

## Coping With Drought: The Role of Wild Food Plants In Semi-Arid Areas of Katsina State

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### **Abstract**

*This paper discusses the issue concerning the use of wild food plants in supplementing food deficit in northern Katsina state, an area that persistently experience late onset, long dry spell and early cessation of rain. Data were collected using semi-structured questionnaires, key informants interview, focus group discussion and vegetation inventory. Many wild food plants that provide bark; fruits, flowers, nuts, leaves, roots, seeds and tubers were identified and documented. Spatial variations in species abundance from one location to the other were observed in the area, which could be attributed to land management practices, population pressure and government policy. Even though these wild food plants are increasingly threaten by man activities, they are alternative food resources for improving food and nutritional security of people living in drought disaster risk areas of Katsina state. However further research is needed to investigate nutritional values, production level and their storage for long term use by the people in the area and other ecological zones of Nigeria.*

**Key words:** Drought, Disaster, Risk, Wild food, Adaptation, Katsina state

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### **1.0 Introduction**

Drought is often described as a creeping phenomenon because of its gradual nature and slowly accumulated effect over an extensive period of time (Guatier *et al.*, 2016). It changes most of the time in terms of its onset, intensity, duration and geographical coverage. African countries where rainfall accounted for over 70% of food production have the highest incidence of drought (Masinde, 2018).

EM-DAT report of 2014 as cited in Masih *et al.*, (2014) and Masinde (2018) indicated that out of 238 drought disasters recorded all over the World between 2006 – 2015, 118 occurred in Africa and is responsible for the death of 20,078 people in African countries out of 20,257 recorded deaths due to the impact of drought. In other words, only 173 people died from 50% of the drought that occurred in other parts of the World and 20,078 people died from the other 50% that were experienced in African Countries.

It affects humanity in different ways including crop failure, food shortage which often leads to famine, mass migration and loss of life.

The capacity of people particularly communities living in semi-arid areas of northern Nigeria to avoid drought hazard impact may be limited, this is compounded by shortcomings in government capacity to provide short-term relief and put in place long-term drought mitigation

measures. People that are living in drought-prone zone have devised different mitigation measures to minimize the impact of drought in their areas.

Among the strategies that are used to cope and mitigate drought impact is the use of Wild Food Plants (WFP) as documented in different part of Africa. (Asfaw and Tadesse 2001; Wilfred *et al.*, 2006; Bvenura and Afolayan 2015; Broegeard *et al.*, 2016; Cooper *et al.*, 2018 and Mashileet *et al.*, 2019).

Shumskiy *et al.*, (2014) define WFP as "plants that grows spontaneously in self maintaining population in natural or semi natural ecosystem and can exist independently or direct human actions'. They were also described as plants with edible parts that grow naturally on farmland, follow or uncultivated land (Assefa and Abebe, 2010). WFP are largely found in the wild or uncultivated land but are also grown or left within indigenous communities on a subsistence scale, hence can be considered semi-domesticated or a step toward their domestication (Shava, 2005). Thus, they can easily be propagated and grown with little or no external inputs requirement such as fertilizer or pesticide and can be integrated into sustainable farming systems.

WFP are important sources of nutrients in rural areas of Africa where deficiency in minerals and vitamins are increasingly recorded (Glew and Venderjagt, 2006; Bharucha and Pretty, 2010 and Mashileet *et al.*, 2019) Analysis of some of the WFP indicated their nutritional value and quality is comparable or even superior to domesticated varieties (Humphry *et al.*; 1993; Lockett and Grivetti 2000; Olujobi 2005).

Even though the relevance of WFP as food supplement or a means of survival during drought and famine period has been acknowledge (Humpry *et al.*; 1993; Effeh 2000; Frances and Mohammed 2003) it still need to be given more attention (Broegaard *et al.*, 2016). It is widely reported that indigenous knowledge of WFP is in danger of being lost as people habits, value system and natural environment changes (Flyman and Afolayan 2006; Wilfred *et al.*, 2006; Assefa and Abebe, 2010). There is the need to document acceptance level, consumer preference, nutritional values, method of preparation and preservation, marketing, agronomic and agricultural potentials of WFP with a view of devising policy framework for promoting their sustainable use and maximizing their economic potentials particularly in drought vulnerable areas.

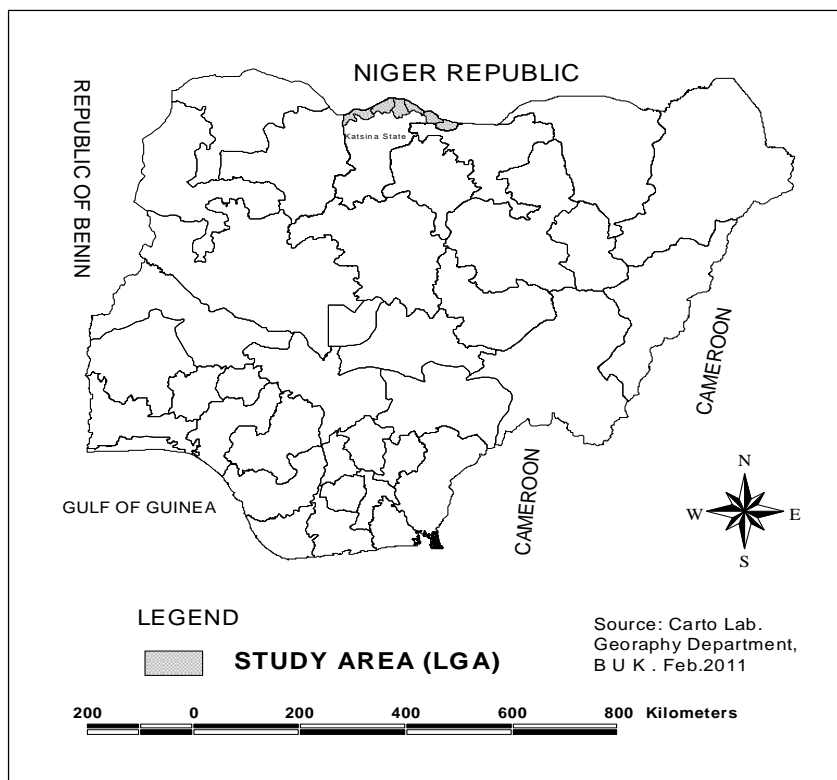
The aim of this study is to document the diverse WFP used by people living in drought disaster prone areas of Katsina State.

## **2.0 MATERIALS AND METHODS**

### **2.1 Geographic Setting of the Study:**

The study area is located between latitude 12°52'N and 13°19'N and longitude 7°16'E and 7°43'E. Six villages were selected (BirniKuka, Sawani, Bumbum, Magama, Dankama and Yakubawa), in other words, one village were selected from each one of the six local governments ( Jibia, Kaita, Mashi, Maiadua, Zango and Baure) of Katsina State that share border with Niger republic. The landscape is underlain by sedimentary rock, dominantly flat with aaverage height of 300 meters above sea level (Abdulrashid, 2012). Local vegetation adapt to climatic rhythm of long dry season and short wet season. The dominant trees in the area developed long tap roots thick barks which allow them to withstand the long dry season and bush fire. The rainfall is received between May-September; annual average is below 700mm. Temperature are high in most part of the year with the mean daily between 27°C to 40°C between March and May and 18°C to 25°C in November-February (Temlinson 2010). The soil are sandy ferruginous type of latosols, highly weathered and markedly laterized and slightly acidic due

to low organic matter content and phosphorous (Abubakar 2006). Subsistence rainfed farming is the major economic activity.



**Figure 1: Location of Study Sites within Katsina State and Nigeria**

## 2.2 Reconnaissance and Pilot Surveys:

The research was conducted between 15<sup>th</sup> July – 20<sup>th</sup> August 2019. Reconnaissance survey was conducted to increase familiarity with the study area and the purpose of the research was explained to the local traditional rulers to get their permission and maximum cooperation from their subjects.

The villages were systematically selected and the numbers of respondents chosen in each village take into consideration its population size. A pilot survey was conducted to test the reliability and viability of the research tools and techniques. All the research assistants that help in questionnaire administration are tertiary institution students and are well familiar with the terrain of the village and fluent in the local language (Hausa) spoken by the majority of the population.

**Table 1: Sample Sizes and Some Characteristics of the Study Area**

Local Govt.	Villages	Location (Coordinate)	Estimated Population	Sample taken	Dominant tribe
Baure	Sawani	12 <sup>o</sup> 52'N, 8 <sup>o</sup> 49'E	1,300	13	Hausa/Fulani

Maiadua	Bumbum	13 <sup>0</sup> 16'N, 8 <sup>0</sup> 07'E	1,700	17	Hausa
Mashi	BirninKuk a	13 <sup>0</sup> 19'N, 07 <sup>0</sup> 59'E	3,200	32	Hausa/Fulani
Jibia	Magama	13 <sup>0</sup> 06'N, 07 <sup>0</sup> 16'E	3,600	36	Hausa
Kaita	Dankama	13 <sup>0</sup> 18'N, 07 <sup>0</sup> 47'E	4,500	45	Hausa/Fulani
Zango	Yakubawa	13 <sup>0</sup> 04'N, 08 <sup>0</sup> 29'E	1,800	18	Hausa/Fulani
Estimated Population and Samples sizes respectively			16,100	161	

Sources: Field Work (2019)

Semi structure questionnaire with open-ended and close-ended questions were used to get information on the availability WFP in each village, time of harvested, uses and preparation (Frances and Mohammed, 2003).

Focus group discussion (FGD) was held in each of the six villages. The FGD is aimed at weighing and balancing the information derived from questionnaire administration with a view of getting a consensus and develops generalization on WFP identified in each village, time of harvest, uses and preparation. Selection of the FGD members take into consideration of age, gender, literacy (Western or Arabic/Islamic knowledge's) and social status of the participants. As Mogotiset *al.*, (2011) point out these factors affect variation in traditional knowledge in communities.

Local plant names mentioned by the respondents and verified during the FGD, were later matched with scientific ones using the following references; Von May dell (1990) and Blench (2007)

### 3.0 RESULTS AND DISCUSSION

A total of 161 questionnaires were administered to men (77%) and women (23%). Only 34% of the respondents have formal education but all have attended Quranic Schools. Farming is the primary occupation of 96% of the respondents. Different type of domestic animals were kept by the villagers, goats, being the most common (81%) owned by the household. Other animals kept include sheep (52%), cattle (22%), donkeys (13%), camel (7%). Four types of domestic birds were kept chickens (61%) ducks (5%) Pigeon (3%), Guinea fowl (22%). Most of the respondents (64%) kept domesticated animals for their cash value, not for their food potentials. Money obtained from the sale of animals were used to purchase food to fill in the harvest deficit, cloth and finance other expenses particularly wedding ceremonies.

All the respondents practice rainfed cultivation but Fadama cultivation was practice by 37% of the respondent majority, in Jibia, Kaita and Maiadua Local Governments. Most planting of Fadama occurred late spring before the arrival of first rain. The most prominent cultivars grown in the Fadama include tomato, Onion, chilly pepper, sweet potato, lettuce, Okara cabbage, carrot, water melon and others. Also grown in the Fadama together with the domesticated crops were numerous so called "edible weed" of agriculture define as volunteer

species and recognized as food resource (Cooper *et al.*, 2018). The most prominent and purposely planted is *Yakuwa* (*Hisbiscus Sadariffa*).

### 3.1 Drought Perceptions and Responses

The perception that drought have being regularly occurring was held by 63% of the respondents; and additional 15% believed that drought had worsened in recent years. In contrast 21% Indicated that drought had not occurred in recent years. Most of those who hold this opinion were less than 40 years of age.

There was disagreement among the participants of FGD on the differences between dry spell and drought. The consensus was reached through voting, majority believed that if dry spell exceed 2 weeks it is a drought base on the believe that most of the crops that are grown in that area cannot withstand 2 weeks without rainfall, even if it withstand, the harvest will be very poor. Majority of the respondents (71%) belief that drought was caused by spiritual factors others (9%) attribute the occurrence of drought to improper human action such as committing sins, refusal to giving alms, adultery etc. Two percent link it to unsustainable utilization of environmental resources such as deforestation, poor farming practice, overgrazing among others. Only one person linked drought to climate change by giving example of changes in the pattern of rain fall which were not the same compare to the past 30 – 40 years ago. In other words, in the past the onset of rain is late March now shifted to late May or early June.

Majority of the respondents (72%) reported significant dietary changes between drought and adequate rainfall years. The changes were in the quantity of food intake, while others stated that the quality of food eaten during drought was worse than during years of adequate rainfall. More edible wild food plants and more cassava were consumed during drought.

Regarding quantity of food eaten during drought, 81% said they did not have enough to eat. Different periods of drought were recalled by the respondents 1948, 1972-73, 1983 – 84 and 1991 – 92.

The respondents unanimously agreed that past droughts created greater hunger and hardship than the most recent ones. The respondents also pointed out that several factors, such as technological, cultural, economic and political factors have help to some extent in mitigating the severity of the most recent droughts. One of the respondents (87 years old man) narrated what he heard from his father where thousands of people died and migrate from their villages in Northern Katsina during the 1915 – 1917 droughts. He argued that the severity of the drought will never be the same as it was experienced before Nigeria independence because of improve means of communication, transportation and other mitigation measures such as head of household temporary migration, sending male children to Quaranic schools in urban areas or in extreme cases mortgaging farmland or cutting down trees in one farmland to buy food or to settle medical bills

### 3.2 The Use of Wild Food Plants to Mitigate Drought Disaster

Rural communities of Northern Katsina State make use of wide range of WFP to supplement their diet. The importance and reliance of WFP increase in times of drought or famine likewise household who has food deficit even in period with normal rain fall use more WFP to fill in the food deficit.

All the respondent make us of WFP and identified a total of 60 wild food from 50 plant species (see table 2).

The respondents could not identify or show more than 25 WFP growing within 2 kilometers away from their respective villages during the transect walk. However the villagers acknowledge that certain WFP which were previously available had disappeared as a result of excessive exploitation, drought or desertification. Most of the respondents (93%) increase the use of WFP during drought period to augment their diet. Others gathered WFP for sale to buy food stuff or to meet other financial needs. Gathering of WFP was not gender or age related men, women, children and elderly gathered.

### **3.3 Seasonal Availability and Locations Where Wild Food Plants are Found.**

WFP are available at different period, four period were identified by the informants and corroborated by other studies elsewhere

1. The pre-raining season, it is period when humidity increases and many trees started bearing flower.
2. The rainy season; from the first rain of planting to the end of the rain ( June or July – September)
3. The harvest season when many plants mature and produce grain and fruits. Harvest period from late August up to November.
4. The dry season is the Harmattan period starts November – December and last up to January -February (Frances and Mohammed 2003, Humphrey *et al.*, 1993). Large proportion of WFP are found on individuals farmland the rest are found on few follow land, grazing and cattle track and forest reserve.

### **3.4 Uses of Wild Food Plants**

Some WFP product have more than one edible product such as *Adansonia digitata*, *Bolanites acgyptiaca*, *Ficusigens* (Baure) *Momordica blasamina* *Ziziphus spina-christ*, all their leves and fruits are edible. *Tarindus indicap* produces edible flower seeds and fruits. *Hibiscus sabdariffa* produce different edible products.

Some of the WFP were used daily and are very important sources of food for the respondents. The leaf of baobab tree *or* kuka (*Adansonia digitata*), prepared as a powder and used to thicken and flavor sauces. *Pakia biglobos* (dorawa) seed (Kalwa) grounded and prepared into a spice and used to flavor sauce. Leaves of *Hibiscus sadariffa* (Yakuwa) is added to sauces.

*Tapinanthus globiferus* and *Leptadenia hastatata* are, cooked mixed with groundnut residue (kulikuli) and eaten.



**TABLE 2: WILD FOOD PLANTS USED BY SOME COMMUNITIES OF NORTHERN KATSINA STATE IN DROUGHT PERIODS**

Scientific/Botanical Names	Hausa Names	Edible components	Preparation and use
<i>Acacia Seyal</i>	<i>Dakwara</i>	Leaves	Pounded; flour use to prepare soup
<i>Bauchinia thonningis</i>	<i>Kalgo</i>	Leaves	Leaves cooked
<i>Cucumis prophetarum</i>	<i>Cicidu</i>	Leaves/seed	Leaves cooked and eaten or pounded flour used to prepare soup
<i>Leptadenia hestata</i>	<i>Yadiya</i>	Leaves and flower	leaves cooked
<i>Mitracarpumverticillation</i>	<i>Gogamasu</i>	leaves/root	Leaves cooked
<i>Moringa Oleifera</i>	<i>Zogale</i>	Leaves, flower seed	leaves and flower cooked, oil extracted from the seed
<i>Ceratotheca Sesamoides</i>	<i>Yalo</i>	Leaves	Pounded; flower used in soup preparation
<i>Corchorus Olitorius</i>	<i>Lalo</i>	Leaves	Used in soup preparation
<i>Cucumnismelo</i>	<i>Gurgi</i>	Fruits, seed	Fruit eaten
<i>Fimbristillis hupidula</i>	<i>Gudegude</i>	<b>leaves</b>	leaves cooked or pounded and use in soup Preparation
<i>Senna Occidentalis</i>	<i>Raidore</i>	Leaves	Leaves cooked or pounded and use in soup Preparation
<i>Annona Senegalensis</i>	<i>Gwandardaji</i>	Fruit, leaves, flower	Fruit eaten leaves use in soup, flower used to flavor Food
<i>Cammiphora Africana</i>	<i>Dashi</i>	Leaves	Leaves cooked or pounded and used in soup Preparation
<i>FicusIngens (Mig) Mig</i>	<i>Shirinya</i>	Leaves	Leaves cooked or pounded use in soup preparation
<i>Ficus Platyphylla</i>	<i>Gamji</i>	Leaves, fruit	Leaves cooked or pound and used in soup Preparation
<i>Hibiscus sabidariffavar</i>	<i>Yakuwa</i>	Leaves, fruit, seed	Leaves seed and fruits used in soup preparation
<i>Kyllinfgaerecta</i>	<i>GemunKwado</i>	Leaves	Leave cooked or pounded and used in soup preparation
<i>Parkia biglobosa</i>	<i>Dorawa</i>	Fruit, seed	Fruit eaten, seed used in soap preparation
<i>SesamumSpp</i>	<i>RidinKadangare</i>	leaves	Leaves cooked or pounded and used in souppreparation
<i>Boscia Senegalensis</i>	<i>Tabila</i>	Fruits, leaves	Fruits eaten and leaves cooked
<i>Leptadenia Pyrotechnica</i>	<i>Kalimbo</i>	Leaves, flower	Leaves and flowers used in soup preparation
<i>Adensonia digitata</i>	<i>Kuka</i>	Fruit, leaves, seeds	Fruit used added to milk, seed and leaves used in soap Preparation
<i>Cenchrus biflorus</i>	<i>Kwrangiya</i>	Seed	Seed threshed cooked and eaten
<i>Ziziphus Mountania</i>	<i>Magarya</i>	Fruit, leaves	Fruit dried and eaten, leaves pounded in soup Preparation
<i>Acacia Siebenana</i>	<i>Farar Kaya</i>	Leaves Gum	Leaves pounded and used in soup preparation, gum eaten
<i>Zizipus Spinachristi</i>	<i>Karna</i>	Fruits	Fruit dried and eaten
<i>Azardirachta indica</i>	<i>Bedi</i>	Seed	Oil extracted from the seeds
<i>Hyphaene Thebaica</i>	<i>Guruba</i>	Fruit	Fruit dried and eaten

<i>Tamarindus indica</i>	<i>Tsamiya</i>	Flower, Fruit and seed	Fruit prepare as porridge
<i>Guiera Senegalensis</i>	<i>Sabawa</i>	Leaves	Leaves pounded and used in soup preparation
<i>Senna Occidentalis</i>	<i>Tafasa</i>	Leaves, seeds	Leave cooked and pounded in soup, seed: oil extraction
<i>Spondias Mom bin</i>	<i>Tsadarlamnudi</i>	Fruits	Fruits eaten
<i>Dioscorea buibifera</i>	<i>Tuwonbiri</i>	Fruits	Fruits eaten
<i>Lannea Micro carpa</i>	<i>Faru</i>	Fruits	Fruits eaten
<i>Creiteva religosa</i>	<i>Gudai</i>	Leaves	leaves cooked
<i>Tribulusteriestus</i>	<i>Hana takama</i>	Fruits	Fruits eaten
<i>Pennistese tumgbucaru</i>	<i>Lawur</i>	Fruits	Fruit eaten
<i>Sorghum bicolor</i>	<i>Janjare</i>	Seed	Seed thrashed and eaten
<i>Sclerocarya birrea</i>	<i>Daniya</i>	Fruit	Fruits eater
<i>Stylochitonlancirolius</i>	<i>Akwari</i>	Leaves, fruits	Leaves and fruit used in soup preparation
<i>Ximerica americana</i>	<i>Tsada</i>	Fruits	Fruits eaten
<i>Citrullus lonatus</i>	<i>Gunna</i>	Fruits	Fruits used in soup preparation
<i>Sterculla Setigera</i>	<i>Shasfa</i>	Leaves	Leaves pounded and used in soup preparation
<i>Bauhihia rufescens</i>	<i>Sisis</i>	Leaves	Leaves pounded and used in soup preparation
<i>Perosopos Africana</i>	<i>Kirya</i>	Fruits	Fruits pounded and used in soup preparation
<i>Dereiniun nu cricaroum</i>	<i>Taura</i>	Fruits	Fruits eaten
<i>Grewia bicolor</i>	<i>Dargaza</i>	Fruits leaves	Leaves cooked and fruits eaten
<i>Eragrosti stremula</i>	<i>Komaiyya</i>	Seed	Seed threaded cooked and eaten
<i>Acacia nilotica</i>	<i>Bagaruwa</i>	Leaves	Seed used

Source: Field work (2019)



The WFP were categorized according to the way they are used (Table 2.) Most of the WFP provided leaves which were use like spinach, followed by those that provided fruits and others. Of the 50 WFP identified, utilization of 26 increases at the time of food scarcity such as drought and famine period, (Frances and Mohammed 2003) or when farmers are waiting for crop harvest. For example the seed of *cenctirusbiflorus* are harvested threshed and eaten but it require huge work to produce reasonable amount for consumption.

### 3.5 Medical and Food Plants

A large number of WFP species were used both as food and medicine. During the FGD, the respondents were not willing to give details of medicinal values of some of the species used as WFP and at the same time used to cure some common diseases. However they mentioned the most common known to everybody within the communities (table 3).

**Table 3 Plants Used For Medicine and Food**

<b>Botanical/Scientific Name</b>	<b>Hausa</b>	<b>Preparation and use</b>
<i>Ximenia Americana</i>	Tsada	Bark and nuts soaked in water: drink to cure Snake and scorpion bites.
<i>Zizphus mauritiana</i>	Magarya	Bark and roots mixed with salt, cooked, eaten to alleviate abdominal problems
<i>Parkia biglobosa</i>	Dorawa	Bark and roots soak in water, drunk to cure Ulcer, snake and scorpion bites
<i>Dereium Microcarpum</i>	Taura	Bark roots soaked in water to control diarrhea and abdominal discomfort.
<i>Balanite aegyptiaca</i>	Aduwa	Bark and roots soaked in water to cure abdominal pain and gastric ulcer.
<i>Adasonia digitata</i>	Kuka	Bark and roots soak in water to ease birth and control diarrhea.

Source: Field work (2019)

Proximate analysis of WFP analyze by Lockett and Grevitte, (2000) found that *Hyphaenethebaica* (goriba) *Cenchrus biflorus* (Karangiya) seeds *Cessia Ociedntalis* (raidore) and *Leptadonia hastata* (yadiya) have more than 20% proteins values. Mean fat values of  $\geq 5\%$  were found in the leaves of *Sclerocayi birrea* (daniya) and *leptadonia hastate* (yadiya) were reported by Glew and Vanderjargt, (2006). Minerals analysis have found that leaves of *Cessia Occidentalis* have the highest value of calcium of more than  $\geq 5000\text{ug/g}$  dry weight iron concentration range of more than  $200\text{ ug/g}$  dry weight were found in the leaves of *commiphora Africana* (dashi), *Leptadenia hestata* (yadiya) and *cassia occientalis* (raidore) (Wilfred et al. ) seed of *Parkia biglobosa* (dorawa) *Adansonia digitata* (kuka), *cissuscornifolia* (tuwonbiri) *Zizphus mauritiana* (Magarya) have highest concentration of copper ( $\geq 1.00\text{mg}/100\text{g}$ ). *Moringa Olleifera* (Zogele), *Adansonia digitata* (kuka), *Bolanite aegyptiaca* (aduwa) and *Veronia colorate* (Shuwaka) have relatively high concentration of iron ( $\geq 55.0\text{mg}/100\text{g}$ ).

WFP are importance source of livelihood by providing diets and in supplementing the food need of poor household particularly during disasters in drought disaster prone areas of Katsinastate. They are also important sources of income to many household. As noted in other parts of Africa (Flyman and Afolayan, 2006; Wilfred *et al.*, 2006)

*Adonosia digitata* and *Tamarindus indica* were the most prominent species utilized by the household on the daily basis and throughout the year in the study area as was also observed in Niger Republic by Humpry *et al.*, (1993).

The availability of WFP food vary from year to year due to rainfall variability and other factors, hence many household used to store it after drying to prolong their availability. There is no clear distinction between WFP that are used during drought and those that are used at period of normal rain fall. Most of the WFP are used regularly, but reliance on them increases during drought or famine period as also reported by Mashile *et al.*, (2019); Venter and Witkoski (2013) in South Africa. Cooper *et al.*, (2018) in Ghana, Rwanda, Uganda and Tanzania. As observed by Frances and Mohammed (2003) "One person's wild food can be another person's means of sustenance". Generally, WFP are more important to those who could not produce sufficient food from their farms and do not have the means of buying it from the market.

#### 4.0 CONCLUSION

WFP are important drought coping strategy used by rural communities, they are valuable resources for improving food and nutritional security of the household living in semiarid areas. Some of the WFP are used on the daily basis and some on a less regular basis as specific need arise. Parts of trees, shrubs and herbaceous plants provide ingredients for preparation of varieties of diets. Generally, the use of WFP increases during critical period of drought or famine period, also household who have poor harvest or food deficit increases the use of WFP to supplement what they have.

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