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Nutritional and Medicinal Values of the Three Most Used Plants in Chad: *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L.

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Abstract

This review explores the nutritional and health benefits of three vegetable plants in Chad: *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L. These plants are widely consumed by Chadian population, but few research studies have focused on their nutritional and health benefits. The aim is to stimulate research, investment, and in-depth studies on these plants to encourage their use and transformation in Chad. *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L. are Malvaceae species with medicinal properties and traditional use in Chad. They contain essential amino acids and have antinociceptive, anxiolytic, anti-inflammatory, and anxiolytic activities. Their extract has hypoglycemic potential as a preventative or adjunct therapy for pre-diabetes or diabetes. *Hibiscus sabdariffa* is rich in essential vitamins, including vitamin A, which is beneficial for eyes, anti-aging, and sight. Its vitamin C helps fight free radicals and ensures good resistance to infections. *Corchorus olitorius* L. has a nutritional composition ranging from 1.2 to 34.4 mg/100 g and is known for its mucilaginous seeds, young tops and leaves, and silky hair. These plants have potential medicinal applications in antidiabetic, anti-gastritis, and prebiotic fields, and play a significant role in neural development and health. Promoting their use in Chad requires conservation programs, public policies, and local population planting. Future research should focus on their nutritional and medicinal properties, targeting underutilized species to address micronutrient deficiencies. Enhancing bioconservative properties and communication of these plants' virtues are crucial for their optimal availability and protection.

Keywords

A. esculentus, *H. sabdariffa*, *C. olitorius*, Nutritional and Medicinal

1. Introduction

In Chad, three plants are among the 80,000 to 400,000 species of vegetable plants in the world and are the most consumed and widespread among the Nigerian ladies living in the Mayo-Boneye district: *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L. Although these plants are of considerable value and usage, only a few research works have focused on their nutritional and health benefits in Chad, which have mainly focused on the preparation and uses of food. It is in this context that this review proposes to provide the reader with a comprehensive update of the composition in minerals, vitamins, pro-vitamins, antioxidant activity, fiber, bioactive compounds, phytochemicals, and medicinal properties of *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L. with the objective of stimulating research, investment, in-depth studies, and encouraging the use and/or the transformation of these interest food plants in Chad [1]-[3].

In the Republic of Chad, vegetables are the most important sources of vitamins and minerals that need to be added to the diet to make it complete and in line with the health and nutrition recommendations. Despite this essential role, the majority of the population does not have access to these vegetables, and their consumption remains low, mainly because they are not produced in sufficient quantity and not in readily available places. Chad's food gap is one of the highest, overriding the African average. Moreover, bioclimatic constraints are responsible for the low diversity, the fragility, and vulnerability of agriculture, and the main food insecurity in Chad. Vegetable production is characterized by a high dependence on rainfall, shallow ploughing and land preparation techniques, and organic fertilizers are scarce [4] [5].

2. Historical and Cultural Significance of *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L. in Chad

The natural flora of the country has always been a source of nutrients and therapeutic treatment ensconced in the lifestyle of the indigenous Chadians. A malnourished child or adult cannot thrive, and women use all possible means to help their families. One of the tangible expressions of this wisdom in the fight against malnutrition is reflected in the choice of food plants used in Chad. Here, we have chosen to present the properties of three very common plants used in the traditional diet in Chad: *Abelmoschus esculentus* (L.) Moench, *Hibiscus sabdariffa* L., and *Corchorus olitorius* L. The data for this study comes from the introduction of these foodstuffs to students in Chad. A questionnaire was offered to our first- and second-year students. When the data was compiled, it was found that these plants were used in the students' families during their childhood [6] [7].

3. Botanical Descriptions of *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L.

These three species are part of the Malvaceae family. *Hibiscus sabdariffa* is an

annual plant that grows to about eight feet in height. It produces large fleshy leaves with deeply lobed lobes. The calyx is tangy, the fruit is fleshy and contains multiple seeds. The calyx is used fresh or dried for the preparation of "Bissap". *Abelmoschus esculentus*, or Okra, is an annual or perennial plant. It reaches about 1 - 2 meters high. It produces large, lush leaves with fine margins. The fruit is a longitudinally ribbed capsule, and it is the immature pod that is consumed. *Corchorus olitorius* is a plant that grows to 2 - 6 feet in height. It produces a dry leaf that is supported on a long petiole. The fruit is a smooth capsule that contains many seeds. Okra and jute are distinguishable through the leaf, the petiole that bears it, and the seed, while the "Bissap", which is also used as food, is obtained from the calyx [8] [9].

Anyone in Chad knows the importance of *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius*, which are very popular in family gardens. They are easily found and known, but often not grown where they are cultivated; indeed, we can find them as weeds in gardens. Traditionally, these plants are widely consumed as food and are also known for their medicinal properties. The objective of this study is to bring together information on the use of *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* in terms of their nutritional and medicinal qualities. These foods have been used therapeutically from time out of mind and are in tune with people. Indeed, per the interviews, approximately 98.88% of the respondents use them to treat and/or prevent certain diseases [10].

4. Nutritional Composition of *Abelmoschus esculentus*

The nutritional composition of *A. esculentus* leaves showed that the proximate composition determined on a dry weight basis were moisture, 23.4%; crude protein, 30.4%; lipids, 7.04%; ash, 31.51%; carbohydrate, 8.08%; and caloric content 146 kJ/100g. The leaf contained 18.9 mg of ascorbic acid/gm, 6.6 mg of beta-carotene, 13.5 mg of total phenolic, and 4.3 mg of alpha-tocopherol. The amount of pectin was about 9.2% - 9.6%. The most representative fraction of the fatty acids of *Abelmoschus esculentus* indicated that *A. esculentus* contained unsaturated fatty acids, particularly muclaic acid. Nuts (dry weight) contained 31.2% crude lipids, 21.1% proteins, 9.6% cellulose, 4.4% pectin, 3.6% ash, and 25.1% carbohydrates (ethanol 76.9%, and the remaining carbohydrates, glucides). Moreover, the results showed the saturation of the fatty acids to be 59.3%; the unsaturation index was 47%, the coefficient of iodine was 53.13, and the peroxide index (PI) was less than 8 (3.5). The fatty acid composition was reviewed for Stolz SCs in 2009. Pectin was quantitatively found, as well as maltose, sucrose, raffinose, and chiro-inositol [11] [12].

The research results present the general nutritional composition of *A. esculentus* according to dry weight, and the content of individual amino acids, fatty acids, and the mineral composition of *A. esculentus* in Chad. The proximate composition indicated that *A. esculentus* contained about 20.3% nutritional calories.

The essential amino acids were relatively high compared to normally consumed vegetables in Chad. The relatively abundant amino acids were leucine, valine, lysine, isoleucine, and phenylalanine, as well as methionine. All these essential amino acids were about 33%, 23%, 42%, 42%, 43%, and 31%, respectively, whereas the sulfur-containing amino acids were 11%, and threonine was 36%. The protein contained about 26% of the amino acid composition of *A. esculentus*. This indicated that this plant contained a significant amount of protein [13].

5. Medicinal Properties of *Abelmoschus esculentus*

The antinociceptive, anxiolytic, anti-inflammatory, and anxiolytic activities of the extract of the *Abelmoschus esculentus* plant were reported. Moreover, the safety of plant fruits was confirmed by the fact that they have been an important part of the diet in Chad as well as around the world, and it is consumed regularly without the risk of adverse effects. A few clinical trials support the traditional use of *Abelmoschus esculentus* by demonstrating the hypoglycemic potential of the plant as preventive or adjunct therapy for pre-diabetes or diabetes. For example, *Abelmoschus esculentus* was co-administered in a clinical study to patients with poor metabolic control to type 1 diabetes, type 1 diabetic-acromegalic patients, type 2 diabetic hypertensive patients, experimental diabetic patients, and with metabolic syndrome patients. All patients were treated with different antidiabetic drugs. These studies demonstrated the hypoglycemic potential of *Abelmoschus esculentus* as preventive or adjunct therapy for pre-diabetes or diabetes. However, the detailed mechanisms remain to be elucidated. Over the world, many of the medicinal plants have been well-documented for their hepatoprotective properties. The treatment of plant extracts shields cells from the oxidative tension exerted by diverse hepatotoxic agents. In fact, the *Abelmoschus esculentus* plant has a high level of carbohydrate and fiber, and a low level of fat and protein. Also, fruits are rich in vitamins and minerals. The findings of in-depth studies published to date have demonstrated their efficacy [14] [15].

The traditional and medicinal use of *Abelmoschus esculentus* as a therapeutic natural substance is quite recognized. *Abelmoschus esculentus*, known also as okra, is used in the traditional medical setups around the world. Different parts of the okra plant, such as the seeds, fruits or young pods, roots, and leaves, are used to cure sickness. It is used in the management of constipation, obesity, diabetes, cholesterolemia, skin pigments, infertility in women, infertility in men, alcoholism, dysentery, and others. Around the Senegalese area, the concoction made from the roots of an okra plant is used traditionally to reduce blood sugar levels. The numerous effects of okra lend support to the use of okra in the control of diabetes and hypercholesterolemia. Moreover, the research showed that the okra helped to minimize the degree of kidney damage associated with diabetes [16] [17].

6. Nutritional Composition of *Hibiscus sabdariffa*

Different analytical methods are used, namely iodometry for the moisture con-

tent, the Kjeldahl method for the proteins, the Van Soest method for the fibers, the Bligh and Dyer method for the lipids, but also the atomic absorption method of Shimadzu for the minerals. Also, a chromatographic technique is used for compound identification. The results of the samples showed that the HS calyces contained a lot of nutrients, such as 10.03% of proteins, 2.70% of lipids, and 36.58 mg of iron per 100 g of dry matter, which makes it a good alternative food for the local population. There were also a lot of therapeutic compounds such as vitamins A, C, magnesium, zinc, phenols, and flavonoids. This natural food could help Chad achieve food and nutrition security [18].

The hibiscus flower (*Hibiscus sabdariffa*) is one of the three essential plants in Chad. This plant is rich in essential vitamins for the passage of nutrients, etc. It is rich in vitamin A, which is good for the eyes, anti-aging, and good for sight. Its concentration of vitamin C helps to fight against free radicals and ensures good resistance to infections in the epithelial cells. Ingested without moderation, *H. sabdariffa* helps to improve the denial of bowel problems. Applying it to the epidermis after hibiscus infusion also helps to remedy wounds, erythema, and hair anomalies. This work allowed us to study the nutritional and therapeutic value of *Hibiscus sabdariffa* (HS). The samples of HS used came from the locality of Bol [19].

7. Medicinal Properties of *Hibiscus sabdariffa*

Hibiscus is a plant of great medicinal interest and its consumption has tended to increase in recent years; its infusions and powders made from the dried flower can have very interesting medicinal applications. The most marketed part of the roselle is the calyx, which has been described to have a strong antihypertensive effect either by its diuretic activity or by its ability to act as spasmolytic or vasodilating, mainly due to the anthocyanins, vitamin C, and citric and punic acid. Its pharmacological properties are attributed to numerous compounds such as organic acids (citric, L-malic, and L-tartaric), anthocyanins (cyanidin and delphinidin based), flavonoid glycosides (quercetin, myricetin, and kaempferol), sugars (galactose and glucose), ascorbic acid (40% - 45%), fatty acids, and mucilaginous substances, among others. It also protects the kidneys because of its malic and citric acids, which prevent their hardening and uncleanness. In addition, it helps to eliminate toxins and excess water from the body, helps fight cholesterol, relaxes blood vessels, and helps treat slight urinary tract infections. Protects the throat and oral mucosa, fights bad breath and is useful for dental health. The high content of vitamin C makes it an extraordinary supplement to strengthen the immune system and improve overall health [20] [21].

Hibiscus sabdariffa L. is a species belonging to the Malvaceae family. The species is native to India and Malaysia, from where it has spread to the African and American continents. The plant is also present in Senegal, Mauritania, Sudan, and Chad. Known by the Chadians as "Tougouli", *Hibiscus sabdariffa* is an annual herb used for food, medicinal, and coloring purposes. Plants are used to treat scurvy and liver disease. Hibiscus calices have been known for a long time for their

diuretic, hypotensive, choleretic, laxative, and depurative effects. Hibiscus tea is very popular in several African countries because of its diuretic and cardioactive properties. Infusion of the sepals is also used to treat abdominal pain. The effects of these bioactive compounds have been evolved in several systems, and the knowledge of the potential beneficial effects of Hibiscus has also been studied and received a lot of attention and acceptance [22].

8. Nutritional Composition of *Corchorus olitorius* L.

The β-carotene values of *Corchorus olitorius* ranged from 1.2 to 34.4 mg/100g. β-cryptoxanthin in flakes of dried corchorus, 0.79 mg/100g, was higher than β-carotene. Corchorus microphyllus carried the highest α-carotene (7.43 mg per 100g) and β-carotene (25.03 mg/100g) contents. All the β-cryptoxanthin in the extractable pool had decomposed after 3 days. The study suggested that Corchorus species could contribute considerably to the recommended intake of provitamin A carotenoids in diets of the xerophytic region. In addition to pro-vitamin A, jute leaves contain other carotenoids, and pigments, which limit oxidative stress, thereby increasing the shelf life of products. In sites where access to electricity and fridges is a real challenge for most families, these pigments contribute to the preservation of the nutritional or the patch of sometimes heated dishes injurious to the vitamins they contain. Remarkably, volunteers taking a low dose of β-carotene showed a decrease in DNA damage by 18%. One-carotenoid intake reduces the risk of cardiovascular disease. The most commonly reported effects reviewed include decreased leukocyte function and lymphocyte, decreased TNF-α and CRP production and decreased adhesion molecule expression. Significant alterations in mononuclear cell metabolism, induction or inhibition of apoptosis, PARP activity or ROS production have not been generally recognized as possible one-carotenoid activities [23] [24].

Corchorus olitorius L. was the plant most used in Chad. Therefore, we present its nutritional and medicinal values to enhance its importance in the diet for nutritional and medicinal virtues. For this, we used several reports of food products and biological analyses of the leaves. These reports have shown that jute leaves are high in protein, vitamins, mineral elements, and antioxidants. The leaves are highly consumed in some regions of Africa for the dietary fiber, particularly the labeling in the prevention of constipation. For medicinal applications, descriptive studies have supported the use of jute leaves in the prevention at the end of the menstrual pains, and their significant inhibitory activity on an α-amylase also suggests a postprandial hypoglycemic effect [25].

9. Medicinal Properties of *Corchorus olitorius* L.

There have been several qualities in *Corchorus olitorius* L. like mucilaginous seeds, young tops and leaves, and silky hair within mammals ranging from consumption via the digestive system of host parasites to facilitating the appetite, nurturance, and digestion of an animal that ingests the seeds, and mucilaginous

foods for humans and in traditional medicine uses of the seeds, young tops, and leaves to various parts of the leading body systems and for some disorders. These food and medicinal uses of the plant have been reported from at least 13 countries in Africa, seven countries in Australasia, six countries in the Caribbean, 18 countries in Southeast Asia, and 19 countries in West Asia. The consumption of young top leaves occurs mainly during food shortage periods, and the mucilaginous seeds are easily absorbed by the digestive system, which provides a rapid method for managing livestock at the most significant growth disadvantage times of the year [26] [27].

Corchorus olitorius L. is an herb used for both medicinal and consumption purposes. It is a laxative, appetite stimulant, digestive, antiscorbutic, tonic, purgative, aphrodisiac, astringent, and antipyretic, and its seeds are purgative, carminative, tonic, astringent, cosmetic, stomachic, expectorant, hyperthermic, and anti-scorbutic. It is a putative vaccine for anthrax, fever, headache, ophthalmia, inflammation, scabies, herpes, chafes, abscesses, depression, contraception, dysuria, and tumors [28].

10. Comparison of Nutritional Values among *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L.

The fat thus has an energy value of just under three times that of sugar and protein with four times as much. Total lipids contain all types of fats present in plant tissues. It is essential in food for its fatty acid composition, but the high level of digestion of such fatty acids. It is considered that a foodstuff contains a significant amount of lipid when the lipid content is 10%. The leaf of *Abelmoschus esculentus* contains a significant quantity of lipid greater than or equal to 20%. Lipids are absent in the leaves of *Hibiscus sabdariffa* and *Corchorus olitorius*. On average, the leaves of Abelmoschus, Hibiscus, and Corchorus contain respectively 1.56 g, 0.88 g, and 0.3 g of lipid per 100 g dry weight. Fiber is part of the diet essential for the proper functioning of the body; it should be rich enough. Fiber is a form of carbohydrate in the human diet. It is an essential nutrient. It cannot be digested or absorbed directly but helps digestion or examines the body, softens the stool, and reduces intestinal transit time [16] [29].

In the domain of species mainly used as food in Chad, *Hibiscus sabdariffa* is the most used as the first and second place in consuming temporarily dehydrated leafy vegetables. *Abelmoschus esculentus* is the most preferred species by Chadians as a temporary and perennial leafy vegetable in the country, and the most frequently eaten species of this type. *Corchorus olitorius* is consumed temporarily and permanently as a leafy vegetable by the population. The analysis results of the leaves of these three plants allow us to know their nutritional (crude protein, fat, carbohydrate, and fiber) and energetic values. It is considered that the protein is interesting if it has a value greater than or equal to 30%. The protein rates found in the leaves of *Corchorus olitorius* and *Abelmoschus esculentus* are higher than the rate found in *Hibiscus sabdariffa* [30].

11. Comparison of Medicinal Properties among *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L.

The results obtained show, therefore, that the plants *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L., known all over the world, are highly rich in bioactive compounds that have several nutritive and therapeutic virtues. The study showed also that some medical preparations can induce adverse effects. That justifies the use of the plants in therapy to treat several types of diseases, in spite of the scientific validation. Crude extracts could be enriched with bioactive substances without giving secondary effects in the therapeutic context to avoid alteration of the noble properties of the extract. The possibility of isolating the pure compound (forskolin, gossypol, mucilage, galactomannan, and B-sitosterol), could be a case for further laboratory study as well as preclinical and clinical studies such as the experiment of tumor development, blood pressure, and hypoglycemic responses. The ultimate goal is to scientifically prove the medicinal properties of these plants despite the curative effect perceived by the local populations. So, standardizing and valuing medicinal plants remains the local populations' chart against the diseases [31].

The ability of the three plants *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L. to cure diseases, especially chronic and life-threatening ones that reacted poorly to modern medicine, was assessed. Among the 154 different types of diseases noted as curable by the plants, cancer (16.55%), diabetes (11.04%), and hypertension (8.22%) were of major preoccupation. The drugs were very effective in solving the problems and improving the lives of the sick. At one time, it was the only treatment available in rural areas where inhabitants, having a modest standard of living, did not have the possibility to pay for large illnesses at the hospital [32] [33].

12. Traditional Uses of *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L. in Chad

The results obtained from the interviews and literature review showed that these species were widely used to treat different health problems, such as jaundice, digestive diseases, bacterial and viral infections, anemia, gynecological and anemic problems, pharyngitis, inflammation, ear infections, wound infections, heatstroke, stress, lack of hair, typhoid fever, insomnia, hypertension, constipation, and diarrhea, in the people of the Chari Baguirmi region. These species are also used in local culinary recipes to prepare porridge, sauces, spices, and herbal teas. Their aerial parts are often eaten and cooked by local communities. It appears from our investigation that the Rudi floral parts have the highest number of multiple citations, which explains their wide use for therapeutic and nutritional purposes throughout the Chari Baguirmi Region. The edible flowers have a very viscous or mucilaginous flavor, which is rare in other crops. Novices can be sensitive to this feature. Although the fruit pods are used in traditional cuisine and medicine, fruit development is often limited by pod borer pests. Their production can also

be affected by stress. In addition, the aerial parts of vegetables also contain K, antioxidants, ascorbic acid, tocopherol, β-carotene, anthocyanin, tocotrienol, phenol, and fatty acids. These findings are interesting since it is quite rare to affirm these nutritional values in other similar crops [34].

This study was carried out by exploring the literature, and by collecting conventional information through interviews with traditional practitioners and the community on the nutritional and medicinal uses of three species of *A. esculentus*, *H. sabdariffa*, and *C. olitorius*.

Chad is a semi-arid country with a hot, dry climate and, at best, partially humid. The high temperatures reach 48˚C in the fiirki, the hottest month of the year, while the lowest is 17˚C in February. Concerning the distribution of plant families in Chad, 71 families are represented, among which eight are largely dominant: Poaceae, Fabaceae, Malvaceae, Asteraceae, Euphorbiaceae, Boraginaceae, Malvaceae, Solanaceae, and Amaranthaceae. Among these, Malvaceae is a widespread plant family and has 8 genera with 26 species (including *A. esculentus*, *H. sabdariffa*, and *C. olitorius*) established [35].

In both allergy and traditional medicine, nutritional and medicinal applications have been presented and highlighted for different parts of the following endemic and endemic plants: *Abelmoschus esculentus* (*A. esculentus*), *Hibiscus sabdariffa*, and *Corchorus olitorius*. However, only a few publications exist on these three species of the Malvaceae in the field of Chad pharmacopoeia. The aim of this study was to carry out an ethnopharmacological survey in the region of Chari Baguirmi in Chad to highlight the traditional uses of the three main plant species of the Malvaceae family and, eventually, which can be the objective of the development and promotion of local resources [36] [37].

In Chad, the pharmacopoeia is based on traditional practices using several formulations, including herbal teas, herbal macerated oil, and head applications. In general, the Chadians already have a rather precise idea of the therapeutic effects of the plants cataloged in their pharmacopoeia. It would therefore be very interesting to also carry out a survey of current use in order to obtain information on the quantities, use, and forms used [38].

13. Current and Potential Applications in Nutrition and Medicine

The mature fruit of *Abelmoschus esculentus* is used as a vegetable, rich in protein, carbohydrates, lipids, carotenoids, and hydrocarbon content. It also has a high content of polyphenols and flavonoids. The supercritical fluid extract from this fruit has been proven to be an effective potential natural antioxidant and nutraceutical ingredient, with applications at the commercial level. The aqueous extract has been approved for its safety in humans. The isolated polysaccharides, HPTS1, GT-R, and GT-21, have potential medicinal applications such as antidiabetic, anti-gastritis, anti-H. pylori, and prebiotic applications. The deposition of quercetin on the surfaces of petal-like structures has the potential to improve skin permeation, signifying potential applications in cosmetic and dermatologi-

cal fields [39].

The nutritional and medicinal values of *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* have been confirmed by many studies, but the mechanisms and bioactive components are not well understood. *Abelmoschus esculentus* has potential prebiotic activity and bioactive components that could be used to prevent or pre-treat many diseases. *Hibiscus sabdariffa* has important bioactive components that could be used for body weight management, skin diseases, heat stroke, blood pressure and lipid control, diabetes, and more. *Corchorus olitorius* has polysaccharides with antioxidant, anti-inflammatory, anti-tumor, immune-boosting, and wart-healing acceleration activity, along with many other bioactive components that have potential applications against various diseases [40] [41].

14. Challenges and Opportunities in the Utilization of *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* L. in Chad

The consumption of *Abelmoschus esculentus* L., *Hibiscus sabdariffa*, and *Corchorus olitorius* L. in the form of dietary complement must be promoted because they contain the essential dietary components necessary for the growth of the population. These vegetables can awaken revamped and serious interest in improving basic nutritional, economic, and health factors. However, strategies must be put in place to enhance their use by creating more *in-situ* and *ex-situ* conservation programs to save these plants from extinction. It is necessary for the authorities to adopt public policies aimed at promoting these three vegetables and the local population to plant them, produce them, and consume them [42].

The *Abelmoschus esculentus*, *Hibiscus sabdariffa*, and *Corchorus olitorius* vegetables are the three most used economically by the Chadian population. They are sources of supply to the population and have a deep cultural importance that is much appreciated because of their pharmacological importance and the income of the population. The three most used plants can also contribute to the improvement of the state of health of the population thanks to their content of essential dietary components. The promotion and use of these three vegetables in Chad and the fight against their disappearance would be based on *in-situ* and *ex-situ* conservation strategies, public policies, and planting of local populations.

15. Future Research Directions

It is important to mention that *C. olitorius* L. is not only the most desirable leafy vegetable by the people living in Chad, but it is also very relevant in the vegetable perspective group. A source of nutrients with a good proportion of B-carotene to alleviate the deficiency of vitamin before the onset of the tree nutritional harvest. Active role in neural development, health, and maintenance of connecting tis-

sues. Consequently, innovative works such as the development of a race structure marker and gene mapping should be conducted to understand the gene layout of *C. olitorius* L. and the success that globally changing the variety to carry an increase in the nutritional and health value of novel compounds. Comprehensive human development, including nervous system development, and the evolution of preterm infants. Overall, research on *C. olitorius* needs to intensify and focus more on the nutritional contributions and health benefits of this popular vegetable, and other neglected vegetables should be similarly and better utilized. Promoting the various combinations to meet the deficiencies.

Corchorus olitorius is usually mixed with other vegetables, such as Balanitesaegyptiaca, Moringa peregrina, and Amaranthus spinosus, to flavor the poor and inadequate diet. In this study, research on the sesquiterpene lactones of chicory and the ginseng saponins of spermatophytes showed that the total cardenolides and anticancer activities of the saponins were different in different parts of L. oleifera. Among them, the crude extracts of dried fruits in two-year-old Linzhi and Retzi showed the best inhibitory activity and the reproduction of human molecular seeds. Evaluation. Future studies on the composition of *C. olitorius* should focus on its nutritional and medicinal properties, while other underutilized species should also be targeted to come up with a variety of combinations to fill gaps that are intended to reduce the deficiency of target micronutrients. Economic cutting resulting in reduced plant height would be very profitable for farmers and commercial production of nutritional compounds seasonally, as well as non-protein and protein biomolecules.

16. Conclusions

Some of these plants are popular in traditional medicine; it follows that there is a need to quantify and translate the traditional use of plants into suitable pharmaceutical formulas, so that certain problems are resolved. The challenge is to improve research into the active substances present in these species, so that they can be used as phytomedicine. A rigorous scientific context is necessary to promote a harmonious return to the consumption of plants in a country where the costs of synthetic pharmaceutical products sometimes border on the impossible for many people. In an attempt to avoid over-exploitation and deforestation, an increasing effort will be needed to enhance the totally undertreated bioconservative properties of traditional vegetable plants, considering the prospect of damage caused by synthetic products. The nutritional, medicinal, and bioconservative virtues of the plants investigated must be communicated to future generations to ensure their optimal availability and protection. For this purpose, application aids and management guidelines can be developed based on the results of the study.

This study allowed profiling of local Burkinabe traditional vegetables using their medicinal bioactivity, nutrients, and nutritional compounds. Indeed, *Abelmoschus esculentus*, *Hibiscus sabdariffa* L., and *Corchorus olitorius* represented such great sources of health for humans. They constitute a key data for nutritional

anthropology, which is an area of study that deals with the relationship of food to health and exercise and an aspect of the field focusing on the specific evolutionary adaptations shaped by a shared history of the co-evolution of hominids and the flora. With a view to the risk of food insecurity in the days to come, the consumption of green leaf cereal plants could be a source of alternative food rich in vitamins and amino acids through their potential nutritional and medicinal properties.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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