

Full Length Research Paper

Ethnomedicinal plants used for the treatment of gastro-intestinal parasitic diseases in human in Yeki district, Southwest Ethiopia

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The use of medicinal plants plays a major role in the primary health care of human beings in Ethiopia. A study was carried out to document ethnomedicinal plants used for the treatment of gastrointestinal parasitic diseases of human in Yeki district, southwest Ethiopia. The key informants were selected using purposive sampling method. The information was obtained from 26 informants and 8 herbalists through the use of a semi-structured interview and observation on the habitat of medicinal plants. The collected data were analyzed using excel spread sheet. The survey revealed that 29 plant species belonging to 20 families were identified, and they were used for the treatment of gastrointestinal parasitic diseases of human. Among different intestinal parasite studied, protozoa (Amoebiasis) contributed the highest prevalence (48.28%) which infects children frequently. Lamiaceae (13.79%) species was the most frequently used plant family. Leaves were the most frequently used plant parts, constituting 51.72% followed by bark, seed, and fruit each with 6.89%. The remedies were prepared crushing single plant (62.5%) and in few cases mixtures of different plants (37.5%). Plants like *Maytenus arbutifolia* and *Pycnostachys meyeri* were approved by most of the healers which was used to control parasites. The collated data analysis revealed that a protozoan parasite infection is the most prevalence in the area due to less personal and environmental hygiene. The study revealed that information on medicinal plants was mostly confined to older people, and there is danger that this knowledge can be lost before being passed on to next generations. Therefore, there is an urgent need to document information on these plant species so that the future generation can benefit from it. Further investigation should be carried out to validate the efficacy and safety of the aforementioned plants so as to provide cheap alternative ways of controlling parasites.

Key words: Ethnomedicine, gastrointestinal parasite, helminthes, medicinal plants, protozoa.

INTRODUCTION

Traditional medicinal plant is used for the treatment of human ailments throughout the world's primary health

care, e.g, human intestinal parasitic diseases by the help of indigenous medical practitioners. There has been an

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increase worldwide in the realization of the use of medicinal plants in various traditional health systems of developing countries (Mirutse et al., 2009; Yalew et al., 2012; Tolossa et al., 2013).

In the history of Ethiopia, the use of traditional medicinal plants for treating different human ailments can be confirmed in all parts of the country. The plant remedies are still the most important and sometimes the only source of therapeutics for nearly 80% of the population in Ethiopia, especially rural populations (Lulekal et al., 2008). The collection and processing of medicinal plants provide employment and income opportunities for a large number of people in rural areas (Ngarivhume et al., 2015). The importance of traditional medicinal plants in conservation of biological diversity merits the attention it has gotten worldwide.

Gastrointestinal parasitic infections caused by intestinal protozoa and helminths are among the most common human infections throughout the world especially high prevalence in poor and socio-economically deprived communities in the tropical and subtropical countries including Ethiopia. Parasitic infections due to protozoa and helminths are responsible for substantial morbidity and mortality worldwide especially children in developing countries (Utzinger et al., 1999; Norhayati et al., 2003; Stepek et al., 2006; Haque, 2007; Ukwubile, 2012; Speich et al., 2013; Traore et al., 2013; Abdullah et al., 2016).

The intestinal parasitic infections are transmitted mainly through fecal contamination of food or water. These are the most frequent in areas where sanitation and hygiene are poor. The most common gastrointestinal parasites that cause frequent diseases/infections on human are protozoa (amoebiasis, giardiasis) and helminthes. Ascariasis, taeniasis (tapeworms), hookworm infection trichuriasis and etc. are among the top ten most common infections in the world (Norhayati et al., 2003; Corrigan et al., 2011). These infections continue to be a global health challenge, particularly among children in poor communities in developing countries. Epidemiological assessments of these infections have traditionally focused on estimating the number of infections (prevalence), which occur worldwide. Unfortunately, rural populations have limited access to health services and anti-parasitic substances used for gastrointestinal parasites control, due to poverty and inaccessibility. On the other hand, most of the existing drugs produce side effects such as abdominal pain, loss of appetite, nausea, vomiting, head ache and diarrhea. Therefore, these people are closely associated with medicinal plants to treat the intestinal parasite infection.

According to Lulekal et al. (2008) and Kefalew (2015), there is a considerable global interest in tapping the accumulated knowledge of traditional medicine and therefore, researches are being carried out in the district region with the aim of increasing the use of traditional medicine to the welfare of the human population. In

addition, the increase in population growth rate would result in the intensification of agriculture in marginal areas which would lead to deforestation with decrease in number or loss of medicinal plants in the wild (Pankhurst, 2001). Therefore, the study was carried out to document ethnomedicinal plants used for the treatment of gastrointestinal parasitic diseases in human in Yeki district, southwest Ethiopia and for sustainable conservation of these species.

METHODOLOGY

Study area

The survey was conducted in Yeki District, Sheka Zone, Southwest Ethiopia which was organized by 23 official Kebeles. The area is located at 611 km southwest of Addis Ababa. Geographically, the district lies between 7°12' to 7°43' W latitude and 35°32' to 35°75' E longitude. The altitudinal range of the district falls between 1001 to 2007 m above sea level, and it receives high amount of rainfall with mean average of 1591 mm annually and recorded high rainfall from April to September. Moist evergreen vegetation is the most popular in the area which is conducive for diverse medicinal plants. It is also conducive for cultivation of cash crops such as coffee, ginger, turmeric, piper and others (Yeki Woreda Administration office, 2014). Based on the 2007 Census conducted by the CSA of Ethiopia, this district has a total population of 134,519, of whom 68,895 are men and 65,624 women; 24,829 or 18.46% of its population are urban dwellers. The majority of the inhabitants practiced Ethiopian Orthodox Christianity, with 44.85% of the population reporting their belief, 29.8% were Protestants, 21.66% were Muslim, and 1.99% practiced traditional beliefs. The six largest ethnic groups reported in this Woreda were the Kafficho (29.78%), the Amhara (29.48%), the Oromo (11.67%), the Mocha (7.45%), the Bench (7.33%), and the Sheko (7.26%); all other ethnic groups makes up 7.03% of the population (CSA, 2007) (Figure 1).

Site selection and informant determination

The compiled ethnomedicinal data were gotten from Yeki district, Sheka Zone Southwest Ethiopia in 2017. The study sites were selected purposively from the district of 23 Kebeles/Villages (that is, Gobito, Adisalem, Qorcha and Fide). This sampling technique was first made with the help of a district agricultural office to collate the detail information about herbalist found in the district. All traditional healers or herbalists were incorporated based on the guidance and information of elder people in the locality. The local herbalists and elder informants were selected using both purposive and random sampling from the district to gather anti intestinal parasitic plants common in the locality. A total of 8 herbalists (2 healers from each village) and 26 key informants (approximately 6 elder informants from each village) were gotten. Then the researchers approached the herbalist and elder informants to collect the information on the medicinal plants used to treat gastrointestinal parasite diseases of human. Hence, almost all the interviewed herbalists were volunteers for giving all possible information and trends for treatment of gastrointestinal parasitic diseases effectively in the village.

Data collection method

Based on the preliminary survey of the site, the traditional healers

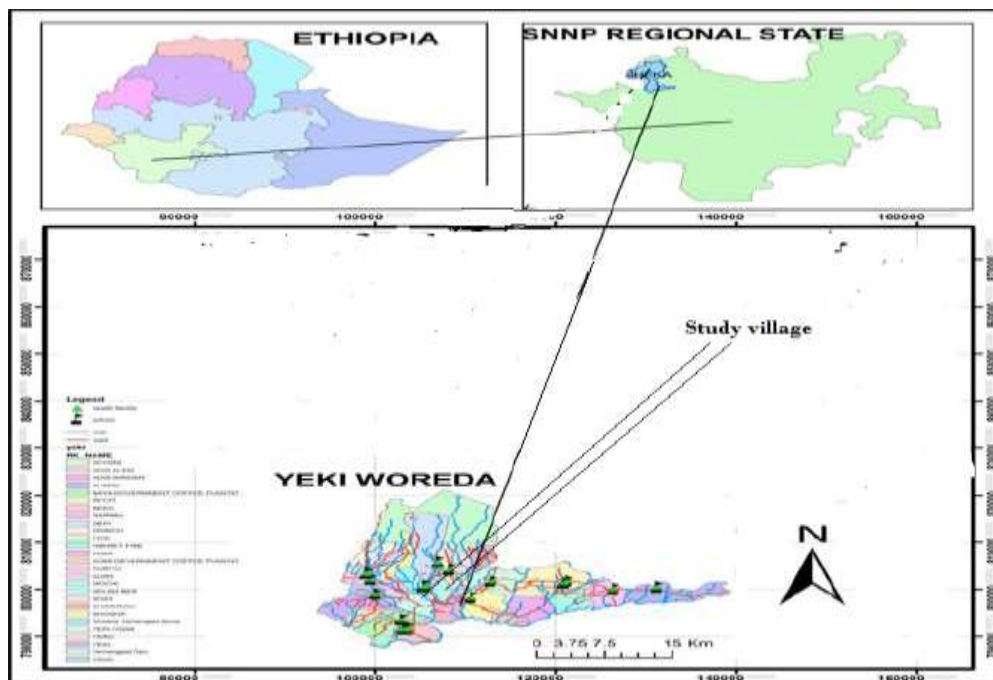


Figure1. Map of study area

were able to get at least two round of contact detail information from the community. In order to generate valid and extensive data, the study employed a combination of different method of approaches. These methods were questionnaires, semi-structured interview, focus group discussion, case study, field observation, identification of medicinal plants and informant consensus. The study was carried out to evaluate people's knowledge and their management practices on the valuable medicinal plants used for the treatment of intestinal parasitic infections and economic uses of these plants.

Plant collection and identification

Plant specimens were collected during guided field work with the informants and traditional healers. At times, the field activities included taking notes on plants and the associated indigenous knowledge with preliminary identification of the plants to family and sometimes to species levels. For further information, photograph of the medicinal plants and other important activities of herbalists during remedy preparation were recorded in the field. The plant specimens were pressed, dried and identified at the National Herbarium of Ethiopia using voucher specimens and flora of Ethiopia and Eritrea.

Data analysis

The collected ethnobotanical data reported medicinal plants used for gastrointestinal parasite diseases, and associated indigenous knowledge was entered into Excel spreadsheet and summarized using descriptive statistics. The spreadsheet data filter facility was employed to determine frequencies and percentage of citations by healers so as to identify the most common parts used and route of administration, and habit of medicinal plants preferred for the

treatment of liver problem throughout the country. The results were presented using pie charts, bar chart and tables.

Informant consensus factor (ICF), preference ranking and fidelity level (FL)

The diseases and remedies reported were grouped into categories based on the distribution in the district. The Informant consensus factor (ICF) was calculated for each category to identify the agreements of the informants on reported cures for the group of ailments. The ICF was calculated as follows:

$$ICF = \frac{Nur - Nt}{Nur - 1}$$

Where:

ICF: Informant consensus factor
Nur: number of use citation
Nt: number of species used.

Fidelity level (FL) was calculated to determine the percentage of informants that reported the uses of a medicinal plant as a remedy for the same major intestinal ailment using the formula, $FLI = Ip/Iu \times 100$, where Ip is the number of informants who independently indicate the use of a species for the same major intestinal ailment and Iu the total number of informants who mention the plant for any major intestinal ailment. Preference ranking on plants that were reported by 5 and above informants that was used as a treatment for multiple diseases was conducted. Four informants, one from each village based on the number of medicinal plants reported by each informant, were selected to rank the plants. The informants were briefed on the marking of the plants that the most preferred was given the highest points (1) and least preferred was given the lowest point (6).

RESULT AND DISCUSSIONS

General information of informants

In this survey, a total of 34 persons (26 informants and 8 traditional healers) were involved for reliable data collection in Yeki district of four villages. Most of the informants found in the study area were males (88.24%) because the traditional knowledge of practicing medicinal plants as healers was transmitted from father to the elder son. Therefore, females could not be the healer or practitioners however; four of the elder female informants were selected for approving the practice in the locality. Most of the respondents were between the age of 55 and 75 years old (93.6%). The person in this age group is more experienced and knowledgeable as compare to the younger age. Orthodox religion and informant job account for higher percentage of the study participants.

Prevalence of gastrointestinal parasite diseases and signs

Among the common intestinal parasites affecting human wellbeing were protozoa (48.28%) followed by ascaris (20.69%) (Table 1). Therefore, the study revealed that the most prevalent parasitic diseases in the area were protozoal such as amobia and giardia followed by ascaris. This prevalence is seen because of lack of sanitation in the area.

Similarly, the case is described in some local communities of the world that are exposed to parasitic diseases (Speich et al., 2013; Saqur et al., 2017). The major clinical signs as identified by the traditional herbalists considered as being related to gastrointestinal parasites infections in humans are stomach ache, presence of tapeworm segments in the faeces as well as the presence of blood and mucous in the faeces and/or diarrhea for protozoa parasitic infections. In this case, most of the traditional herbalists used different diagnosis to identify the type of protozoa and helminthes diseases. Based on this, amoebiasis differ from giardiasis infection due to mucus with faeces and the diarrhoea contains mucus and blood. These results are also in line with the findings of Stepek et al. (2006), Haque (2007) and Saqur et al. (2017) which was conducted in different parts of the world. The parasitic diseases are frequently observed in children compared to adult because children play with each other in the dirt without washing their hands except their parents instruct them to wash their hands. Similarly according to the study of Abdullah et al. (2016) and Saqur et al. (2017), children are mostly faced with intestinal parasitic infection.

The most common gastro-intestinal parasite infected age groups of human in the study area were identified by the traditional medical practitioners and key informants. Based on the response, gastrointestinal parasite

frequently affects children of ages of 3 to 10 (47.06%) followed by age group 11 to 20 (26.47%) and less than 2 years old (11.76%) (Figure 2). Hence, these age groups are susceptible to develop the parasitic infection compared to other age groups. This finding was also in agreement with the finding of different researchers conducted across the world by which most of children were infected by intestinal parasitic infections (Norhayati et al., 2003; Stepek et al., 2006; Haque, 2007) (Figure 2).

The result showed that diseases that were frequent in the study area have higher informant consensus factor (ICF). Medicinal plants that are effective in treating certain disease and well known by community members also have higher ICF. Intestine worms had the highest ICF value (1) followed by tapeworms (0.75) whereas; protozoa had the lowest ICF value (0.5) (Table 1). Fidelity level (FL) as an estimation healing potential was determined for some medicinal plants.

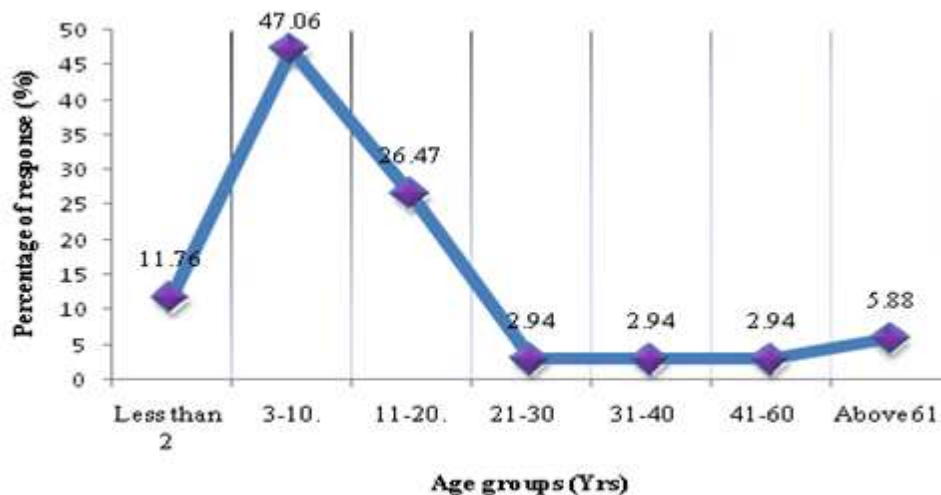
Accordingly, *Pycnostachys meyeri*, *Hagenia abyssinica*, *Ocimum lamifolium* and *Croton macrostachyus* were the plants having the highest level values for their use to treat intestinal parasitic infections and diseases. As the medicinal plants prescribed by informants for the same health problem such as protozoa infections (amoeba), the informants showed preference of one over the other. Preference ranking of six medicinal plants that were reported for treating amoeba was conducted after selecting six key informants. The informants were asked to compare the given medicinal plants based on their efficacy and to give the highest number (1) for the medicinal plant which they thought most effective and the lowest number (6) for the least effective plant. *Maytenus arbutifolia* and *Pycnostachys meyeri* ranked first indicating that it is the most effective in treating protozoa infections (amoeba) followed by *Prunus Africana* and the least effective was *Brucea antidysenterica* (Table 2).

Medicinal plants used

A total of 29 species of medicinal plants used for the treatment of gastrointestinal parasitic diseases was collected and documented from the study area. These identified species were represented with 20 families. From which, family Lamiaceae had the highest species contributing 4 species (13.79%) and closely followed by family Asteraceae with 3 species (10.34%), and Cucurbitaceae, Euphorbiaceae, Rosaceae and Rubiaceae represented each with 2 species (6.89%). The remaining 14 families represented each by 1 species (Figure 3). The numbers of medicinal plants used for treating human ailments and associated ethnomedicinal knowledge has been observed in different regional state of Ethiopia (Lulekal et al., 2008; Tolossa et al., 2013; Kefalew et al., 2015). The existence and utilization of such a large number of medicinal plants by people in the study area indicates that the majority of the people used indigenous

Table 1. Type and informant consensus value category of intestinal diseases in human in Yeki district.

Categories	Species	% of species	No. of use citation	% of all citation	ICF value
Ascaris	6	20.69	17	25	0.69
Intestine parasite infection	4	13.79	7	10.29	0.5
Intestine worms	1	3.45	3	5.88	1
Protozoa	14	48.28	27	39.71	0.5
Tapeworms	4	13.79	13	19.12	0.75
Total	29	100	-	-	-

**Figure 2.** Common age groups infected by intestinal parasite.**Table 2.** Preference ranking of six medicinal plants used to treating amoeba disease (R= respondents).

Species	Key respondents						Total	Rank
	R1	R2	R3	R4	R5	R6		
<i>Aeollanthus densiflorus</i>	5	6	4	2	5	5	27	5th
<i>Ajuga integrifolia</i>	4	4	1	5	4	4	22	4th
<i>Brucea antidysenterica</i>	6	5	6	6	5	6	34	6th
<i>Maytenus arbutifolia</i>	3	2	3	3	1	1	13	1st
<i>Prunus africana</i>	1	3	2	4	3	3	16	3rd
<i>Pycnostachys meyeri</i>	2	1	5	1	2	2	13	1st

medicinal practices to treat different health problems. The study shows that the traditional healers of the study area were found to play great roles in the primary healthcare systems of the local people as they were treating resource poor people who had little access and could not afford the cost of modern medications.

Habits of medicinal plants

The assessment on the growth form of the medicinal

plants depicted that herbs constituted the highest number of 11 species (37.93%) collected, and closely followed by trees 7 (24.14%) and 6 species shrub (20.69%) (Figure 4). However, a single plant belongs to epiphytic medicinal plants. This finding shows that the most represented life forms of medicinal plants for the treatment of gastrointestinal parasite in the study area was herbs followed by trees. This might show that there is abundance of herbs in the study area because the area is rich with rainfall for nine or more months. This makes the area conducive for the growth of herbs. Therefore, the

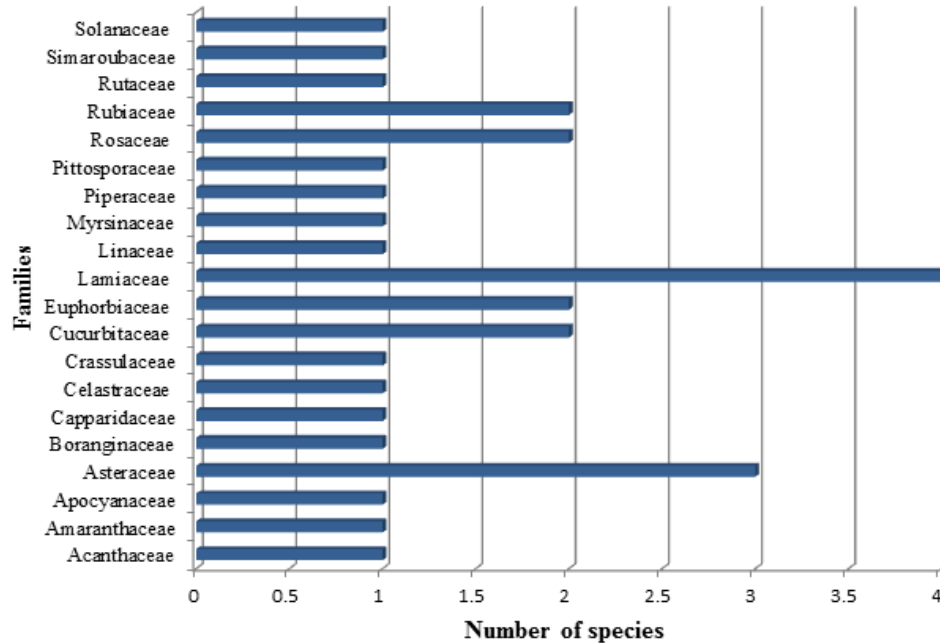


Figure 3. List of families with the species.

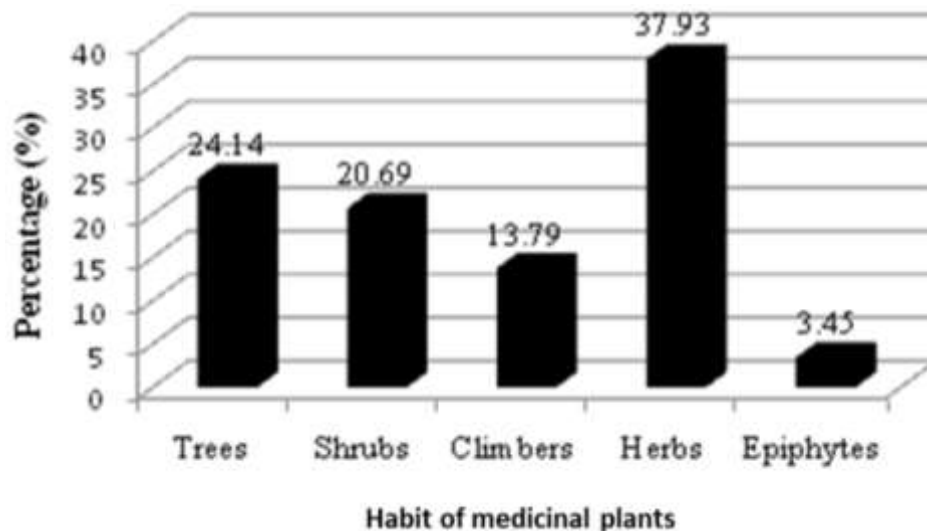


Figure 4. Habit of medicinal plants in the study area.

trend of using more of herbaceous plants could be advantageous as it is easier to cultivate them when they are in short supply and even naturally grown in natural environment. In similar fashion, the present study was in line with the report made by Mirutse et al. (2009) in Southwest Ethiopia, in cases where it is humid for most months of the year creating a favorable condition for the growth of herbs. Apparently, the herbs were the most harvested for the treatment of diseases of humans and

the livestock, which agrees with the previous studies of Mirutse (2001), Mirutse et al. (2009) and Mohammed and Berhanu (2011) on ethnobotanical conducted in Ethiopia. Nonetheless, the findings of Debela et al. (2004), Haile and Delenasaw (2007) and Fisseha et al. (2009) conducted in various parts of the country, sees shrubs as the primary growth form of remedies. Furthermore, the study area remains moisture/humid for several months for the year creating conducive environments for the

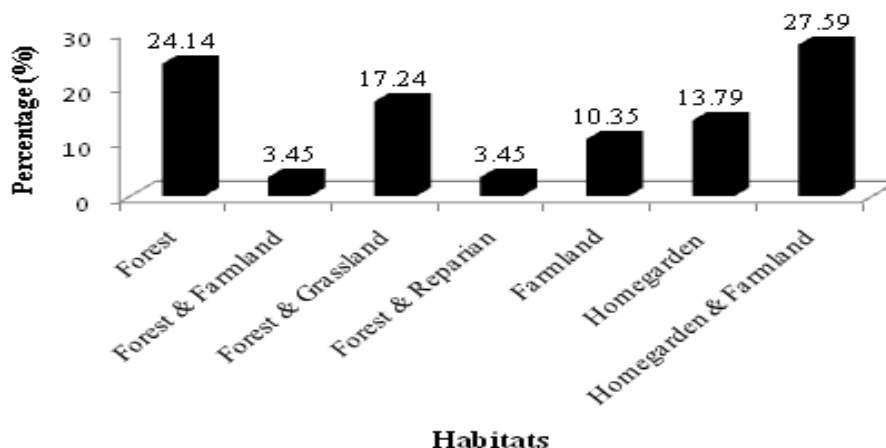


Figure 5. Habitat of medicinal plants in the study area.

growth and management of herbs. Thus, this is why local people of the study area mostly harvested leaves, fruits, seeds, rhizomes and bulbs of crops and herbs in every season.

Habitat of medicinal plants

Based on the data collected from key informants of the study area, around 8 species (27.59%) medicinal plants were obtained from both homegarden and farmland closely followed by 7 species (24.14%) obtained from forest, and 5 species (17.24%) collected from forest and grassland area (Figure 5). The finding of the present study agreed with the study conducted in other part of Ethiopia by Yalew et al. (2012), which revealed that medicinal plant (47.37%) were collected from the wild in the nearby forest and grassland areas, and almost above half (51.5%) of the medicinal plants were collected from the natural habitat (Gidey et al., 2011). On the other hand, the finding was in line with that of Gidey (2010) who reported highest number of medicinal plants from home garden in Alamata Town, Northern Ethiopia. This difference might be related to the variation in medicinal plant distribution in different climatic zone. Moreover, Yeki district got rain throughout the year unlike northern part of the country which gets sufficient rain in only two seasons mainly summer and autumn.

Plant parts used

Cumulatively, twenty nine (29) medicinal plants were used in the 4 sites (villages) of the district for the treatment of gastrointestinal parasitic infection/diseases in human. Frequently cited plant by the traditional healers was *Sonchus bipontini* (Asteraceae). The data revealed that most of the medicinal plants are used separately.

Different plant parts such as leaves, stem, barks, fruits, roots, seeds and flowers were used in preparing the remedies. The plants parts widely used by the traditional healers are the leaf (51.72%) followed by bark, seed, fruit and leaf and roots each with 6.89% (Figure 6). Grinding and mixing with water are the predominant modes of preparation of the medicine plants provided by local herbalists, and the oral route is used as the main administration way (96.55%). The dosage of a remedy depends on the age of the patient. In general, children have small quantities compared to adult. Almost all of the interviewed healers were men. Generally, they use their knowledge on medicinal plants to help the community by selling their products to the patients in the village and district. The major signs/symptoms diagnosis by healer to treat the parasite infection considered as being due to gastrointestinal parasites infections were stomach-ache, diarrhea, the presence of the worms and blood in the faeces. Five (20.83%) of the medicinal plants reported were approved, and commonly used in all of the four sites for the treatment of gastrointestinal parasitism.

Mode of remedy preparation and administration

Most of the parts of the plant used to treat gastrointestinal parasite was fresh form of the medicinal plants which are given to the patient for treating the parasite. The medicine extract which is chew directly or through swallowing was actively given to parasitic patient orally (96.55%) and dermal (3.45%) (Figure 7). The remedies were prepared, crushing a single plant (62.5%) and in few cases mixtures of different plants (37.5%). In the study, there were various methods of preparation and application for the different types of remedies identified. Also, various preparations forms were observed like infusion, crushing, decoction, concoction, powdering and chewing. However, there were few inconsistencies in the

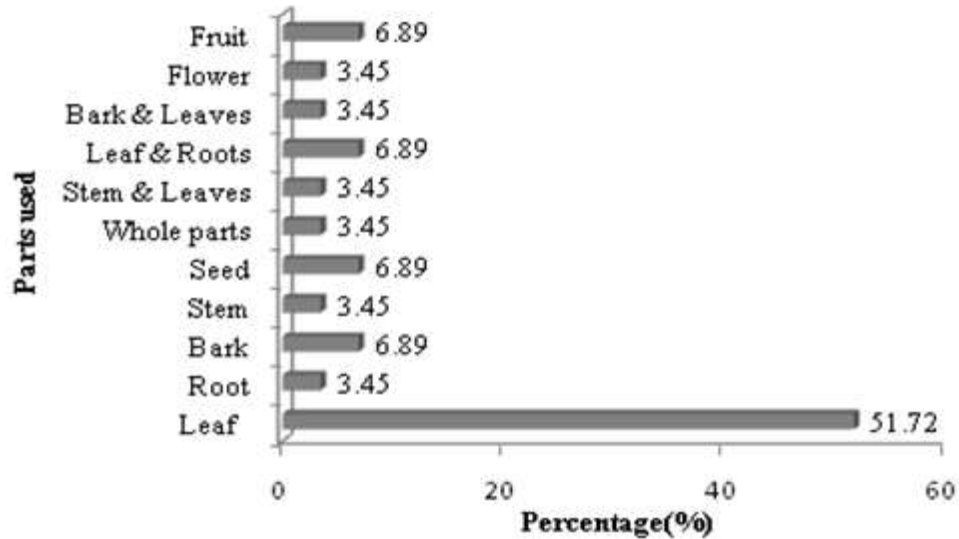


Figure 6. Parts of medicinal plants used for treatment of intestinal parasitic diseases.

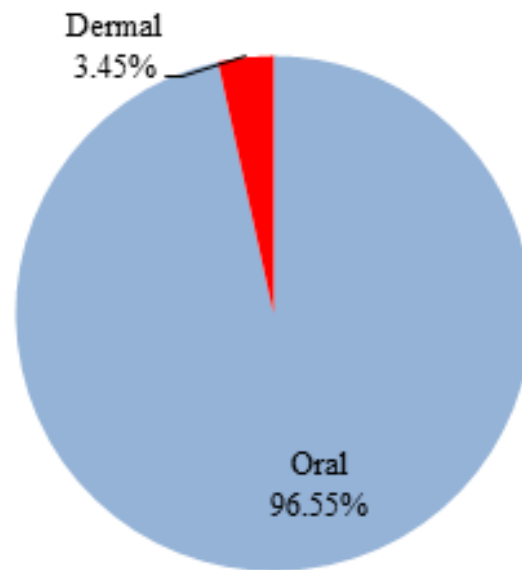


Figure 7. Route of administration to treat intestinal parasite.

parts used, the indications and the mode of preparation of the plants products from a site to each other. The plants parts were used separately but sometimes, traditional healers also used some ingredients such as honey, butter, cheese, milk and black barley to prepare the remedies (Table 3).

Conservation perspectives

As pointed out by informants in the study area, highest number of natural medicinal plants entails that majority of

the plants should not be cultivated purposively by traditional healers for the uses of remedies. In addition to this, the area is moist rich with plant diversity and possible to harvest numerous plants from wild immediately to treat the patient. Accordingly, local practitioners of the study area depend on the wild source of natural environment as compare to the ones cultivated (home gardens) to obtain the medicinal plants. But the activity of management mechanisms for future sustainability of wild medicinal plants is still ineffective. Based on the study, it needs emphasis to identify the threatened plants and to take appropriate conservation

Table 3. List of medicinal plants used for treatment of gastrointestinal parasitic diseases in Yeki districts, Southwest Ethiopia.

Species	Local name	Hb	Hab	PU	Diseases treat	Mode of preparation	RA	Voucher number
<i>Aeollanthus densiflorus</i> Ryding (Lamiaceae)	Yexxo (K)	H	FL, GL, HG	St and L	Amoeba	Grind the fresh leaf and mix the extract with milk and boil it, then drink 1 glass a day for 2 days	Or	BDM007
<i>Ajuga integrifolia</i> (Lamiaceae)	Armagussa (Am)	H	FL, FR	L	Amoeba (chronic)	Grind them and drink 1 joint small finger size juice on empty stomach for 3 days	Or	BDM011
<i>Brucea antidysenterica</i> J.F. Mill. (Simaroubaceae)	Abalo (Am)	T	FR	L	Amoeba (Light)	Grind the leaf tip (bud) of Nukesho and Ye'ero then mix them with butter. Drink the juice with coffee cup measures depth of little finger joint every morning for two days. Detoxify by eating four spoon of cheese for each term	Or	BDM021
<i>Canthium oligocarpum</i> Hiem (Rubiaceae)	Afo(K)	Sh	FR	B	Amoebia diarrhea	Pounding, squeezing and mixing with honey	Or	BDM008
<i>Celosia trigyna</i> L. (Amaranthaceae)	Daggichoo (K)	H	HG	L and R	Tape worm	Chew the leaf (four mouthfuls) and swallow per a day for four days. No side effect. Eating Raw leaf 4 times in a day but not for pregnant. Boil root then next morning mix the extract with honey then take 1glass/1cup for baby	Or	BDM021
<i>Cineraria abyssinica</i> Sch. Bip. ex A. Rich. (Asteraceae)	Nopphoo (K)	Cl	F	L	Ascaris	Squeeze the leaf	Or	BDM012
<i>Cleome gynandra</i> L. (Capparidaceae)	Allaatti ate (K)	H	FL	L	Ascaris	Squeeze the leaf	Or	BDM025
<i>Croton macrostachyus</i> Del. (Euphorbiaceae)	Waagoo (K)	T	FR, FL	B	Ascaris	Grind and mix with porridge then eat it	Or	BDM022
<i>Cucurbita pepo</i> L. (Cucurbitaceae)	Duba (Am)	Cl	HG	Se	Intestinal worms	Boil the seed and eat it as food	Or	BDM005
<i>Cyanoglossum lanceolatum</i> Forssk. (Boraginaceae)	Caaqo (Or)	H	FL	R	intestinal parasites	Ground and squeeze	Or	BDM003
<i>Embelia schimperi</i> Vatke (Myrsinaceae)	Enqoqo (Am)	T	FR	Fr	Tape worms	Crush the fruit in the form of juice and drink it for 1-2 days	Or	BDM006
<i>Hagenia abyssinica</i> (Bruce) J.F. Gmel. (Rosaceae)	Koso (Am)	T	FR	Fl	Tapeworm	Powdering from dry flowers and dissolve it with water then drunken	Or	BDM004
<i>Justicia shimperina</i> (Hochst. ex Nees) T.Anders (Acanthaceae)	Sensel (Am)	Sh	Hg and FL	L	Tapeworm	Ground and squeeze the leaf	Or	BDM016

Table 3. Contd.

<i>Kalanchoe petitiiana</i> A. Rich (Crassulaceae)	Indahula (Am)	H	FR, GL	L	Ascaris	Putting fired leaf and put on the stomach of infants	Dr	BDM020
<i>Carica papaya</i> L. (Caricaceae)	Papaya (Am)	H	HG, FL	Se	Amoebia	Crush seed and mix with honey then drink the prepared juice	Or	BDM018
<i>Maytenus arbutifolia</i> (Celastraceae)	Atat(Am)	Sh	FR, GL, FL	L	Amoeba	Grind the mixture of leaves of Atato, tikur inchet and Ye'ero together. Then drink the wet extract with cup of 1 st line of a small finger for 2 days	Or	BDM026
<i>Microglossa pyrifolia</i> (Lam.) Kuntz (Asteraceae)	Nibasho	Sh	GL, FL	L	Amoeba	Grind the fresh leaf and then mix the extraction with yogurt and drink the mixture four spoon per a day	Or	BDM001
<i>Ocimum lamifolium</i> Hochst. Ex Benth. (Lamiaceae)	Dama kese (Am)	Sh	FL,HG	L	Ascaris	Grind the leaf and mix the extraction with water. Then drink for babies ¼ of adult; No side effect Grind the fresh leaf and drink the extract with water. 1glass a day for 2 days/in cup for baby, baby>5 year	Or	BDM015
<i>Oncinotis tenuiloba</i> Stapf. (Apocyanaceae)	Ceno (K)	Cl	FR, GL	L	Chronic amoeba (bloody)	Crush the mixture of fresh leaves of Ceno together with leaves tip of Ye'ero and then mix the extraction with cheese (with butter) or honey. Then eat four spoon or mouthful every morning for three days	Or	BDM028
<i>Peperomia abyssinica</i> Miq. (Piperaceae)	Gergio (Sh)	Ep.	FR, RP	St	Amoeba	Chew and swallow the juice of fresh stems	Or	BDM024
<i>Peponium vogelii</i> (Hook.f) Engl. (Cucurbitaceae)	Tojo (Sh)	Cl	GL, HG	Fr	Intestine parasites	Eat the fruit as he/she can possible. Drinking alcohol is forbidden	Or	BDM009
<i>Pittosporum viridiflorum</i> Sims. (Pittosporaceae)	Shello (Sh)	T	FR, GL	L	Intestinal parasite	Grind the fresh leaves and drink the extracted juice.	Or	BDM002
<i>Prunus africana</i> (Hook.f.) Kalkman (Rosaceae)	Tikur enchet (Am)	T	FR	L	Amoeba (Bloody diarrhea)	Crush the leaf tip of tikur inchet together with embuay then eat with ox beef or cheese (with butter) or honey for two to three days; for babies and pregnancy	Or	BDM027
<i>Pycnostachys meyeri</i> Gilrke (Lamiaceae)	Ye'ero (K)	H	GL, FR	L	Amoeba	Grind in wet, mix with water then drink 1 coffe cup for 4 days and ¼ for babies	Or	BDM019
<i>Ricinus communis</i> L. (Euphorbiaceae)	Gulo/ Kobo (Am)	Sh	HG, FL	L and R	Intestinal parasite	Crush the leaves together with the leaves of tikur inchet and then extract juice and prepare smooth ox meat and roast it until it dry enough. Then eat with smooth roasted ox beef/meat one per a day two days; drinking water is forbidden	Or	BDM017
<i>Ruta chalepensis</i> L. (Rutaceae)	Caddiraammoo	H	Hg	WP	amoebic dysentery	Ground and squeeze	Or	BDM013

Table 3. Contd.

<i>Solanum anguivi</i> Lam. (Solanaceae)	Embuay (Am)	H	FL, HG, GL	L	Amoeba	Grind the leaf and drink the extraction or crush the mixture tikur inchet then eat by mixing with butter, abish, and doro meat Is better to take alcohols As food at morning; No side effect;	Or	BDM023
<i>Sonchus bipontini</i> Asch. (Asteraceae)	Meracho (Sh)	H	FL, HG,	L	Amoeba	The fresh leaf of the plant mix with honey and/ or milk (cheese). Then the mixture is eaten two mouthfuls or spoon per a day. This also has been given for pregnancy; No side effect because the cheese/milk is as detoxifier; For children ¼ of the adult Grind the leaf of Meracho and Nukesho and then mix the extraction with water. Drink the juice with coffee cup measure depth of small finger of upper joint; Detoxified by eating two mouthful or spoon of honey or cheese/ergo; no side effect; forbidden for pregnancy.	Or	BDM029
<i>Vangueria madagascariensis</i> Gmel. (Rubiaceae)	Gujimato (Sh)	T	FR	L and B	Ascaris	Grind the leaf of Gujimato and prepare porridge with bula and then eat the porridge as a food. 1.Boil and drink the extract for 4 days 1glass for adult and 1 coffee cup for babies; 2.mix with barely powder then drink	Or	BDM010

NB:- Hb=Habit (T=Tree, Sh=Shrub, H=Herb, Cl=Climber, Ep.=epiphyte); Hab=Habitat (FR= Forest, FL=farmland, HG=homegarden, RP= riparian); PU=part use (L=Leaves, St=stem, R=Roots, B=bark, Fr= Fruit, Se=Seed, Fl=flower, Fr=fruit, WP=whole part); RA=Route of administration (Or=Oral, Dr=Dermal).

measures in the district. According to Lulekal et al. (2008) and Yalew et al. (2012), local practitioners depend on the wild source of medicinal plants. Hence, the activity of managing and conserving medicinal plants in natural environment is not easy if the plants are over exploited then there will be a challenge in the conservation of resources in their wild environments. Various ethnomedicinal studies conducted in different regions proved the presence of great diversity of medicinal plants and occurrence of gastrointestinal infections (Tariq et al., 2015).

Conclusion

This study underlined that 29 medicinal plants

were used to treat gastrointestinal parasites diseases in human, and the symptoms that might be related to gastrointestinal parasites identified by traditional healers. Therefore, there is a realistic potential that these plants would contain compounds with anti-parasitic potency. This study contributes to the enormous indigenous knowledge on medicinal plants and plant-based remedies practiced within ethnic groups. The finding needs the improvement and promotion of the local traditional practitioners using medicinal plants to treat gastrointestinal parasites. There is also the need to investigate the phytochemical, pharmacological and toxicological profile of the plants used in order to ensure their efficacy as well as their safety. Anti-parasitic tests should be carried out to assess the efficacy of the inventoried

plants on gastrointestinal parasites. Every stakeholder must consider the status of these very valuable medicinal plants to propagate in homegarden and botanical garden for Ex situ conservation purposes.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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