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The Socio-Cultural and Economic Impact of Senna Occidentalis Linn Exploitation to the Livelihood Sustainability of Population in Maroua-Cameroon

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ABSTRACT

Senna occidentalis Linn, represents a significant medicinal and cultural resource for communities across Sub-Saharan Africa, including the Maroua town community in the Far North Region of Cameroon. The main objective of this write-up is to examine the multifaceted sociocultural and economic impact of Senna *occidentalis* exploitation on the livelihood sustainability of the population in Maroua. A mixed approach was used in carrying out this research through secondary and primary data collection. To investigate, observations, field surveys were carried out using questionnaires on 300 people and finally interviews were conducted. From field findings, 99.9% of the sampled population confirm knowing the use of the plant especially in the sociocultural domains. Meanwhile 99% confirmed its economic importance. The exploitation of Senna *occidentalis Linn* can be ameliorated via sensitization and practice during, health, economic and environmental seminars, training of local population from local associations and integration of both traditional and modern medical institutions and the encouragement of small and medium size enterprise for the production of coffee, art and craft works, and manufacture of cosmetic products. This would alleviate poverty and increase savings and investment and the standard of living of the population. However, given the poor exploitation of this plant and rapid urbanisation, can the creation of green belt areas help reduce the loss of this biodiversity?

KEYWORDS: Senna Occidentalis, Exploitation, Livelihood Sustainability, food security, Maroua

1. INTRODUCTION

The relationship between human communities and plants forms one of the oldest and most fundamental aspects of healthcare and livelihood systems worldwide, Bizikova (2011). As part of African culture, the exploitation of shrubs plants serves as cultural heritage which needs to be cherished and protected. In Sub-Saharan Africa, this relationship has been cultivated over a long period of time, with traditional plant-based medicines continuing to serve as the primary healthcare resource for approximately eighty percent of the population (Maroyi, 2012: Mariam B, 2020). Among the diverse flora utilized in African traditional medicine, Senna *occidentalis Linn*, a member of the Fabaceae family, stands out as a plant of exceptional ethnobotanical and pharmacological significance. This important species has been established as part of traditional healthcare, cultural practices, and livelihood across tropical and subtropical areas of Africa, Asia, and the Americas (Vijay *et al* 2013; A. Esmail, 2015).

In the Northern Region of Cameroon, plants and shrub plants are highly valued as they don't only serve as sources of food but also serve as sources of shelter, during the harsh and scorch sun. This plant plays vital role combatting one of the most recurrent and dreadful illness malaria which has cause about 2481 deaths from about 3.327,381 cases according to the WHO (2022) reports. Taking by regions, we see that in some regions it registers more than 15 % cases of death 17.9 % and 17.6 % in Adamawa and Far-north region respectively DHIS2, (2023). This plant is mostly in this zone look upon as source of livelihood (fuel wood, curative and furniture).

The Senna *occidentalis* occupies a unique position in traditional medicine, cultural heritage, and socioeconomic practice of the local population of Maroua. The town is characterized by Sudano-Sahelian climate and rich cultural diversity, hosting multiple ethnic groups including the Toupouri, Mundangs, Massa, peuls, Maffa, and Mousgoum peoples, each maintaining a distinct traditional knowledge systems regarding medicinal plant utilization (Saotoing *et al*., 2011; 2015). Within this culturally complex environment, S. occidentalis has been transmitted through

generations as both a medicinal resource and a cultural commodity, particularly valued for its use as a coffee substitute during periods of economic hardship and resource scarcity. The main objective of this write-up is to examine the multifaceted sociocultural and economic impact of Senna *occidentalis* exploitation on the livelihood sustainability of the population in Maroua.

2. MATERIAL AND METHOD

2.1. Study Site:

This research work is carried out in the Maroua town which is the biggest town in the Diamare Division of the Far North Region of Cameroon. The area is located between 10°34.33' N and 10°38.00' N latitude and between 14°16.48' E and 14°21.36' E longitude. This Region is the most populated in the country after the Centre with around 3,945,168 million populations Knoema, (2015). Maroua is the chief-town of the Diamare Division with a surface area of 4665 km^2 and is bounded to the South by the Mayo Kani division, to the North by Logone and Chari and Mayo Sava divisions, to the East by Mayo Danay and to the West by the Mayo Tsanaga. Administratively, the city of Maroua covers three subdivisions: Maroua I, II and III. This chief town topography is also noteworthy.

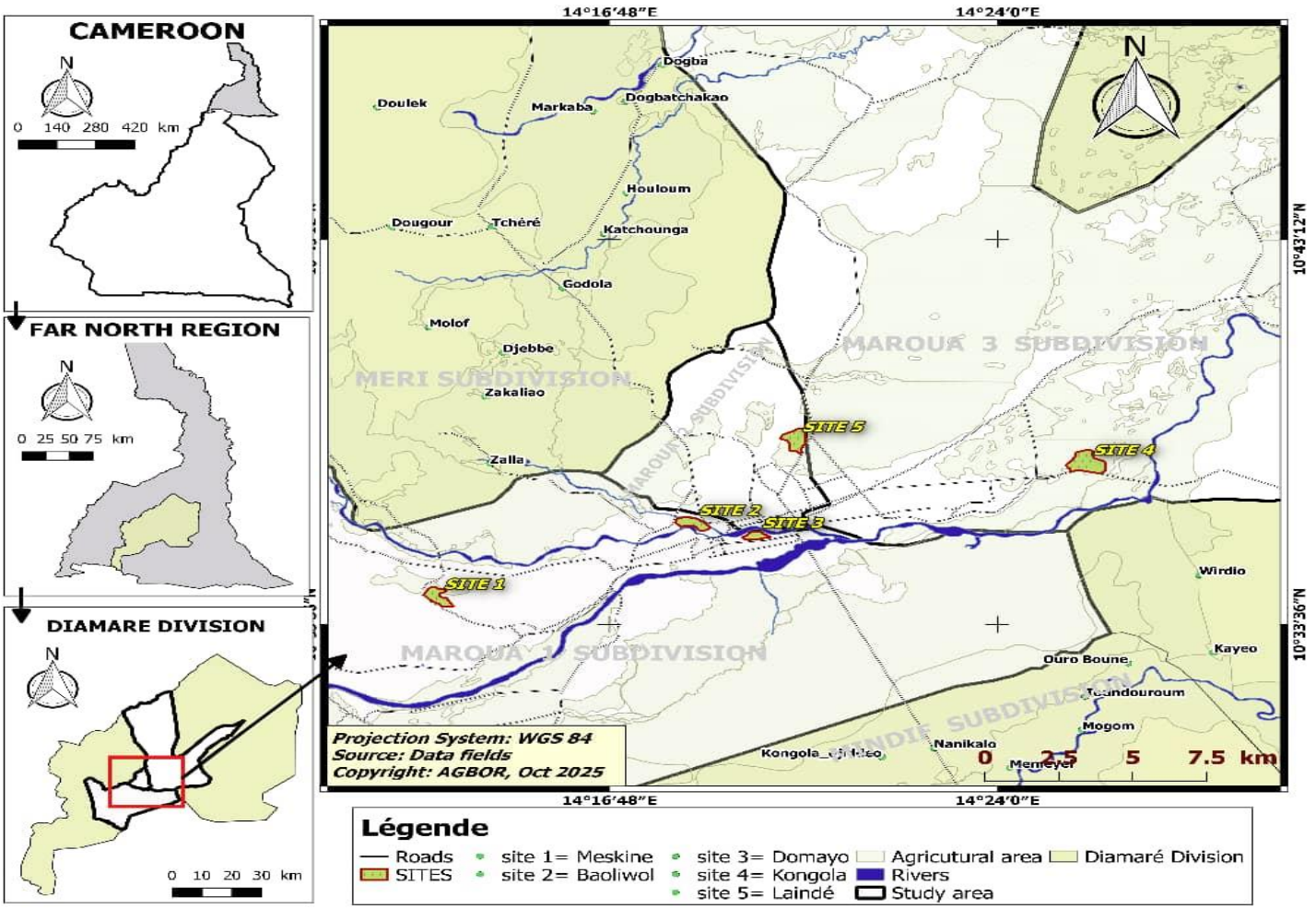


Figure 1*: Location of Maroua Town and The Study Sites (1-5)*

The above map presents the study sites, which are five in total, found in three subdivisions of the Diamare division far north Cameroon; Baoliwol, Domayo, kongola, Liande and Meskine. These areas portray the entire population of Maroua as they are found in both urban and suburban areas, giving the view of the locals.

2.2. Method and materials:

To obtain the results in this paper, the deductive hypothetical method was used, that observations concerning the above situation was done, later setting some theoretical assumptions that require verification from the field via some deep survey. Thus the questioning of 300 people from the selected quarters in the town of Maroua, which

transcends both the urban, milieu and the rural, not forgetting the urban fringe area. However, 60 people were questioned, from the 5 study areas. Also some interviews were conducted in certain research institutes, (IRAD Maroua). And also conducted some biochemical analysis on the plants leave, with regards to its nutritional quality and antioxidant potentials. Nevertheless, to assess this information, some tools were used, such as telephone (for pictures), use of kobo tool box to question, excel software, to arrange and analyse the data.

3. RESULTS

3.1. The socio-culture impact of Senna *occidentalis:*

During the survey, it was discovered that Senna *occidentalis* plant can play a role in the culture of the people as it can be consumed in extreme case of accusation of witchcraft. It was also mention in the field that the plant's leaves are a source of medicine, this cure is done by infusion, boiling and even squeezing of the leaves given the type of illness it need to cure.

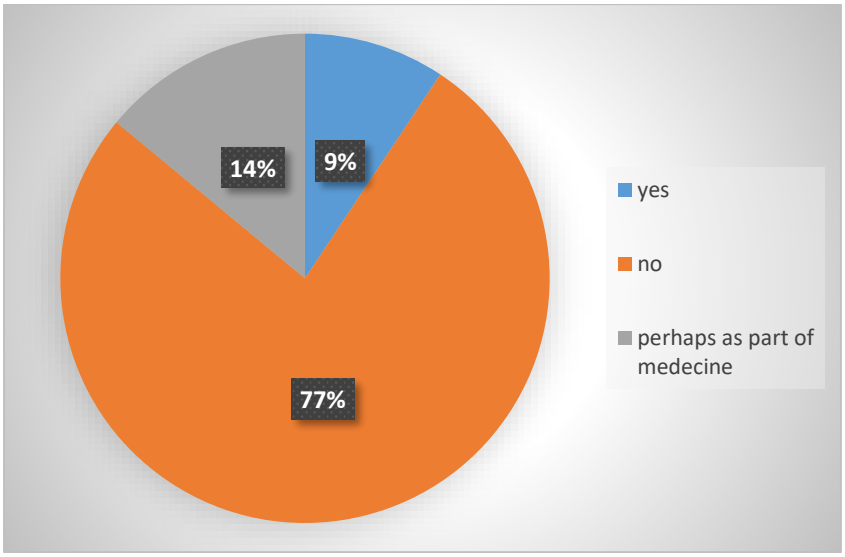


Figure 1: Can this plant be consumed.
Source: Field Survey, EYUMINE December, 2024.

The figure (1) presents the main reasons for the exploitation of this plant in this study. From figure 1 it indicates the results of the question whether or not this plant leaves could be consumed as a vegetable. It is found that 9% yes, a 77% no and 14% of doubts (maybe, in used as medicine) looking at their percentage it can be observed that the population do not adhere to the consumption of this plant as vegetable.

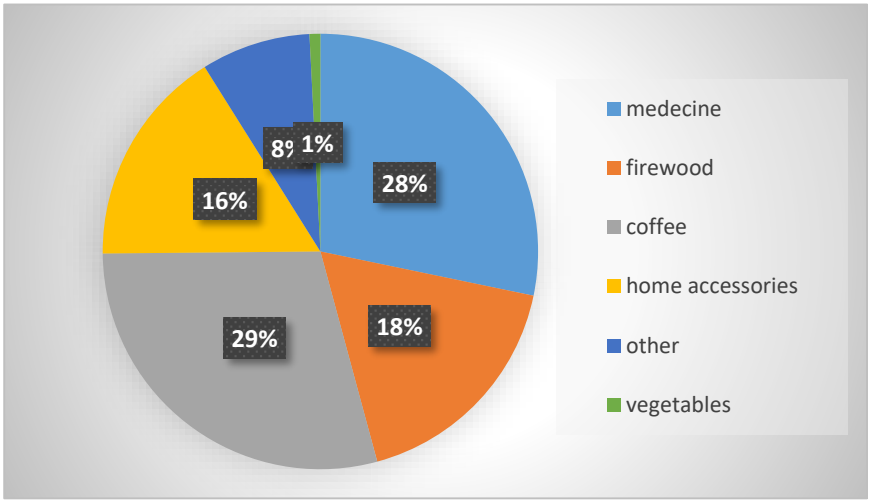


Figure 2: **sociocultural uses of Senna *occidentalis Linn***
Source: Field Survey, EYUMINE December, 2024.

From field findings, 28% of the respondents exploit it for medicinal reasons, 18% use it as wood for cooking, meanwhile 29% use it as coffee, 16%, used as home accessories and 1% vegetable. Noticing the various percentages, as the largest percentage, it is proven that this plant is highly used by the localities as coffee having 29%, also others (fighting drought, elevate nutrients from soil and agricultural reason) having 8%. Looking at this diagram we can conclude that an appropriate efficient exploitation of this plant could gain the interest of the entire population using this local plant to substitute imported beverages as coffee.

Plate 1: The use of *Senna* plant as Home accessories

Photo 1



photo 2





photo:3



photo:4

The first photo (1) shows the harvested Senna stems which are characterised to be about 1 – 2m long and being erect. This stems are ready for use in producing somehow eco – derived fences. The second photo (2) shows the crafting process of these fences using the ready plant stems. Meanwhile photo (3) still portrays the process of local fence production from the stems of Senna occidentalis Linn. In the same photo the craftsman according to him ingesting some powder derived from local herbs would maintain his ability to continue crafting. Lastly, the fourth image (4) presents the already finished product. This activity was captured mostly in kongola. However, this activity shows how this plant has importance in the cultural lives of the local population.

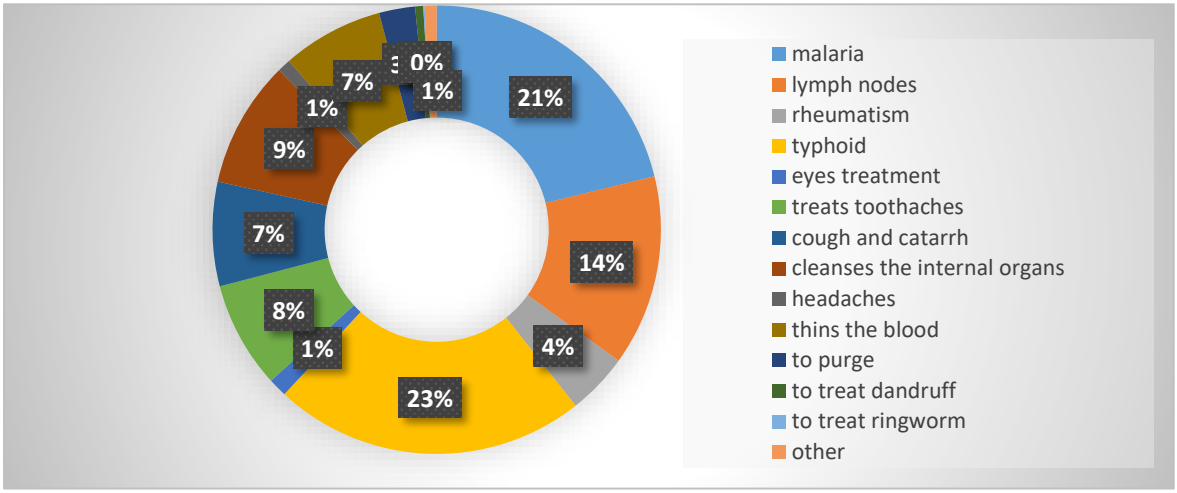


Figure 3: which illness does it treat
Source: survey. EYUMINE, December 2024

This diagram shows the various illnesses that could be cured from this plant. there is rheumatism, eyes treatment, headache, for purging, ringworm, typhoid and malaria and many more. But amongst this illnesses, we have typhoid 23% (value of 234 people) and malaria 21% (value of 220 people) which are the most recurrent in the quarters under study. However, this plant cures malaria and typhoid, for malaria, the leaves are use via infusion, generally a glass of this liquid is taken both in morning and in the evening for serious cases, the grains of this plants are boiled, the patient is covered with a large tissue so as to trap the vapour from the boiled grains. After covering, the boiled grain water is used by the patient to bath (this method is used when the patient is suffering from severe malaria and or typhoid). In the case of typhoid, the roots of the plant are also used, by boiling and drinking. Also, to cure lymph node swelling, the leaves of this plant are grinded and applied to the swollen areas, at time this swollen areas are cut a bit to permit the clotted blood to flow out and sometime this blood becomes pulse.



Photo 1: The consumption of *Senna occidentalis Linn* grains as cofffee substitute
Source: Field survey, EYUMINE, July 2020

The image above presents breakfast meals in a local family in the study area. In this image there are pastries (puff-puff, pancake), rice fufu and okra soup and as coffee there is coffee Senna. The image however shows that though many are still weary of the use of this plant grains as coffee, in some families it has really been integrated as part of the breakfast meals. Just as the image taken from one of the households in kongola. This image helps with the understanding that, though it might not be a general thing used by many individuals and

families due to lack of info's and awareness about the plant, however it can be integrated so that more families become acquainted to the coffee which not only serves as beverage but also help alleviate to a certain level the stand of living of the local population.

Table 1: Nutritional quality of *Senna Occidentali Linn* Leaves

Parameter	Unit	Results		
		EB1	EB2	EB3
Carbohydrate content	mg Glucose/g	09,69	09,64	09,58
Proteins content	mg Casein/g	14,78	15,23	14,90
Amino acid	mg Alanine/g	23,88	23,43	23,62
Lipids content	mg/100g	04,78	05,03	05,20
Reducing sugar content	mg Galactose/g	07,12	06,93	06,82
DMC	g/100g	94,39	93,77	93,86
Ash content	g/100g	04,57	04,63	04,51

Source: Laboratory results (IRAD MAROUA), EYUMINE, 2024

From the table above, there are 7 parameters and various units of measurement, these parameters have determination of dry mater content address on the table as DMC, determination of ash content, determination of total soluble amino acids, determination of total reducing sugars, determination of total lipid content, determination of total protein content and determination of total carbohydrate content. And for each of the determinations, three different samples were conducted giving the results as EB1, EB2 and EB3, these results are indicated following the type of measurement done.

The focus would be on the DMC lab result. Following the three samples, in order to determine it, some principles and procedures need to be observed. The DMC involves, removing water from the fruit sample (which is the leaves) by heating it at 105^0c in a ventilated oven until the mass of the sample remains constant. In the various tubes/ crucibles used for weighing, these tubes previously weighed (M0), the weighing was done using a Sartorius balance with a precision pf 1/10000, these tubes containing 5g of the sample(M1), they were heated for 24 hours under heating temperature of 105^0c. after cooling in a desiccator, the crucible containing the dry sample was weighed (M2). To express the experiment calculation, the AOAC (2005) method was used. where;
M0 = mass of empty crucibles, M1 = mass of samples and crucibles before drying
M2 = mass of samples and crucible after drying.

From the table the TMS results being revealed in percentage shows that in the three sample procedures, the leaves of Senna occidentalis Linn still contain high nutritive value (EB1:94.39%; EB2:93.77% and EB3:93.86%). This is supported by S. Manikandaselvi et al (2016), who talked of this plant being nutritive and as a dietary supplement to treat anaemia. Also, Omoikhoje et al (2018), talked of Senna plant leaves enhancing nutrient that could be used to repair worn out tissues and disease control as it contains crude protein, fat, ash, crude fibres and nitrogen free extracts.

3.2 The economic impacts of Senna occidentalis

During the survey it was noted that this plant has an economic worth to the local population. However, when further survey on the field portray its little use in this domain in the study area.

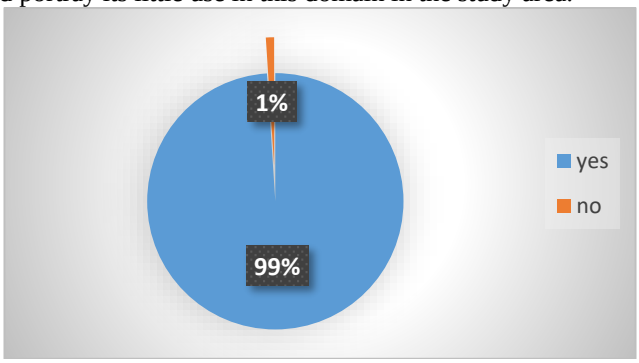


Figure 4: Can this plant be traded.
Source: Field Survey, EYUMINE December, 2024.

Following the pie chart, it's been affirmed that this product can be commercialized for profit, with a 99% yes. From the findings, it is worth noting that though valuable this resource is not valorised by the local people, starting from the lehman to the local authorities in place.

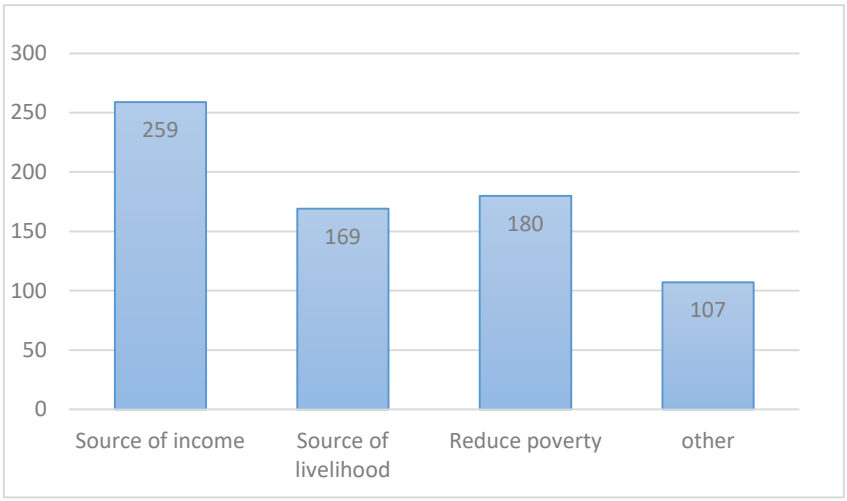


Figure 5: The importance of *S.* o Linn to the local popularion**.**
Source: Field survey, EYUMINE, December 2024.

This graph illustrates how the exploitation and commercialization of Senna occidentalis Linn can be of great importance to the local population under study. The graph presents the selling of this plant could serve as a source of income (259), source of livelihood (169) reduces poverty (180) others (create job opportunities and more) 107. This shows that Senna occidentalis Linn serves many purposes. It was observed in the field, during field survey that the local population face some financial difficulties but paradoxically go for imported products meanwhile they still have resource that can produce quality and sustainable product, this would help reduce household income expenditure.

4. DISCUSSION

The socio- cultural and economic impacts of Senna *occidentalis* on the livelihood sustainability of Maroua community can be explain through the health, social and cultural benefits of the plants and its resourceful ability or potentials

4.1.1. Health Impacts of Senna Occidentalis On the livelihood sustainability of Maroua Community

The field survey showed that this plants parts are very useful to cure many illnesses such as malaria, typhoid and even rheumatism. Thus, the health impact of Senna occidentalis on the livelihood sustainability of Maroua community is seen through its use in traditional healthcare practices, representing a critical component of the local medical system (fig.3). Its presence in traditional remedies or medicine, reflects both the plant's potency and its cultural integration within the community's health practices over generations. The roots are most commonly used, prepared as decoctions by boiling dried root material in water for extended periods, about 30 minutes and at temperatures approaching 95^{o} C. These bitter-tasting medicines are administered orally, and taken multiple times (2-3 times) daily until the illness symptoms are alleviated. In an ethnobotanical survey conducted in Maroua between December 2009 and involving 800 participants, S. occidentalis emerged among the ten most frequently utilized medicinal plants for malaria treatment, alongside Azadirachta indica, Mangifera indica, and Psidium guajava (Saotoing et al, 2015).

Contemporary scientific validation of these traditional antimalarial applications has been provided through numerous in vitro and in vivo studies. Research presented in Mali, by Mariam Bagayogo (2020), in her thesis, Senna occidentalis Linn could be used for malaria treatment, in this locality, this plant has been processed, showing the interconnectedness of both traditional and modern medicine, which if applied in the Maroua context would really, fit the demands of the people given their great interest in the use of natural treatment to cure their ailments.

Also, recent research from the University of Maroua has further validated the antimalarial potential through novel applications. A study by Ngatarang and colleagues demonstrated that combined leaf extracts of S. occidentalis and Khaya senegalensis exhibited potent larvicidal activity against Anopheles gambiae larvae, the primary malaria

vector in the region. The optimal combination achieved LC50 values of 290 parts per million for stage II larvae and 320 parts per million for stage IV larvae, with complete mortality achieved at 250 parts per million within 6 to 12 hours of exposure. This shows an innovative extend of traditional plant use, contributing potentially to management strategies against malaria in the study area (Ngatarang et al., 2024).

Also, Gastrointestinal problems are major areas where Senna. *occidentalis* do intervene in the local traditional practice. The laxative contents have mainly anthraquinone glycosides, that make the plant particularly valuable for treating constipation. Leaf and seeds infused or boiled also serve this purpose, but paying attention to the dosage. The plant is also used for treating dysentery, diarrhea, and various abdominal complaints, (mainly the use of roots). This was also asserted in the works of Samuel kleda (2006) and Mengue (2014) that this plant parts are all vital and play a role as curative to the illnesses plaguing the local people.

Furthermore, this plant can be used as medicine for respiratory ailments; its flower infusions and leaf decoctions are traditionally used for treating bronchitis, asthma, and chronic cough. The preparation involves soaking fresh or dried flowers in hot water, with the infused liquid consumed as a tea. Seeds are roasted and grinned, with the powder mixed with honey or other elements then applied respiratory problems. Other scientific studies revealed that extracts have bronchodilatory and anti-inflammatory properties, which may contribute to symptomatic relief in respiratory conditions (Sini et al., 2010; Al- snafi, 2015). This brings us back to figure. 5, that shows a variety of illnesses that could be treated with Senna occidentalis Linn

The use of root decoctions as febrifuge and diuretic agents, for the treatment of urinary tract infections, management of diabetes, and addressing various pain conditions including rheumatism and gout. The roots are also used in treating hepatic disorders, with traditional knowledge recognizing the plant's liver-protective properties, which have been subsequently validated via experimental studies demonstrating protection against chemically induced liver damage in animal models (Sharma et al., 2014).

4.1.2. Safety Considerations and Toxicological Profile

The research study of this plants potential use shows notably it's good for consumption, following the laboratory results on the plants characteristics, it can also be consumed as vegetable[1]. S. occidentalis though having medicinal potentials, there is awareness of potential toxicity, especially when it comes to seed consumption. Scientific toxicological studies have identified the presence of toxic laxatives and other compounds in seeds, which can cause muscle generation and liver damage at excessive doses, particularly in livestock. However, toxicity appears to be dosage problem and primarily linked with seed consumption rather than traditional medicinal use of other plant parts. Furthermore, Acute and sub-chronic toxicity studies in laboratory using animals have demonstrated that leaf and root extracts shows relatively good safety profiles when used at normal doses. with toxic effects only manifesting at doses that are substantially exceeding those used in traditional medicine. Traditional healers in Maroua demonstrate sophisticated knowledge regarding appropriate dosing, plant part selection, and preparation methods that reduce toxic risks while maximizing medicinal benefits ((Omoikhoje *et al* 2023); Pierre Malzy, (2018); Okoye and Okereke, 2014). From the survey results, not only is the preceding ideas correct, also due to the toxicity of the seeds, the locals to cure acute malaria, these seeds are boiled, and the patient baths his/ her body, with the liquid in other to alleviate the serious symptoms of both malaria and typhoid illnesses.

4.2. Cultural Impacts: Consumption as Coffee Substitute

Among the diverse applications of Senna occidentalis within the Maroua community, its historical and contemporary use as a coffee substitute represents a particularly significant cultural practice with profound socioeconomic implications. The use of this plant in different areas has given rise to many local names including; Negro coffee, and coffee Senna, (in the locality, kinkeliba tea/ coffee) which reflects both the characteristics of a product (food, beverages or materials), when well prepared and the economic realities faced by communities during periods of coffee scarcity or economic hardship.

4.2.1 Traditional Preparation Methods

The transformation of S. occidentalis seeds into a coffee-like beverage involves specific traditional cooking methods / techniques that have been refined through generations of practice in the local area and others. The process begins with harvesting mature seed pods when they have fully dried and begun splitting naturally. Seeds are extracted from the pods and cleaned. The cleaned seeds undergo a roasting process, which represents the critical step in developing the coffee-like flavour and aroma. Roasting is mostly done using traditional methods. The seeds are heated gradually with continuous stirring to ensure even roasting and at some cases and areas burnt

[1] Table 1: Nutritional quality of *Senna Occidentali Linn* Leaves

completely. The roasting process continues until the seeds achieve a dark brown to almost black colour and emit aromatic odour that is distinct, but just like, coffee. The duration and temperature of roasting vary according to individual preference and traditional knowledge, with some practitioners preferring lighter roasts (but out of toxic risk) while others favour more intense roasting for stronger flavour development (Al-Snafi 2015)

After the roasting, the seeds are cooled and subsequently grinned into a fine powder (in other areas the grains are just used without grinning). The powder is then prepared as a beverage using methods similar to coffee preparation. Water is boiled and the grinned roasted seeds are added, either allowing the mixture to boil together briefly or putting the powder in hot water similar to infusion methods. The liquid gotten is then passed through a swifter or drained and consumed hot, often with sugar, milk, or spices added to it according to individual preference and cultural tradition. Thus according to the findings, this plants use and exploitation from the beginning, stems from the hardship faced by the local population in the past, that is due to the lack of finance, due to the fact that coffee / tea is not cultivated in the localities. Also some climatic issues such as drought, have really prone the people to hardship, most especially economic hardship. Thus Senna occidentalis Linn provides an alternative way, serving as coffee / tea. This helps the local population to be resilient facing these difficulties.

The preparation and its consumption most especially in these study areas, are done in morning gatherings, a way of hospitality offerings to visitors. These sharing portray unity and friendship amongst the local population. it also helps to maintain the peoples' identity. However, these practices are passed down by the older generations to the younger ones, teaching them, the best methods of harvesting, selecting and roasting. This transmission is always done orally. Compared to historical periods, these practices are diminishing due to improved varieties and market assessable products. Nevertheless, this culture still persists in some areas as it has medicinal values and most especially its use in some localities is linked to ancestral traditions and identity or a cultural heritage. This plants exploitation serves as food resource to the people. The consumption as coffee, could be aligned as advantageous as well as it having a negative impact. The nutritional composition of roasted S. occidentalis seeds includes proteins, amino acids, some minerals, and various phytochemicals that survive the roasting process as seen in table 1 above. The anthraquinonoid, which contributes to the plant's laxative properties, may be reduced through roasting but likely remains present to some degree. Knowledge from the local population demonstrate the awareness of these properties, with consumption generally limited to moderate amounts, thus, excessive consumption may produce unwanted or negative effects. Just like Edmond A. Badock *et al* (2023), S. Manikandaselvi *et al* (2016), and Al-snafi (2015), made it clear in their works that this grains must be well roasted so as to alleviate the toxicity.

4.3. economic impacts

According to the survey done, this plant has economic potential which might serve a great purpose to the local population using it. It is worth noting that this plant in all its part according to the field survey in the area of studies, shows that it can be sold. (fig.4) The grains well roasted can be used as coffee substitute, its leave used as coffee could be sold, other parts used by tradi-practitioners for medicinal purpose are sold by these people as source of income. Also, from other findings, this plant following the local culture and needs, it is used to produce fences known as 'seccou', which are sometime temporal fences used by the locals when a wall collapses, or when the individuals' income does not permit for erecting a wall from either blocks (from cement) or mud. (plate. 5).

However, this plant in the locality, is used as coffee in home either for breakfast or for hospitality sake, given the culture of the locals. Thus the use of it helps the household to minimize cost as expenditure is reduced from buying beverage drinks, at the same time curb expenses on health issues as it also serves a medicinal purpose. These ideas were also according to Tchekessi et al 2023, Mengue 2014, kleda 2006, and Mariam Bagayogo 2020, pruning the fact of it having these economic values, which if sustained can help the local population to reduce the rate of poverty and health issues but render the environment potentially viable economically.

Furthermore, from the secondary findings, this plant economic potentials go way more beyond the above mention. Given its cultural and economic potentials, a prospective economic future, shows the use of this plant parts in the manufacturing of not only medicine locally but in the pharmaceutical industry for the production of antiseptic products for skin care. Also in the brewery industry for the production of wine and beverages, the production of tea (from leaves) and coffee (from roasted grains).

4.4. Sustainability and Resource Management

The availability of Senna *occidentalis* plant parts use in medicinal and cultural resources depends mainly on sustainable management practices and effective conservation strategies done for generations. However, despite its ruderal characteristics, which is seen sometimes as resistance to harvesting pressure, multiple factors threaten

its sustainability and the traditional knowledge associated with its use. Thus, understanding these threats and developing appropriate conservation responses, represents an urgent priority for preserving both the biological resource and the cultural heritage it supports. Thus, the effective conservation of S. occidentalis resources and associated traditional knowledge requires strategies focusing on both biological conservation and cultural preservation. The cultivation in home gardens, community medicinal plant gardens, and institutional botanical collections, can ensure plant material availability even if wild populations of the plant declines. However, protecting S. occidentalis in its natural habitats, requires coordination with agricultural planning and land management policies. Creating protected areas, medicinal plant reserves, or sacred groves where traditional harvesting is permitted. Furthermore, S. occidentalis conservation should be considered in agricultural extension programs, so as to promote coexistence and strategies where farmers deliberately maintain plants species in field margins, fallows, or agroforestry systems, that recognizing their medicinal value.

Also, ethnobotanical surveys can be organised, using standardized methodologies, which should be done to comprehensively document S. occidentalis uses, preparation methods, and traditional ecological knowledge across all ethnic groups in Maroua and other communities. This documentation serves multiple purposes including creating permanent records of knowledge that might otherwise be lost, facilitating knowledge sharing across communities, providing baseline data for pharmaceutical research, and supporting traditional medicine practice validation and integration into formal healthcare systems (Simbo, 2010).

CONCLUSION

Senna *occidentalis Linn* hold a considerable place in the socio-cultural and economic lives of the local population, as it serves, as medicinal resource, cultural artefact, and economic asset. The plant's use in community health practices reflects centuries of accumulated traditional knowledge, that is from antimalarial remedy to skin treatments, gastrointestinal remedies and respiratory care. The scientific acceptance of many traditional uses through contemporary pharmacological research proofs true. However, this plant resistance does not only depend on its ability, for it is turning towards its extinction due to the human activities being carried out such as infrastructural development, and also agriculture activities. Thus, the preservation of Senna. *occidentalis* and its traditional knowledge depends upon collective action from all stakeholders including local population, traditional healers, researchers, healthcare providers, policymakers and more. S. occidentalis if protected, will continue to serve the local population for generations to come, maintaining its roles in traditional healthcare, cultural heritage, and livelihood support while adapting to changing socioeconomic and environmental conditions.

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