A comparative analysis of ethnobotanical applications by the *AbaWanga* people in western Kenya

S. Ndondolo[1], B. O. Owuor[1], M. M. Gakuubi[2], W. Wanzala[1,3]

[1]*Department of Natural Sciences, Faculty of Science, The Catholic University of Eastern Africa, P.O. Box 62157-00200, Nairobi, Kenya*
[2]*Department of Biology, Faculty of Science, Mwenge Catholic University P.O. Box 1226, Moshi, Tanzania*
[3] *Department of Biological Sciences, School of Science and Information Sciences, Maasai Mara University, P O Box 861-20500, Narok, Kenya.*

Received: May 20th, 2016; Accepted: July 30th, 2016

AbaWanga people of western Kenya are known to have a rich history of ethnobotanical knowledge, probably due to their long interactive history of migration from North Africa to West Africa and then to Central and finally to East Africa. Their collective and accumulative ethnobotanical knowledge during the long migration and settling at their current geographical location largely remains unknown and is likely to be just as rich and worth analyzing, hence the current study of the *AbaWanga* people. Non-alienating, dialogic, participatory action research (PAR) and participatory rural appraisal (PRA) approaches involving 100 women and men aged over 30 years old were utilized. A combination of snowball and purposive sampling methods were used to select 100 key respondents. The methods comprised a set of triangulation approach needed in ethnobotanical knowledge of non-experimental validation process. The study showed varied ethnobotanical uses and existence of a complex and extensive ethnic-based plant nomenclature system with more mononomials than polynomials. There were 54 human diseases/ill-health conditions treated, controlled and managed together with a wide range of plants and plant products offering nutritional, socio-cultural/economic and veterinary values. Most prevalent diseases/ill-health conditions treated, controlled and managed included: - upper respiratory tract infections, reproductive health (such as barrenness), mental illnesses, cancer, schizophrenia and stroke. The study showed that there was a rich ethnobotanical knowledge and ethnopractices amongst the *AbaWanga*; that is potential for developing useful ethnoproducts for improving livelihoods of people. There was an indication that plant- and plant products-based ethnomedicine system was practically developed and potentially useful.

Keywords: *AbaWanga* people and livelihoods, Ethnobotanical knowledge, Ethno-nomenclature, Plants and plant products, Mumias, Kenya

Corresponding author: Prof. Dr. W. Wanzala, *School of Science and Information Sciences, Maasai Mara University, P O Box 861-20500, Narok, Kenya. E-mail:* osundwa1@yahoo.com *or* wanzala@mmarau.ac.ke

1. Introduction:

As notes in a previously published manuscript (Ndondolo et al. 2016) the *AbaWanga* people continue to rely heavily on a wide range of indigenous plant species for medicinal, agricultural, narcotic/hallucination, timber, fuel, fences/boundaries, supporting crops, shrines/worshiping and dietary purposes. This dependence on plants and plant products has necessitated and promoted cultural-based classification of identified useful and none-useful plant species into unique folkloric groups followed by their naming (ethno-nomenclature) as early as the beginning of their plant-human interaction and civilization processes (Kokwaro 1993, Anon. 2012). This important ethnoknowledge has been neglected and is therefore, at risk of being lost (Cunningham 1993, WHO 1996, Wanzala et al. 2012). In this paper, we discuss the results of a survey conducted to analyze ethnobotanical applications by the *AbaWanga* people, partly focusing on their ethnomedicines, nutrition, ethnosystemtics and ethnonomenclature of various plant species and plant products. It was further hypothesized that plant taxonomy and nomenclature among the *AbaWanga* people were based on the plant use, origin, phenotypic characteristics and geographical location/ecological niche of plant species as this approach of evaluation may help identify useful plant species currently neglected and largely unknown.

2. Methods:

Prior to starting the project, an informed consent was sought from the key individual respondents through meetings and discussions held with village elders and the local administration, which represents the office of the president, Government of Kenya.

2.1. Description of the study area

2.1.1. AbaWanga people and their geographical location

The people are very diverse as previously described (Ndondolo et al. 2016) and predominantly occupy the former Wanga Kingdom as shown in Figure 1.

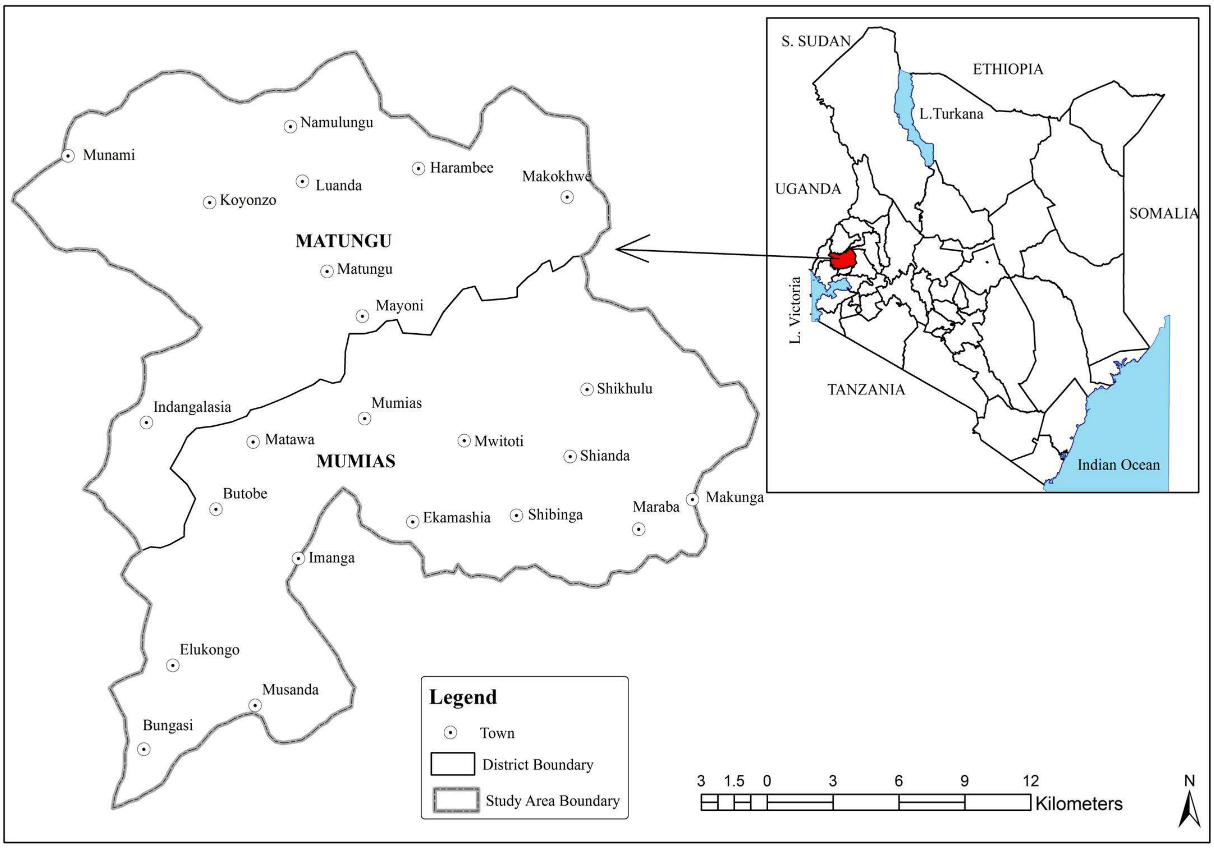

Figure 1. A map of Kenya showing the geographical location of the Wanga people (in the former Wanga Kingdom, currently comprising Mumias and Matungu districts) in Kakamega County, western Kenya.

2.2. Sources of information on Wanga ethnobotany

The target populations in this study were the custodians of the Wanga indigenous knowledge, which includes: - the herbalists/ethnopractitioners, herbal vendors and other knowledgeable members of the Wanga community. Knowledge of Wanga ethnobotany was surveyed and documented from a varied number of sources in the study area. The identification of sources of information of ethnobotany of veterinary importance, key respondents were selected from local veterinarians, para-veterinarians and agricultural extension officers responsible for providing extension services to livestock farmers within Mumias and Matungu districts. Local livestock traders and dealers, as well as individual livestock farmers, contributed their knowledge of ethnoveterinary medicine based on their professional and economic activities. Meetings of local administration in the office of the President, Government of Kenya were attended and got useful leading information to the identification of potential key respondents. Church leaders, community/village/clan leaders and Wanga council of elders had also very useful leading information on Wanga ethnobotany. Local ethnopractitioners, including general traditional healers/herbalists, diviners, curse detectors, specialized medicine men/women, Traditional Birth Attendants (TBA), spiritualists/ritualists and community prophets and spiritual leaders formed a particular special subset of knowledgable people from whom key respondents were also drawn. Secondary data were also considered a very important source of leading information and at Mumias and Matungu District Veterinary Offices' (DVOs') and Health Centers' records on traditional healthcare systems of the Wanga were accessed and utilized. All these groups were consulted because each was associated with a specific aspect of ethnobotanical knowledge relevant to the study.

2.3. Composition of the key respondents

Ethnopractitioners offering primary healthcare services to humans and local livestock industry were considered the target key respondents in the study and the selection process was based on the knowledge base, experience and current herbal practices in human and ethnoveterinary medicine of the target individual. The first step in this study was the generation of a purposive sample of the key respondents from a wide range of sources mentioned above. Key respondents were considered local experts or people in the study area with knowledge of a particular issue or technology of interest (in this case, Wanga ethnobotanical knowledge) (Etkin 1993, Waters-Bayer and Bayer 1994, McCorkle et al. 1997). They have a more extensive understanding of local sociocultural systems than others in the community. A purposive sample referred to a particular subset of knowledgeable people in Wanga ethnobotanical knowledge systems. Intensive and extensive collaboration and interaction with these key respondents were considered an effective research strategy of accessing the relevant information (Oakley 1981, Warry 1992). A probability random sampling technique would not have been appropriate for this type of sociocultural set-up, as not everyone sampled randomly may have the required knowledge (Etkin 1993, Martin 1996, Cotton 1996, Cunningham 2001). A combination of snowball and purposive sampling methods was employed to select the key respondents. Once a few ethnopractitioners and others with an interest in Wanga ethnobotanical knowledge, had been identified using the above sources, fruitful initial contacts were made and more key respondents were identified using their existing networks. Upon the establishment of the snowball sample, a purposive sampling technique was then employed to select a sample of 100 key respondents from Mumias and Matungu districts. This procedure is widely used in ethnoknowledge studies to get information from hidden populations, which are difficult for researchers to access (Cunningham 1993, Heckathorn 1997, Heckathorn 2002, Salganik and Heckathorn 2004, Tongco 2007). The purposive sampling technique ensured that only key respondents with the desired qualities and quantities of information on Wanga ethnobotanical knowledge were selected (Russell 2002).

2.4. Administration of questionnaire to key respondents

Each of the key respondents was asked to fill a well structured questionnaire with the help of the interviewer. The questionnaire consisted of 18 questions requiring: - (1), the location where questionnaire is administered (village), (2), identity of the person being interviewed (name, sex, age, level of education, occupation etc.), (3), respondent consent agreement (4), type of ethnobotanical knowledge system practiced and how it was acquired by the interviewee (5), the type of organisms treated (6), how the remedial products are identified, prepared, stored and administered (7), how organisms are treated and monitored (8), how ethnopractitioners are paid for their services (9), how ethnobotanical knowledge is shared amongst ethnopractitioners and transferred through generations (10), diseases and/or ill-health conditions treated (11), plant and/or plant products used and their state/form (12), state of affairs of the plant and/or plant products used for treatment (13), factors contributing to the state of affairs of the plant and/or plant products used for treatment (14), measures being taken for the state of affairs of the plant and/or plant products used for treatment (15), challenges facing the profession of ethnopractitioners (16), personal opinion of the interviewee regarding the profession of ethnopractitioners (17), what should be done to improve the profession of ethnopractitioners in the interviewee’s area, and (18), personal observation of indications of commitment to sustainable use of ethnobotanical knowledge by the interviewer in the homestead of the interviewee.

Each time a questionnaire was administered to the interviewee, a senior relative/friend and a representative of the local administration from the office of the area sub-chief who was familiar with the interviewee, were requested to accompany the interviewer. These two people engaged the interviewee into an interactive and productive discussion as the questionnaire was filled by the interviewer. This composition formed a very productive interaction that provided an enabling environment for Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) research to take place successfully. This method was considered very useful and robust because it reduced the following sources of bias: - (1) modeling bias, which was the projection of the interviewer's views on to those studied (2) strategic bias, which was the expectation of benefits by the subject (3) familiar relationships between interviewer and interviewee (senior relative, administrator representative and interviewee), which would reduce resistance to questioning but could lead to rote answers and outsider bias and (4), reduction of "key personae" bias (Sutton and Orr 1991). These preconceived notions would therefore lead to incorrect filling of the questionnaire and poor documentation and analysis of the collected information (Etkin 1993, Waters-Bayer A, Bayer 1994).

2.5. Personal interviews/discussions with selected key respondents

After filling of the well-structured questionnaire, an interview/discussion with the selected key respondents was held. This was guided exchanges, semi-structured by a mental checklist of relevant points to confirm the validity of the information in the questionnaires of other key respondents interviewed earlier.

2.6. Collection of specimens of plants and plant products

Following a personal interview with the selected key respondents, a field trip was made to identify and collect listed plant specimens and/or ethnobotanical products. The specimens were harvested, prepared, packaged and stored according to the herbarium rules and regulations until transported to Herbarium at the Catholic University of Eastern Africa, Nairobi, Kenya for botanical identification using voucher specimens and according to the Hutchinson Phylogenetic system of classification. While in the herbarium, further non-experimental studies were also conducted. For each plant species collected from the field, a voucher specimen was prepared and deposited in the Herbarium at the Catholic University of Eastern Africa, Nairobi, Kenya.

2.7. Collection of secondary data on Wanga ethnobotany

As part of non-experimental validation process of documented plants and plant products used by the *AbaWanga* people and evaluate their potential effectiveness, a systematic collection of secondary data on traditional plant uses of *AbaWanga* people from the District Veterinary Offices (DVOs) preceded. This was followed by an extensive literature search on the taxonomy of the plant specimens collected and their ethnobotanical applications from the internet, research institutions, non-governmental organizations (NGOs) and Herbarium libraries and laboratories. All these methods comprised a set of triangulation approach needed in ethnobotanical studies and surveys for the process of non-experimental validation (Lans 2001).

2.8. Enumeration of ethnobotanical applications of documented plants and plant products

Plant species and plant products traditionally used by the *AbaWanga* people, including their uses, use value indices of one species a cross all informants, was made (Tables 3 and 4).

2.9. A quantitative analysis of the plant family use value index

The family use value (UVF) index was procedurally done as previously outlined (Gakuubi and Wanzala 2012) to estimate the value of plant species in the studied community at the level of the plant family. First, a single plant species use value index was calculated by dividing the number of uses mentioned that particular plant species by the number of times this species was repeatedly mentioned of its uses on different occasions encountered. Secondly, sum was obtained for all plant species use value indices for one species divided by the number of all respondents mentioning the uses of the same plant species. Thirdly, the FUV index, which deals with the relationship between the total amount of plant species within a given family and the sum use value indices for all the plant species identified from the field was calculated according to Hoffman and Gallaher (Hoffman and Gallaher, 2007) as follows:

-FUV = $\sum$ UVs/ (n_s),

where: - FUV = family use value index (use value of one plant family across all respondents), UVs = use values for all the plant species within a given family and n_s = total amount of plant species within a given family.

The family use value index biologically represents the accumulative value effect of all individual plant species encountered belonging to one plant family across all respondents (Hoffman and Gallaher, 2007). Further, family taxonomic ranks were previously noted to be more stable than lower taxonomic levels such as genera and species and make it easy to identify new plant species during field investigations (Wanzala et al. 2012).

2.10. A quantitative analysis of respondent consensus factory index

To estimate the variability of documented knowledge of ethnoveterinary medicine and determine the homogeneity of the information given by the key respondents, respondent consensus factor (Frc) index for the most common use categories with the number of reported plants and/or plant products and/or reformulations, were calculated based on Heinrich et al. (1998) as follows: -

Frc = (nur – nt)/ (nur – 1),

where: - Frc = respondents consensus factors, nur = number of use citations in each category of use and nt = number of species used.

In addition to defining how homogeneous, the documented information is in the study population based on the degree of consensus in respondents' responses, the Frc values revealed the strength of reliance on respondents on various plants and plant products for use (Gerique, 2006). The Frc values range from 0 to 1. A high value (close to 1 and/or equal to 1) indicated that there was a well-defined selection principle for certain specific plants and plant products traditionally used in the community and/or there is sharing of information amongst the ethnopractitioners offering services in that particular community. A low value (close to 0 and/or equal to 0) on the other hand indicated that plants and plant products used a wide range of plants and plant products without relying on specific proven ones and/or the ethnopractitioners offering services do not share information amongst themselves.

3. Results and Discussion

3.1. Characteristics of key respondents

Key respondents were categorized into three groups, namely: - 1. leading herbalists, 2. herbal vendors and 3. non-specialists in ethnobotanical knowledge (Table 1). In each of these categories, further breakdown into gender, age and method of acquisition of ethnobotanical knowledge and experience was made for the sake of easy understanding and clarity in the table. Within these three categories, the majority of respondents were males aged over 50 years old, with the exception of herbal vendors (Table 1) as the older group might not afford moving from place to place marketing their herbal remedies. This may further explain why most respondents in the herbal vendors' category acquired their ethnobotanical knowledge through apprenticeship as they were probably sent by the older group, with instructions to market herbal remedies in distant places, an indication that there was probably good mentoring and/or apprenticeship, which ensured successful transmission of the desired knowledge through generations (Gakuubi and Wanzala 2012). However, the majority of leading herbalists in the study area acquired their ethnobotanical knowledge through own experiences such as dreams, visions, observations etc. Majority of the non-specialists in ethnobotanical knowledge are based in the rural areas where the majority of the population that uses plants and requires the services of ethnobotanists is based (Cunningham 1993, Wanzala et al. 2012).

Table 1. A description of the profiles of key respondents in different categories and their acquisition of ethnobotanical knowledge and experience (N = 100).

S/No.	Description of the categories of key respondents	No. of key respondents	Percentage (%)
Leading herbalists (n = 11)			
1.	**Gender**		
a	Male	8	72.73
b	Female	3	27.27
2.	**Age (yrs)**		
a	30-40	1	09.09
b	41-50	3	27.27
c	Above 50	7	63.63
3.	**Acquisition of ethnoknowledge and experience**		
a	Traditionally trained/Apprenticeship	2	18.18
b	Inheritance	4	36.36
c	Own experience-dreams/visions/observations	5	45.45
Herbal vendors (n = 19)			
4.	**Gender**		
a	Male	13	68.42
b	Female	6	31.58
5.	**Age (yrs)**		
a	30-40	13	68.42
b	41-50	4	21.05
c	Above 50	2	10.53
6.	**Acquisition of ethnoknowledge and experience**		
a	Traditionally trained/Apprenticeship	15	78.95
b	Not trained	14	21.05
Non-specialists in ethnobotanical knowledge (n = 70)			
7.	**Gender**		
a	Female	40	57.14
b	Male	30	42.86
8.	**Age (yrs)**		
a	30-40	10	14.29
b	41-50	10	14.29
c	Above 50	50	71.42
9.	**Place of residence**		
a	Urban	25	35.71
b	Rural	45	64.29

N/B: The age of key respondents were confirmed from their: - (1), birth certificates and/or (2), national Identity Cards (ID) in Kenya.

3.2. Ethnosystematics and ethnonomenclature

Figure 2 shows the responses from key respondents on whether or not there existed a system of plant groupings and classification among the *AbaWanga* people. From the results shown in Figure 2, 78% of the key respondents confirmed the existence of a system of grouping and classification of plants among the *AbaWanga* people while 10.2% of the key respondents denied its existence whereas 12% could not be able to remember whether or not such a system existed. This further explains risks involved in storing information on humans based on their memory as this can be undermined by the loss of memory and/or mortality thus leading to the loss of potentially useful information (Wanzala et al. 2012). Nevertheless, the information in Table 2 regarding the local names of plants and their corresponding literal meanings in Wanga dialects and the basis for plant taxonomy and nomenclature shown in Figure 3, confirms the existence of such a system of classifying and naming plants based on a varied number of considerations. However, such a system is very complex as it is not standardized and is entirely ethnic-specific in nature.

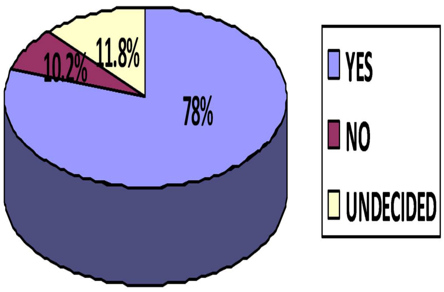

Figure. 2. Plant grouping and classification among the *AbaWanga* people (n = 100).

3.3. Basis of plant classification and nomenclature among the *AbaWanga* people

Varied responses on the basis of plant classification and nomenclature among the *AbaWanga* people are presented in Figure 3. This variability could probably be attributed to the many existing clans of *AbaWanga* people, each evolving with its own unique identity, ethnobotany being part and parcel of this identity. Majority of key respondents confirmed the classification and nomenclature of plants to be due to uses, followed by morphological characteristics, geographical location, events and origin in that order. These results are also confirmed by the information provided in Tables 3 and 4. However, there were plants, which had no name and/or could not have the corresponding literal meaning in Wanga dialects. Such plants were less important in the community and their uses were unclear. Another problem with plant grouping and classification in the community was that there were some plants, which were similar in morphological characteristics and it was perplexing to distinguish and classify them and give specific local names.

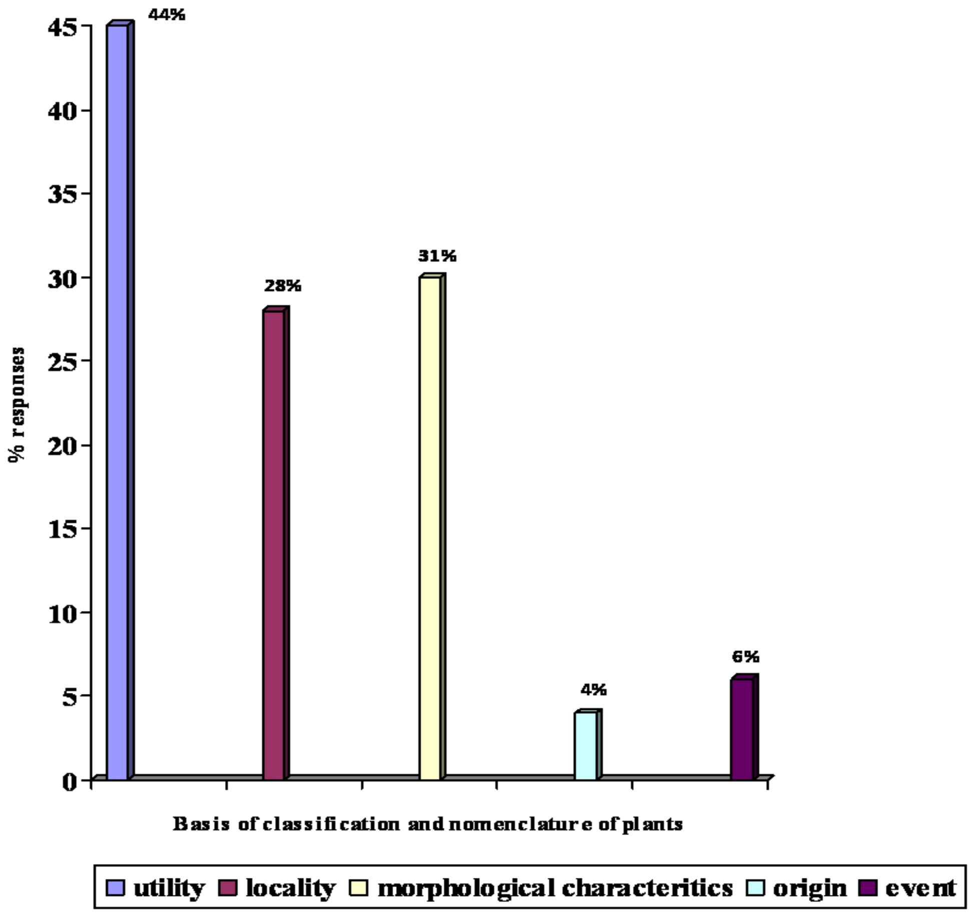

Figure 3. The basis for plant classification and nomenclature amongst the *AbaWanga* people of Mumias and Matungu districts in western Kenya (n = 100).

3.4. Mononomial versus polynomial nomenclature of plants by the *AbaWanga* people

The names given to various plant species were mononomials (89%), whereas only 11% were polynomials (Figure 4). From the survey results, only those plants that were useful to the *AbaWanga* people were classified, grouped and named. The names given to the plants were based on a variety of considerations (Figure 3) such as the morphological characteristics of the plant for example, the plant, *Mwinyalira matsai* (urinating blood) is named because when the bark of the plant is cut, blood-like substance (red sap) comes out. In other circumstances, the

name(s) that were given to the plant(s) also suggested its geographical location, for example, a plant like *Mutswitswi* is found at the place called *Shitswitswi*.

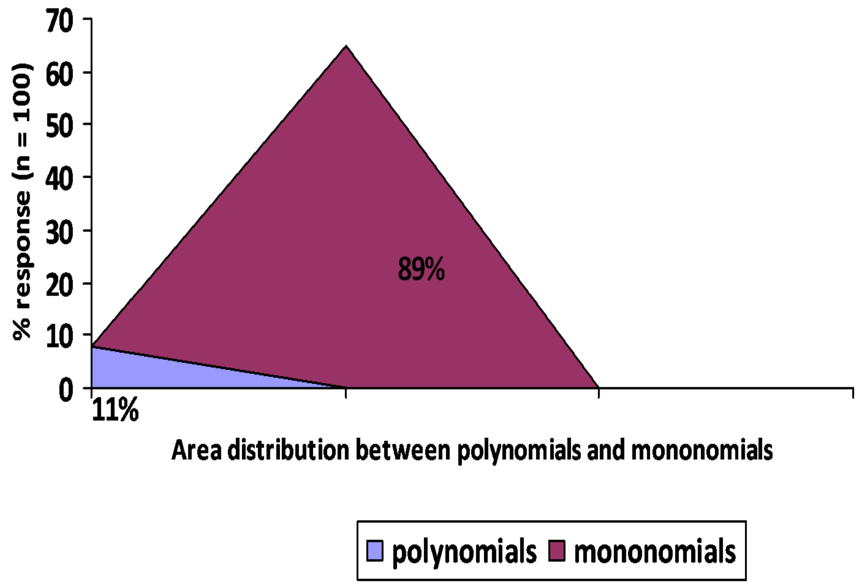

Figure 4. Mononomial versus polynomial nomenclature in Wanga community.

3.5. Frequency of use of medicinal plants

The response results are shown in Table 2. About 39% of the key respondents always used herbal medicine while 58% use it on rare occasions while 3% do not use herbal medicine in any way. This indicates that many people depend on medicinal plants for their health remedies. People had varied reasons for using herbal medicine, particularly at the expense of conventional medicine. Some used it because there were some sicknesses, which could not be cured by conventional medicine. Whereas to others, conventional medicine and services were just too expensive to afford and perplexing to access.

Table 2. How often the *AbaWanga* people use herbal medicines against conventional counterparts (n = 100)?

Category for the application of herbal medicine in life	Percent of respondents
Always	39
Rarely	58
Not at all	3

3.6. Herbal medicine versus conventional medicine consideration

From the survey, a considerable proportion, comprising 47.53% of the respondents agreed that herbal medicines can complement conventional medicine in primary healthcare systems (Figure 5). However, a proportion comprising 21.05% of the respondents is in a dilemma of making a decision as to whether or not herbal medicine complement conventional medicine in modern lifestyles.

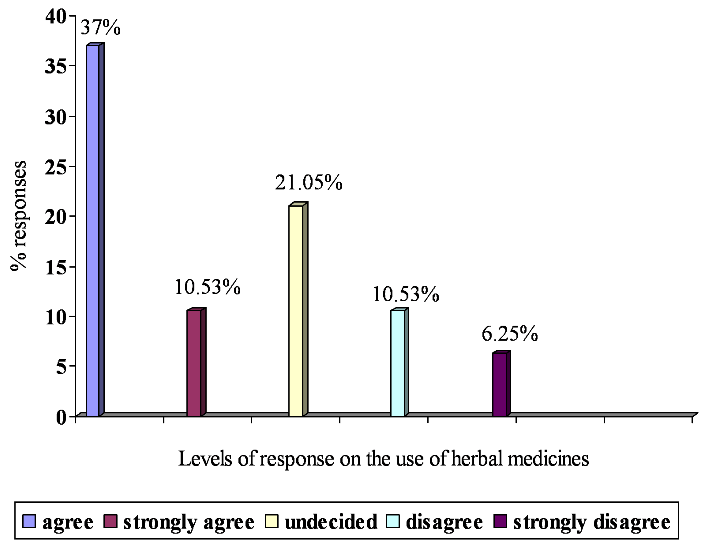

Figure 5. Responses on whether or not herbal medicine can complement conventional medicine in modern lifestyle (n = 100).

3.7. A quantitative analysis of consensus building amongst respondents on ethnobotanical uses

Considering the diversity of the category of uses based on plant species and plant products shown in Table 3 and the number of plant species described in vernacular language (Anangwe and Marlo 2008), together with their ethnic-based ethnosystematics, ethnonomenclature as shown in Tables 3 and 4, is a clear indication of the dependence of the livelihood of *AbaWanga* people on plants for many years. The information on how plant species and plant products are used to alleviate human-ill health conditions as shown in Table 3 is a clear manifestation of the significant role plants play in the community. For this reason therefore, the interviewer sought to establish consensus building amongst respondents on ethnobotanical uses by calculating the respondent consensus factor (Frc) indices shown in Table 4. Out of 60 uses, 35 are represented by only one single species with Frc index of 1, while the rest of the uses had relatively high Frc indices (Table 3). As noted by Hoffman and Gallaher (Hoffman and Gallaher 2007), the high Frc index values (that is, those values close to 1 and/or equal to 1) are represented by a single or very few plant species and are used by a large number of respondents while low Frc values (that is, those values close to 0 and/or equal to 0) give an indication that respondents do not agree over which plant species and plant products to use. Nevertheless, high Frc values further indicate that there may be a community consensus over sharing of highly valued ethnobotanical knowledge amongst the service providers and/or the beneficiaries and such knowledge may be common community ethnobotanical knowledge. Therefore, it follows with logical necessity that the knowledge of such plant species and products which undoubtedly score highly may be suitable for selection for pharmacological and phytochemical studies (Gerique 2006). It is indeed self-evident that almost all plants documented for various uses/applications are well known in the community and this may imply the long history of the ethnobotany of the *AbaWanga* people.

Table 3. An evaluation of respondent consensus factor (Frc) of the Wanga community for the various uses/applications of previously enumerated plant species (n = 66).

Groups of categories	Description of categories of conditions for which plant species are used and/or applied	Number of use citations in each category	Number of plant species used	Respondent consensus factor (Frc)
Applications on human ill-health conditions				
1	Indigestion/gastrointestinal tract problems	16	5	0.73
2	Malaria	26	5	0.84
3	Broken limbs	3	1	1.00
4	Menstrual problems	11	3	0.80
5	Tuberculosis (TB)	9	2	0.88
6	Genital thrush	9	2	0.88
7	Hunchback	3	1	1.00
8	Rickets	3	1	1.00
9	General medicinal value for humans	8	3	0.71
10	Eye, ear, nose and throat infections	54	13	0.77
11	Typhoid	6	1	1.00
12	Ringworm	6	1	1.00
13	Herpes	6	1	1.00
14	Flu	16	4	0.80
15	Stomachache	25	6	0.79
16	Joints' aches	11	3	0.80
17	Backbone/backache	6	2	0.80
18	Sexually Transmitted Diseases (STD)	24	7	0.74
19	Dysentery/diarrhea	26	7	0.76
20	Measles	5	1	1.00
21	Human scabies	9	3	0.75
22	Human infertility	7	2	0.83
23	Worm infections	3	1	1.00
24	Cardiac problems	3	1	1.00
25	Kidney problems	3	1	1.00
26	Swollen Lymph nodes	2	1	1.00
27	Arthritis	2	1	1.00
28	Chest problems	5	2	0.75
29	Menopause induction	3	1	1.00
30	Toothache	8	2	0.86
31	Nausea condition	6	2	0.80
32	Vomiting	6	2	0.80
33	Snake bite problems	5	1	1.00
34	Asthma	7	2	0.83
35	Human constipation problems	6	2	0.80
36	Urinary infections	2	1	1.00
37	Men prostate cancer	4	1	1.00
38	Influenza	6	1	1.00
39	Abdominal pains	6	1	1.00

40	Delivery complications in women	3	1	1.00
41	Fertility rates promotion	3	1	1.00
42	Inhalant problems	1	1	0.00
43	Ulcers	7	3	0.67
44	Liver disorders	4	1	1.00
45	Headache	4	1	1.00
46	As an antiseptic agent	4	1	1.00
47	Typhoid	4	1	1.00
48	Fever	2	1	1.00
49	Hair loss	2	1	1.00
50	Anaemia	2	1	1.00
51	High blood pressure	2	1	1.00
52	General body weaknesses	5	1	1.00
53	Bronchitis	3	1	1.00
54	Boils	12	4	0.73
Human nutrition applications				
1	An appetizer	3	1	1.00
2	Food (vegetables)	100	23	0.78
Socio-cultural and economic applications				
1	Cultural values	2	1	1.00
Applications on veterinary ill-health conditions				
1	Poultry infections	7	1	1.00
2	General medicinal value for veterinary uses	9	2	0.78
3	East Coast fever	6	1	1.00

3.8. The quantitative analysis of the plant family use value

A total of 31 families were documented with Fabaceae family having the highest number of species (16.67%), followed by Euphorbiaceae (9.09%), Asteraceae (6.06%), Poaceae, Rutaceae, Myrtaceae, Bignoniaceae and Anacardiacea (each comprising 4.55%), Meliaceae, Solanaceae, Cucurbitaceae, Moraceae, Ebenaceae, Lamiaceae and Amaranthaceae (each comprising 3.03%), while the rest of 16 families, each represented by one plant species (Table 4). From results presented in Table 4, Meliaceae, which was represented by two plant species, was reported as the most useful family utilized in the studied community followed by Oleaceae, Leguminaceae, Asteraceae, Hypericaceae, Euphorbiaceae, Bignoniaceae, Ulmaceae, Sapindaceae, Pittosporaceae, Musaceae, Melianthaceae in that order, some families being represented by more than one single plant species. It is worthwhile noting that Fabaceae family, which comprises the highest number of plant species in the studied community, has a considerably lower family use value index (Table 4). A family comprising plant species with many uses has correspondingly high family use value index, probably, the family having evolved together with the community and many of its plant species being known to the community for many years, hence the development of varied uses (Wanzala et al. 2012).

Table 4. An evaluation of documented plant species at the level of family use value indices in the community (n = 31).

S/No.	Plant family	Number of species	% of all species	Family use value (use value of one plant family across all respondents)
1	Amaranthaceae	2	3.03	0.21
2	Anacardiaceae	3	4.55	0.64
3	Asclepiadaceae	1	1.52	0.33
4	Asteraceae	4	6.06	1.58
5	Basellaceae	1	1.52	0.17
6	Bignoniaceae	3	4.55	1.02
7	Caricaceae	1	1.52	0.33
8	Cleomaceae	1	1.52	0.14
9	Convolvulaceae	1	1.52	0.25
10	Cucurbitaceae	2	3.03	0.38
11	Ebenaceae	2	3.03	0.42
12	Euphorbiaceae	6	9.09	1.19
13	Fabaceae	11	16.67	0.88
14	Hypericaceae	1	1.52	1.25
15	Lamiaceae	2	3.03	0.59
16	Lauraceae	1	1.52	0.25
17	Leguminaceae	1	1.52	2.00
18	Meliaceae	2	3.03	4.20
19	Melianthaceae	1	1.52	1.00
20	Moraceae	2	3.03	0.67
21	Musaceae	1	1.52	1.00
22	Myrtaceae	3	4.55	0.47
23	Oleaceae	1	1.52	2.00
24	Pittosporaceae	1	1.52	1.00
25	Poaceae	3	4.55	0.28
26	Rosaceae	1	1.52	0.50
27	Rutaceae	3	4.55	0.83
28	Sapindaceae	1	1.52	1.00
29	Solanaceae	2	3.03	0.35
30	Tiliaceae	1	1.52	0.17
31	Ulmaceae	1	1.52	1.00

4. Conclusions

Ethnobotanical applications are more practiced by men in rural areas than women are and the ethnopractices are less familiar to the younger generation than the older one. This gap is threatening the continued existence and transmission of the ethnobotanical knowledge to the next generation as anticipated.

As previously concluded (Ndondolo et al., 2016), the study showed that the *AbaWanga* people of western Kenya had an explicit ethnosystem of plant taxonomy and nomenclature, which exemplified an extensive interaction between humans and plants. The implication of this is that the evolution of the civilization of the *AbaWanga* people has been in tandem with ethnobotanical applications throughout their history. This is self-evident in their rich plant-based *Wanga* idiom, the rich ethnobotanical knowledge and ethnopractices of herbalism for primary healthcare services as well as for nutrition and cultural values at community and family levels for humans, animals and plants as well. The community had an ethnobotanical-based solution for almost every existing ill-health condition. Up to date, traditional herbal medicine is well preferred by people more than conventional medicine particularly due to the fact that the plants and plant products used are readily available, accessible and cheaper than the conventional medicine. This further explains why the plant taxonomy and nomenclature of the *AbaWanga* people is prominently based on how they use the plants and plant products in their daily life and partly on the doctrine of signatures. With regard to nomenclature, the study revealed that there were more mononomials than polynomials, a clear indication of a long history of ethnobotanical applications as shown by the quantitative analysis of the plant family use value.

The fact that there were many non-useful plant species in this community, this was indeed a clear indication that the evolution of the civilization of the *AbaWanga* people is still continuing and henceforth, many other useful plant species are yet to be discovered. The scientific study of the community's plants and plant products may therefore help identify useful pharmaceutical ingredients to be deployed in the health industry.

Competing interests

The authors declare that they have no competing interests.

Acknowledgements

The author wish to acknowledge the financial and material support received from The Catholic Scholarship Program (CSP) to support this research. Our deepest gratitude goes to all the respondents

interviewed during the survey study; the AbaWanga ethnopractitioners of whom, while responding to our inquiry for information used in this research and throughout the guided field excursions, trusted us to share the treasured ethnoknowledge and keep it secretive as they have done for many years. These are the actual owners of the information submitted in this manuscript for publication!

References

Anangwe A, Marlo RM (2008). Wanga-English Dictionary. https://www.google.co.ke/?gws_rd=ssl#q=Abawanga+dictionary, as retrieved on Saturday, October 5th, 2014, at 2:54PM East African Time.

Anonymous (2012). The *AbaWanga* Kingdom: History, Present and Future. http://abawanga.wordpress.com/ , as retrieved on Saturday, September 22nd, 2012, at 9:22 PM East African Time.

Cotton CM (1996). The ethnobotany: principles and applications. 1st edition, ISBN – 10: 047195537X (ISBN-13: 978–0471955375). New York, USA: John Wiley & Sons, Chichester.

Cunningham AB (1993). African Medicinal Plants: Setting priorities at the interface between conservation and primary health care. Working paper 1. UNESCO, Paris, France.

Cunningham AB (2001). Applied ethnobotany: people, wild plant use and conservation. 1st edition. ISBN-10: 1853836974 (ISBN-13: 978–1853836978), Earthscan, London, UK.

Etkin NL (1993). Anthropological methods in ethnopharmacology. Journal Ethnopharmacology, 38: 93–104.

Gakuubi MM, Wanzala W (2012). A survey of plants and plant products traditionally used in livestock health management in Buuri district, Meru County, Kenya. Journal of Ethnobiology and Ethnomedicine, 8: 39.

Gerique A (2012). An introduction to ethnoecology and ethnobotany theory and methods. http://www.utpl.edu.ec/summerschool/images/stories/presentaciones/ethnoecology.pdf., as retrieved on July 27th, 2012 at 5:47PM East African Time.

Heckathorn DD (1997). Respondent-driven sampling: a new approach to the study of hidden populations. Social problems, 44(2): 174–199.

Heckathorn DD (2002). Respondent-driven sampling II: deriving valid estimates from chain-referral samples of hidden populations. Social problems, 49(1): 11–34.

Heinrich M, Ankli A, Frei B, Weimann C, Sticher O (1998). Medicinal plants in Mexico: Healers' consensus and cultural importance. Social Science and Medicine, 47: 1859–1871.

Hoffman B, Gallaher T (2007). Importance indices in ethnobotany. Ethnobotany Research and Applications, 5: 201-218.

Kokwaro JO (1993). Medicinal Plants of East Africa, 2nd edn. East African Literature Bureau, General Printers Limited, Kampala, Nairobi, Dar Es Salaam, Tanzania.

Lans C (2001). Creole Remedies. Case studies of ethnoveterinary medicine in Trinidad and Tobago. PhD Thesis, Communication and Innovation Studies, Wageningen University and Research Centre, Wageningen, The Netherlands.

Martin JG (1996). A 'people and plants' conservation manual. 1st edition, Volume 7. ISBN-10:1844070840 (ISBN-13: 978–1844070848), London, New York: Chapman & Hall.

McCorkle MC, Rangnekar VD, Mathias-Mundy E (1997). Introduction: whence and whither ER&D? In: Ethnoveterinary Medicine: Alternatives for Livestock Development. Proceedings of an International Conference held in Pune, India, November 4–6, 1997. Volume 1: Selected Papers. File 2 of 9: Part 4: Introduction and Part 1: Applied Studies of Ethnoveterinary Systems. Edited by Mathias E, Rangnekar VD, McCorkle MC, Martin M. Pune, India: BAIF Development Research Foundation.

Ndondolo S, Owuor BO, Gikubi MM, Wanzala W (2016). A survey of ethnobotany of the *AbaWanga* people of Mumias and Matungu districts in Kakamega County, western Kenya. Indian Journal of Traditional Knowledge, 15 (1): 93 - 102.

Oakley A (1981). Interviewing women: a contradiction in terms. In participatory research and the race to save the planet: questions, critique and lessons from the field. Edited by de Rocheleau D. Agriculture and Human Values, 11: 4–25.

Russell B (2002). Research methods in anthropology: qualitative and quantitative methods. 3rd edition, ISBN-10: 0759101485 (ISBN-13: 978–0759101487), California, USA: Altamira Press.

Russell B (2002). Research methods in anthropology: qualitative and quantitative methods. 3rd edition, ISBN-10: 0759101485 (ISBN-13: 978–0759101487), California, USA: Altamira Press.

Salganik MJ, Heckathorn DD (2004). Sampling and estimation in hidden populations using respondent-driven sampling. Sociological Methodology, 34(1): 193–239.

Sutton AJ, Orr DB (1991). The use of the school essay as an RRA technique: a case study from Bong County, Liberia. In: RRA Notes: Participatory Methods for Learning and Analysis No. 14. Edited by Tadesse D., London: International Institute for Environment and Development (IIED), Sustainable Agriculture Program, Issue No. 19, 33–38.

Tongco D (2007). Purposive sampling as a tool for informant selection. Ethnobotany Research and Applications, 5(1): 147–158.

Wanzala W, Takken W, Mukabana WR, Pala AO, Hassanali A (2012). Ethnoknowledge of Bukusu community on livestock tick prevention and control in Bungoma district, western Kenya. Journal of Ethnopharmacology, 140 (2): 298-324.

Warry W (1992). The eleventh thesis: applied anthropology as praxis. Human organization, 51: 155–163.

Waters-Bayer A and Bayer W (1994). Planning with Pastoralists: PRA and More. A Review of Methods Focused on Africa. Eschborn, Germany: Germany Agency for Technical Cooperation (GTZ).

WHO (1996). The World Health Report: Fighting Diseases, Fostering Development, World Health Organization (WHO), Geneva, Switzerland.

Arabian Journal of Medicinal and Aromatic Plants

www.ajmap.org ISSN 2458-5920