration Control (NAFDAC) and WHO quality guidelines, the herbal drug or preparation in its entirety must be considered as the active ingredient. It is evident from this and from the fact that herbal medicines are complex mixtures of substances that great effort must be made to ensure quality.

According to the World Health Organization (WHO), "Herbal Preparations" contain plant parts or plant material in the crude or processed state as active ingredients and may contain excipients (foreign substances) (WHO, 1996; Busse, 1999). Combinations with chemically defined active substances or isolated constituents are not considered herbal preparations (Busse, 2000; GNDP, 2004). Similarly, the European Medicine Evaluation Agency (EMEA) defines herbal the general public (Busse, 2000; Ang-Lee *et al*., 2001). A major drawback of a missing premarket control is that products which contain potentially unsafe or undeclared levels of toxic contaminants or do not contain the labeled amount of constituents may be introduced. In countries such as India, China and UK work has been done in the field of quality assessment of herbal preparations (Busse, 2000).

In Nigeria, however, even though, there is proliferation of herbal products on the market, not much has been done in this field. The producers of the herbal preparations, in Nigeria do not have the required laboratories or expertise to perform quality control on the preparations they produce. This brings the problem of inconsistency on the quality of the herbal preparations in the country. This work therefore, seeks to evaluate the quality of some herbal preparations on the Nigerian market using harmonized procedures.

MATERIALS AND METHODS

Study area

The study area is Gombe, Gombe state. Gombe is a city in north eastern Nigeria and a Local Government Area. It is located between latitude 10° 17 N and 11.10 °E and longitude 10.283 °N and 11.167 °E. The LGA has a total area of 52 km^2. It is the capital city of Gombe State and has

an estimated population of 24268,000 (Population Census, 2006). The city is the headquarters of the Gombe Emirate, a traditional state that covers most of Gombe State (Gombe State Online Nigeria Daily, 2010).

Sample Collection

Five different samples of herbal preparations were collected from different Manufacturers within Gombe metropolis. Clinical specimens from teaching hospital Gombe was collected and processed by according to methods of Cheesbrough, (2016). Microbiological analysis of herbal preparations was carried out. Herbal preparations collected were tested for the bacterial and fungal load by pour plate method. All the microbial contaminants were characterized at least to genera level (Cheesbrough, 2016). Each container will be inspected or packaging unit for conformity with pharmacopoeia monographs or other requirements regarding packaging and labeling. Any defects that may influence the quality or stability of the contents (physical damage, moisture, etc.) will be inspected. Five (5) herbal products were selected for this study after obtaining good literature and affectivity of each, the samples were further inspected for:

Table 1 Samples Composition

Name of Sample	Composition/Ingredient
1. MED BUNCH	*Cleistopholis patens, Xlopia aethiopica, Srcuridaca Longedunculata, Mandifera Indica, Morinda Lucida, Zanthoxyylum Zanthoxylloides, Zingiber officinale,*
2. ADDAWA'UL HUMMA(STEAMING)	Treated Water. Guava leaves, Mango leaves, Neem tree leaves, Bitter Orange tree leaves, Umbrella tree leaves
3. AL-MUWAFAQA	*Ficus gnaphalocarpa.* *Mandifera indica* *Cidium guajava* *Kuma ficus*

4. Ma'u Shifa (Yellow cassia extract)	*Mandifera indica,* *Morinda lucida* Mango leaves Neem tree leaves Umbrella tree leaves

Chemical analysis

Organoleptic tests

(i) **Colour:** The sample was examined under diffuse daylight or artificial light source with `wavelengths similar to those of daylight may be used. The colour of the sample was compared with that of a reference sample.

(ii) **Odour:** Small portion of the sample was placed in to a beaker of suitable size, and slowly and repeatedly inhaled the air over the material. If no distinct odour is perceptible a gentle pressure will be applied to the beaker to confirm the odour. The sample's odour strength was determined (none, weak, distinct, strong) and then the odour sensation (aromatic, fruity, musty, mouldy, rancid, etc.). A direct comparison of the odour with a defined substance or reference substance was used (e.g. peppermint should have an odour similar to menthol, cloves should have an odour similar to eugenol).

Determination of physicochemical properties

(i)Total ash*:* About 2 – 4 g of the ground air-dried sample were accurately weighed, in a previously ignited and tared crucible (usually of platinum or silica). the weighed sample will be Spread the material in an even layer and ignite it by gradually increasing the heat to 500–600 °C until it is white, indicating the absence of carbon. Cool in a desiccator and weigh.

(ii) Acid insoluble ash: To the crucible containing the total ash, 25 ml of hydrochloric acid will be added and cover with a watch-glass and was boiled gently for 5 minutes. The insoluble matter on an ashless filter-paper was collected and wash with hot water until the filtrate is neutral. Filter-paper containing the insoluble matter will be transferred in to the original crucible, dry on a hotplate and ignite to constant weight. Allow the residue to cool in a suitable desiccator for 30 minutes, then weigh without delay. Calculate the content of acid-insoluble ash in mg per g of air-dried material.

Macroscopic and Microscopic Examination

(i) Surface and touch characteristics: Each of the sample was examined with a magnifying lens (6x to 10x). The dry residue of each of the sample was touched to determine if it is

soft or hard; bend and rupture it to obtain information on brittleness and the appearance of the fracture plane – whether it is fibrous, smooth, rough, granular, etc.

Inspection by microscopy

The following equipment were used:

A microscope equipped with lenses providing a wide range of magnification and a sub-stage condenser, a graduated mechanical stage, objectives with a magnification of 4×, 10× and 40×, and colour filters of ground glass, blue-green; high eye point, eyepieces were preferred for wearers of spectacles; a lamp, either separate or incorporated into microscope.

Phytochemical screening

Each of the herbal drugs selected were analyzed for its phytochemical constituent without any extraction with relevant solvent.

Test for Flavonoids: A 5 ml of the herbal drug were added to a concentrated Sulphuric acid (1 ml) and 0.5 g of Mg. A pink or red coloration that disappear on standing (3 min) indicated the presence of flavonoids.

Test for Tannins: Two methods were used to test for tannins. First, about 1 ml of the drug was added in 2 ml of water in a test tube, 2 to 3 drops of diluted ferric chloride solution were added and observed for green to blue-green (cathechictannins) or blue-black (garlic tannins) coloration. Second, 2 ml of the aqueous extract was added to 2ml of water, a 1 to 2 drops of diluted ferric chloride solution was added . A dark green or blue green coloration indicates the presence of tannins.

Test for saponins: To 1 ml of aqueous extract were added few volume of distilled water in a test tube. The solution was then be shaken vigorously and observed for a stable persistent froth for 20 min.

Test for alkaloids: Three methods were used to test for alkaloids.

(i) A 10ml of the extract will be evaporated under water bath to obtain the dry residue, follow by the addition of 1.5 ml HCl (2 %) acid solution. After that, 1 to 2 drops of Mayer's reagent and Wagner was added, a yellow- white precipitate indicates the presence of the alkaloidal base.

(ii) A 10 ml of the extract was evaporated under water bath to obtain the dry residue, it will then be dissolved in 5 ml of HCl (2 N) and filtered. A few drops of Mayer's reagent and Wagner’s were added; the presence of precipitate indicates the alkaloids.

(3) A 15 ml of the aqueous extract was added 2 ml of NH_4OH a 10 % (pH =7). The alkaloid was extracted 3 times with 10 ml chloroform. The chloroform layer was then washed 3 times with 2 ml of HCL (10 %). This were divided into two portions. Mayer's reagent was added to one portion and Wagner's reagent to the other. The formation of a brown or white precipitate was regarded as positive for the presence of alkaloids.

Test for anthraquinone: Eight (8) ml of the extract was treated with the Bornträger reagent, a positive test is revealed on the appearance of a bright color change from orange red to purple.

Test for sterols and steroids: Sterols and steroids were sought by the reaction of Liebermann. Ten (10 ml) ml of extract will be evaporated. The residue was dissolved in 0.5 ml of hot acetic anhydride follow by the addition of 0.5 ml of the filtrate chloroform. The mixture was then treated with the Liebermann-Burchard. The appearance, at the interphase, a ring of blue-green, showed a positive reaction.

Test for the carbohydrate – Reducing sugars: Two methods were used to test for reducing sugars. First, the ethanol extract (1 ml) was added to 1ml of water and 20 drops of boiling Fehling's solution (A and B) in a test tube were added too. The formation of a precipitate red-brick in the bottom of the tube will indicates the presence of reducing sugars. Secondly, 2 ml of aqueous solution, 5-8 drops of boiling Benedict's solution. A red-brick precipitate showed the presence of reducing sugars.

Determination of functional groups

FT-IR was used to identify all the functional group present in the sample.

Microbiological analysis

Plate count

For bacteria, petri dishes of 9 – 10 cm in diameter were used, 1 ml of the herbal material was inoculated on a plate count media and incubated at a temperature not exceeding 45 °C for 48 – 72 hours. It was then diluted to obtain an expected colony count of not more than 300. Colonies formed was calculated using the plate with the largest number of colonies, up to a maximum of 300. For fungi Petri dishes of 9 – 10 cm in diameter was used, 1 ml of the herbal material were inoculated on the 15 ml of liquefied Sabouraud glucose agar with antibiotics incubated at 22 ^{0}C for 72 hours. The number of colonies formed was calculated the results using the dish with not more than 100 colonies.

Biochemical identifications

Inoculation of Klingler Iron Agar

Three characteristic colonies from the plating media will be inoculated into Kligler Iron Agar (KIA) as follows: the media will be stabbed to the butt and then the slant was streak with a zigzag configuration. The test tube was incubated overnight. On the following morning, reactions were examined in the KIA tubes. Tubes suspicious for *Salmonella* had an acid (yellow) but an alkaline (red) slant. They produced gas (bubbles or cracks in the agar) and/or produce hydrogen sulfide (black along the stab line).

Standardization of inoculums

The density of suspension inoculum on the media for susceptibility test will be determined using the McFarland standard Cells corresponding to $10^6 \times 10^8$ CFU/mL

Antibacterial assay

The sensitivity of each herbal product will be determined using agar well diffusion technique with modifications. Wells will be bored into the already gelled nutrient agar medium which has been previous seeded with the test organism using the spread plate method. The 6 mm diameter wells were bored using a sterile cork borer. The wells were then filled with 0.2 mL of each of the herbal product extracts (500, 400, 250, 100 and 50 mg/ml) and care was taken not to allow the solution to spill to the surface of the medium. The plates were allowed to stand on the laboratory bench undisturbed for 1 hour to allow proper absorption into the medium before the plates was incubated at 37 °C for 18 h. The plates were later observed for the zone diameter of inhibition (ZDI). The effects of the herbal extracts on the test organism will be compared with that of a standard antibiotic, amoxicillin as a control, using 12 mm as indicative of sensitivity according the guidelines of the Clinical and Laboratory Standards Institute of 2013.

Minimum inhibitory concentration (MIC) of the extract on *Salmonella*

The MIC of the herbal extract will be determined using methods of Bukar et al. with modification. Plant extracts of 100 %, 80 %, 60 %, 40 %, 20 concentrations will be prepared. One milliliter of the different concentrations of each herbal extract was added to 9 mL of the nutrient broth in test tubes and 1 mL of the standardized inoculum of the test organism was also be added. The control will be also set up, but amoxicillin was used instead of the herbal extracts. The activity was determined by visual method and increase in turbidity of the test

tubes using spectrophotometer.

Minimum bactericidal concentration (MBC) of the extracts on Salmonella

The MBC of the extracts was determined using the method of Eldeman *et al.* (1986) with modifications. Samples was taken from tubes with no change in turbidity in the MIC assay and sub cultured onto freshly prepared nutrient agar plates and incubated at 37 °C for 18 h. The lowest concentration of the extract that did not allow any increase in number of viable cells or bacterial growth on the surface of the agar plates were taken as the MBC.

Statistical analysis

The results were expressed as mean ± SD. The two-way ANOVA test was used to compare results among and within groups for any significant difference in antibacterial activity of the extracts and the control.

RESULTS

The findings from this study are presented and interpreted as follows:

Antimicrobial susceptibility pattern of Salmonella isolates

The salmonella isolates according to antimicrobial susceptibility pattern shows that (table 2) highest zone of inhibition was found against Ciprofloxacin (27 ± 2.0), followed by Amoxycillin (21 ± 2.0) and Gentamycin (19 ± 2.0).

Phytochemical characteristics of herbal preparations

The screening for phytochemical components of herbal preparations in this study (table 3), indicated that all the compounds are present in small to moderate amounts in all the samples tested, with yellow cassia as the highest, followed by Med Bunch, where alkaloids was found in high amount.

Microbiological quality of the herbal preparations

The assessment of microbiological quality of the herbal preparations (table 4) revealed that only Ma'u Shifa recorded a total colony count of 2 ± 1 and no faecal coliforms was found in the samples

Antibacterial efficacy of the Herbal Samples on the Salmonella isolates

Antibacterial activity of the Herbal Samples on the Salmonella isolates from this study (table 5) shows a highest zone of inhibition with respect to highest concentration (100%) across all the herbal samples. This trends was also observed for the Minimum Inhibitory Concentration (MIC) in 100% and 80% concentrations.

Minimum Bactericidal Concentration (MBC) the herbal samples

The lethal effects of the samples on Salmonella isolates in this study indicated a highest concentrations (MBC) of 10% in Med Bunch and Ma'uShifa preparations.

Table 2: Antimicrobial susceptibility pattern of Salmonella isolates from this study

Antibiotics (µg)	Number and susceptibility of isolates	
	Sensitive (Mean ± S.D)	Resistant
Ampicillin (10)	17 ± 4.0	00
Amoxycillin (30)	21 ± 2.0	00
Cefuroxime (30)	-	00
Ciprofloxacin (5)	27 ± 2.0	00
Cotrimoxazole (25)	9 ± 2.0	00
Erythromycin (25)	13 ± 1.0	00
Gentamycin (10)	19 ± 2.0	00
Pefloxacine	13 ± 1.0	00
Rocephin (10)	-	00

Table 3: Phytochemical Screening of herbal preparations used in this study

Phytochemicals	Herbal preparations and Test				
	Med Bunch	Al-Muwafaqa	Ma'u-shifa	Y. Cassia	A. Humma
Alkaloids	+++	+	+	++	+
Anthraquinone	++	+	++	+	+
Flavonoid	+	+	+	++	++
Glycosides	+	+	+	++	+
Saponins	+	+	+	++	+
Steroids	++	+	+	++	+
Tannins	+	+	+	+	++

Key: +++ = Present in high amount
++ = Present in moderate amount
+ = Present in small amount
- = Absent

Table 4: Microbiological quality of herbal preparations used in this study

Herbal Samples	Total coliform count	*E.coli* count
Med-Bunch	0	0
Al-Muwafaqa	0	0
Ma'u Shifa	2 ± 1	0
Yellow cassia	0	0
Addawa'ul humma	0	0

Table 5: Anti-salmonella Activity of the Herbal Samples on the *Salmonella* isolates from this study

Herbal Samples	Concentrations (%) and Susceptibility/Zones of Inhibition (mm)				
	20	40	60	80	100
Med-Bunch	0	0	5.1 ± 2.1	6.8 ± 4.0	11.2 ± 2.3
Al-Muwafaqa	5.1 ± 1.3	7.9 ± 1.4	8.2 ± 1.2	8.8 ± 1.9	9.4 ± 2.1
Ma'u Shifa	0	0	0	7.7 ± 1.4	9.2 ± 1.1
Yellow cassia	0	5.2 ± 1.7	9.5 ± 1.0	12.9 ± 1.1	13.4± 2.1
Addawa'ul humma	8.0 ± 1.3	11.2 ± 1.0	13.4 ± 2.	18.1 ± 1.31	22.4 ± 1.1
Ciprofloxacin (10µg/disc)	0	0	0	0	28.1 ± 2.4

Values are expressed as Means ± Mean Deviation

Table 6: Minimum Inhibitory Concentration (MIC) of Herbal Samples

Herbal Samples	Concentrations (%) and Inference				
	20	40	60	80	100
Med-Bunch	0	0	0	1	1
Al-Muwafaqa	0	0	0	1	1
Ma'u Shifa	0	0	1	1	1
Yellow cassia	0	1	1	1	1
Addawa'ul humma	0	1	1	1	1
Ciprofloxacin (10µg/disc)	0	1	1	1	1

Key: 0 = Turbid 1 = Clear

Table 7: Minimum Bactericidal Concentration (MBC) of Herbal Samples

Herbal samples	Herbal preparations and Test					
	M.B	A.M	M.S	Y.C	A.H	Ciprofloxacin (10 µg/disc)
MBC (%)	10	1	10	1	1	0.01mg/ml

Key: M.B = Med-Bunch A.M = Al-Muwafaqa M.S = Ma'u Shifa,
Y.C = Yellow cassia A.H = Addawa'ul humma

Organoleptic properties of the Herbal preparations

The screening for organoleptic characteristics of the herbal preparations in this study (table 7) revealed that the samples fruity, turbid or clear, brown, green and bitter in taste. But Ma'ushifa and yellow cassia are offensive and choking.

Physicochemical properties of the herbal samples

The assessment of physicochemical properties of the herbal preparations (table 9) showed that Ma'ushifa and yellow cassia are acidic, while med bunch, Al'mawafaqa and Addawa'ul Humma are alkaline, with some quantity of phosphate (1.02-4.20mg/kg).

FT-IR representation of functional groups in the herbal samples

In this study, the common functional groups associated with the herbal preparations are; –OH, $–CH_3$, C ≡ C and C = O, but the methyl group ($–CH_3$) was absent in med bunch, Al'mawafaqa.

Table 8: Organoleptic Properties on the Herbal Preparations used in this study

Herbal samples	Organoleptic Properties				
	Odour	Taste	Touch	Color	Clarity
Med-Bunch	Fruity	Bitter	Soft	Dark brown	Cleared
Al-Muwafaqa	Fruity	Bitter	Brittle	Brown	Turbid
Ma'u Shifa	Offensive	Bitter	Brittle	Dark green	Turbid
Yellow cassia	Choking	Bitter	Soft	Green	Cleared
Addawa'ul Humma	Fruity	Bitter	Soft	Dark green	Turbid

Table 9: Physicochemical properties of the herbal samples used in this study

Herbal samples	Physicochemical Properties				
	Sulphate mg/Kg	Phosphate mg/Kg	Acidity (mg/L)	Alkalinity (mg/L)	pH
Med-Bunch	0.11	2.40	0.63	0.82	7.31
Al-Muwafaqa	0.09	1.09	0.41	0.88	7.49
Ma'u Shifa	0.23	1.32	0.92	0.09	6.92
Yellow cassia	0.42	3.1	0.98	0.04	6.03
Addawa'ul Humma	0.72	4.2	0.51	0.92	7.52

Table 10: FT-IR representation of functional groups in the herbal preparations used in this study

Herbal Samples	Functional groups			
Med-Bunch	–OH	–	C ≡ C	C = O
Al-Muwafaqa	–OH	–	C ≡ C	C = O
Ma'u Shifa	–OH	$–CH_3$	C ≡ C	C = O
Yellow cassia	–OH	$–CH_3$	C ≡ C	C = O
Addawa'ul humma	–OH	$–CH_3$	C ≡ C	C = O

DISCUSSION

Use of traditional medicine in the treatment of typhoid in Nigeria has been gaining remarkable success, despite the side effects and shortcomings. In this study, highest zone of inhibition was found against Ciprofloxacin, followed by Amoxycillin and Gentamycin, which are some of the common drugs used clinically in the treatment of typhoid in this area.

The compounds are present in small to moderate amounts in all the samples tested, with yellow cassia as the highest, followed by Med Bunch, where alkaloids was found in high amount. All the herbal preparations use in this report for the anti-typhoidal, were found to contain the most important secondary metabolite such as alkaloid and flavonoids but med-bunch happens to contained more alkaloid than the rest of the herbal samples. While yellow cassia, and addawa'ul-humma contain more flavonoids, components exhibit their antimicrobial effects by destroying the cell wall of antigen and hence render it death. Steroid was also found in sufficient quantity in all the five herbal preparation. With the exception of Ma'u-shifa and Addawa'ul-humma, for the three trials carry out for the phytochemicals only Al-Muwafaqa happens to contain no Anthraquinones. Research has shown more than 65 % of Nigerians in the rural areas rely heavily on locally made herbal products (WHO, 2008).

In this study, only Ma'u Shifa recorded a total colony count of 2 ± 1 and no faecal coliforms was found in the samples, which indicated a very low level of contamination. All the herbal extract proven to contain OH groups which is more effective in antibacterial activity. At

least 3 functional group were identifies from each of the herbal extract containing unsaturated triple bond, double bond and carbonyl group in addition to the –OH group. This functional groups is responsible for the antibacterial effect (*Salmonella typhi*) by destroying the cell wall of the bacteria and hence render it inactive or death.

Med-bunch, Ma'u shifa exhibit so much anti-typhoid activity and statistically no difference at p> 0.05 but statistically difference when compared with yellow cassia and Addawa-ul humma that shows 100 % inactivity at fungi. The MIC for the candida shows that Ma'u shifa has the best activity against candida with the MIC of 60 % followed by med bunch with the MIC of 80 %. The assessment of physicochemical properties of the herbal preparations (table 8) showed that Ma'ushifa and yellow cassia are acidic, while med bunch, Al'mawafaqa and Addawa'ul Humma are alkaline, with some quantity of phosphate (1.02-4.20mg/kg), which is an important essential mineral element and part of nucleotide.

According to the traditional healers, medicines prepared by combining two or more plants are more potent than those prepared with single plants. This has been attributed to the additive effects of the plants (Addo-Fordjour *et al*. 2008, Okello and Ssegawa 2007) where the combination of several medicinal plants increases the quality and efficacy of medicine. Similar observations have also been recorded amongst the Kani communities in India (Ayyanar & Ignacimutum, 2005). There is the general belief that health care delivery system in Nigeria is very poor (W.H.O 2008). Various reasons have been adduced for this state of affairs and they include inadequate supply of health professionals, poor distribution of health facilities with concentration of the available few, in the urban centres, poor access to safe drinking water, poor harnessing of all available medical and health systems and poor infrastructural development, among others (*Farmacopea Argentina, 2008)*. This has made Nigeria to lag behind many other developing countries because a large proportion of Nigerians especially in the rural areas can still not access affordable health care. However, to a large majority of the populace their main source of health care is traditional medicine which is available, accessible and affordable to them (Erinoso, 1998).

This is the ancient medical practice that has sustained them over the centuries and which, in spite of government lukewarm attitude towards it, continue to wax stronger. For a practice which more than 80 per cent of the population rely upon for care and cure, it deserves to be fully developed and sustained by all stakeholders (Pharmacopoeia, 2005). Government should therefore create the enabling environment for the development of traditional medicine and its

eventual integration into the health care delivery system of the country and for the benefit of the people.Both the herbal preparations prove to contain no contamination, Addwa'ul humma, Ma'u shifa, yellow cassia has the highest anti-typhoid activity while that of Med-bunch and Ma'u shifa exhibit low anti-typhoid activity.

CONCLUSION

This study revealed that, all the herbal preparation contains the most important functional group (OH) which is chiefly responsible for the anti-typhoid activity. Both the herbal preparations proves to contain no contamination, Addwa'ul Humma , Ma'u Shifa, Yellow cassia has the highest anti-typhoid It is now obvious that exclusive reliance on one particular health practice cannot assuage the health needs of the populace. There is no doubt that traditional medicine remains in the forefront in meeting the health needs of the people especially in the rural areas of the country in spite of the expansion of orthodox medicine as this study demonstrate.

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