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ISSN 0189-6016©2007**TRADITIONAL LEAFY VEGETABLES IN SENEGAL: DIVERSITY AND MEDICINAL USES****Gueye Mathieu*, Diouf Meissa****

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*E-mail : gueye_guirane@yahoo.fr**Abstract**

Six administrative regions of Senegal were investigated. Forty species of vegetable leaves which are traditionally consumed in Senegal have been inventoried. All species are members of twenty-one families the most numerous of which are *Amaranthaceae* Juss., *Malvaceae* Juss., *Moraceae* Link., the *Papilionaceae* Giseke and *Tiliaceae* Juss. The species are subdivided into three groups: cultivated leafy vegetables, plants gathered annually, perennial sub-ligneous and ligneous species. The gathered species represent 67.5% of the inventory, 40.7% of which is ligneous. Cultivated species account for 32.5% of the inventory. The species are consumed for their medicinal properties, nutritive value and eating habits linked to specific ethnic traditions. During the drought years, with the scarcity of main food (millet, mays) consumption of leafy vegetables is high. All species reported except *Sesuvium portulacastrum* L. are consumed like vegetable herbs. The species of *Hibiscus* are eaten in spinach and condiment form while *Sesuvium portulacastrum* L is cooked in salad. Of the forty species examined, eleven are widely consumed. Within the entire study area, *Hibiscus sabdariffa* predominates among species consumed, followed by *Moringa oleifera* Lam. and *Senna obtusifolia* Link. A high consumption level of some species like amarante, *Corchorus tridens* L., *Corchorus aestuans* L., *Leptadenia hastata* Decne. and *Vigna unguiculata* (L.) Walp is confined to certain areas. In addition to their consumption as vegetables, the medicinal uses of 57.5% of these is of primary importance. The most commonly exploited parts are, respectively, leaf (40%), roots (20%), and bark (13.3%). Among the numerous pathologies treated, abscess, constipation, and rheumatism are predominant followed by aphrodisiac uses. The *Amaranthus* spp. L., *Leptadenia hastata* Decne., *Senna obtusifolia* Link., *Adansonia digitata* L. and *Tamarindus indica* L. are species with multiple medicinal uses.

Key words: Traditional leafy vegetables – diversity – medicinal uses – Senegal**Introduction**

During the course of the last decade, the rapid genetic deterioration of traditional, cultivated species as well as their native forms has become apparent, indicating absolute necessity for urgent development of regional and national programmes to safeguard phylogenetic resources. The intense anthropologic pressure associated with the degradation of ecosystems as well as profound edapha-climatic changes constitute the principal factors in the loss of genetic diversity among the available indigenous species. Clement (1997) noted that the accentuation of dry season phenomena cannot alone account for the deterioration of biodiversity. In fact, the loss of natural resources as well as middle class rural and urban pauperization constitutes the primary factors limiting alimentary stability. Thus, research should be oriented towards producing vegetables of nutritive value.

Several studies have shown that vegetable production is profitable and provides a good source of vitamins and minerals (Westphal, 1985). In developing countries, particularly in Sub-Saharan Africa and especially in Senegal, horticultural research programmes are basically oriented toward European-type vegetables. Nevertheless, traditional or indigenous vegetables which have adapted to native agro-ecological conditions are sometimes more abundant in certain nutrients essential for the optimal development of organisms in comparison to vegetables of

European origin. Among these traditional vegetables, would include the leafy ones such as amaranth, manioc, patate aquatique and taro, which contains the same average constituents of protein as are present in legumes such as peanuts, soy beans and niebe. They possess seven times more calcium, twice the iron, one-hundred and ninety-one times more beta carotene, and seventy-eight times more vitamin C (Oomen et Grubben, 1978). Additionally, they have tremendous ecological flexibility in relation to the local environmental conditions and their organoleptic qualities are highly prized by indigenous populations. In the light of these facts, we contend that there is an urgent need to develop programmes to safeguard the phyto-genetic resources. Today, the management of biodiversity represents one of the most crucial aspects in the process of realization of different strategies aimed at sustainable development. The effective management of the local phyto-genetic resources requires us to focus on both the reassessment of local, traditionally consumed leafy vegetables and the careful itemization of their various medicinal and other uses.

Materials and Methods

Three exploratory and collection expeditions were made throughout Senegal. In order to examine the greatest diversity of leafy vegetables, six administrative regions of Senegal were selected out of the ten existing ones since 2000. The choice of sites visited was made by taking into account the existing climatic and agroecologic zones. In fact, in Senegal, the scientific community subdivides the country into six agroecologic zones: river valley, woody pasture, groundnut basin production, the <<niayes>>, eastern Senegal, and the Casamance.

This study was undertaken in both the dry and the rainy seasons. Investigations and inventories tracked the specimens around women groups as well as produce growers for both domestic and commercial purposes. An open but semi-structured interview technique was adopted. The questionnaire, which was extensive, contained many points from the chart of resources which allows an inventory of species, their different varieties, the changes occurring in their distribution level within the zone, and the traditional knowledge. Designated methods to determine the use, evolution, the distribution of species and local varieties were employed. In order to obtain traditional knowledge about each species, senior members of the local communities were interviewed.

Corroboration of information was verified according to the confrontation technique advanced by El Rhaffari et al. (2002). A unit of information will be considered accurate/corroborated when it has been reported a minimum of two times in two different localities by different informants.

The names of species have most frequently been given to us in the local language. Additionally, we always engaged a guide to interpret the local language who had excellent knowledge of the indigenous species, and who could accompany us on field outings to see the species in question and to collect samples or indeed, in the case of herbaceous species, the entire plant. In this way the species have been identified in the field or subsequently in the laboratory with the Flora of Senegal (Berhaut, 1967) and/or by comparison with the herb specimens from the collection of Institut Fondamental d'Afrique Noire (IFAN), the most important in all French-speaking Africa. Collected specimens are deposited in IFAN herbarium.

Results

Several administrative regions of Senegal have been visited. In all, we have collected samples within nine locations in the areas of: Mboro (for the niayes), Saint Louis (for the river valley), Matam (for the river valley and the woody pastoral zone), Bakel (for the river valley and eastern Senegal, Tambacounda (for eastern Senegal), Kolda, Ziguinchor, and Bignona (for Casamance), and Fatick (groundnut basin) (Figure. 1). We investigated forty species of local vegetables in Senegal; the leaves of which are traditionally consumed (Table 1). These species are distributed amongst twenty-one families, the most abundant of which are *Amaranthaceae*, *Malvaceae*, *Moraceae*, *Fabaceae* and the *Tiliaceae* (Table 1).

It seems that all the species inventoried with the exception of *S. portulacastrum* are eaten as vegetable herbs (boiled leaves are mixed in a sauce or with other vegetables) (Table 1). All of the *Hibiscus* (*H. asper* *H. sabdariffa* and other *Hibiscus* *sp.*) are frequently consumed like spinach and as seasoning. *T. indica* is equally useful as a seasoning, *S. obtusifolia* is eaten like spinach, but only *S. portulacastrum* is eaten in a salad. All the responses to this question pertaining to the five species most frequently consumed by locality, have resulted in an expansion from the original five into a total of eleven species within the forty inventoried (Figure 2). Only *H. sabdariffa* is consumed everywhere in Senegal, in fact, it was sited six times as the primary leafy vegetable consumed in the nine visited zones. It follows that, respectively, *M. oleifera* and *S. obtusifolia* *L.* (Figure 2) *hastata*, *C. tridens* and *C. aestuans*



Figure 1: The primary zone for the collection of traditional leafy vegetables of Senegal

Table 1. List of vegetable species traditionally consumed like in Senegal.

Species	Method of consumption	Supply system	Family
<i>Abelmoschus esculentus</i> Moench.	Vegetable herbs	Cultivated	<i>Malvaceae</i>
<i>Adansonia digitata</i> L.	Vegetable herbs	Gathered perennial species	<i>Bombacaceae</i>
<i>Amaranthus graecizans</i> L.	Vegetable herbs	Gathered annual species	<i>Amaranthaceae</i>
<i>Amaranthus hybridus</i> L.	Vegetable herbs	Cultivated	<i>Amaranthaceae</i>
<i>Amaranthus spinosus</i> L.	Vegetable herbs	Gathered annual species	<i>Amaranthaceae</i>
<i>Amaranthus viridis</i> L.	Vegetable herbs	Gathered annual species	<i>Amaranthaceae</i>
<i>Arachis hypogaea</i> L.	Vegetable herbs	Cultivated	<i>Papilionaceae</i>
<i>Balanites aegyptiaca</i> Del.	Vegetable herbs	Gathered perennial species	<i>Balanitaceae</i>
<i>Boerhaavia diffusa</i> L.	Vegetable herbs	Gathered annual species	<i>Nyctaginaceae</i>
<i>Boerhaavia erecta</i> L.	Vegetable herbs	Gathered annual species	<i>Nyctaginaceae</i>
<i>Brassica carinata</i> A. Braun	Vegetable herbs	Cultivated	<i>Brassicaceae</i>
<i>Ceratotheca sesamoides</i> Endl.	Vegetable herbs	Gathered annual species	<i>Pedaliaceae</i>
<i>Corchorus aestuans</i> L.	Vegetable herbs	Cultivated	<i>Tiliaceae</i>
<i>Corchorus olitorius</i> L.	Vegetable herbs	Gathered annual species	<i>Tiliaceae</i>
<i>Corchorus tridens</i> L.	Vegetable herbs	Gathered annual species	<i>Tiliaceae</i>
<i>Cordia senegalensis</i> Juss.	Vegetable herbs	Gathered perennial species	<i>Boraginaceae</i>
<i>Cucurbita maxima</i> Lam.	Vegetable herbs	Cultivated	<i>Cucurbitaceae</i>
<i>Euphorbia balsamifera</i> Ait.	Vegetable herbs	Gathered perennial	<i>Euphorbiaceae</i>

		species	
<i>Ficus capensis</i> Forssk.	Vegetable herbs	Gathered perennial species	<i>Moraceae</i>
<i>Ficus iteophylla</i> Miq.	Vegetable herbs	Gathered perennial species	<i>Moraceae</i>
<i>Ficus sycomorus</i> L. susp. <i>gnaphalocarpa</i> (Miq.) C.C. Berg	Vegetable herbs	Gathered perennial species	<i>Moraceae</i>
<i>Ficus thonningii</i> Blume	Vegetable herbs	Gathered perennial species	<i>Moraceae</i>
<i>Gardenia ternifolia</i> Schumach. et Thonn.	Vegetable herbs	Gathered perennial species	<i>Rubiaceae</i>
<i>Hibiscus asper</i> Hoek. F.	Spinach, vegetable herbs, condiment	Gathered annual species	<i>Malvaceae</i>
<i>Hibiscus sabdariffa</i> L.	Spinach, vegetable herbs, condiment	Cultivated	<i>Malvaceae</i>
<i>Hibiscus abelmoschus</i> L.	Spinach, vegetable herbs, condiment	Gathered annual species	<i>Malvaceae</i>
<i>Ipomoea batatas</i> (L.) Poir.	Vegetable herbs	Cultivated	<i>Convolvulaceae</i>
<i>Jacquemontia tannifolia</i> Griseb	Vegetable herbs	Gathered annual species	<i>Convolvulaceae</i>
<i>Lagenaria siceraria</i> (Molina) Standl.	Vegetable herbs	Cultivated	<i>Cucurbitaceae</i>
<i>Leptadenia hastata</i> Decne.	Vegetable herbs	Gathered annual species	<i>Asclepiadaceae</i>
<i>Manihot esculenta</i> Crantz.	Vegetable herbs	Cultivated	<i>Euphorbiaceae</i>
<i>Moringa oleifera</i> Lam.	Vegetable herbs	Cultivated	<i>Moringaceae</i>
<i>Senna obtusifolia</i> Link.	Spinach, vegetable herbs	Gathered annual species	<i>Caesalpiniaceae</i>
<i>Sesuvium portulacastrum</i> L.	Salad	Gathered annual species	<i>Ficoidaceae</i>
<i>Solanum aethiopicum</i> L.	Vegetable herbs	Cultivated	<i>Solanaceae</i>
<i>Stylochiton warneckei</i> Engl.	Vegetable herbs	Gathered annual species	<i>Araceae</i>
<i>Tamarindus indica</i> L.	Condiment, vegetable herbs	Gathered perennial species	<i>Caesalpiniaceae</i>
<i>Trianthema portulacastrum</i> L.	Vegetable herbs	Gathered annual species	<i>Ficoidaceae</i>
<i>Vigna unguiculata</i> (L.) Walp.	Vegetable herbs	Cultivated	<i>Papilionaceae</i>
<i>Zornia glochidiata</i> Reichb. ex DC.	Vegetable herbs	Gathered annual species	<i>Papilionaceae</i>

are not frequently consumed species. In fact, they appear to be the species most frequently consumed in only two of the localities visited. The zones in which they have their greatest consumption are as follows: *C. tridens* in the North-East (Matam and Bakel), *C. Aestiams* in Casamance and *L. hastata* in the groundnut plains, and in the niayas (Figure 2). *V. unguiculata* is most preferred in the East (Bakel) and in Eastern Senegal (Tambacounda). Amaranth is heavily consumed in Tambacounda, the unspoiled region of Casamance (Figure 2).

Siemonsma's (1982) modified classification allows us to subdivide the leafy vegetable inventories into three groups: cultivated, plants gathered annually, and the perennial ligneous species (Table 1). Cultivated leafy vegetables can be subdivided into two sub-groups: those cultivated only for leaves (*M. oleifera*, *A. hybridus*, *C. aestuans*, *B. carinata*) and those cultivated first for their fruits, their root, or tubers and secondly for their leaves (*V. unguiculata*, *I. batatas*, *M. esculenta*, *A. esculentus*, *C. maxima*, *L. siceraria* and *A. hypogea*). *H. sabdariffa* constitutes an exception because it is cultivated either exclusively for its leaves, exclusively for its flowers (calices and epicalices) or for both at once. Gathered species are the most numerous and constitute 67.5% of the species inventoried of which 40.7% are ligneous. Those that are cultivated constitute 32.5%. Gathered annual or perennial species have been used in various ways.

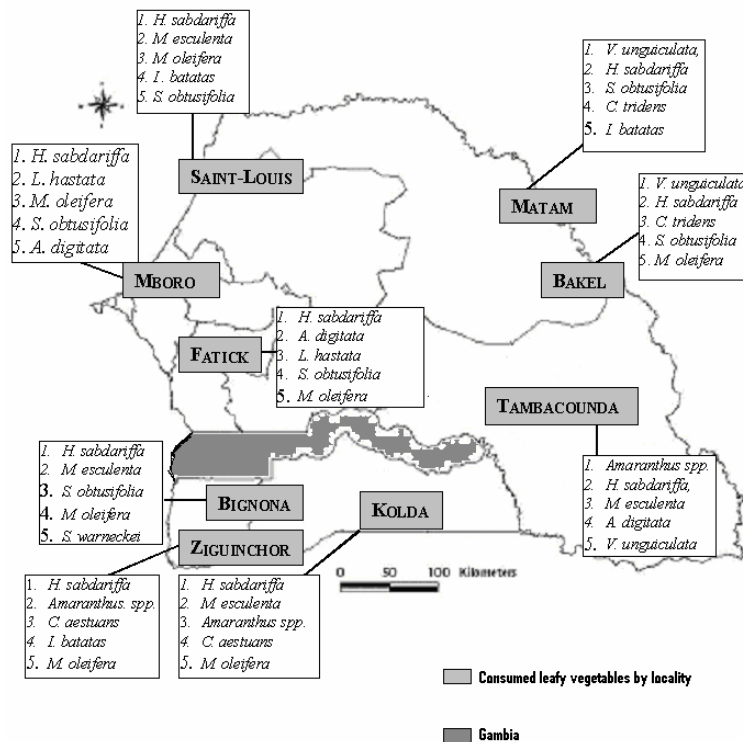


Figure 2. The five (5) most frequently consumed traditional leafy vegetables by locality

The present investigation reveals that in addition to the dietary uses of the vegetables, 57.5% of them are used extensively in traditional medicine. In effect, boiled leaves of all varieties of *H. sabdariffa* and *H. asper* are used to treat cold and fever, whereas the flowers calices and epicalices of the red variety when liquefied or prepared as a decoction are highly prized everywhere in Senegal and taken as a beverage which efficiently treats tiredness. As to the level of medicinal use, there was no distinction between the different species of amaranth. It was noted that leaves and roots of amaranth heals ear infection, wounds, pustules, lepromes, abscesses, and burns. It is also used like *S. obtusifolia* to reduce post-partum abdominal pains. *S. obtusifolia* seems to be effective as a purgative and efficiently treat the darts. The rubbery sap of *L. hastata* has been indicated as a strong salve while the different parts of the plant (root and leaf) are used against rheumatism, blennorrhagia, hemorrhoids, eczema and varicose veins. The bark of *F. sycomorus* is a well known aphrodisiac but also treats sterility in females and skin diseases, whereas leaves and bark of *F. iteophylla* are used to treat cough and tiredness. *V. unguiculata* is indicated in cases of vitamin deficiency. Roots of *C. senegalensis* and fruit of *A. digitata* help to combat colic. Additionally, *A. digitata* is efficient against abscess, whitlow, diarrhea and dysentery. Diabetes and rheumatic pain can be treated respectively by leaves and seeds of *M. oleifera*. While *M. esculenta* can be used for boils and *E. balsamifera* for hemorrhoids, intestinal worms and skin diseases. *B. aegyptiaca* and *T. indica* are used to improve sexual desire like an aphrodisiac and is sometimes indicated as a laxative. Tamarind is also indicated against rheumatic pain and vomiting while roots of *G. ternifolia* are effective against jaundice. The medicinal uses of other species were not reported. For medicinal purposes, the leaves were the part most used (40%), the roots were used less often (20%), followed by the bark (13.3%) while the fruit, seeds, stems and flowers, are rarely used as medicine.

Discussion

The number of reported self-sown leafy vegetables consumed is forty whereas thirty-eight of them were noted in Cameroon (Stevens, 1990) and 31 at Bemba du Katanga (Malaisse, 1997). Among the species inventoried, 67.5% were collected from the wild and only 32.5% were cultivated. The predominance of wild collected species confirms the work of Westphal et al (1985) which noted that uncultivated plants provide the principal source of leafy vegetables in tropical and sub-tropical regions. Nevertheless, they did not exceed 10% of the leafy-vegetables

consumed (Westphal et al., 1985). Our results revealed that the most frequent form of consumption is as garden herbs. In fact, all the species encountered are included in the preparation of a sauce which accompanies local dishes which are made primarily of cereal flour (millet, sorghum, and corn). In this way, as Giffard (1974) has noted, the leaves constitute an irreplaceable dietary supplement for those who eat millet without frequent access to fish, meat or fresh fruits which play an important role in the dietary equilibrium of the population in the Sahelo-Sudanese area. Diouf et al., (1999) noted that their consumption is attributed to their medicinal virtues as well as their rich sources of vitamins. They are said to be tonics and will also be effective against diabetes, rickets, arterial hypertension and constipation. The consumption of leafy vegetables is also linked to the traditions and dietary patterns of each ethnic and socio-economic group (Diouf et al., 1999).

The principal reasons given by the population include nutritive qualities and medicinal virtues. Thus, it is important to note what Waithaka and Chwaya (1991) have shown that the consumption of 100 g of *Niebe* leaves provides 35% of the iron, 110% of the calcium, 260% of the vitamin C, and 150% of the vitamin A recommended for adults. Amaranth provides 34% of the iron recommended for adults, 100% of the calcium, 320% of the vitamin C and 170% of the vitamin A. According to Adu-Dupaah (1997), the leaves of *niébè* are richer in protein than their seeds. Additionally, several studies (Kerharo and Adam, 1974; Bergeret and Ribot, 1990; Pousset, 1992; Tramil, 1996; Fortin et al., 1997; Lô et al., 1999; Arbonnier, 2000) have reported different medicinal properties for at least one half of the species inventoried. A large number of traditionally utilized plants can be considered as complements or dietary supplements, but they are also regarded as medicines. It seems also that populations that live in the continental zones, far from the coastal zones, consume more leafy vegetables and it seems to be the same for those living in the woody zones.

Thus, rural populations take a keen interest in those species with particular attention to the baobab (*Adansonia digitata*) because all the parts of the tree can be utilized. The leaves of *M. oleifera* are reputed to be efficient against diabetes, and the leaves of *V. unguiculata* are used to prevent vitamin deficiency and/or malnutrition. The rubber sap of the *L. hastata* in Senegal is reputed to be highly effective for healing. The other parts of the same species are also very useful against ailments of the prostate, rheumatism, etc. The multiple uses of *L. hastata* were confirmed by Kerharo and Adam (1974) and Arbonnier (2000) who also reported that the leaves are useful for lactation and as a purgative. *L. hastata* and *T. indica* are important species in pharmacology (Bergeret and Ribot, 1990) as are most of the species for which medicinal uses have been reported. In fact, the inventory of medicinal species sold by the naturo-paths in a survey of different markets in Senegal has shown that some leafy vegetables, including *T. indica*, *M. oleifera*, *F. capensis*, *F. iteophylla*, *L. hastata*, *G. triacantha*, even though consumed as vegetables, are also highly prized for their pharmacology (Gueye et al 2005; Lo et al., 1999).

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