

Collection And Consumption of Wild Edible Mushrooms In Three Villages of Binga, Zimbabwe

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Abstract

This study evaluates the importance of wild edible mushrooms as food in three villages of the Binga, Zimbabwe. A purposive sampling method was employed to select three villages from two (Local Government Area) wards, 25 households per each village randomly selected from the total household list provided by the district administration department, with a total of 75 households. An open ended, structured semi structured interview guide was used to provide a preliminary list of wild edible mushrooms in the area and the identification methods used, using seven households from the three villages. Structured, semi-structured and guided forest walks with some of the informants and forest picking observation was carried out with local guide assistants who have the skills of local (Tonga) language and Shona language. An econometric model was used to identify the factors influencing wild edible mushroom consumption in the study area. Descriptive statistics was used to describe the socio-economic characteristics of the respondents. Results from purposive sampling showed that seven ethnospecies of wild edible mushrooms were listed (in Tonga and scientific names in parenthesis: Bakapyapya (*Cantharellus spp*), Bakayanda (*Amanita loosii (zambiana)*), Bwabbaya (*Termitomyces spp*), Indyuu (*Termitomyces titanicus*), Madongila (*Amanita spp*), Mbuse (*Termitomyces clypeatus*), Nowa (*Lactarius kabansus*) and Indyuu, Madongila, Nowa) and of these three were noted as extinct species (Indyuu, Madongila, Nowa). About 43% of the participants consumed wild edible mushrooms once every day, 19% twice every day and 14% every second day during the rainy season, underpinning the potential importance of wild edible mushrooms for food security. Around 52% of the participants collected wild edible mushrooms once every day, 28.6% of the every second day while around 16% collected once a week, during the rainy season. Ethnobotanical knowledge of wild edible mushrooms was mainly passed orally from elderly to young people (72.9% of the participants), while 15.7% passed by mothers to their children and 11% learned from female elders to young women and girls. Identification techniques such as texture feeling, colour underneath and on top, breaking and observing milk like liquid oozing out and points of collection were used. Women (21.4%), women accompanied by girl child (24.3%) are especially involved in wild edible mushrooms collection, while a minority 1.4% men, women accompanied by boy child (7.1%) did the collection. The mean monthly income per household is US\$108.57, largest in Simandala and lowest in Dumbwe. The average age of the participants is 45.37 years. Of the 70 participants, 61.4 were female and 38.6 were male. Average consumption of wild edible mushrooms per meal per household is 1.436kg. About 95.7% of the participant served wild edible mushrooms as main relish, accompanying the staple. The mostly consumed were Indyuu (Zhouchuru) and Bakayanda (Nhedzi), consumed by 100% of the participants. Linear regression showed that the coefficients were positive and not significant at $p < 0.05$ level, only significant on household size.

1. Introduction

Wild edible mushrooms have been collected and consumed for decades providing a major source of income and significant additions to the diets of rural poor people in developing countries and have been prized as a delicacy for more than 2000 years (Kashangura et al., 2005). They have been consumed by

people not only as a part of the normal diet but also as a delicacy due to their desirable taste and aroma and as nutraceuticals (Largeteau et al., 2011) and their importance has been established since ancient times (Dijk et al., 2003). They form integral parts of traditional and cultural practices for rural people. Rural people eat wild edible fungi both as a matter of choice and as a food of last resort (Boa, 2004). Research by Rammeloo & Walley (1993) showed that edible fungi gathered from the wild form part of the diet of many local populations in Sub Saharan Africa. These findings confirm studies done in Nigeria by Oso, (1975), in Zambia Pegler & Pearce, (1980) and in Malawi Morris, (1984). These studies also revealed a wealth of information on wild edible fungi that hinted at wider use in other countries. According to Boa (2004), substantial quantities of wild edible fungi are collected from the wild and eaten, but may go unrecorded, an area where there are still significant gaps in information.

Binga is one of the most marginalized and least developed districts in Zimbabwe, with generalised poverty compounded by external shocks such as droughts and being far from the markets (Save the Children, 2001). The district faces poor supplies of food at high prices, while earning low prices for items like livestock are sold out of the area (Save the Children, 2001). With poverty, low levels of economic activity and the poor quality land that they have available to them, non-farm activities are potentially an important source of income.

Wild foods play quite an important role in people's diets, particularly when the availability of food crops is scarce, or when households have insufficient money to buy enough food or when access to markets is challenging (Save the Children, 2001; Ojelel et al., 2019). The estimated contribution of wild foods was around 10-15% of minimum energy requirements for all groups, though the contribution in terms of micronutrients was probably more significant than in terms of energy (Save the Children, 2001). In addition to "normal" wild food consumption, at times there is a high amount of consumption of "famine food" types of wild foods. One particular root – "kabombwe" (*Boscia angustifolia*) – eaten mainly from December onwards. The preparation of a drink/ soup from the crushed root requires at least 4 hours' boiling. It has sedative qualities and families reported having a dedicated person to wake other family members up after half an hour to ensure that they have not died (Save the Children, 2001). Poisonous tubers such as gompe, mwanja and masabayo are the main meals for some households during the most difficult months (July – November and January) (Save the Children, 2001). The wild foods' contribution, although difficult to quantify with confidence is estimated to be 10% for the poor and medium groups and 5% for the better off (Save the Children, 2001).

The consumption and importance of wild edible mushrooms in Zimbabwe is not well documented, however, Pierce & Sharp (2000), listed the vernacular names of Zimbabwean fungi. This might perhaps be due to lack of information about the extent of their use and their importance to rural people or difficult to measure/quantify compared with the other staples (Boa, 2004). The wild edible mushrooms may increase the supply of food to many areas of weak food security. However, most information on fungi is

available on cultivated species while data on wild edible fungi remain scarce (Boa, 2004). Basic information on diversity and consumption of wild edible mushrooms in Zimbabwe is lacking. The documentation of collection and consumption of wild edible mushrooms can serve as an initial step towards further detailed studies on the use and importance of wild edible mushrooms to increase supply of food to many semi-arid areas of weak food and nutrition security. It is in this context that a study was undertaken to explore various methods used by people in three villages of Binga district in identifying, collecting and consuming identifying the wild edible mushrooms, with the following specific study objectives:

- To quantify the amount of wild edible mushrooms consumed per household per meal.
- To investigate the attitudes of the people in three villages of Binga on wild edible mushrooms.

2. Materials And Methods

2.1. Description of the Study Area

The study was carried out in the three villages: Donga, Dumbwe and Simandala, all located Binga district, Matabeleland North, Zimbabwe. Binga district is in south-western Zimbabwe, south of Lake Kariba, across the lake from Zambia, lies along the southern Zambezi Escarpment. While specific data are unavailable for the studied villages, with mean annual rainfall and average temperature is 450 mm and 30°C respectively. The climate of Binga is semi-arid (Campbell et al., 1996). Natural vegetation in the region is mainly of the miombo type: a closed deciduous non-spinescent woodland dominated by the genera *Brachystegia*, *Julbernardia*, and *Isoberlinia* (*Fabaceae*, subfamily *Caesalpinioideae*), which generally occur on geologically old, nutrient-poor soils (Campbell et al. 1996). The Tonga people inhabit the area.

1. Survey structure

An open ended, structured semi structured interview guide was used to provide a preliminary list of wild edible mushrooms in the area and the identification methods used. A survey of wild edible mushrooms names through informal interviews with seven households in three villages was undertaken. During this exploration, a list in local names (ethnospecies) and Tonga names of existing wild edible mushrooms was developed and used as field names. These names were then used in the semi-structured interview presented in section 2.3.

Respondents also asked about their attitudes towards the use of wild edible mushrooms, availability and who and how they learned about wild edible mushrooms during collections. Data on the consumption of wild edible mushrooms were extracted from, and is discussed, in the context of all the wild food plants of the study area that included wild edible fungi (Boa, 2004) and the ethnospecies as listed by Pierce & Sharp (2000).

2.3 Data Collection Methods

The questionnaire was developed using prior interviews from the seven households in the three villages. Structured, semi-structured and guided forest walks with some of the informants and forest picking observation was carried out with local guide assistants who have the skills of local (Tonga) language and Shona language.

One focus group with approximately 10 people each was interviewed in each village. Data was collected using a structured and semi-questionnaire, developed through pre-visiting a couple of households in the three villages during the onset of the rain season in December, 2020. Secondly, the survey had 75 adult participants, 25 participants were interviewed in each village. A purposive sampling method was employed to select three villages from two Wards, 25 households per each village randomly selected from the total household list provided by the district administration department, with a total of 75 households. Five cases with missing data were ignored, not included for analysis, and therefore, resulting in 70 households included in the analysis.

Corresponding botanical names were obtained from the preliminary wild edible mushrooms survey and identification by Pierce & Sharp (2000). A principle of triangulation was followed to confirm knowledge, list names, availability or extinction (1) repetition (cited by at least two persons in two distinct interviews), (2) direct observation during guided forest walks or (3) informal confirmation by secondary informants and other villagers or (4) response received during focus groups.

2.4 Data Analysis

The data collected in this study were both quantitative and qualitative and descriptive in nature, therefore, descriptive statistics, frequency analysis, and statistical significances among the households in the three studied villages were used. These data were presented using percentages, frequency, ranking, coefficients, tables and bar charts.

3. Results And Discussions

Tables 1 shows selected socio-economic characteristics of the surveyed households as averages per village. The mean monthly income per household is US\$108.57, largest in Simandala and lowest in Dumbwe. The average age of the participants is 45.37 years. Of the seventy participants, 61.4 were female and 38.6 were male. Their ages ranged from 18 to 66 years, with 45 years as the median. Family

members ranged from 3 to 11, with the mean household size being 6 persons. The majority of the households (57.1%) comprised between 5 and 6 family members, while 30.1% comprised 7-11 family members and 12.8% had less 5 family members. The majority of the households (91.4%) had incomes not exceeding US\$100, a very small proportion of the participants (8.6%) had incomes ranging between US\$100 and US\$200. The result of the household income level in Table 1 revealed that the mean household is US\$108.57. This indicated that majority of the participants are very poor because their household income were far below the poverty datum. Poverty line (PDL for July at US\$495) represents the cost of a given standard of living that must be attained if a person is deemed not to be poor (Dube et al., 2016).

When consumed, the average mushrooms quantities per meal per household was 1.400kg in Dumbwe, 1.320kg in Donga and 1.580kg in Simandala. All villages collected the wild edible mushrooms from the forests and would accompany the staples. Similar reports were obtained by Collection of mushrooms in Zimbabwe (2002), who reported that wild edible fungi are commonly collected, sold and consumed and households eat up to 20kg of wild edible mushrooms in a productive year but only 5-10kg in deforested areas of Zimbabwe. Boa (2004) also reported that wild edible fungi are collected for food, rural people eat wild edible fungi both as a matter of choice and as a food of last resort.

Table 1: Socio-economic household characteristics by village

Variable	Dumbwe	Donga	Simandala
<i>N</i>	20	25	25
Household size (number)	6.4	6.28	5.92
Household income (US\$)	100	104	120
Age (years)	44.95	44.72	46.36
Amount consumed (kg)	1.400	1.320	1.580

Source: Authors

Taxonomic diversity of wild edible mushrooms

Table 2 shows the wild edible mushrooms reported and consumed in the three villages. A total of seven ethnospecies of wild edible mushrooms were reported and consumed in the study area. Most frequently cited and consumed ethnospecies were Nhedzi (*Amanita loosii [zambiana]*, 100% of the participants) Zhouchuru (*Termitomyces titanicus*, 100% of the participants), 85.7% cited and consumed Bowa hwepamuuyu (*Termitomyces spp*), 62.9% and 65.7% cited and consumed Tsvuketsvuke (*Cantharellus spp*) and Huzutwe (*Termitomyces clypeatus*), respectively. The remainder of the wild edible mushrooms were characterised by low citation and consumption, only mentioned and consumed by less than 50% of the participants, these include: Zheve (*Lactarius kabansus*), 48.6% and Nyabururu (*Amanita spp*), 30%, showing they were probably of less importance in terms of their contribution to food security compared to highly cited and consumed first three species. The current study ethnospecies list is comparable with 199 vernacular names mainly for edible mushrooms recorded by Pierce & Sharp (2000). A large number of wild edible mushroom parts consumed in the current study (5, 71.4%) are head and stalk, with major use as relish, accompanying the main staple foods i.e. maize meal/pearl millet/millet thick porridge called sadza in local language (Nsima in Tonga). A study in Malawi by Boa (2004) on picking of wild edible mushrooms (bowa) by Mr Kenasi showed that the bottom part of the stalk was thrown away the wild edible mushroom parts sold and consumed in Malawi were only heads. This disagrees with the current findings where the authors reported a larger proportion of the participants consumed both head and stalk. Interviews with participants revealed that the majority of wild edible mushrooms were collected during rainy and towards harvest season, December to March. The rainy season is characterized by a broader diversity of nutritional foods including fresh wild edible mushrooms. Similar results were obtained by Yongabi et al. (2004), who found onset of rainy seasons to be important as it is customary to find rural people across many African countries (for example, Cameroon, Nigeria, Malawi, Ghana, Benin Republic, Togo, Uganda, Ethiopia, Kenya, Equatorial Guinea and Zimbabwe) going out to search wild edible mushrooms from decaying wood and palm trees.

Table 2: Wild edible mushrooms reported in the three villages

Tonga	Ethnospecies	Scientific name	Plant part	Culinary use
Bakapyapya	Tsvuketsvuke	<i>Cantharellus spp</i>	Head & stalk	Relish
Bakayanda	Nhedzi	<i>Amanita loosii (zambiana)</i>	Head & stalk	Relish
Bwabbaya	Bowa hwepamuuyu	<i>Termitomyces spp</i>	Head & stalk	Relish
Indyuu	Zhouchuru	<i>Termitomyces titanicus</i>	Head & stalk	Relish
Madongila	Nyabururu	<i>Amanita spp</i>	Head	Relish
Mbuse	Huzutwe	<i>Termitomyces clypeatus</i>	Head & stalk	Relish
Nowa	Zheve	<i>Lactarius kabansus</i>	Head	Relish

Note: Relish in the Zimbabwean context are main or side dishes accompanying the maize meal thick porridge called sadza.

Culinary use and preparation of wild edible mushrooms

The most consumed wild edible mushroom types were Nhedzi and Zhouchuru, consumed by all the participants (100% of the participants), mostly as fresh relish, while Nyabururu and Zheve were consumed by less than 50% of the participants (30% and 48.6%, respectively). Results from the current study shows that 95.7% of the households served the wild edible mushrooms as the main relish with the main staples. The wild edible mushrooms types were frequently mixed in one pot, in rare cases, a sole type was cooked that is if the harvest was good. The wild edible mushrooms were just boiled and then salt added to taste and served, but in rare cases, cooking oil or peanut butter, or locally produced fresh cream and tomatoes would be added to make a sauce. The most consumed parts of the wild edible mushrooms are head and stalk, frequently combined, boiled and served as relish and the reasons for continued consumption of these wild edible mushrooms included economics and lack of alternatives to accompany the main staples. In this context, the wild edible mushrooms play significant roles as far as food security is concerned in these areas of the study, they add flavour to the staples. Research by Save the Children (2001) showed that the wild foods play quite an important role in people's diets, contributing around 10-15% of energy and micronutrients requirements, high amounts during time of food scarcity. Similarly, Ojelel et al. (2019) reported the importance of wild foods in the subsistence of many human populations particularly when the availability of food crops is scarce, when household budgets are not enough to buy enough food or when access to markets is challenging. Also, findings from Maroyi (2013) showed that edible foods contributed (100%) towards food security and nutrition for the people in Shurugwi.

Coefficients of wild edible mushrooms consumption by village

Table 3 shows the coefficients of wild edible mushrooms consumption by village. The sign of the coefficient shows the direction of the variables in relation with the dependent variable. The coefficients of wild edible mushrooms consumption per village were negative for Donga, positive for Simandala and not significant at $p < 0.05$ level. Two dummy variables were used for the three villages, Dumbwe being constant, whereas D_1 and D_2 for Donga and Simandala, respectively. The average consumption of wild edible mushrooms per meal per household is 1436 grams. The result is different from the result obtained by Manduna & Vibrans (2018) on consumption of wild-growing foods in the Honde valley in which the average quantities per meal per family were around 700 grams in Chipupuri and around 500 grams in Maradzika. The variable household size is positive and significant at $p < 0.05$ level. This implies that as the household size increases, the amount of wild edible mushrooms consumed per meal increases by 206.5grams. Similar results were reported by Adegbenjo et al. (2020) on factors influencing the consumption of wild and cultivated mushroom species in South-western Nigeria, where they observed a positive at $p < 0.01$ level of significance on household size variable. On the other hand, location

(Simandala), age of participants and household income had a positive coefficients of wild edible mushrooms consumption although not statistically significant. Additionally, location- Donga and gender had negative coefficients of wild edible mushrooms consumption, also not statistically significant. Our results confirm Adegbenjo et al. (2020) findings, who stated that gender has a positive correlation with the likelihood of the respondents to consumption although their results were not statistically significant. In our case male participants consumed less than female counterparts though not statistically significant.

Table 3: Coefficients of wild edible mushrooms consumption by village

Variable name	Wild edible mushrooms consumption per household	
	<i>Coefficient</i>	<i>p-value<0.05</i>
Location variables		
Constant	1400	.000
Donga (<i>D1</i>)	-80	.644
Simandala (<i>D2</i>)	180	.300
Socio-demographic and socio-economic variables		
Constant	305.974	.432
Age of respondent	7.336	.103
Household size	206.523*	.000
Household income	1.210	.552
Constant	2.898	.000
Male respondents	-0.899	0.436

1. Note: * denotes significant at 5%.

b. Dependent variable: Consumption/household/per meal in grams, age/years, household size/number of persons, household monthly income in USD, and gender of the respondent.

Source: Authors

Figure 1 depicts the frequency of consumption of wild edible mushrooms in the three villages of Binga district. About 43% of the participants consumed wild edible mushrooms once every day, 19% twice every day, and 14% every second day, underpinning the potential importance of wild edible mushrooms for food security. Additionally, 10% of the participants consumed wild edible mushrooms twice a week, 4.3% thrice a week, once per week and twice per month. A smaller proportion of the participants, 1.4% consumed wild edible mushrooms three times a day. This disagrees with the findings of Manduna & Vibrans (2018) who reported families consumed wild food plants about twice per week in season. They further reported that the wild-growing food plants were important during the first 3 months of the year (January to March), which also contrary to the reports of interviewees from our study, where participants said they started collecting and consuming the wild edible mushrooms as early as December, 2020.

Figure 2 depicts the frequency of collecting the wild edible mushrooms by the participants. The frequency of collection of wild edible mushrooms varied among the households. However, most households collected the wild edible mushrooms once every day (around 52%), followed by 28.6% collecting every second day, while 15.7% of the participants collected the wild edible mushrooms once a week, a small proportion (4.3%) collected twice in a month. This is related to the report of Boa (2004) who observed the collection of wild edible mushrooms in Malawi where the collection was done only once a day.

Part of the questionnaire collected information on the members of the households in the three villages who usually collected the wild edible mushrooms. Figure 3, shows just few cases (1.4%), fathers do collect the wild edible mushrooms, whereas, mothers, mothers and girl child, and mothers and boy child did the collection of wild edible mushrooms (21.4%, 24.3% and 7.1%, respectively), showing that mothers were better knowledgeable of wild edible mushrooms compared to their counterparts- fathers. About 45.7% of either mothers or fathers accompanied by children collected the wild edible mushrooms. Our findings showing fewer cases of fathers collecting the wild edible mushrooms are similar to Manduna & Vibrans (2018) results on Consumption of wild-growing food plants in the Honde Valley, Zimbabwe. They reported that it was unusual for the men to bring home any collected food plants, except fruit in families with very young children. Boa (2004) reported that women frequently go on collecting trips in many parts of southern Africa and a number of reports confirm the importance of this activity during the three to four month season each year. The results are different from the results obtained by Boa (2004) on wild edible mushroom collectors, in which wild edible mushroom collectors were men in China, while both men and women were involved in the collection of wild edible mushrooms in Mexico. The same author reported that it was unusual for men as collectors, because the collectors in Malawi were mostly women, as the case in Tanzania and Burundi. Mother or father and children collected the wild edible mushrooms (45.7%). Our findings showed that participants limited themselves to only a few wild edible mushrooms species that they were familiar with and were easy to recognize.

The wild edible mushrooms collectors used indigenous knowledge in identifying the edible ones. Figure 4 shows that breaking and observing milk like liquid oozing out, or checking the colour underneath and top of the mushrooms, or points of collection (which included anthills, under trees, on decomposing baobab trees) or used either of the above to identify wild edible mushrooms. About 62.9% of the participants used

either of the following to identify wild edible mushrooms: breaking and observing milk like liquid oozing out, check colour underneath and top, Points of collecting (Anthills, under trees, decomposing baobab trees) and Shape, texture and smell. Additionally, 24.3% of the participants used the points of collection such as anthills, under trees, decomposing baobab trees to identify the wild edible mushrooms, 7.1% used shape, texture and smell. A smaller proportion of the participants, 2.9% checked colour underneath and top or breaking and observing milk like liquid oozing out in identifying the wild edible mushrooms. Most of the participants who checked colour underneath and top said this check was common on Nhedzi, Bowa hwepamuuyu, Zhouchuru and Huzutwe, which they said head tip is light brown. Additionally, Zhouchuru and Huzutwe were collected on anthills, whereas Bowa hwepamuuyu collected on dead baobab trees. Zheve is identified by breaking and observing milk like liquid oozing, and only collected experts as it was easily confused by another similar type which is poisonous. Rural people have long associated the appearance of edible fungi with particular trees and have incorporated this in local names. In southern Africa, chimsuku and kamsuku both describe *Lactarius* spp. that grow under masuku trees (Pearce, 1981). Edible species of *Favolus* are collected from dead wood inside tropical rain forests, while *Termitomyces* only grow in association with termites and their nests and are dependent on the organic matter brought by the insects from their feeding on trees. Although *Termitomyces* are saprobic, they are symbiotic with termites. Twenty edible species of *Termitomyces* have been recorded from Africa and Asia (Pegler and Vanhaecke, 1994). Among the local people, names of edible mushrooms are based on the substrates on which they grow, their association with insects, and unrelated taxa are given collective names (Apetorgbor et al., 2006). In Malawi, people collect wild edible mushrooms under miombo trees (Boa, 2004). Traditional communities also have better ecological knowledge about local environments Angelsen (2010). Boa (2004) reported that wild mushrooms collectors knew that certain wild mushrooms were found near certain tree species and that each year the same type of wild mushrooms appear in the same places. In this current study, some households collected wild edible mushrooms, for example (Bwabbaya- Bowa bwepamuuyu) on decomposed baobab trees, on anthills (Indyuu- Nzouchuru). *Agrocybe aegerita*, an edible saprobic species growing physical connection to the roots can be seen, here on a tree stump in Bologna, Italy (Boa, 2004). *Lactaron* sp. white fluid appears after breaking the gills, whereas, the sac is a distinctive feature of *Amanita* (Boa, 2004). Some countries have developed the guide for edible mushrooms, for example in Israel the guide is written in Hebrew and Russian (Wasser, 1995), following the arrival of over one million Russians in the 1990s and their strong tradition of collecting wild edible fungi. Mushroom poisoning are rare, are associated with a number of events: young children collecting indiscriminately mushrooms; wrongly identifying a local species that turns out to be poisonous; food shortages and economic hardship force people to hunt for food. Wild edible mushrooms provide a notable contribution to diet in central and southern Africa during the months of the year when the supply of food is often perilously low (Boa, 2004).

Availability and attitudes towards wild edible mushrooms

Table 4 shows the availability and attitudes towards wild edible mushrooms by the participants. The respondents preferred the ones common in the area (75.7%) (n=70) while 24.3% liked the taste of the wild edible mushrooms. They pointed out that the availability of wild edible mushrooms is tremendously

diminishing. The availability of wild edible mushrooms has strongly decreased (92.9%) of the respondents (n=70), while 7.1% mentioned a decrease availability of wild edible mushrooms, citing rare existing of some of wild edible mushrooms for example Zhouchuru, Nyabururu and Zheve. Comments, particularly by elders and women, during focus group and individual interviews indicated a trend toward an extinction of certain species, because of prevailing weather patterns; several people mentioned the loss of native woodlands, anthills, indigenous trees, where the wild edible mushrooms are most abundant, may lead to their extinction.

Several studies supporting the extinction of wild food plant sources that are important in the traditional African diet have been documented for more five decades ago. In Zimbabwe, there is evidence that with the expansion of organized agriculture, and the land clearing and deforestation resulting from increasing fuel-wood demands, several species of wild fruit and vegetable plants are rapidly disappearing from the rural dietary (Gomez, 1988). In a survey carried out in Masvingo province (Kaeser-Hancock and Gomez, 1985) it was found that communal farmers recognized the names of certain wild fruit trees but no longer consumed the fruit owing to the disappearance of these species from the natural vegetation. Collection of mushrooms in Zimbabwe (2002) reported that households eat up to 20 kg in a productive year but only 5-10 kg in deforested areas. Similar observation were obtained by Manduna & Vibrans (2018), who reported that the participants in their study only mentioned that some fruits and vegetables had become more difficult to find recently because of the increase in the human population. Apetorgbor et al. (2006) reported that edible mushrooms were collected from forest reserves, secondary forests and fields under fallow, however, with the current rate of bush burning and deforestation, collection of edible mushrooms from the wild is threatened. To matters worse, wild edible plants species are still largely ignored in land use planning and implementation, in economic development, and in biodiversity conservation endeavours (Dessaiegn, 2017). Traditional knowledge on wild edible plants is being eroded through acculturation and the loss of plant biodiversity along with indigenous people and their cultural background, promoting research on wild food plants is crucial in order to safeguard this information for future (Dessaiegn, 2017).

Table 4: Availability and attitudes towards wild edible mushrooms

Attitudes towards wild edible mushrooms		Changes in availability	
Prefers the ones common in the area	75.7	Strongly decreased	92.9
Like the taste	24.3	Decreased	7.1

4. Conclusions

The wild edible mushrooms are important as sources of relish and served as the main dish in Binga. The most consumed are Nhedzi and Zhouchuru. They consume once, twice and thrice in that descending order, underlining their importance for food and nutrition security, especially for the poor people in Binga. Wild edible mushrooms collectors use indigenous knowledge in identifying the edible ones. Further studies can be carried in other places in Zimbabwe, ethnospecies and transfer of ethnobotanical knowledge among the people should be documented for future and resource usage and effect of climate change on availability of wild edible mushrooms.

Declarations

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Declarations

Ethics approval and consent to participate: The authors declare that they obtained an informed consent to participate from people who were involved in this study.

Contributions

The authors participated in the fieldwork and wrote the manuscript. All authors read and approved the final manuscript.

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Consent for publication

The authors declare that they obtained an informed consent for publication from the people involved in this study.

Competing interests

The authors declare that they have no competing interest to disclose.

Availability of data and materials

Please contact author for data requests.

References

Adegbenjo AE, Adedokun MO & Oluwalana SA (2020) Factors Influencing the Consumption of Wild and Cultivated Mushroom Species in South-western Nigeria. *Journal of Forest and Environmental Science* 36.4: 311-317. doi.org/10.7747/JFES.2020.36.4.311

Angelsen A (2010) Policies for reduced deforestation and their impact on agricultural production. *Proc. Natl. Acad. Sci.* 107, 19639–19644.

Apetorgbor MM, Apetorgbor AK & Obodai M (2006) Indigenous knowledge and utilization of edible mushrooms in parts of Southern Ghana. *Ghana Journal of Forestry* Vol. 19 & 20. 20-34.

Boa ER (2004) *Wild Edible Fungi: A Global Overview of Their Use and Importance to People (Non- Wood Forest Products)*, FAO, Viale delle Terme di Caracalla, Rome, Italy. 1-145.

Borelli T, Hunter D Powell B, Ulian T, Mattana E, Termote C, Pawera L, Beltrame D, Penafiel D, Tan A, Taylor M & Engels J (2020) Born to Eat Wild: An Integrated Conservation Approach to Secure Wild Food Plants for Food Security and Nutrition, Review. *Plants* 9.1299: 1-36. doi:10.3390/plants9101299

Campbell B, Frost P & Byron N (1996) Miombo woodlands and their use: Overview and key issues. In: *The miombo in transition: Woodlands and welfare in Africa*, ed., B. Campbell, 1–10. Bogor, Indonesia: Center for International Forestry Research (CIFOR).

Central Statistical Office (Zimbabwe) & Macro International Inc. (2000) *Zimbabwe Demographic and Health Survey 1999*. Calverton, Maryland: Central Statistical Office and Macro International Inc.

Dessalegn AA (2017) Ethnobotanical survey of wild edible plants and their contribution for food security used by Gumuz people in Kamash Woreda; Benishangul Gumuz Regional State, Ethiopia. *Journal of Food and Nutrition Sciences* 5(6):217–224.

Dijk H, Onguene NA & Kuyper TW (2003) Knowledge and Utilization of Edible Mushrooms by Local Populations of the Rain Forest of South Cameroon. Royal Swedish Academy of Sciences, *Ambio*: 32 (1) 19-23.

Dube P, Ihle R & Heijman W (2016) "Food security in Zimbabwe: Demand for African indigenous vegetables," 2016 Fifth International Conference, September 23-26, 2016, Addis Ababa, Ethiopia 246455, African Association of Agricultural Economists (AAAE). 1-25. DOI: 10.22004/ag.econ.246455

Gomez MI (1988) A Resource Inventory of Indigenous and Traditional Foods in Zimbabwe. Department Of Biochemistry, University Of Zimbabwe, Zambezia Research Report XV (i): 53-71.

Harkonen M, Saarimiki T & Mwasumbi L (1994) Tanzanian mushrooms and their uses 4. Some reddish edible and poisonous Amanita species. *Karstenia* 34, 47

Kaesler-Hancock G & Gomez MI (1985) 'Patterns of Rural Food Production and Consumption: A Case Study in Gutu Communal Lands' (Harare, Univ. of Zimbabwe, Dep. of Biochemistry, unpubl.).

Kashangura C, Kunjeka EC, Mabveni ARS, Chirara T, Mswaka K & Manjonjo-Dalu V (2005) Manual for mushroom cultivation. Biotechnology Trust of Zimbabwe, Harare: 1-66.

Largeteau ML, Llarena-Hernández RC, Regnault-Roger C & Savoie J (2011) The medicinal *Agaricus* mushroom cultivated in Brazil: biology, cultivation and non-medicinal valorisation. *Appl Microbiol Biotechnol* 92:897–907. DOI 10.1007/s00253-011-3630-7.

Manduna I & Vibrans H (2018) Consumption of Wild-Growing Vegetables in the Honde Valley, Zimbabwe *Economic Botany* 72:4. 436-449 DOI 10.1007/s12231-019-9441-y.

Maroyi A (2013) Use of weeds as traditional vegetables in Shurugwi District, Zimbabwe. *Journal of Ethnobiology and Ethnomedicine*. 9:60. 1-10. Doi:10.1186/1746-4269-9-60

Morris B (1984) Macrofungi of Malawi. Some ethnomycological notes. *Bull. Brit. Mycol. Soc.* 18, 45-57.

Ojelel S, Mucunguzi P, Katuura E, Kakudidi EK, Namaganda M & Kalema J (2019) Wild edible plants used by communities in and around selected forest reserves of Teso-Karamoja Region, Uganda. *J. Ethnobiol. Ethnomed.* 15.3:

Oso BA (1975) Mushrooms and the Yoruba people of Nigeria. *Mycologia* 67, 271- 279.

Owen F (1982) 'Women's Health Survey', cited by A. Berg, 'Malnutrition in

Zimbabwe' (n.p., World Bank, paper prepared for the Population, Health and Nutrition Sector Study.

Pierce G. & Sharp C (2000) Vernacular names of Zimbabwean Fungi: A Preliminary Checklist. *Kirkia*, 17(2), 219-228. Retrieved July 14, 2021, from <http://www.jstor.org/stable/23502317>

Pegler DN & Pearce GD (1980) The edible mushrooms of Zambia. *Kew Bull.* 35, 475-491.

Rammeloo J & Walley R (1993) The edible fungi of Africa south of the Sahara: a literature survey. *Scripta Bot. Belg.* 5, 1-62.

Svanberg I & Lindh H (2019) Mushroom hunting and consumption in twenty-first century post-industrial Sweden. *Journal of Ethnobiology and Ethnomedicine.* 1-23.

Yongabi A. K. (2014) Current Developments in Mushroom Biotechnology in Sub-Saharan Africa. *WSMBMP Bulletin* 11, July 31, 2014. 1-11.

Yongabi K, Martinez-Carrera D & Agho M (2004) Ethnomycological studies on wild mushrooms in Cameroon, Central Africa. *Micologia Aplicada International*. 16 (2):34-36.

Save the Children (2001) *Binga District Household Economy Assessment 2001-02*. Harare: Save the Children (UK).

Figures

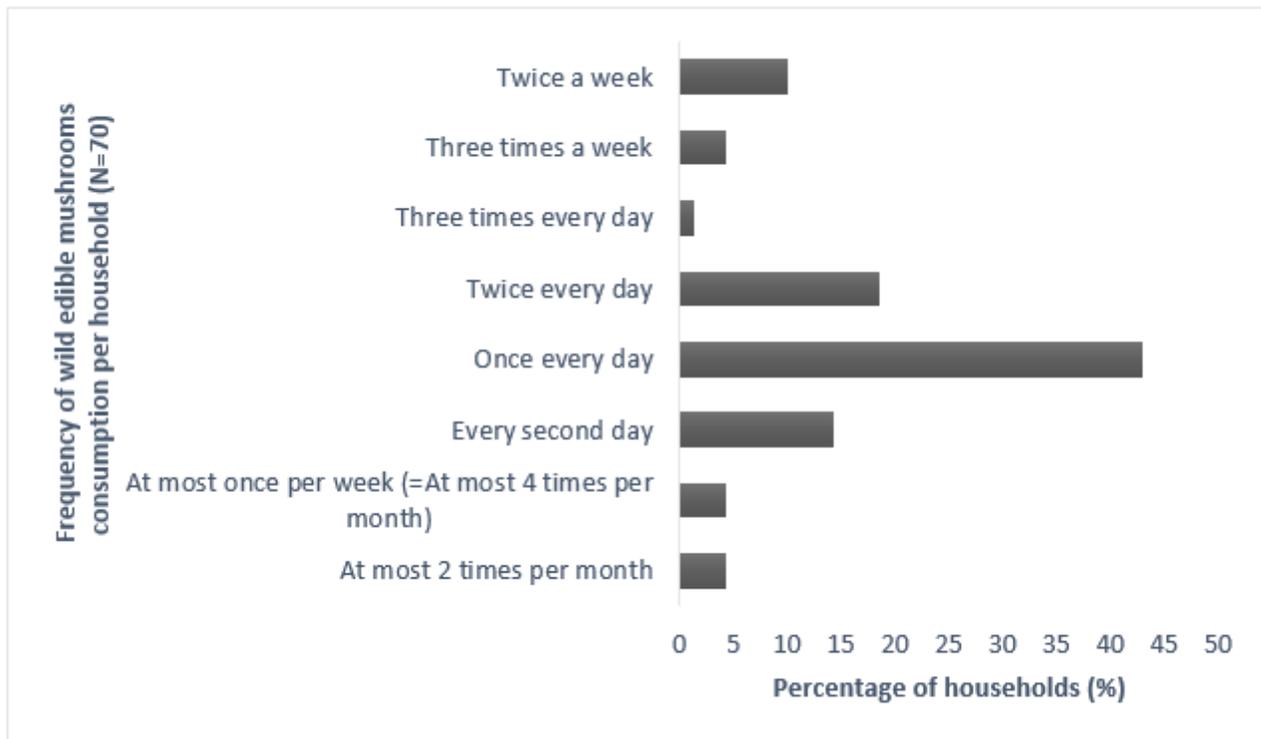


Figure 1

Frequency of wild edible mushrooms consumption by households in the three villages Source: Authors

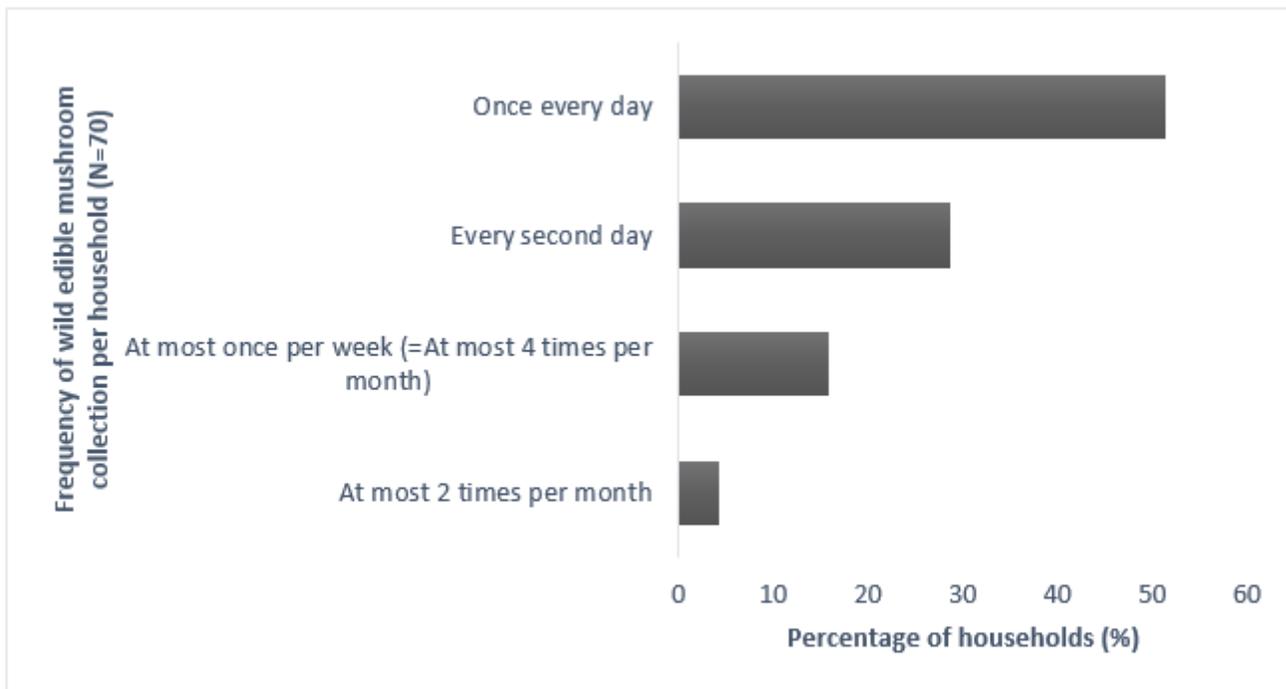


Figure 2

Frequency of wild edible mushrooms collection by households in the three villages Source: Authors

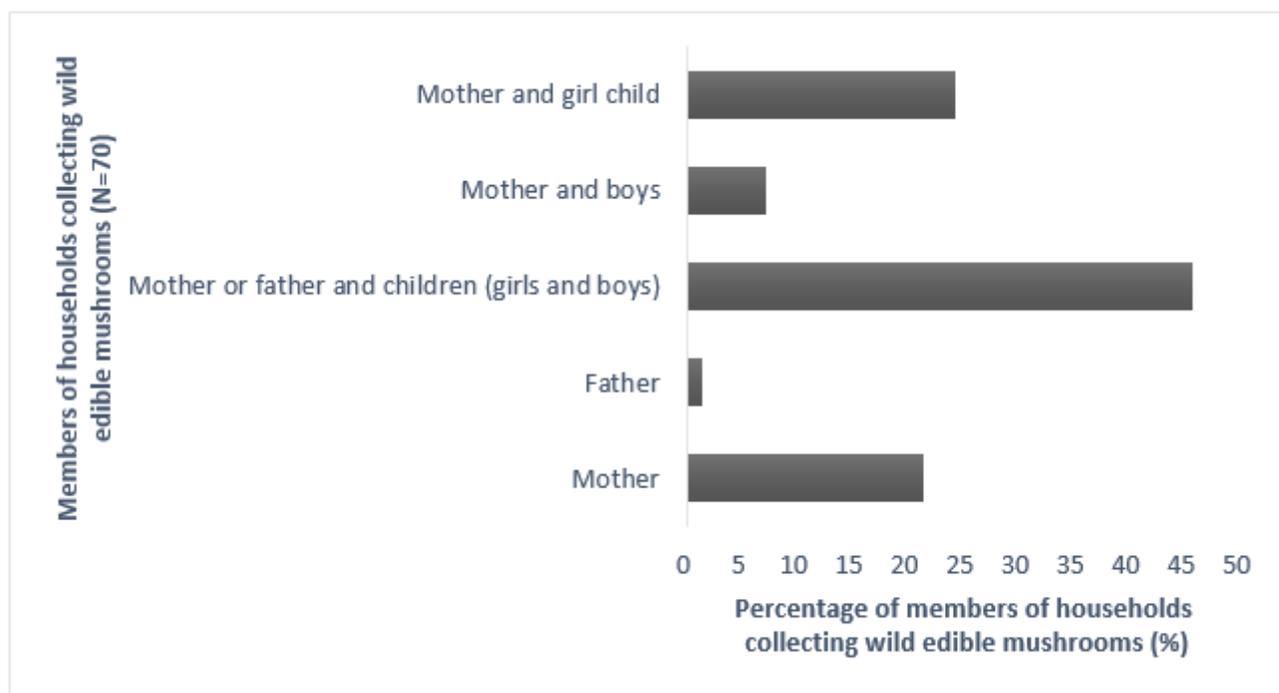


Figure 3

Members of the households collecting wild edible mushrooms in the three villages Source: Authors

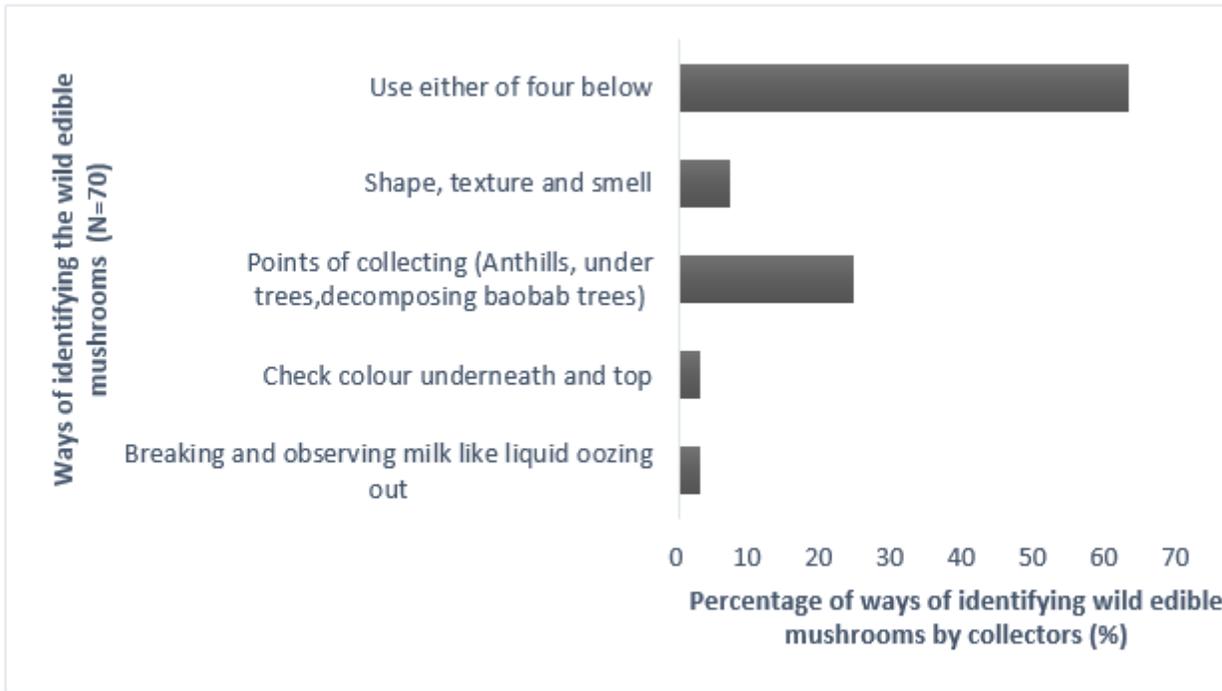


Figure 4

Ways of identifying the wild edible mushrooms during collection by household members in the three villages Source: Authors