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Ethno-Medicinal Uses of Selected Indigenous Fruit Trees from the Lake Victoria Basin Districts in Uganda

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Assessment of ethnomedicinal uses of indigenous fruit trees (IFTs) was carried out using both household surveys and focus group discussions (FGD) in the five Lake Victoria Basin (LVB) districts of Uganda. A total of 400 respondents were interviewed on the availability of IFTs in their locality, their medicinal uses, parts used as medicine and methods of preparation. Frequencies of responses, Informant Consent Factor (ICF), Fidelity Level (FL) and User Value (UV) were analysed. The predominant methods for preparing/administering medicine from IFTs were decoction (47%), eating fruit pulp (33%), chewing (5%), smoking (3%) and application as ointment (1%) among others. The highest ICF of health conditions claimed to be treated using IFTs were bone pain (ICF=0.833) and loss of appetite (ICF=0.833). The most cited IFT for medicinal uses was *Saba comorensis* (UV=0.39) and the least was *Carissa edulis*. Evaluation of bioactive components of these IFTs would help justify their apparent therapeutic claims.

Keywords: Ethno-uses, Medicinal plant, Indigenous fruit trees, Lake Victoria Basin & Uganda.

1. Introduction

Lake Victoria Basin (LVB) is among the richest regions in terms of natural resources in East Africa, yet it is has the poorest communities with high incidences of diseases such as malaria, dengue, fever, leishmaniasis, cholera, skin diseases and respiratory tract infections [1]. Due to the high cost of health services and poor health infrastructure in the region (which cannot allow majority of the poor population in LVB to seek proper health care), most of these communities living around the LVB have to rely on traditional medicine for primary health care. According to WHO, 80% of population in developing countries depends on traditional medicine, mainly medicinal plants for primary health care [2]. Such therapeutic role of traditional medicine has been attributed to the bioactive components present in the different medicinal plants.

Indeed since ancient time indigenous fruit trees (IFT) have been a source of traditional medicine and

their importance is based on essential nutrients and bioactive phytochemical components they contain. Indigenous fruit trees are also rich sources of micro nutrients such as vitamins (e.g. vitamin C and A) and minerals (e.g. Na, K, Ca, P, Zn and Fe) including macro nutrients such as carbohydrates, proteins, fats and fibre that play important functions in the body development and good health [3]. In recent years, bioactive phytochemical compounds such as flavanoids, coumarins, tannins, saponins and anthocyaninins have also gained great importance because of their health benefiting properties. The consumption of fruits has also been shown to plays a significant role in prevention and delay in the onset of chronic degenerative diseases such as hypertension, cancer and cardiovascular diseases [4].

The above importance has attracted the attention of several pharmaceutical companies to carry out research in bioactive components as they search for new drugs. Apart from the strong belief that pharmaceutical drugs from bioactive components are effective, safe and have fewer side effects, the discovery of potential bioactive compounds as drugs usually starts with ethnobotanical survey to select suitable plants for pharmacological studies [5].

Even if several ethno-botanical surveys on medicinal plants have been conducted in different parts of the world, surveys focusing on IFTs have received less attention in pharmaceutical research. The fact that IFTs are used in folk medicine to treat different ailments makes them a potential source of pharmaceutical drugs, a study like this one that aims at documenting the ethno-medicinal uses of IFTs in the Lake Victoria Basin (LVB) districts of Uganda can also open up a door for very paramount pharmaceutical research.

2. Materials and Methods

2.1 Study area

Lake Victoria Basin (LVB) is a broad band following the Lake shores through much of Uganda, western Kenya into northwestern Tanzania, northeastern part of Rwanda and some parts of Burundi [1]. It covers an area of 193,000km^2 with a population close to 30 million people. This study was conducted in the LVB districts of Masaka, Buikwe, Kamuli, Namutumba and Busia of Uganda (Figure 1). These districts were selected after a reconnaissance study with the guidance of key informants based on the availability of common IFTs and diverse categories of communities.

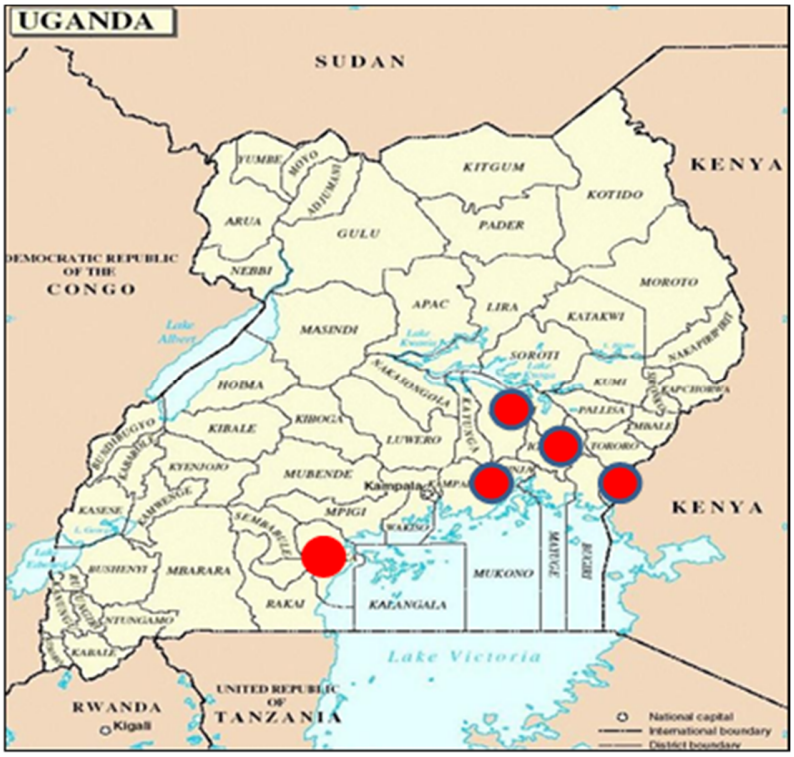

Fig 1: Sampled Lake Victoria Basin districts in Uganda

2.2 Data Collection

Data were systematically collected through administration of questionnaires, key informant interviews and focus group discussions carried out in local dialects known to the people in each district. In Masaka and Buikwe districts (Luganda dialect), Kamuli and Namutumba districts (Lusoga dialect) and Busia district (Samia dialects) were used with the help of local interpreters. The population studied included communities with high and diverse interests in the use and management of IFTs. Eighty (80) households were interviewed in each district. In total 400 (238 males and 162 females) were interviewed

and their ages ranged from 20-102 years. Ethnical issues regarding respect, prior informed consent and

basic fairness towards custodians of knowledge were obtained prior to data collection.

The major variables of the study included but not limited to: list of IFTs in the locality known to the respondents, their medicinal uses that include diseases being treated by various IFTs, parts of the IFT used or commonly preferred for use for treatment, method of preparing the medicine and claim(s) about a particular medicine from a particular IFT(s). Medicinal claim of these IFTs were recorded according to the disease's name and symptom in the local language which were later matched with the biomedical terminologies from the previous ethno botanical surveys [6].

The respondents were requested to confirm the IFTs they mentioned for scientific identification through direct field observations. Common IFTs were identified directly through field observations with the help of a taxonomist and samples of those that could not be identified in the field were taken to Makerere University Herbarium for further verification.

After the household surveys, focus group discussions were held four month later in each district to validate the list of IFTs collected during the household surveys. Both the males and females were mobilized to participate in the focus group discussion as a way of collecting their divergent views on the local medicinal uses of IFTs. For each group of the same sex, a total of 8-12 members who participated in the household survey were mobilized in each sampled parish. In order to obtain opinion from various age groups, each gender group comprised of: youths (18-30 years), middle aged (above 30 – 40 years) and also those of over 40 years and above.

2.3 Data analysis

The collected data were entered into Microsoft Excel for analysis. In order to assess the homogeneity of information on the reported uses of IFTs in local/traditional medicine, Informant Consensus Factors (ICF) was determined for each reported disease [7]. The frequency for use of IFTs for treating a particular ailment was assessed in terms of Fidelity Level (FL) following Rokaya *et al.* [8]. The relative importance of each IFT as traditional medicine was assessed using User Value (UV) as by Mwine *et al.* [9].

Informant Consensus Factor was calculated using the expression: ICF= $(N_{ur}-T)/(N_{ur}-1)$; Where; N_{ur}- is number of respondents mentioning the disease and T-number of IFTs mentioned for the disease. As in other previous studies, high ICF value (close to 1.0) indicates a very high confidence in the use of IFTs for treating that particular disease [10]. It is also an indication of large variation in information on the reported use of a particular plant by the respondents.

Fidelity level (FL) was calculated using the expression; $FL_{ij\ (\%)} = NP_{ij}/N_i \times 100$, Where; NP_{ij} is the number of use-reports cited for a given plant species; i for a particular ailment category j and N_i is the total number of use-reports cited for any given species i. While IFT which has only one user report is not included in the analysis for accuracy purpose, the plant species with the highest FLij value is considered the most preferred species for a particular ailment category j [10]. User value (UV) of the reported IFTs species was assessed using the expression; $UV=\sum U/n$; where; U–number of user citation and n-is number of the respondents [8].

3. Results

3.1 Indigenous fruit trees and Ethnomedicinal uses

Eight IFTs commonly used for medicinal purposes in the LVB districts of Uganda were found to be distributed in eight genera and seven families (Table 1). The family apocynaceae had two species while the families; anacardiaceae, burseracea, clusiaceae, fabaceae, sapotaceae and myrtaceae, each had one IFT species. The reported IFTs in the above families were; *Tamarindus indica* , *Garcinia buchananii* , *Carissa edulis* , *Rhus vulgaris* , *Canarium Schweinfuthii, Saba comorensis* , *Vangueria apiculata and Chrysophyllum albidum* reported by 47%, 42%, 34%, 31%, 28%, 19%, 18% and 14 % of the respondents, respectively.

The reported IFTs were claimed to treat 38 health conditions. Indigenous fruit trees with most medicinal uses were; *T. indica* (with reported 18 medicinal uses) followed by *S. comorensis* and *G. Buchananii* (with reported 15 uses each), *Canarium schweinfuthii* (with reported 11 medicinal uses); R. *vulgaris*, *C. albidum*, *V. apiculata* and *C. edulis* with reported 11, eight, five, four and three medicinal uses respectively.

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Table 1: Traditionally claimed medicinal uses of Indigenous Fruit Trees (IFTs) within the LVB districts of Uganda

Botanical family	IFT species	Local name (dialect)	Parts used	UV	Diseases/symptom claimed to be treated	FL	Method of preparation	Previous citations
Anacardiaceae	*Rhus vulgaris* Meikle	Obukwakwaso (LUB) Owayo (SAM), Busogyole (LUB)	L L L F/L L SB F L L F	0.11	Yellow fever Cough Malaria Gastro-intestinal disorder Syphilis Tooth ache Immunity booster Small pox Swollen lymph Prevention of diseases	33.3 15.4 18.2 13.3 n.a 28.6 33.3 n.a n.a	Decoction Steaming Decoction Eat/Decoction Decoction Chewing Eating Decoction Decoction	Moshi *et al* [23]
Apocynaceae	*Carissa edulis* Vahl	Enyonza (LUB), Ntooga (LUG)	R R R/L	0.22	Fever/Malaria Measles Helminth infection	9.1 20.0 6.7	Decoction Decoction	Tolo *et al.* [24] Maurice et al.[25] Ibrahim *et al.*[26]
Apocynaceae	*Saba comorensis* Bojer ex A.DC.	Amachawango (SAM), Amovongo (LUG)	F F F F F F F F F F F L F F F	0.39	Anemia Measles Yellow fever Appetizer Immunity booster Wounds Skin diseases Gastrointestinal disorder Eye diseases Malaria Joint paints Helminth infection Urinary tract Bone pains Post-partum	n.a 20.0 33.3 71.4 33.3 75.0 13.3 26.7 50.0 18.2 50.0 20.0 n.a 57.1 50.0	Eating Eating Eating Eating Eating Eating Eating Eating Eating Eating Eating Decoction. Eating Eating Eating	Inngjerdingen *et al.* [15] Teklehaymanot & Gidaya [16] Grade *et al.* [27] Teklehaimanot & Gidaya [16] Grade *et al.* [27] Grade *et al.* [27]
Burseracea	*Canarium*	Empafu (LUB), Mbafu	L	0.15	Cough	23.1	Decoction	

	schweinfurthii Engl	(LUG)	F		Anemia	n.a	Eating	
			R		Eyes diseases	50.0	Decoction	
			L/R		Helminth infection	6.7	Decoction	
					Evil spirits	80.0		
			SB		Diarrhea	5.9	Smoking	
			SB		Goiter	n.a	Decoction	Ngbede *et al.* [28]
			S		Hypertension	20.0	Pasting	
			SB		Gastrointestinal disorder		Decoction	Ngbede *et al.* [28]
			SB		Tooth ache		Decoction	
					Cardiovascular	6.7		
			SB		Condition	14.3	Chewing	
			F		Yellow fever	50.0	Eating	
			R				Decoction	
Clusiaceae	*Garcinia buchananii.* Baker.	Ensali (LUB, LUG), Nsaala (LUG)	SB/L				Decoction	
			SB		Cough	38.5	Chew	
			L		Tooth ache	14.3	Decoction	
			SB		Measles	20.0	Decoction	
			SB		Malaria	9.1	Decoction	
					Helminth infection	4.8		Gidaya *et al.*[20]
			L/SB		Ulcers		Decoction	
			SB		Hypertension	66.7	Decoction	
			SB		Diabetes	20.0	Decoction	
			L/SB		Gastrointestinal disorders	n.a	Decoction	Balemba *et al.* [21]
					Dizziness	6.7		Boakye *et al.* [22]
			L		Allergies,		Decoction	
			L/SB		Evil spirits	n.a	Decoction	
			SB		Chest pain	n.a	Smoking	
			SB		Asthma	20.0	Decoction	
			L		Cardiovascular condition	n.a	Decoction	
			SB		Eye diseases	n.a	Decoction	
						50.0		
			L				Decoction	
Fabaceae	*Tamarindus indica* L.	Enkoge (LUG, LUS), Omuhuwa (SAM)	SB/L/F	0.22	Helminth infection	53.3	Decoction/Eat	Havinga *et al.* [16]
			L		Cough	23.1		
			F		Measles	40.0	Eating	
			R		Toothache	28.6	Decoction	
			F		Malaria	36.4	Eating	
			SB/L		Ulcers	33.3	Decoction	
			F		Hypertension	60.0	As Juice	
			L/F		Diarrhea	n.a	Decoction/Eating	

			R/SB F F SB F R/L F R/SB R		Appetizer Felon Cellutis Gastrointestinal disorders Skin diseases Bone pain Wounds Postpartum Joint pain Aphrodisiac	28.6 n.a n.a 40.0 n.a 42.9 25.0 50.0 50.0 50.0	Decoction As Juice As Juice Decoction As Juice As Ointment As Juice Decoction Decoction	Havinga *et al.* [16] Havinga *et al.* [16] Havinga *et al.* [16] Gueye & Diouf [15]
Rubiaceae	*Vangueria apiculata* K. Schum	Matungunda (LUG)	F L SB/F R	0.06	Hiccups Gastrointestinal disorders Tooth ache, Antidote	n.a 6.7 14.3 n.a	Eating Decoction Chewing/Eating Incision	Bussmann [29]
Sapotaceae	*Chrysophyllum albidum G*	Amahuu (SAM)	F F F F F	0.09	Yellow fever Malaria, Aphrodisiac Immunity booster Helminth infection	33.3 9.1 50.0 33.3 6.7	Eating Eating Eating Eating Eating	Houessou *et al* [30]

Note: Parts of IFT: F=fruit pulp, SB=bark, R= root, L= leaves, S=Seeds; Language dialect: LUG=Luganda dialect, LUS= Lusoga dialect, SAM= Samia dialect; n.a = not applicable because it was mentioned once.

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Six of these IFTs were reportedly used to treat malaria, gastrointestinal disorders, and helminthes infections; five IFTs were reported to be used in treating tooth ache ailments; four IFTs were reported to be used in treating measles, eye diseases and cough while three IFTs were claimed to be used in treating hypertension, yellow fever and as immunity booster.

Another two IFTs were reported to be used in treating evil spirits attacks, postpartum, joint pain, bone pain, ulcers, wounds, cardiovascular conditions, improving appetite and as aphrodisia. One particular IFT was reported to be used for treating health conditions such as chest pain, anemia, diabetes, skin diseases, allergies, asthma, syphilis, urinary tract infections, felon, cellutis, diarrhea, goiter, hiccups, small pox, and swollen lymph and besides being used as antidote (Table 1).

3.2 Indigenous fruit tree parts used and modes of preparation medicine from them

The various parts of IFTs commonly preferred for medicinal purposes ranged from fruits followed by leaves, stem bark, roots and seeds reported by 35%, 27%, 26%, 12% and 1% of the respondents respectively (Table 1).

In some cases, a combination of parts such as stem bark and leaves , roots and leaves, fruits and leaves and even three parts fruit pulp, stem bark and leaves were reported to be used in treating a particular ailment.

A diversity of methods for the preparation of different IFTs parts into medicine has been reported. The most predominant methods were decoction followed by eating, drinking as juice, chewing, smoking, steaming, incision, pasting and application as ointment reported by 47%, 33%, 6%, 5%, 3% and 1% of the respondents, respectively. A decoction is prepared by boiling the part of IFTs with water. Eating is by biting and swallowing the fruit pulp. Juice is made through extraction of the fruit pulp and mixing with water and/or without sugar.

While smoking is burning the plant part on fire to release its smoke, steaming is inserting/putting the plant part in steam and incision is cutting the skin part with sharp blade followed by the application of powdered material of IFT part to the bleeding incised part. On the other hand, pasting is mixing the powdered part of the plant with water and applying on the body and lastly the application of IFT medicine as ointment is through mixing the powdered part with oily material and applying it on the affected part.

3.3 Informant's Consensus Factor for different Health conditions treated by IFTs

The Informant Consent Factor (ICF) for diferent health conditions reportedly treated by of IFTs within the LVB districts of Ugandaare presented in Table 2. High ICF is associated with very few medicinal plants having a large number of user reports; thereby suggesting an agreement among the respondents for using those few plants in the treatment of a particular health condition. In this study, the health conditions claimed to be treated by IFTs and with the highest ICFs were bone pain (ICF=0.833) and use as an appetizer (ICF=0.833). Each of these health conditions was reported 7 times to having been treated with two IFTs species. Nevertheless, helminthes infection with ICF=0.642 and gastrointestinal disorders with ICF=0.642 were reportedly mentioned 15 times and treated using six IFT species (Table 2).

Table: 2 Informed Consent Factor for diseases reportedly treated by indigenous fruits trees in the selected LVB districts of Uganda

Health condition	IFTs	Use reports	ICF
Bone pain	2	07	0.833
Appetizer	2	07	0.833
Evil Spirits	2	05	0.750
Cough	4	13	0.750
Eyes Diseases	2	04	0.670
Wounds	2	04	0.670
Helminth infection	6	15	0.642
Gastrointestinal disorders	6	15	0.642
Ulcers	2	03	0.500
Malaria	6	11	0.500
Hypertension	3	05	0.500
Tooth ache	5	07	0.333
Measles	4	05	0.250

ICF= Informant Consensus Factor

On the other hand, cough with ICF=0.750 was reported 13 times as being treated using four IFTs while ailments such as evil spirit (ICF=0.750) and eye diseases (ICF=0.670) were reported five and four times respectively as being treated using two IFTs. Ulcers with ICF=0.500, malaria with ICF= 0.500 and hypertension with ICF=0.500 were reported as being treated using two, six and three IFT species respectively. Tooth ache with ICF 0.333 and measles with ICF=0.25 were reportedly treated using five and four IFT species respectively (**Table 2**).

3.4 Fidelity level (FL) for potential of IFTs to treat a particular health condition

The potential of IFTs to treat a particular health condition was assessed using Fidelity Level (Table 1). The highly reported IFT for treatment of bone pain (FL=57.1%) and as appetizer (FL=71.4%) was *S. comorensis* while that for treating eye diseases was *C. schweinfurthii*. The IFTs reported as most important for treatment of cough was *G. buchananii* (FL=38.5%) while that for treatment of wounds was *S. comorensis* (FL=75%). Indigenous fruit trees (IFT) reported for treating helminthes infections and gastrointestinal disorder was *T. indica* (with FL=53%) and (with FL=40%), respectively. Ulcers was reported to be mostly treated using *G. buchananii* (FL=66.7%), while malaria and hypertension were reported to be best treated using *T. indica* (FL=36.4%) respectively. For tooth ache, the reported valuable IFTs were *T. indica* (with FL=28.6%) and *R. vulgaris* (with FL=28.6%) while *T. indica* with (with FL=40%) was also again reported as best preferred for treating measles.

3.5 Assessment of the IFTs medicinal User Value (UV)

Among the reported IFTs within the LVB districts of Uganda (Table 1), those reported to have high medicinal uses were *S. comorensis* (UV=0.39, 30 out of 76 informants), *Tamarindus indica* (UV=0.22, 42 out of 187 informants), *C. Schweinfurthii* (UV=0.15, 17 out of 113 informants), *G. buchananii* (UV=0.13, 21 out of 166 informants), *R. vulgaris* (UV=0.11, 14 out of 125 informants) and that reported to have a low medicinal use was *C. edulis* (UV=0.02, reported by 3 out of 135 informants).

4. Discussion

4.1 Indigenous fruits trees (IFTs) and medicinal uses

The use of IFTs for medicinal purposes has been known to many communities for centuries. For instance, a study carried out in Pakistan, documented 11 wild fruit tree species belonging to 8 genera and 8 families [11]. Although 38 medicinal uses were reported for the eight (8) IFTs in this study, 19 medicinal uses of them were previously reported by other authors (Table 1). The fact that only one family (Sapotaceae) was similar between Uganda and Pakistan is an indication that IFTs vary from one area to another.

In this study, some of the medicinal uses reported had also been reported in other previous studies. A case in point is *T. indica* that has been reported to be highly valued for treating diabetes and anorexia [12], laxative and rheumatic pain plus vomiting [13], jaundice, yellow fever and as blood tonic [14], wounds, insect and snake bites [15], fever, respiratory problems and dysentery [16]. Similarly, *S. comorensis* had also been reported to be used in treating rheumatism, oral thrush, venereal diseases, stomach ache, diarrhea with blood [17], back pain, maternal conditions such as labor induction [27], scabies and boils [15].

Furthermore, *G. buchananii* has also been reported to be highly valued for treating tuberculosis, chronic diarrhea, cryptococcal meningitis, herpes zoster, herpes simplex, skin rashes, symptoms associated with HIV/AIDs [18;19], ascariasis [20], dysentery and abdominal discomfort [21;22]. *Canarium schweinfurthii* on the other hand has been reported to be traditionally used against malaria, fever, constipation, diarrhea, postpartum pain, rheumatism, sexually transmitted diseases and as a stimulant [27], syphilis and for rectal injections [31], treating of wounds, as emollient with stimulative and diuretic properties [32].

The variation reported in the medicinal uses of IFTs in the various studies indicates their varying potential therapeutic properties which may be attributed to the presence of bioactive components in them. While , the variation reported in the medicinal uses of similar IFTs may be due to differences in their environmental growth conditions, similarity reported in the medicinal uses of particular IFTs could be attributed to the extensive community knowledge on curative properties of IFTs [33, 34; 35]. This may also indicate similarity in the bioactive components in these IFTs.

The fact that some of these IFTs have already been tested for bioactive phytochemical properties and evaluated pharmacologically for their effectiveness is a proof of the significant role IFTs can play in enhancing primary health care. For example, laboratory analyses of the leaves of *C. schweinfurthii* indicate that its leaves contain tannins, saponins, glycosides, steroids, carbohydrates and fatty acids bioactive phytochemicals [34] while the stem bark and leaves of *T. Indica* has been reported to contain tannins, saponins, sesquiterpenes, alkaloids and phlobatannins [14]. Pharmacologically, the oil from the fruit pulp of *C. schweinfurthii* has been reported to have a very high antioxidant potential and a promising radical scavenging capacity [35] in addition to its essential oil having an *in vitro* antimicrobial and antioxidant activities [38].

Similarly, the stem bark and leaves extract of *T. indica* have been reported to be active against both gram positive and gram negative bacteria [14]. According to Boakye *et al.* [22], the bark extract of *G. buchananii* has got an anti-motility diarrhea remedy. All the above examples of ethnobotanical and pharmacological studies are indication that IFTs have a potential for development into pharmaceutical drugs.

4.2 Commonly used parts of the IFTs as medicine and their modes of preparation

This study indicates that fruits are the most commonly used plant parts of IFTs as medicine. This is in contrast to other ethnobotanical surveys, where either the roots or leaves are the most dominant plant parts used as medicine. For example, Teklehaimanot [39] reported the use of roots both in single and multiple treatments while Gidaya *et al.*, [20] reported the use of leaves as the most dominant plant parts for medicinal purposes. In general, the dominant use of fruits of IFTs for medicinal purpose can be attributed to their multiple roles in both nutrition and health.

4.3 The Significance of Informant Consensus Factor (ICF)

In a study like this one, the high ICF value usually indicates that the respondents are knowledgeable about the use of IFTs in the management of such ailments [7]; that is bone pain and improving appetite. Bone pain has symptoms such as bone injury, sickle cell anemia and loss of mineralization in the bones, a condition called "oesteoporosis" that affect mostly the elderly. Since fruits are rich sources of essential minerals, it is probable that elders who are custodians of indigenous knowledge could have shared their experiences of managing oesteoporosis using IFTs. Similarly, as fruits are known to improve appetite, it is again probable that majority of communities are likely to be knowledgeable on the importance of using fruits in improving their appetite, hence the importance of IFTs to them.

Unlike high ICF, low ICF may indicate either no consensus of information between/among respondents or little sharing of information. The existence of low ICF for some IFTs in this study could be due to loss of indigenous knowledge on their use in the treatment of particular health conditions in a long run. For instance, Song and Kim [40] reported use of IFTs in treating muscular skeletal disorder with highest ICF =1.00 and veterinary ailment with lowest ICF= 0.33 while Rajakumar and Shivanna [41] reported use of IFTs in the treatment of liver complaints with highest ICF=0.77 and skin diseases and disorders with lowest ICF =0.12. In another study, Teklehaymanot [37] reported the use of IFTs in the treatment of venereal disease and impotence with highest ICF=0.67 and cancer with lowest ICF =0.00 while Rokaya *et al*. [42], reported use of IFTs in the treatment of gastro-intestinal disorder with the highest ICF= 0.4 and ophthalmological uses with ICF=0.00.

4.4 The Significance of Fidelity Level

Since Fidelity level (FL) indicates the most used IFT for particular health condition, its good healing potential and the likelihood to be biologically active [20], in this study *S. comorensis* may be one of the IFTs with good healing properties and bioactive components for improving appetite, managing bone pain and treating wounds while *T. indica* may be good for treating helminth infection, gastrointestinal disorder, malaria, hypertension measles and tooth ache. Similarly, *G. buchananii* may have good healing properties and bioactive components against cough and ulcers while *C. schweinfurthii* may have good healing properties for eye diseases. These results show that there is need to conduct chemical and pharmacological evaluation of the reported IFT parts that are currently being claimed to have properties for treating many aliments.

The importance of FL has also been shown in other similar previous ethnobotanical surveys of different medicinal plants. For example, it has been established that *Allium fistulosum*, *Lagenaria leucantha*, *Lonicera japonica*, *Pyrus pyrifolia* var.*culta* and *Zingiber officinale* with FL = 100% can be used to best treat respiratory system disorders [39], while *Justicia adhatoda, Cyclea peltata*, *Memecylon umbellatum*, *Phyllanthus amarus* and *Tabernaemontana alternifolia* can be used to treat bronchitis, dysentery, herpes, jaundice and snake bite, respectively, with FL=100% [43]. It has also be shown that *Ocimum lamiifolium, Phytolacca dodecandra, Amaranthus dubius and Amaranthus graecizans* have been the most used medicinal plants for MICHI, rabies, skeleto-muscular diseases and skeleto-muscular diseases with (FL=100%) respectively [20]. On the other hand, *Dracaena arborea, Mitragyna inermis, Moringa oleifera* and *Opilia amentacea* are reported to be the most suitable for the treatment of fever with FL=100% [44].

4.5 User Value (UV)

The high UV can indicate either that the IFTs are abundant or communities are knowledgeable on the medicinal uses of particular IFTs. With reported high UV (Table1), *T. indica* is clearly shown to be an IFT that is abundant in four of the five study LVB districts in Uganda. Indeed *T. indica* has already been domesticated, making it more popular among the population [16]. Despite these, its medicinal uses are known to the majority of the respondents compared to the low UV for *C. edulis*. The low UV for *C. edulis* may indicate that this IFT could be becoming scarce or is at the increasing risk of disappearance. Thus, such information on low UV for particular IFTs could be used to help communities conserve such IFTs.

5. Conclusion

The findings presented here indicate that IFTs within the LVB districts of Uganda have several ethno-medicinal uses with potential for further development into pharmaceutical drugs. The variation in knowledge level about the use and importance of reported IFTs in ethno-medicine could be due to migrations of communities resulting into lack of interest in sharing of information between and among different community groups and/or transition in local knowledge of IFTs. There is therefore a need to sensitize the communities within the LVB about the importance of these ethno-medicinal uses. Further evaluation of bioactive components needs to be carried out on some of the IFTs with high UV values in order to confidently justify the current therapeutic claims about them and the need to develop them intopharmaceutical drugs.

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