

The Gradual Loss of African Indigenous Vegetables in Tropical America: A Review

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Leaf vegetables and other edible greens are a crucial component of traditional diets in sub-Saharan Africa, used popularly in soups, sauces, and stews. In this review, we trace the trajectories of 12 prominent African indigenous vegetables (AIVs) in tropical America, in order to better understand the diffusion of their culinary and ethnobotanical uses by the African diaspora. The 12 AIVs were selected from African reference works and preliminary reports of their presence in the Americas. Given the importance of each of these vegetables in African diets, our working hypothesis was that the culinary traditions associated with these species would be continued in tropical America by Afro-descendant communities. However, a review of the historical and contemporary literature, and consultation with scholars, shows that the culinary uses of most of these vegetables have been gradually lost. Two noteworthy exceptions include okra (*Abelmoschus esculentus*) and callaloo (*Amaranthus viridis*), although the latter is not the species used in Africa and callaloo has only risen to prominence in Jamaica since the 1960s. Nine of the 12 AIVs found refuge in the African-derived religions Candomblé and Santería, where they remain ritually important. In speculating why these AIVs did not survive in the diets of the New World African diaspora, one has to contemplate the sociocultural, economic, and environmental forces that have shaped—and continue to shape—these foodways and cuisines since the Atlantic slave trade. Since these vegetables are neglected and underutilized species (NUS) that represent the biocultural heritage of the African diaspora in the Americas, their culinary traditions merit intensified scholarly attention and conservation efforts.

Las verduras de hoja y otras hortalizas verdes forman un componente crucial de las dietas tradicionales en el África subsahariana, utilizadas popularmente en sopas, salsas y guisos. Aquí, revisamos las trayectorias de doce prominentes vegetales indígenas africanos (VIAs) en América tropical, con el fin de entender mejor la difusión de sus usos culinarios y etnobotánicos por la diáspora africana. Los doce VIAs fueron seleccionados de trabajos de referencia africanos e informes preliminares reportando su presencia en las Américas. Dada la importancia de cada uno de estas verduras de hoja y hortalizas verdes en las dietas africanas, nuestra hipótesis fue que las comunidades afrodescendientes en América tropical continuarían con las tradiciones culinarias asociadas con estos VIAs. Sin embargo, una revisión de la literatura histórica y contemporánea, y consultas con especialistas científicos, muestra que se han ido perdiendo gradualmente los usos culinarios de la mayoría de estos VIAs. Dos excepciones notables incluyen la okra (*Abelmoschus esculentus*) y el callaloo (*Amaranthus viridis*), aunque esta última no es la especie utilizada en África y el callaloo solo ha alcanzado prominencia en Jamaica desde la década de los 1960s. Nueve de los doce VIAs encontraron refugio en las religiones de origen africano Candomblé y Santería, donde siguen siendo de importancia ritual. Al

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contemplar por qué estos VIAs no sobrevivieron en las dietas de la diáspora africana del Nuevo Mundo, uno tiene que considerar las fuerzas socioculturales, económicas y ambientales que han formado—y continúan formando—a estas prácticas alimentarias y culinarias desde el comercio transatlántico de esclavos. Dado que estas hortalizas son especies desatendidas y subutilizadas (especies vegetales promisorias) que representan el patrimonio biocultural de la diáspora africana en las Américas, sus tradiciones culinarias merecen una mayor atención académica y más esfuerzos de conservación.

As verduras e outras hortaliças verdes sempre desempenharam um papel fundamental na dieta da África Subsaariana, onde são utilizadas em sopas, molhos e cozidos. Dada a importância destas espécies nesta região, este manuscrito tenta retratar a difusão dos usos culinários e etnobotânicos de doze hortaliças Africanas (AIVs) usadas pela Diáspora Africana na América tropical. Tais espécies foram selecionadas a partir de obras de referências Africanas, e em estudos preliminares descrevendo suas ocorrências no continente Americano. Nossa hipótese previa que as tradições culinárias associadas a estes vegetais seriam mantidas pelos Afrodescendentes vivendo no novo continente. No entanto, revisões da literatura tanto histórica quanto contemporânea, bem como consultas com especialistas no assunto, nos mostram que estas tradições culinárias vêm diminuindo gradativamente. Duas exceções importantes são o quiabo (*Abelmoschus esculentus*) e o caruru/bredo (*Amaranthus viridis*). Esta última, a qual não é mesma espécie científica usada na África, se tornou popular na Jamaica apenas depois dos anos sessenta. Nove AIVs estudadas, entretanto, ainda são amplamente utilizadas em religiões de matriz Africanas, tais como o Candomblé e a Santería, onde são consideradas de grande importância ritualística. Uma vez que estas AIVs não foram mantidas na dieta do dia-a-dia da Diáspora no Novo Mundo, é preciso então considerar os possíveis fatores socioculturais, econômicos e meio-ambientais que influenciaram, ou que ainda influenciam os costumes e tradições associadas a estes vegetais para os Afrodescendentes Americanos. Tendo em vista que estas espécies negligenciadas ou subutilizadas (NUS) constituem uma importante parcela da herança biocultural da Diáspora Africana nas Américas, é imprescindível que maiores estudos e esforços de conservação biocultural sejam executados.

Key Words: African diaspora, edible plants, Neglected and Underutilized Species, cuisine, ethnobotany, AIVs, traditional foods, leaf vegetables, Atlantic slave trade..

Introduction

The infamous Atlantic slave trade represented “the largest long-distance coerced movement of people in history” (Eltis 2007). Over 12 million enslaved sub-Saharan Africans were transported to the Americas over the course of nearly four centuries—from 1501 to 1866 (Nunn 2008). Winds, currents, and geopolitics shaped their provenance and final destination. Africans arriving in Brazil came predominantly from Angola and to a lesser extent from southeast Africa and the Bight of Benin. On the other hand, Africans carried to the Caribbean and North America were mainly brought from West Africa, especially from the Bights of Biafra and Benin, as well as the Gold Coast (Voyages 2018). Brazil witnessed the arrival of nearly five million Africans between 1538 and 1851, more than any other colony or country. The French, Dutch, English, and Spanish Caribbean Islands received well over four million Africans. Nearly 400,000 arrived in the USA, and almost 300,000 were transported to Dutch Guiana (Suriname) (Voyages 2018). Driven by the labor demands of plantation

agriculture—especially sugar and tobacco in the Caribbean—and mining for gold and silver in Brazil, the trade in Africans served to replace the population void left by the catastrophic demise of the Amerindian population. As a result, from the Caribbean and down the coast of Brazil, the New World human landscape has been dominated numerically throughout much of the past five centuries by people who trace their ancestry to Africa (Klein 1990).

Africans introduced numerous cultural elements to the Americas. Western African–derived religions, healing systems, music, language, and myriad other features of African life and lifeways, great and small, arrived and survived, often hybridized with Amerindian and European traditions (Carney and Voeks 2003). Counted among these was ethnobotanical knowledge and practice. African medicinal species, many of which were weeds and other successional species, arrived by chance in the Americas and were incorporated early into healing plant pharmacopeias (Voeks 2013). Domesticated crop plants, such as African rice (*Oryza glaberrima* Steud.), ackee (*Blighia sapida* K.D.Koenig), African oil palm

(*Elaeis guineensis* Jacq.), African yams (*Dioscorea* spp.), and sesame (*Sesamum indicum* L.) arrived early in the Americas and were embraced by people of African descent (Bedigian 2013; Carney and Rosomoff 2011; Parry 1955; Watkins 2018). No doubt, some of these arrived via African agency, while the movement of others was facilitated by European commercial actions. Some species arrived inadvertently as weedy stowaways, whereas others were brought specifically as sustenance for Africans both during and after slavery. At the same time that African species were arriving in the Americas, species of American provenance were similarly populating the West African anthropogenic landscape through the slave trade and were soon being cultivated and incorporated into local dishes (Carney and Rosomoff 2011; Voeks 2013). Maize (*Zea mays* L.) was being cultivated in São Tomé by 1534, cassava (*Manihot esculenta* Crantz) in Gabon by 1612, sweet potato (*Ipomoea batatas* L. Lam.) in São Tomé by 1520–1540, pumpkin (*Cucurbita pepo* L.) in Guinea by 1564–1565, and new cocoyam (*Xanthosoma sagittifolium* L. Schott) was introduced to the Gold Coast in 1843, carried by repatriated slaves to Liberia (Alpern 2008). Several centuries of plant introductions between tropical Africa and the Americas, intentional and accidental, created a similar domesticated and disturbance flora in these geographically separated regions, a process of botanical appropriation and homogenization that was termed “the Columbian Exchange” by Crosby (1993).

Some of the Old World food plants that arrived in the Americas during the slave trade went on to become principal ingredients in signature dishes of the African diaspora (Walker 2001). Many were cultivated in the provision gardens of enslaved and free blacks, providing both sustenance and powerful cultural connections to their distant homelands (Carney and Rosomoff 2011). Among the pulses, pigeon peas (*Cajanus cajan* [L.] Millsp.) in the Caribbean deserve mention. In the southern USA, black-eyed peas (*Vigna unguiculata* [L.] Walp.) became especially associated with Hoppin’ John, a dish prepared with peas, rice, and bacon, and often eaten for luck on New Year’s Day (Carney 2001). In Brazil, black-eyed peas are prepared into a dumpling known as acarajé, fried in African palm oil and sold on the streets of northeastern Brazilian cities. It was first noted in the literature in Brazil in 1802, being sold by Africans on the streets of Salvador, Bahia (Borges 2008, 11). Acarajé is also tightly associated with practitioners of the Candomblé

religion, a belief system that arrived during the slave trade from Nigeria and Benin, and as such, represents an important cultural marker of African cuisine in Brazil (Voeks 2013). Another important example is the ackee, introduced from West Africa to Jamaica probably in the 18th century, although the precise date remains obscure. The ackee fruit, in spite of its potential toxicity if not harvested properly, has achieved considerable prominence in Jamaican culture, even becoming a chief ingredient in the Jamaican unofficial national dish “ackee and saltfish” (Higman 2008; Picking and Vandebroek 2019; Rashford 2001).

The present review focuses on African vegetables in tropical America. Often named “African indigenous vegetables” (AIVs), they are “exotic or indigenous taxa [in Africa] that have been in use for a sufficient length of time to be part of the local food habits, knowledge systems and customs of [African] communities” (Shackleton et al. 2009, 66). Among the various foodways that characterize West African cuisines, the preparation of leafy and green vegetables into soups, sauces, and stews stands out. Perhaps no other cooking tradition is featured so prominently in their regional cuisine (Walker 2001). Green vegetables are used uncooked as salads, boiled, steamed, or fried and served as side dishes, used as edible packing material, and especially added to soups and stews. Many impart a bitter flavor, a common characteristic of African dishes. Some with mucilaginous properties are used as thickening agents for stews, including okra, hibiscus or sorrel, and jute mallow (*Corchorus olerarius* L.) (Carney and Rosomoff 2011, 177–179). Some are domesticated or semidomesticated and cultivated in home gardens, whereas many more are weedy or otherwise gathered in the wild. Continent-wide, there are upwards of 1000 species employed for their greens. Irvine (1956) reported over 150 species of greens being consumed in West Africa alone. More recently, 245 vegetable species were documented in Benin, a relatively small West African nation, of which 72% are wild and only 19% are clearly under cultivation (Achigan-Dako et al. 2010, 21). In diets that are often dominated by starchy crop plants, such as maize and cassava, green vegetables represent crucial sources of minerals and micronutrients, such as vitamins A, C, and E; folate; calcium; iron; and zinc (Walker 2001; Yang and Keding 2009).

Although several important crop species and traditional foodways arrived in tropical America from Africa because of the Atlantic slave trade, there is

little discussion in the literature regarding leaf vegetables and edible greens (with the exception of Carney and Rosomoff 2011). Therefore, the objective of this article is to review the evidence for the arrival and continued use of these AIVs in tropical America in the cuisines of the African diaspora. Given the importance of leaf vegetables and edible greens in the sub-Saharan African diet (Achigan-Dako et al. 2010; Chweya and Eyzaguirre 1999; Irvine 1956; Shackleton et al. 2009), our working hypothesis was that the majority of these AIVs, and the culinary traditions associated with them, would continue to be used by Afro-descendants in tropical America.

Methods

It was outside the scope of this paper to include plant use in contemporary migrations, which merits its own study and review (cf. Renne 2007). Instead, we focused on evidence for the continuation of culinary plant use practices since the Atlantic slave trade by the African diaspora in the Americas.

In order to compile a list of likely species, we combined a literature review, our own field observations in Latin America and the Caribbean, and consultations with in-country specialists. Comprehensive published sources of African vegetables consulted as source material included the PROTA4U Database and the following reference works: Achigan-Dako et al. (2010), Chweya and Eyzaguirre (1999), Grubben and Denton (2004), Irvine (1956), and Shackleton et al. (2009). From the literature, we developed a preliminary list of AIVs based on the following five criteria: (1) the species has a *primary use* in Africa as a leaf vegetable (or edible green) according to several reference works; (2) the species is geographically widespread in sub-Saharan Africa; (3) the species has an established importance as a leaf vegetable (or edible green) and is commonly used in Africa, and (4) the species is present in tropical America; or (5) there was a preliminary indication of the ethnobotanical use of the species by the African diaspora in the Americas.

We focused on leaf vegetables, with the exception of okra (*Abelmoschus esculentus*), which is a green (fruit) vegetable, because of the plant's well-established signature role in the African diaspora in the Americas. We excluded vegetables that are primarily used in Africa for another purpose, such as root vegetables that serve as a source of carbohydrates, and pulses that are used as a source of

proteins, except when they had an equivalent dual purpose. For example, cowpea (*Vigna unguiculata*) is an important pulse but also an important leaf vegetable in West Africa and was included. We also excluded a considerable list of important vegetables that arrived in Africa from the Americas during the colonial era which have been incorporated into African cuisine, such as pumpkin, sweet potato, and new cocoyam (*Xanthosoma sagittifolium*). Based on their well-documented importance as leaf vegetables in Africa, there were three notable exceptions to the exclusion of non-native African species on our list. These were several amaranths (*Amaranthus* spp.), including red amaranth (*Amaranthus cruentus* L.), which was an early arrival in Africa from the Americas (Alpern 2008), Malabar spinach (*Basella alba* L.) from Asia, and cassava (*Manihot esculenta* Crantz) from South America. Our initial plant list was modified further after discussions about the importance of the selected AIVs in Africa and tropical America, with a special emphasis on their use by the African diaspora. We also consulted several specialists, mentioned in the acknowledgments, for their personal knowledge of the presence and use of these species in tropical America. Spelling of species, family, and author names were verified with the *Catalogue of Life* (<http://www.catalogueoflife.org/>).

For the historical literature review, we used relevant archival resources, especially the published historical works of European colonial physicians and scientists. Many of these were examined from online sources, including the Biodiversity Heritage Library, whereas others were consulted in the Huntington Library in Pasadena, California.

In addition, we consulted contemporary scientific publications and reviews. The presence or absence of specific AIVs was identified through a detailed literature search using binomials (and some synonyms) in Google Scholar, Web of Science, and JSTOR. We largely confined our search to tropical America, including the West Indies and the Caribbean, and the Southeastern USA, and added geographic identifiers if the keyword search for a species and its use as a vegetable in tropical America turned up too many results. Key words included "species name," vegetable, leaves, America, and ("African diaspora" OR Afro-descendant* OR Maroon*). Finally, perusal of the bibliography of consulted publications ("snowball referencing") led to other publications.

We acknowledge that popular websites on the internet can be a rich source of knowledge about culinary uses and foodways. However, we were very

conservative regarding their use and incorporation of the results, preferring to use scholarly literature instead, since the information on these sites may be more reflective of modern trends rather than traditions.

Results

Of the dozens of prospective species that we explored, a list of 12 AIVs (11 leaf vegetables and one fruit vegetable) was retained according to the five criteria set out in the methods (Table 1). Of these, nine species are native to Africa and three are exotic, even though for some species their exact origin remains disputed.

ABELMOSCHUS ESCULENTUS (L.) MOENCH

The geographical origin of *Abelmoschus esculentus* is disputed, with different authors considering either a West African, Ethiopian, or South Asian origin (De Lannoy 2001; Grubben and Denton 2004; Kumar et al. 2010). Although the leaves are edible and consumed in Africa, okra is mostly prized as a fruit-vegetable, as the usual edible part is the immature green fruits (Grubben and Denton 2004). West Africans appreciate these fruits especially for their mucilaginous properties in soups, stews, and sauces. Early observers in West Africa noted the prominence of okra in the local cuisine. In Sierra Leone, Thomas Winterbottom (1803, 64) reported that okra entered into pepperpots, just as they did in “the celebrated pepper pot of the West Indies.” Dalziel (1935, 128–129) reported that okra sauces in Sierra Leone were known as “palaver sauce,” and usually included okra leaves, immature fruits, cassava, chilies, and sometimes dried okra flowers. Okra fruits can also be conserved for later consumption by drying in the sun and then grinding them to a powder (De Lannoy 2001), or by pickling (Grubben and Denton 2004). Irvine (1956) noted that okra leaves were used dried or fresh, and there were also several medicinal properties associated with the species.

Okra was the first AIV recorded in the Americas. Dutch physician Willem Piso reported from Brazil in the mid-1600s that quigombo (origin of the term gumbo) had been brought from Africa by slaves, and that “the Africans taught the indigenous Americans [Amerindians] how to use and prepare them” (Piso 1948 [1648], 441–445). Daniel Rolander noted from mid-18th-century Dutch Suriname that okra was much appreciated. The soup was said

to provide “extraordinary health benefits to convalescents and underweight seniors [and to] revitalize those exhausted by sex” (Van Andel et al. 2012, 855). According to Higman (2007), as early as the 1700s, okra was made into pepperpots in the Caribbean. By 1763, it was reportedly cultivated in every Jamaican garden. In the 18th and 19th centuries, okra was known as a chief vegetable in Jamaican pepperpots and thick soups, with a pepperpot being described as a Sunday dish and “soup of tender greens and salt meats, including callaloo of several sorts, okra, yams [*Dioscorea* spp.], coco [*Xanthosoma sagittifolium*], plantain, seasoned with peppers” (Higman 2008). However, nowadays in Jamaica, okra is often steamed with fish and serves more as garnish (Vandebroek pers. obs.).

The name quimbombó for *Abelmoschus esculentus* is reportedly of African origin (Esquivel and Hammer 1992). Okra soup or stew is now a signature dish of the African diaspora throughout most of the Americas. Walker (2001) discusses the odd wordplay of okra in Louisiana. Although the term gumbo for New Orleans’ iconic dish comes from the African Bantu language (“ki ngombo” in Angola, Van Andel and Ruyschaert 2011), Louisiana gumbo in fact now usually excludes okra, its namesake, including instead native American sassafras leaves (*Sassafras albidum* [Nutt.] Nees) as a thickener (Rowell et al. 2007). When it is prepared with okra, the dish is referred to [redundantly] as okra gumbo, meaning “okra okra” (Walker 2001, 64). Louisiana gumbo is the northern version of callaloo, a profoundly important okra-based dish enjoyed throughout the Caribbean (except in Jamaica). Walker (2001, 64) says that callaloo in Trinidad is composed of okra and the leaves of cocoyam, and many consider it to be Trinidad’s national dish. Higman (2007) reports that “one of the ‘native delicacies’ of Trinidad was callaloo, a green soup made with tannia leaves [*Xanthosoma sagittifolium*] and ochras, in which is boiled a land crab.” In the eastern Caribbean, a dish called coo-coo (or coucou) combines okra with a peppery preparation of cornmeal (polenta) (Bourne et al. 1988). In Barbados, cou-cou (made with ochro, the Bajan name for okra) and flying fish is the national dish (Higman 2007). All these are considered characteristic West Indian dishes. Okra is nowadays considered a standard element of Surinamese cuisine (Van Andel et al. 2012). Intriguingly, the common name for *A. esculentus* in Haiti is calalu (Fig. 1), whereas callaloo in Jamaica today refers solidly to the species

TABLE 1. AFRICAN INDIGENOUS VEGETABLES (AIVS) OCCURRING EITHER IN A CULTIVATED OR WILD STATE IN THE AMERICAS.

Species and status in the Americas (wild and/or cultivated)	Family	Common names	Culinary use as greens in the Americas	Religious use in the Americas
<i>Abelmoschus esculentus</i> (L.) Moench (cultivated)	Malvaceae	Okra (US, Bah, DR, Jam, L. Ant.); ochra (L. Ant.); quiabo (Port); gombo (Fr, Hai); gonbo (L. Ant.); gumbo (Hai, L. Ant.); quingombó (PR); güingambo (L. Ant.); gombó, bombó, bolondrón (Cub); quimbombó (Cub, Col, Ven); quingambó (PR); chimbombó (Col, L. Ant.); kimkambo, kinkambo (L. Ant.); kinkambo (PR); ilá (Cand); lila (Sant); calalou, calalou gombo (Hai); molondrón (Cub, DR, PR, L. Ant.); nafé (Cub)	Yes, signature vegetable of the African diaspora	Yes
<i>Adansonia digitata</i> L. (cultivated, although not widespread in the Americas)	Malvaceae	Baobab (Eng, Cub, Hai, PR, Jam); baobá (Port); monkey breadfruit (Jam); mapou africain, mapou étranger, mapou zombi (Hai); pan de manos, pan de mono (Cub)	No	Yes (but only one reference from Brazil)
<i>Amaranthus</i> spp., incl. <i>Amaranthus dubius</i> Mart. and <i>Amaranthus viridis</i> L. (wild and cultivated)	Amaranthaceae	<i>A. dubius</i> : amaranth, pigweed (Eng); amarante, brède de Malabar (Fre); amaranto, bredo (Port); bledo (Cub, DR, PR); bledo blanco, zepina, zepino (DR); blero, blero blanco (PR); epinard, epinard marron (Hai); epinard du pays, zepinna, spinach (L. Ant.); southern pigweed (Bah); Spanish calalu (Jam) <i>A. viridis</i> : amaranth, pigweed, spinach, African spinach (Eng); bledo (Port, Cub, Arg, DR); caruru (Arg, Br); tètè (Cand, Sant); garden calalu, callaloo (Jam); bledo blanco (Cub); blero blanco, blero manso (PR); épinard, épinard blanc (Hai); slender amaranth (Bah)	Yes, but not <i>A. cruentus</i> L., the species most popular in Africa; amaranths are not used exclusively by the African diaspora in the Americas	Yes
<i>Basella alba</i> L. (wild and cultivated)	Basellaceae	Malabar spinach (Eng, L. Ant.); beralha, carurú cipó, espinafre-de-malabar, espinafre-do-ceilão, couve-de-cerca (Bra); spinach, English spinach, basella, Ceylon spinach, poi spinach (L. Ant.); acelga trepadora, bretaña, espinaca de Nueva Zelândia, libato (PR); country spinach (Bah, Jam); espinaca, espinaca de malabar (Cuba)	Yes, but not used frequently	No
	Amaranthaceae		No (ornamental)	Yes

TABLE 1. (CONTINUED).

Species and status in the Americas (wild and/or cultivated)	Family	Common names	Culinary use as greens in the Americas	Religious use in the Americas
<i>Celosia argentea</i> L. (wild and cultivated)		Lagos spinach (Eng); crista-de-galo, celósia, espinafre-africano, suspiro, crista-plumosa (Bra); alacranillo, caddillo (DR); albahaca plateada (PR); cockscomb (Eng, Bah, DR); cresta de gallo (Cub, DR); crete coq, crete coq d'Inde, crete de coq simple, herbe à cataractes, herbe à malingers, herbe à tates, herbe à verrues, la malaye, ti-jeannite, ti-jiannite (Hai); mirabel (Cub), moco de pavo (DR); caccomb (Jam)		
<i>Corchorus olitorius</i> L. (wild and cultivated)	Malvaceae	Jute mallow, Jew's mallow (Eng, Jam); carurí-da-Bahia, morreia, melóquia, melouquite, jura-azul, satar, melokhia (Bra); lalo, feuilles lalo, lalou, petit lalo, petit lalou, ti-lalo, tilalou (Hai); gramigrain, Indian corchorus (Bah); gregré, grénguer, gringuelé, yute, nénguer, grengué (Cub)	Yes, but use restricted to Haiti and perhaps Cuba	Yes
<i>Gymnanthemum amygdalinum</i> (Del.) Sch. Bip. ex Walp. (synonym: <i>Vernonia amygdalina</i> Del.) (cultivated)	Asteraceae	Bitter leaf, common bitter leaf (Eng); vermonie, vermonie commune, ndole (Fre); succumadeira, pau fede (Port); boldo, alumá, arumá (Bra)	No	Yes
<i>Gynandropsis gynandra</i> (L.) Briq. (synonym: <i>Cleome gynandra</i> L.) (wild and previously cultivated)	Cleomaceae	Spider plant (Eng)	? (forgotten vegetable)	No
<i>Hibiscus sabdariffa</i> L. (cultivated)	Malvaceae	Roselle, hibiscus (Eng, DR); vinagreira, caruru-azedo, hibisco, rosela, groselha, groselheira, quiabo-azedo (Bra); ewé Isá pa (Cand); sorrel (Bar, Jam); Jamaican sorrel, red sorrel (Jam); agrio de guinea (Cub, PR); aleluya roja de Guinea, quimbombó chino, rosella, serení (Cub); kenaf, maravilla (DR); oseille de guinée (Hai); roselle (Cub, Hai, Jam); viña (PR), vinagrillo (DR)	Yes, but use of the leaves is restricted to mestizo and nonindigenous groups (Brazil); widely used as a beverage (flower calyces)	Yes
<i>Manihot esculenta</i> Crantz (cultivated)	Euphorbiaceae	Cassava (Eng, Bah, Jam, L, Ant.); yuca (Spa, Cub, DR, L, Ant., PR); manioc (Fre, DR); mandioca, aipim, macaxeira (Port); boniata, huca, naitboa,	Yes, but use of the leaves is restricted to Amerindian and other Amazonian dishes (Brazil), one report by Maroons	Yes

TABLE 1. (CONTINUED).

Species and status in the Americas (wild and/or cultivated)	Family	Common names	Culinary use as greens in the Americas	Religious use in the Americas
<i>Solanum macrocarpon</i> L. (cultivated)	Solanaceae	nubaga, yuca agria, yuca blanca; yuca Cartagena, yuca cristalina (Cub); Manihot esculenta, mandiaco, mandiaco, manioc amer, yuca brava (DR); yuca dulce (Cub, DR); mannioc, manioc américain, manioc amre (Hait); manihot (Hait, L. Ant.); manioc noir (L. Ant.); tapioca (Jam)	in French Guiana, and one report in a mixed Afro-descendant community in Colombia	No
<i>Vigna unguiculata</i> (L.) Walp. (cultivated)	Fabaceae	African eggplant (Eng); aubergine africaine, gboma, anghive, aubergine gboma (Fre); berinjala-amarela, beringela-africana, jilozão (Bra) Cowpea (Eng, DR, Jam); black-eyed pea (Eng, Jam); feijão-fradinho, feijão-de-praia, feijão-caupi, feijão-guai, feijão-de-corda (Bra); canari, caupi, frijol de vaca, frijolitos blancos (DR), chícharo de vaca, engorda muchachos, frijol cabecita prieta, frijol cuarenta días, frijol de bollos, frijol de carita, frijol engorda muchachos, frijol garbonzo, frijol huevo de tomeguín (Cub); pois desconnu, pois inconnu, pois liane, pois manger cochon (Hait); gub-gub (Tri)	Yes, occasionally consumed for its fruits and leaves, mainly in northern Brazil No	Yes

Languages: American/British English (Eng), French (Fre), Portuguese (Port), Spanish (Spa). Countries: Argentina (Arg), Bahamas (Bah), Barbados (Bar), Brazil (Bra), Colombia (Col), Cuba (Cub), Dominican Republic (DR), Haiti (Hait), Jamaica (Jam), Lesser Antilles (L. Ant.), Puerto Rico (PR), Trinidad (Tri), Venezuela (Ven). African-derived religions: Candomblé (Cand), Santería (Sant). Sources: Acevedo-Rodríguez and Strong (2007); Barros (2011); Cabrera (1975); Dalziel (1935); Kays and Dias (1995); Kinupp and Lorenzi (2014); Plants for a Future; Sander and Vandebroek (2016); Schneider (1991); Voeks (1997)

Amaranthus viridis (Table 1) (Acevedo-Rodríguez and Strong 2007; Sander and Vandebroek 2016).

In Brazil, okra is most often cooked in a stew with African palm oil, chilies, onions, and fish or shrimp and is known as carurú. In the late 19th century, Nina Rodrigues (1932, 128) noted that carurú was one of the foremost elements of African cuisine in Brazil, “a type of thick soup, made with okra, cow tongue or leaves of taioba [*Colocasia esculenta* (L.) Schott or *Xanthosoma sagittifolium*], with lots of palm oil and chilies, and that incorporates equally shrimp, fish, meat, or chicken.” In French Guiana, Aluku Maroons (descendants from Africans who escaped slavery) cook and consume okra leaves (Katz et al. 2012).

Okra continues today to be a principal consecrated food for followers of the Afro-Brazilian religion Candomblé. It is especially associated with orixás (spiritual entities) Xangô, male warrior deity of lightning and thunder, and Iansã, hot tempered female orixá of wind and tempests. Carurú is also associated with the celebration of Ibeji, the mythical Yoruba twins, and in many cities is served in the month of September as a religious obligation. The ingredients of Afro-Brazilian carurú vary but always include okra and African palm oil (Cacciatori 1977, 85; Voeks 2018, 198–200). In Cuban Santería, another African-derived religion, okra is one of the most prized foods, especially associated with orisha Chango (Cabrera 1975, 532–33). Also in Cuba, a special dish prepared with okra (*A. esculentus*), called “yonyó,” is offered to the gods (Esquivel and Hammer 1992). Maroons in Suriname reported an aphrodisiac of okra leaves drenched in rum; the okra leaves are kept under the bed tightly pressed in a ball. A soup of okra, fish, and smoked cassava flour is a dish for the spirits in Winti, an Afro-Surinamese belief system (Van Anandel and Ruyschaert 2011).

ADANSONIA DIGITATA L.

The name baobab refers to nine species of the genus *Adansonia*, the best known being *Adansonia digitata*, a massive-trunked iconic tree of sub-Saharan Africa that grows in low-lying, hot, subhumid to dry savannas. Its use as a fruit and vegetable is common in dry areas of West Africa (Shackleton et al. 2009). In addition to its widespread spiritual value, Dalziel (1935, 113) reported a number of material uses in Africa. The fruit, which is high in vitamin C, is widely consumed. The leaves of baobab are used either fresh as a cooked vegetable, or dried and powdered as an ingredient in soups and sauces (Bosch et al. 2004). The young leaves are high in provitamin A, used as a soup vegetable, and are “a quite good substitute for spinach.” It is a good thickener and makes for a slimy soup (Shackleton et al. 2009). In Benin and elsewhere, the leaves are dried, powdered, and used to thicken soups (Maundu et al. 2009). The leaves have many other uses, including fodder for horses and several medicinal uses. In Benin and Mozambique, small sections of the bark are used in a bath to strengthen and fatten up babies (Townsend et al. 2014; Voeks pers. obs.).

Early in the 19th century, Macfadyen (1837) noted that “in Africa [they] dry the young leaves, and mix them in a state of powder with a dish called couscou, prepared by stewing yams, or other similar roots with a small portion of animal food, in order to improve the flavour and taste.” In addition, he observed the sociocultural importance of the tree as follows: “. . . in Africa, the trunk, hollowed out, is employed as a coffin for persons of distinction; and that the bodies are by this means preserved, as if they had undergone the process of embalming.”

Although baobab is extensively distributed in Africa, Madagascar, and Australia, probably by

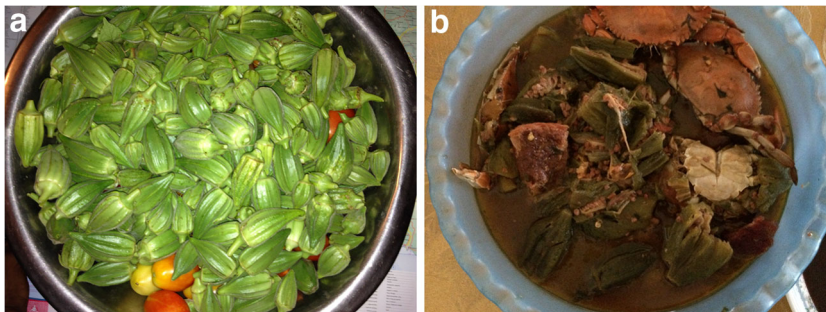


Fig. 1. a Green fruit pods of *Abelmoschus esculentus* (calalu) in Haiti. b Haitian crab stew with *A. esculentus*.

means of water dispersal (Bell et al. 2015), there is no suggestion that its presence in the Americas is as a result of natural seed dispersal. Its first observation is in Barbados in 1750, the Warren Baobab, which had been introduced 12 years earlier (Rashford 1996). Two old trees, grown from seed imported in 1738 from West Africa, are considered one of the seven wonders of Barbados. Baobab is dispersed in other islands in the Caribbean, as well as in parks in Brazil. It is also grown as an ornamental in South Florida (Rashford 1996). In Bahia, Candomblé practitioners recognize the tree as sacred and plant it (Dos Santos 2016). There is, however, no evidence that the leaves of baobab are consumed anywhere in the Americas (Rashford pers. com.)

AMARANTHUS SPP.

Several amaranth species (*Amaranthus* spp.) were domesticated in Central America and Mexico and introduced several centuries ago to tropical Africa (De Lannoy 2001). The genus is known both for its edible seeds and leaves. Today, the amaranths are among the most important leaf vegetables in sub-Saharan Africa and have diversified into a wide range of local cultivars (Maundu et al. 2009). Dalziel (1935, 35–36) listed several species of *Amaranthus* used as pot herbs. Amaranths introduced to Africa were easily adopted by local people and are today widely used alongside native African amaranths (Shackleton et al. 2009). One of the most commonly consumed species in sub-Saharan Africa is red amaranth (*Amaranthus cruentus* L.). It is especially prized in Benin, Togo, Sierra Leone, Angola, Zambia, the Ivory Coast, Nigeria, Tanzania, and Zimbabwe (De Lannoy 2001; Maundu et al. 2009). Although of New World origin, *A. cruentus* is considered “a longtime resident” of Africa (Alpern 2008, 83; Sogbohossou et al. 2015). It was originally grown in Africa for its seeds (De Lannoy 2001). Four species of *Amaranthus* are also cultivated vegetables in eastern Asia: *A. cruentus*, *A. blitum*, *A. dubius*, and *A. tricolor* (Costea et al. 2003), with *A. tricolor* being the most popularly grown for commerce there (Grubben 2016). The last three amaranths presumably originate from Southeast Asia and were carried to other places by emigrants as leaf vegetables, whereas the main leaf amaranth in Africa (*A. cruentus*) hails from Central and South America (Grubben 2016). Of the Asian amaranths, *A. dubius* and *A. blitum* are also important leaf vegetables in Africa and are found wild as well as cultivated (Shackleton et al. 2009).

Various leaf amaranths have been or are still consumed in tropical America, even though reports of their consumption by the African diaspora are not that common for such widely distributed and weedy plants. In the Americas, we did not find reports of consumption of *A. cruentus*, the much-prized amaranth in Africa. The species that stands out most for its prominence as a cultivated vegetable is *Amaranthus viridis* L. in Jamaica. It is possibly of Asian origin (Grubben 2016), although in Southeast Asia it is only occasionally collected as a pot herb from the wild (Jansen 2004).

In Haiti, Belize, and Suriname, the leaves of *A. dubius* are reportedly used in soups or eaten as a nutritional medicine for treatment of anemia. But no exact information is available about its frequency of cultivation or consumption (Balick and Arvigo 2015; Jean-Baptiste 1994; Van Andel and Ruysschaert 2011). In Suriname, *A. dubius* is described as “wild, sometimes cultivated as a vegetable” and “sometimes sold in vegetable stands in [the capital] Paramaribo” (Van Andel and Ruysschaert 2011). In French Guiana, the Aluku Maroons cultivate and eat the leaves of *A. spinosus* and *A. dubius* (Katz et al. 2012). In Cuba, several ruderal amaranths were consumed during the embargo, in thick soups and stews, in the same way as spinach (Roig y Mesa 1988). In Trinidad, leaf amaranths are called spinach bhaji, or simply bhaji (an East Indian name), and the leaves are eaten stewed or in a soup. But cultivation is not as widespread as that of mainstream exotic vegetables. A household survey in Trinidad showed that only 18% of respondents ($N = 678$) grew it in their home gardens, 41% reported consuming it regularly, and that older people, Indians (Hindus and Muslims), and higher income groups consumed more bhaji (Ramdwar et al. 2017). Among Afro-descendant communities in the Colombian Caribbean coast, 60 to 80% of people interviewed reported not having consumed *A. dubius*, a wild vegetable known as “bleo de Puerco,” for several years, and many considered the species an animal food (Pasquini et al. 2018a).

In stark contrast to the decreasing popularity of *A. dubius* among the African diaspora in tropical America, another amaranth species has steadily gained prominence in one of the Caribbean islands over time. Since the 1960s, *A. viridis*, known as callaloo, has become the most widely consumed leaf vegetable in Jamaica (Higman 2008). Although *A. viridis* has a weedy habit like other amaranths, it is popularly cultivated for family consumption

in Jamaican kitchen gardens and farms, but also on a larger scale, mainly for the domestic market (Fig. 2). For preparation, the stalks are peeled and cut up together with the leaves, then combined with a sautéed seasoning of thyme, garlic, tomato, and bell pepper, and steamed until they are soft (Fig. 3). Callaloo is popularly served in Jamaica with fried dumplings, starchy fruits or tubers, or added to curried or stewed chicken back in the last stage of preparation.

In Brazil, several amaranths go by the name carurú (Neto et al. 2016), including *A. deflexus* L. and *A. spinosus*, both of which are weedy ruderals and commonly used as forage for pigs (Kinupp and Lorenzi 2014). Although *A. viridis* was eaten in Brazil in the past (Peckolt 1871, 114), this tradition is less common now. Interestingly, carurú-azedo in Brazil refers to *Hibiscus sabdariffa* (Carney and Rosomoff 2011), an unrelated species, the leaves of which are also consumed as greens in Africa, and a plant that is commonly linked to the African diaspora (Pasquini et al. 2018a). And in Manaus, Brazil, carurú-cipó refers to *Basella alba*, another leaf vegetable linked to the African diaspora (Voeks pers. obs.).

In Trinidad and Tobago, the name callaloo does not refer to a plant species at all, but rather a signature dish that contains okra and dasheen (*Colocasia esculenta*). In Cuba, the name calalú is also applied to a dish with okra as the main ingredient (Esquivel and Hammer 1992), whereas in Haiti, the name calalu is directly applied to the okra plant (*Abelmoschus esculentus*) (Acevedo-Rodríguez and Strong 2007).



Fig. 3. *Amaranthus viridis* (callaloo) leaves steamed with tomato, scallion, thyme, sweet green pepper, and garlic and served with yellow yam (*Dioscorea cayenensis* Lam.) in Jamaica.

Ritual uses of *A. viridis* continue among the followers of African-derived religions in Latin America. Among Brazilian Candomblé followers, the species is known as tètè (Barros 2011), the Yoruba term from West Africa (Verger 1995, 631). Among Santería followers in Cuba, the species is also known as tètè and is included as food for the orishas, as well as for a large number of medicinal purposes (Cabrera 1975, 346). Cuban *yerberias* sell the leaves of the species, known as bledo blanco, for ritual, edible, and medicinal purposes (Melander 2007). In Suriname, the leaves of *A. dubius* and those of the smaller *A. blitum* are used in herbal and ritual baths to appease the spirits, fend off evil, and for good luck (Van Anandel and Ruysschaert 2011).



Fig. 2. a *Amaranthus viridis* (callaloo) bundles prepared for sale. b *A. viridis* cultivation in a peri-urban farm in Portmore, Jamaica.

BASELLA ALBA L.

Malabar spinach, also called Indian spinach or Ceylon spinach, is a perennial vine native to India. It is a leaf vegetable that has spread rapidly throughout most of tropical Africa (De Lannoy 2001). Malabar spinach is an herbaceous perennial grown as an annual, with green or red climbing stems, cultivated for its succulent leaves, which taste like spinach. In West Africa, it is cultivated for its young shoots and leaves and its slightly mucilaginous properties (Abukutsa-Onyango 2004; Dalziel 1935, 38; Irvine 1956). It can either be boiled in stews or soups, fried in oil, or consumed green in a salad (Abukutsa-Onyango 2004). It requires high temperatures to grow well and tolerates high rainfall. It is cultivated in low-altitude to mid-altitude regions in Central Africa, Ivory Coast, Nigeria, and Burkina Faso. Harvesting of the young shoots or leaves can begin about 6 weeks after sowing. Local African cultivars have names that refer to the color of the stems and leaves. In certain regions of tropical Africa, Malabar spinach is an integral part of the traditional diet (De Lannoy 2001). However, other authors call it a minor vegetable that is often grouped with other green vegetables (Abukutsa-Onyango 2004).

In Jamaica, *Basella alba* is known as spinach, but it is not widely or frequently cultivated or eaten (Fig. 4). In Puerto Rico, Liogier and Martorell (2000) describe the species as “sparingly cultivated at lower elevations.” The species is found on Cuba’s Isla de la Juventud, but there is no record of it being consumed (Esquivel and Hammer 1992). Also in Cuba, Roig y Mesa (1988) writes that the Chinese cultivate the red variety of the species and eat the leaves as a vegetable. In Trinidad and Tobago, it is cultivated and known as poi bhaaji or poi spinach, with the Indian term bhaaji (alternatively written as bhaji or bhagee) referring to “a raw or cooked green leafy vegetable” (Winer 2008).

In French Guiana, *Basella alba* is cultivated and described as “spinach that is regularly consumed” (Hoff and Cremers 2005). Among Afro-Colombians, it is often recognized by people, but seldom eaten (Pasquini et al. 2018a). In most of Brazil, *B. alba* is known as bertalha or couve selvagem and is sometimes consumed (Almecina Balbino pers. com.). According to Kinupp and Lorenzi (2014), it is more often cultivated and commercialized in Rio de Janeiro. In Manaus, Brazil, it is known as carurú cipó (Voeks pers. com.) but infrequently eaten, and in Brazil’s Rio Negro region, where it is cultivated, cooked, and consumed, it is

known as carurú by Amerindians (Katz et al. 2012). Although a popular vegetable in Africa and Asia, *Basella alba* is apparently sparingly consumed by Afro-descendants in the Americas. We were unable to uncover any ritual or religious uses of the species by the African diaspora.

CELOSIA ARGENTEA L.

Lagos spinach, also known as celosia or cockscomb, is an attractive perennial herb. It has upright stems that vary between 0.5–1.5 meters (m) in height when fully grown with flame-red flowers, hence its alternate name cockscomb (Maundu et al. 2009). It is a pantropical species, and different authors consider its origin either in Hindustan (India) (De Lannoy 2001), or tropical Africa (Denton 2004). The latter author claims that the ornamental forms with attractive inflorescences probably originate in India. It is a widespread weed and popular crop in tropical Africa, especially in Nigeria, Benin, and Congo-Kinshasa, and known under various names. Its common name in the Yoruba language is translated as “make husbands fat and happy” (Denton 2004). Different cultivars of *C. argentea* are commonly grown in Nigeria, one with green leaves, and another with violet markings on the leaves (De Lannoy 2001). In West Africa, Dalziel (1935, p. 36) reported that *C. argentea* was widely used as a pot herb, usually gathered in the wild, but sometimes cultivated. Celosia is primarily used as a leaf vegetable that breaks down easily when cooked briefly. The young leaves, tender shoots and stems, and young inflorescences are cooked into soups, sauces, or stews, together with onions, hot pepper, and tomato (De Lannoy 2001; Denton 2004). The leaves of the red cultivars reportedly have a slightly bitter taste (De Lannoy 2001).

The presence of Lagos spinach as a garden ornamental was noted by Rolander in 1756 in Dutch Suriname (Van Andel et al. 2012). Dutch naturalist Hendrik Elingsz van Rijgersma also collected the species on St. Martin’s island between 1865–1875, although he did not comment on its uses (Ehn and Zanoni 2002). The species was recently collected in a Brazilian maroon (quilombola) community in the state of Espírito Santo, but it was used only as an ornamental (Crepaldi and Peixoto 2010). It is widely grown as an ornamental in residential gardens all over Brazil and is an escaped weed in tropical regions of the country (Kinupp and Lorenzi 2014). In Barbados, the species exists as a sporadic roadside weed, but is not used (Sonia Peter pers. com.). In



Fig. 4. *Basella alba* (spinach) growing in a Jamaican home garden. The species is not frequently encountered nor eaten.

Jamaica, the species can be found growing along roadsides and in yards as a weed and is scarcely known as an edible vegetable that can be “steamed and eaten to cleanse the blood,” albeit hardly if ever used (Vandebroek pers. obs.) (Fig. 5). In an ethnobotanical study in the Dominican Republic, it was recorded as an ornamental (Minier 2015).

C. argentea has ritual uses among Africa’s Yoruba (Verger 1995), and these have continued to some degree in tropical America. Among Santeria adherents in Cuba, the species is known as libbe kuko and is used in spiritual cleansing ceremonies

(Cabrera 1975, 412). It is also used in Candomblé ceremonies in Brazil (Barros 2011).

CORCHORUS OLITORIUS L.

Jute mallow or Jew’s mallow occurs wild and has been cultivated in Asia and Africa for centuries. Its geographic origin therefore remains disputed. It is a leading leaf vegetable in many African countries, much cultivated and traded, including in the Ivory Coast, Benin, Nigeria, Cameroon, Sudan, Kenya,



Fig. 5. *Celosia argentea* is a tolerated weed in Jamaican home gardens, and people know it is edible but do not appear to use it.

Uganda, and Zimbabwe (Fondio and Grubben 2011). It is an erect annual herb, usually less than a meter high. Although jute mallow grows wild in Africa, it is increasingly being cultivated in gardens (Maundu et al. 2009). Dalziel (1935, 96–97) reported its use as a mucilaginous vegetable by locals “and as a substitute for spinach by Europeans.” It continues to be much appreciated for its high mucilage content as a vegetable addition to African soups and stews (Achigan-Dako et al. 2010, 190–191). According to Fondio and Grubben (2011), “the cooked leaves form a slimy sticky sauce, comparable to okra.” In Africa, it does not appear to be important as a fiber crop apart from domestic use, in comparison with Asia where it is commercialized for jute production. The roots, leaves, twigs, and seeds are also used in Africa as a medicine (Fondio and Grubben 2011).

Although jute is (or was) cultivated extensively in the Brazilian Amazon for its fiber (WinklerPrins and de Souza 2005), its only continued contemporary use as a traditional leaf vegetable may be in Haiti and Cuba. According to Kinupp and Lorenzi (2014), it can be found in specialty organic food fairs in Manaus, Brazil, reflecting a more contemporary use adaptation. Known in Haiti as lalo, it is available wild and cultivated in home gardens, and the leaves are used interchangeably as a food and nutritional medicine in the form of a soup to treat anemia (Jean-Baptiste 1994). As a food, the leaves are also stewed with spices, in combination with either crab or meat (Greene pers. com.). We found lalo for sale

in a rural market in the Artibonité region of Haiti (Fig. 6). *C. olitorius* was featured in a checklist of Cuban cultivated plants as a fiber crop and leaf vegetable as a substitute for okra. However, the authors referred to it as a “typical African plant, formerly used by slaves to prepare some dishes,” casting doubt on its continued culinary use (Esquivel et al. 1989).

Historically, Macfadyen (1837) classified *C. olitorius* as cultivated in Jamaica and noted that “this plant may be frequently met with in our gardens; although it has in a great measure ceased to be cultivated as a pot herb. The leaves boiled, afford a very excellent and wholesome substitute for spinach.” However, to the best of our knowledge, its presence in home gardens and its use as a vegetable seems to have disappeared in Jamaica today. Adams (1972) described *C. olitorius* as an occasional weed of waste places, rough pastures, and marshy areas in 20th-century Jamaica.

The only other contemporary references to consumption of jute mallow leaves is in the ritual uses of Candomblé and Santería. Among Candomblé adherents, jute mallow is known as carurú-da-Bahia, or its Yoruba name óyó (Barros 2011, 118). Cabrera (1975, 433) counted it among the sacred foods of several Santería orishas, including Chango, Yemanya, and Oshum. It continues to be cultivated in Cuban home gardens for ritual purposes in a special dish called grenguere that is made as an offering to the gods (Esquivel and Hammer 1992).



Fig. 6. *Corchorus olitorius* (lalo) sold in a rural market in the Artibonité region, Haiti.

***GYMNANTHEMUM AMYGDALINUM* (DEL.) SCH.
BIP. EX WALP. (SYNONYM: *VERNONIA
AMYGDALINA* DEL.)**

Bitter leaf occurs wild in most countries of tropical Africa and is commonly grown as a vegetable in Benin, Nigeria, Cameroon, Gabon, and DR Congo. It grows as a 2–5-m tall shrub or small tree and is a highly appreciated vegetable in West and Central Africa (Ucheck Fomum 2004). Its narrow, lanceolate leaves are considered an ideal resource for poor farmers because the plant can grow on marginal soils, requires little outside input, and is an integral part of many African cuisines (Shackleton et al. 2009), often in soups. In Cameroon, the bitter-tasting leaves are sometimes eaten unprocessed and raw, mixed with palm oil and salt (Ucheck Fomum 2004). Dalziel reported on its ubiquitous use, but mostly as a medicinal species, “the young leaves are soaked in several changes of water and used in soup.” It is very bitter, hence its association as a medicinal food, being employed variously for its antioxidant, anti-diabetic, hepatoprotective, and other medicinal properties (Dalziel 1935, 421–422; Irvine 1956; Kadiri and Olawoye 2016).

Although widespread and of considerable culinary and medicinal significance in Africa, bitter leaf is rarely encountered in the Americas. The species is not listed in the *Catalogue of the Seed Plants of the West Indies* (Acevedo-Rodríguez and Strong 2007). We could not find any examples of the leaves being consumed in stews or soups in the Americas, and even the medicinal use of the species appears to be rare (Ferreira et al. 2009). The four vouchers in the NY Herbarium are limited to Brazil; two collection events list the plant’s medicinal use to treat problems of the liver and stomach, whereas a third collection event recorded it as an ornamental. In Montserrat, an island in the West Indies, the leaves of a related species, *Vernonia cinerea* (L.) Less., a synonym of *Cyanthillium cinereum* (L.) H. Rob., are drunk in a tea to treat measles (Brussell 2004).

Bitter leaf (alumã in Portuguese) is employed ritually by the Yoruba of West Africa, and this practice has survived in Brazilian Candomblé (Barros 2011, 176; Voeks 1997, 162). The stems of a related species, *Vernonanthura havanensis* DC., a synonym of *Vernonanthura havanensis* (A. DC.) H. Rob., are available in Cuban *yerberias* and used for ritual purposes (Melander 2007).

***GYNANDROPSIS GYNANDRA* (L.) BRIQ. (SYNONYM:
CLEOME GYNANDRA L.)**

Spider plant or cat’s whiskers is a 1-m tall herbaceous annual that is native to the Old World (Maundu et al. 2009). Others have put forward an unknown origin, either in southern Asia, Africa, or Central America (Mnzava and Chigumira Ngwerume 2004). Dalziel (1935, 21–22), using the synonym *Gynandropsis pentaphylla*, said that it was a common weedy pot herb, sometimes cultivated, with various medicinal properties. Although it is increasingly cultivated, it still grows and is collected in a wild state throughout much of Africa. In Benin, it is used both as a leaf vegetable and for its medicinal properties, including treatment of 42 different diseases (Sogbohossou et al. 2018). Throughout Africa, the young leaves or shoots, and also the flowers, are eaten boiled as a pot herb, relish, stew, or side dish. It is important as a leaf vegetable in Nigeria, Zaire, Malawi, Zimbabwe, Cameroon, Botswana, Namibia, and many other countries (Chweya and Mnzava 1997). However, Grubben and Denton (2004) ranked its presence and importance in urban markets in Nigeria (West Africa) as “absent,” and in Kenya (East Africa) as “common to important.”

The leaves are rather bitter, and to mitigate this, in Africa, they are cooked together with other leaf vegetables, including those of cowpea (*Vigna* spp.), amaranths (*Amaranthus* spp.), and black nightshade (*Solanum nigrum* L.). Bitterness is also reduced by adding milk and leaving the mixture overnight in the pot; alternatively, the leaves can be blanched in water first, then drained (discarding the cooking water) and combined with other ingredients in a stew (Mnzava and Chigumira Ngwerume 2004).

Spider plant was reported relatively early in the Americas, and it is presently a widespread weed throughout the Caribbean (Chweya and Mnzava 1997). However, Caribbean voucher specimens at the NY Herbarium did not list any edible uses, instead emphasizing its status as a roadside or agricultural weed, one voucher even carrying a note on its foul smell. Marcgrave and Piso noted in 1648 that enslaved Africans brought the plant to Brazil and consumed it (cited in Alcantara Rodríguez 2016). Daniel Rolander also reported that the species was commonly grown in 18th-century Suriname, where its leaves were eaten raw or cooked like spinach by all inhabitants. Spider plant is, however, no longer eaten in Suriname, even though it still carries its African name akaja there. In both French

Guiana and Suriname, the species lost its role as a food crop and now survives only “as a [naturalized] weed” (Van Andel et al. 2016, 700). According to Van Andel et al. (2012), the species “might be one of the ‘forgotten foods’ that was introduced to the New World by means of the slave trade.”

In Jamaica, Macfadyen (1837) reported on the species under its synonyms, *Gynandropsis pentaphylla* (L.) DC. and *Cleome pentaphylla* L., as a plant with a “warm bitter taste” and “a wholesome green, [said] to be preventative against belly-ache.” But he also added that “to render it palatable, it requires a long boiling, and the water to be frequently changed.” Fawcett (1891), also in Jamaica, called it “bastard mustard.” However, the contemporary flora of Jamaica only mentions the species as “rare and local, a weed of waste ground” and does not refer to its potential as an edible green (Adams 1972).

The species is used for ritual purposes among the Yoruba in West Africa (Verger 1995), but this seems not to have arrived and survived among the African-derived religions of Brazil and Cuba. However, in Cuba, the roots of *G. gynandra* are used in mixtures as a medicine and locally regarded as one of several species that are depurative and diuretic (Cano and Volpato 2004).

HIBISCUS SABDARIFFA L.

Roselle or sorrel is an annual cultivated bushy herb or subshrub of up to 2 m tall or higher and occurs throughout the tropical latitudes. The species is probably native to Africa, where it may have been domesticated in Sudan about 6000 years ago, first for its seeds and later for its leaves and calyces (merged sepals that gradually swell until they become fleshy and succulent). It is common in the savannas of West and Central Africa and often as an escape from cultivation. Apparently, truly wild plants have been collected in Ghana, Niger, Nigeria, and Angola (McClintock and El Tahir 2011). Its drought resistance makes it a particularly suitable crop for hot and dry regions in the tropics and subtropics. In tropical Africa, there exist cultivars with two colors of stems and calyces, either green or red. Green cultivars are mainly grown for their leaves, and red cultivars for their flowers (De Lannoy 2001).

In Africa, the two main uses of roselle are as a vegetable and beverage. Roselle is considered an important leaf vegetable in the drier regions of West and Central Africa (McClintock and El Tahir

2011). The young shoots, leaves, and (fresh) calyces of green roselle are either cooked as a vegetable, or used to make a mucilaginous soup. On the other hand, those of red roselle (and dry calyces) are more popular for sauces (Dalziel 1935, 129; De Lannoy 2001; Irvine 1956; Maundu et al. 2009; McClintock and El Tahir 2011). In Uganda, the seeds are consumed grilled or pounded and mixed with water for use in sauces (De Lannoy 2001). The species also maintains several medicinal uses in Africa. After calyx harvest in West Africa, roselle plants are often given to livestock as fodder (McClintock and El Tahir 2011).

From Senegal to Sudan, in Egypt, and northern Africa, the dried red calyces are popular to prepare a sweetened tea, or, more commonly, a refreshing, sour-tasting cold or frozen beverage, called bissap (in Senegal) or da bilenni (in Ivory Coast, Mali, Burkina Faso), often with mint and ginger added. Other preparations of the calyces include a syrup concentrate, roselle jams and jellies, which are also popular outside Africa, in the Caribbean region, and southern Asia (McClintock and El Tahir 2011).

Roselle is widely cultivated and consumed in the Americas for its red calyces as a beverage, but rarely for its leaves. Van Andel and Ruyschaert (2011) suggested that the seeds of roselle arrived in the Americas on slave ships. In the Caribbean, the calyces of the plant are usually ready for picking just before Christmas. In Jamaica, Barbados, and Montserrat, infusions of the red calyces are a major part of Christmas traditions, to make a tart sweetened drink with nutmeg and other essences (Brussell 2004; Cassidy and Le Page 2002) (Fig. 7). This practice dates back at least a few centuries. Macfadyen (1837) described earlier in Jamaica that the calyces boiled with sugar form “an agreeable acidulated conserve; or they may be made into tarts.” Alternatively, he said, “an infusion also may be prepared from them, known by the name of Sorrel-drink, forming a refreshing beverage.” To this day, many Jamaican families cultivate the plant in their home gardens and farm plots (Peter pers. com.; Sander and Vandebroek 2016). In Cuba, one of its common names (quimbombó chino) refers to the similarity in shape of the fruit to a small okra, also named quimbombó (Roig y Mesa 1988).

Peckolt (1871, 134) reported that *H. sabdariffa* was a food in the late 19th-century Brazil, but it is unclear whether he was referring to the calyces or the edible leaves. Cascudo (1967, 243) says that during the era of slavery in the northeast of Brazil, the species was one of “the most popular” foods for



Fig. 7. Fleshy red calyces of *Hibiscus sabdariffa* (sorrel) to make a sweet-tart beverage in Jamaica. The leaves of the plant, however, are not consumed.

enslaved Africans, but again, he does not mention whether it was the leaf or calyx, or both. In the north of Brazil, the species is known as *vinagreira*, and bundles of young apical branches are sold for consumption as a leaf vegetable (Kinupp and Lorenzi 2014). The leaves are said to flavor some dishes of grilled fish in Belem, Brazil, and are consumed by the mestizo population (Katz et al. 2012, 288). Nonindigenous people who moved to the Amazon region in Brazil also cultivate *H. sabdariffa* in their home gardens. In the State of Maranhão (in the eastern Amazon), roselle leaves are a part of different regional dishes, the most famous one being “arroz de cuxá” (Katz et al. 2012, 290), referred to as *arroz com cuchá*. Cuxá is a sauce made with roselle, sesame seeds, dry shrimp, dry cassava flour, and chili pepper. The word *cuxá* supposedly originates from Upper Guinea in Africa (Cascardo 1967). In southern Brazil, an infusion made with the flower calyces is often used for weight loss (Dickel et al. 2007). Sousa et al. (2015) reported that roselle is sold in Amazonian markets for food, but did not specify the plant parts used. The species is used in rituals by Brazilian Candomblé adherents, although again the plant parts are not noted (Barros 2011, 133). Carney and Rosomoff (2011, 178) reported that roselle leaves are consumed for food and medicine in the Americas, without further specification. Also McClintock and El Tahir (2011) stated that “in the United States leaves and young shoots are also eaten raw in salads.” However, outside of a few

minor mentions, we were unable to discover further evidence of leaf consumption of *H. sabdariffa*.

MANIHOT ESCULENTA CRANTZ

The cassava plant is a shrub with an upright woody stem reaching 4 m in height or more. The leaves are deeply parted into three to seven lobes. The plant produces fleshy, elongated tubers that can measure up to 1 m in length and weigh up to 2 kg at maturity. The cassava plant, called manioc in French-speaking countries, originates from northern South America as a staple food of Amerindians (Bullbrook 1949). Following its introduction in the early 17th century (Alpern 2008), it went on to become an important staple crop in much of sub-Saharan Africa (Shackleton et al. 2009). For subsistence farmers, cassava roots provide a major source of calories because of their high starch content. As a crop, it requires minimum maintenance, and the roots can be eaten 6 months to 3 years after planting, making it an important famine food during times of conflict or natural disaster. Nweke (2005) describes the dispersal of cassava in Africa as “a self-spreading innovation.” There exist “sweet” and “bitter” cassava varieties, which represent non-toxic (sweet) and toxic (bitter) cultivars; the latter varieties are more productive but need to be processed before being fit for consumption (Higman 2008).

Cassava leaves (called “pondu”) are the dominant vegetable in the DR Congo. In 60% of

the countries in sub-Saharan Africa, the leaves are eaten to a varying degree (Latif and Müller 2015; Shackleton et al. 2009; but see also Nweke 2005, 209, who claims that: “Cassava leaves are not eaten in West Africa, except in Sierra Leone, because several indigenous plants supply vegetables traditionally consumed with yam”). The young leaves are cooked like spinach and are popular as a green vegetable, providing a rich source of protein and vitamins A and B. They are mostly served as part of a sauce, eaten with starchy dishes (Latif and Müller 2015). The nutritional value of cassava leaves has been repeatedly emphasized, and authors encourage their use in tropical diets. However, toxic compounds present in the leaves (cyanogenic glycosides) require that traditional preparation techniques of pounding, grinding, and/or boiling are meticulously followed to prevent serious illness or death (Latif and Müller 2015).

As a native plant of Amerindian origin, cassava was and continues to be widely cultivated and consumed in tropical America. In Brazil, which is considered the center of origin for the species, cassava goes by various names—mandioca, aipim, macaxeira, and others. The starchy roots (Fig. 8) continue as the dietary staple of most Amazonian indigenous groups (Carrasco et al. 2016). Among nonindigenous Brazilians, the roots are boiled like a potato, or fried like French fries. The most common preparation is as a flour, called farinha de mandioca. This is often sprinkled on cooked beans in the northeast of Brazil, or more often, is prepared as

farofa, a side dish toasted with salt, meat, butter, and spices. In Jamaica, consumption of cassava roots has declined over time in favor of yams (*Dioscorea* spp.) (Higman 2008). Even bammy cakes, prepared from bitter cassava root flour according to Arawak indigenous traditions and once considered the “bread of the Jamaican people,” have steadily decreased in importance (Mintz 2010). Fear of poisoning seems to be the main reason for the diminished interest in cassava roots as a food in Jamaica (Higman 2008). In Guyana, the expressed poisonous juice from cassava roots becomes nonpoisonous after fermentation. This cassava liquor is called cassareep and is used to flavor and preserve meaty pepperpots; it is considered an Amerindian invention (Bullbrook 1949). In Jamaica, however, this method is not followed in making pepperpots (Higman 2007).

Regarding cassava leaves, the literature reveals records of consumption in Brazil, French Guiana, and Colombia. Historically, the leaves were occasionally consumed by Amerindian groups in coastal Brazil, but according to plantation owner Gabriel Soares de Souza, this was done only “in times of necessity” (Souza 1851[1587], 173). In the 1970s, at least seven Amerindian groups scattered north of the Amazon River consumed cassava leaves (Lancaster and Brooks 1983). Today, a dish called maniçoba in the State of Pará consists of ground cassava leaves cooked with meat and spices and is served with farinha (ground cassava). It represents a culinary specialty of Belem, Brazil. In other regions of the Brazilian Amazon, maniçoba is the name



Fig. 8. Grating of cassava roots (*Manihot esculenta*) in the province of La Vega, Dominican Republic. Use of the leaves, however, was not observed on the island, nor reported in the literature in other Caribbean islands.

given to cassava leaves, whereas in Pará, the leaves are known as maniva (Katz et al. 2012, 288). The Aluku Maroons of French Guiana, who have an African ancestry but live in close proximity to the Wayana Amerindians, also cook and eat cassava leaves (Katz et al. 2012, 290). In a mixed Afro-descendant community in the Caribbean area of Colombia, the leaves and tender shoots of cassava are used as edible parts, but no further information was provided (Alvarez 2014).

Cassava leaves enter into several religious and healing rituals. Brazilian maniçoba, believed to be of Amerindian origin, is consumed during an important religious festival and prepared by crushing, grinding, pounding, and then cooking cassava leaves in water for several days together with meats, lard, and spices (Lancaster and Brooks 1983). Among the Garifuna of Eastern Nicaragua, an alcoholic beverage made from grated cassava roots is used during festivities, rituals, and healing ceremonies (Coe and Anderson 1996). In Suriname, an herbal bath made with cassava leaves, salt, and beer offers protection against evil intentions from humans, while an old cassava bush planted in the yard offers spiritual protection (Van Anandel and Ruyschaert 2011).

SOLANUM MACROCARPON L.

The name African eggplant refers to its African ancestry (Bukenya-Ziraba and Bonsu 2004). It is a large perennial shrub with long, lobed leaves (Maundu et al. 2009). The species is consumed for its leaves and eggplant-sized fruits. Dalziel (1935, 434) reported that the species was cultivated near homes, but was also “half-naturalized.” The fruits of wild spiny forms growing in tropical nonarid parts of Africa are still being gathered occasionally as a vegetable (Bukenya-Ziraba and Bonsu 2004). Both the young leaves and the young fruits of cultivated forms, called “gboma” in West Africa, enter into soups and sauces (Bukenya-Ziraba and Bonsu 2004; Irvine 1956). Throughout West and Central Africa, local cultivars are grown for their leaves, whereas in humid coastal areas of West Africa, cultivars are grown for their fruits (Bukenya-Ziraba and Bonsu 2004).

The species arrived in the Americas, perhaps onboard of slave ships (Van Anandel and Ruyschaert 2011), and was being used for food early in the colonial period. Piso and Marcgrave noted that the species was being cultivated in the northeast of Brazil by 1648, and was consumed by

Africans (Alcantara Rodríguez 2015). There are, however, only sporadic reports later on of the species’ presence. One such collection (W.E. Kerr 2346, NY Herbarium) took place in 1990 in Mansoes Aeroporto, Minas Gerais, Brazil, with the observation that the plant was cultivated. Burkill (1925, 339) reported it in the Caribbean, on the islands of Guadeloupe and St. Croix, as well as in Minas Gerais. It was taken there, he surmised, “with negro slaves.” According to Kinupp and Lorenzi (2014), *S. macrocarpon* is occasionally cultivated, mainly in northern Brazil, but also in the south, for its fruits and leaves. In their reference work on unconventional food plants of Brazil, these authors specify several preparation methods: cooking of the green or mature fruits for consumption as a legume or for use in soups or preserves; preparation of the peeled ripe fruits like eggplant; and sautéing-braising of the young leaves for use in dumplings, soups, broths, and rice dishes.

The name recorded in Guadeloupe was “mélougène de Guinée” (Guinea eggplant) (Burkill 1925). The label of a NY Herbarium specimen (Père Duss 18) collected in Antigua in 1962 mentions that the species is cultivated as an edible plant on properties surrounding Saint-Jean. In Suriname, Saramaccan Maroons grow the plant on their land and cook the young fruit as a vegetable (Reijers 2014). These and other bitter vegetables are considered very healthy in Suriname and are used to treat anemia (Van Anandel and Ruyschaert 2011). In Suriname, the common name for *S. macrocarpon* is “antruwa,” whereas in the Ivory Coast, a similar name (“ndrowa”) corresponds with certain types of *Solanum aethiopicum* L. (Bukenya-Ziraba and Bonsu 2004). Interestingly, Aucan Maroons in Suriname, a different tribal group, recognized but did not grow the species (Reijers 2014).

S. macrocarpon is not listed in the flora of Jamaica (Adams 1972) and Hispaniola (Dominican Republic and Haiti) (Liogier 2000). Perhaps in Jamaica, the use of *S. macrocarpon* was replaced by a relative with smaller fruits that is native to the Americas, *Solanum torvum* Sw. Called susumba, susumber, or gully bean, the young green berries of *S. torvum* are cooked together with saltfish and ackee or cho cho (*Sechium edule* Jacq. Sw.), or they are used in soups, cooked down in coconut milk, or to season rice. Susumba is also considered a powerful spiritual plant in the practice of Obeah, an African-derived spiritual and healing practice (Vandebroek and Picking 2016, 181–186). However, although the

species and the use of its berries are widely known in Jamaica, susumba berries are not part of a regular diet.

VIGNA UNGUICULATA (L.) WALP

Cowpea, or black-eyed pea, is an herbaceous annual native to Africa (Padulosi and Ng 1997). Domesticated in the Neolithic age, southern and eastern Africa are the primary centers of diversity for the wild forms, and cowpea may have been domesticated either there or in West Africa (Vanderborght and Baudoin 2001). It is one of Africa's most important crops, as a pulse as well as a leaf vegetable, and it also serves as fodder. Communities may grow it only for its mature seeds, others just for its leaves and immature pods, and some for both (Shackleton et al. 2009). Dalziel (1935, 266–268) reported many uses for the beans, including fried bean cakes, known by the Yoruba as àkarà, and by Brazilians as acarajé. In many parts of West and East Africa, the young leaves are eaten cooked or used in stews. Cowpea leaves can be served boiled or fried and are often eaten with porridge. Preservation of the leaves for later use is done by sun-drying (Madamba et al. 2006). The roots are eaten in Sudan and Ethiopia. It is also used as a forage or cover crop, especially in the Sahel (Vanderborght and Baudoin 2001).

The first clear report of cowpeas in the Americas was made by Sir Hans Sloane in Jamaica between 1687 and 1689 (Carney 2013). Macfadyen (1837, 289) wrote about its synonym, *Dolichos sphaerospermus* (L.) DC., in Jamaica as the species being “a very prolific and excellent variety of the pulse kind. When used green it is scarcely inferior, and when dry, is in the opinion of many, superior to the pea of Europe.” However, he did not make any mention of the leaves. Acarajé, a dumpling made with cowpeas, is associated with the orisha Iansã in Candomblé (Barros 2011, 176). Maroons in Suriname use the young fruits and the seeds as a vegetable, and among the Saramaccan Maroons, the seeds are also used for preparation of a funeral cake (Reijers 2014).

There is, however, no mention in the literature of the leaves of *V. unguiculata* being consumed in the Americas, although Kinupp and Lorenzi (2014), in their reference work on unconventional food plants of Brazil, recognize the potential of the young leaves for human consumption. Similarly, among Cuban Santería adherents, there are various ritual uses of cowpeas, but not for the leaves (Cabrera 1975,

427). In Cuba, a special dish called euei with *V. unguiculata* (plant part not specified) is made as an offering to the gods (Esquivel and Hammer 1992).

Discussion

The foodways of the Americas represent an enduring culinary conversation between indigenous and diasporic people and plants. During the first centuries of colonization, the food traditions of three cultural groups predominated—Amerindians, Europeans, and Africans. Each brought their traditions of cultivation, collection, and cooking associated with their preferred domesticated and wild plant species, contributing over time to a fusion cuisine (Carney 2013). The beginning of colonization witnessed a flood of Old World edible plants, domesticated and wild, being introduced into the Americas, allowing in particular the Spanish and Portuguese settlers and clergy the ability to recreate their traditional fare in the Americas. Leafy and green vegetables, however, did not represent important elements in the Medieval Iberian diet. “Greens and vegetables,” according to de Oliveira Marques (1971, 22), “were not particularly appreciated” by the Portuguese. The Spanish were of similar opinion. Salads were considered a sensible start to meals, but they were thought to “thin the blood,” and were not considered particularly nourishing (Earle 2012, 142). According to Freyre (1986, 470), during the period of slavery, interest among white Brazilians for vegetables “had practically disappeared.” To this day, the Brazilian diet is largely deficient in green vegetables. As noted earlier, one exception is maniçoba, a popular green stew based on manioc leaves (*Manihot esculenta*) in Belem and Manaus.

The tropical and subtropical Amerindian cuisine included a rich variety of domesticated roots, grains, pulses, and spices (Piperno 2011), as well as wild game, fish, fruits, and insects. They also included some green vegetables in their diet, according to early observers, although in no case (except perhaps *quelites* in Mexico) were these considered central to their respective cuisines. In late 16th-century northeastern Brazil, Gabriel Soares de Souza reported that the native people ate the leaves of taioba (*Colocasia esculenta* or *Xanthosoma sagittifolium*) as both a spinach and cooked with fish. They also occasionally ate the leaves of manioc (*Manihot esculenta*), an observation made by various other

early clergy in Brazil (Cardim 1939 [1584], 71; Vicente do Salvador 1931 [1627], 18). Other 16th-century observers make no mention of vegetable consumption among Brazilian Amerindians (Léry 1625 [1587–88]; Staden 1928 [1557]). In his 19th-century study of Brazilian edible plants, Peckolt (1871, 73) reported that “green vegetables were little sought out by the Indians.”

Contemporary research with indigenous Amazonian groups seems to bear out the notion that green vegetables figure only marginally into their diets, in the past and at present. In a comprehensive review of written sources from Brazil, French Guiana, Peru, Colombia, and Venezuela, Katz et al. (2012, 283) concluded that “greens are not commonly eaten among native Amazonians and that some ethnic groups do not consume them at all.” Although the young shoots of weeds or cassava leaves are occasionally consumed by some groups, most considered greens as little more than animal food, something you feed to tortoises or pet monkeys. Others report that greens are bitter tasting, a property they associate with medicine rather than food (Katz et al. 2012, 291).

As opposed to European colonists and clergy and indigenous Amerindians, arriving Africans hailed from societies in which leaf vegetables figured prominently in their respective diets. From the earliest days of historical observation in sub-Saharan Africa, chroniclers have been impressed by the importance attached to leafy and green vegetables, particularly those cooked into soups, sauces, and stews (Alpern 2008; Winterbottom 1803, 64). The obstacles to Africans introducing their known edible flora to the Americas were considerable, however, and our review of the literature suggests that this tradition has survived only among very few species. Among the hundreds of leaf vegetables that are consumed across Africa, from West to East to South, only a short list arrived in the New World, and only a couple of these have survived to this day in the cuisine of the African diaspora.

Our selection of AIVs in the Americas does not pretend to be exhaustive, but the species we chose were characterized as “common” to “very important vegetables” in African urban markets by Grubben and Denton (2004), with the exception of *Manihot esculenta*, which was not listed by these authors. Moreover, the PROTA4U Database gives each of these species a ranking as vegetables of at least three or higher (on a maximum ranking scale of five). Originally, we had included *Colocasia esculenta* (known as taro, cocoyam, dasheen, or

eddoes) on our list, an Asian native naturalized in Africa. This inclusion was based on its parallel use as a leaf vegetable in Africa and in Trinidad and Tobago, in the latter islands in a signature dish together with okra, called callaloo (Safo Kantaka 2004). However, in Africa, *C. esculenta* is primarily eaten for its starchy corms, and its use as a leaf vegetable has been described as “sparingly” (Shackleton et al. 2009). Furthermore, the use of *C. esculenta* leaves among present-day Trinidadians may have been facilitated in part by the large East Indian population (Sen 2016). We therefore replaced *Colocasia esculenta* on our list with *Manihot esculenta*, another starchy staple crop that is more widely consumed in Africa for its leaves and that originates from the Amazon basin (Shackleton et al. 2009).

We also excluded purslane (*Portulaca oleracea* L.), a cosmopolitan weed of warm areas. Its fleshy shoots and leaves are cooked or eaten in salads in Kenya, Sudan, Ethiopia, the Sahel, and humid West Africa, and the species is occasionally sold in markets. However, as was the case with taro, the use of purslane as a vegetable in Africa was described as “sparingly” (Shackleton et al. 2009). Likewise, in the Americas, its use beyond that of an occasional wild edible plant is unclear. Overall, purslane seems much better known as a medicinal plant and is included in the World Health Organization’s list of most widely used medicinal plants (El Jack 2004). Other possible candidates that we did not include are bitter melon (*Momordica charantia* L.), pigeon pea (*Cajanus cajan* [L.] Millsp.), and the drumstick tree (*Moringa oleifera* Lam.). In making our selection, we focused on leafy or green vegetables with a well-established and longstanding traditional edible use in Africa, versus occasionally or more recently used greens. For the pigeon pea, culinary use of the seeds appears to largely surpass that of the leaves. The drumstick tree, on the other hand, has been widely promoted as a “miracle tree” for its nutritious properties over the last few decades, which complicates disentanglement of its traditional use as a leaf vegetable versus more recently adopted edible uses in Africa and in the Americas. *Momordica charantia*, a native of the Old World tropics that was possibly domesticated in India and southern China (Grubben and Denton 2004), thrives wild in most of Africa, is cultivated in some countries, serves a dual purpose as a vegetable and medicine, but is characterized as “popular with the Asian community in Africa” (Grubben and Denton 2004; Shackleton et al. 2009). In tropical America, it is widely reported as a medicine (Vandebroek and

Picking 2016; Voeks and Leony 2004), surpassing its popularity as a vegetable (but see Reijers 2014 for an example of its use as a vegetable in Suriname). Nevertheless, these and other species certainly deserve to be included in a long list of AIVs that are present in the Americas. The purpose of this review was not to develop a conclusive list of those vegetables, however, but rather to track the continuation or discontinuation in the culinary use of well-established AIVs by the African diaspora across the Americas.

By far, the most important AIV that arrived and survived in the Americas was okra, of which the immature green fruit is eaten. By the mid-18th century, observers reported that okra was widely appreciated wherever there was a significant Black population. In the Southern USA, gumbo became emblematic of Louisiana's African-American population and, over time, the general cuisine of the region. Throughout the eastern Caribbean, okra enters in the signature dish callaloo, and in Trinidad, callaloo has become a metaphor for their mixed ancestry of Europeans, Africans, and East Indians (Allsopp 1996). In Cuba and Brazil, okra is one of the most prized foods among people of African descent. Among Santeria adherents, consuming okra is "one of the most respected ritual obligations" (Ortiz 1924, 94). In Brazil, the rich okra stew known as carurú is one of the signature dishes of Candomblé. In a comparative study in the Caribbean Basin, Torres-Aviles et al. (2015) found that okra was among the species exclusively used by Afro-Caribbeans as a medicinal plant, and not at all by Amerindians or Mestizos. In all cases, from the Southern USA to Brazil, okra is tightly associated with the cuisine and ethnobotanical traditions of the African diaspora.

Following okra, the second AIV that deserves mention as a popular leaf vegetable across Africa and tropical America is the amaranths (*Amaranthus* spp.), although their consumption among Afro-descendants in the Americas is mostly concentrated in Jamaica. The herb callaloo (*Amaranthus viridis*), as opposed to the dish of the same name, has steadily gained prominence over time, to the point where it has become the most important leaf vegetable in Jamaica today. However, Higman (2007) argues that the current premier status of *A. viridis* in Jamaica may well have been facilitated by East Indian immigrants who arrived as indentured workers in 1845. The genus *Amaranthus* is interesting in that several representatives may have made at least two historical transatlantic journeys spanning three continents: (1) Tropical America, where the

genus probably originated; (2) Asia, where several species that became important leaf vegetables were probably domesticated; and (3) Africa, where several species were introduced, albeit some, like *A. viridis*, never rose to prominence there. Instead, in Africa, *A. cruentus* is considered the leading leaf amaranth, followed by *A. dubius*, whereas the latter has remained a sparsely consumed and mostly wild weed in tropical America. In summary, the biological and cultural origins and ethnobotanical trajectories of the leaf amaranths prove difficult to untangle and make an interesting case for further research.

Aside from okra and the amaranths, the cultivation and culinary traditions associated with most AIVs either never arrived in the Americas, or were largely lost during or after the colonial period. Some species, such as jute mallow (*Corchorus olitorius*) or African eggplant (*Solanum macrocarpon*), are only occasionally consumed, whereas others, such as celosia (*Celosia argentea*), are now cultivated as ornamentals or simply tolerated. Some, such as spider plant (*Gynandropsis gynandra*), were noted as foods for Africans in Jamaica, Suriname, and Brazil early in the colonial period, but now have become "forgotten vegetables" (Van Andel et al. 2012, 855). Others that serve a dual purpose in Africa, as flower and leaf (*Hibiscus sabbdariffa*), edible pulse and leaf (*Vigna unguiculata*), or root and leaf (*Manihot esculenta*), in the Americas are mostly restricted to the nonleaf part, although there exist dishes in specific geographic localities based on their leaves. Most other species that arrived during the slave trade are either sparsely encountered and reported as vegetables, or now exist only as unused and unappreciated roadside weeds. In combing through records of AIVs in the Americas, it proved sometimes difficult to untangle the possible cultural associations with their use. Examples include parallel reports in tropical America by African, Amerindian, or Asian communities in relation to the consumption of the leaves of cassava, Malabar spinach, dasheen (*Colocasia esculenta*) and amaranths, and the fruits of bitter melon (*Momordica charantia*). This complexity also extends to the mixed origin of plant names and dishes, such as the cases of callaloo and pepperpots, which represent Amerindian, African, and (to a minor extent) Asian influences and ingredients (Higman 2007).

Perhaps the greatest legacy of AIVs in the Americas is that outside of okra and the amaranths, almost none survived as simply a chief culinary ingredient (with the exception of region-specific dishes), but rather found refuge in the

rituals associated with African-derived belief systems and religions, Santería in Cuba, and Candomblé in Brazil. Of the 12 species we followed, 9 have ritual and religious uses associated with them. Because of the tremendous cultural significance ascribed to species from their homeland, and the long suppression of their belief systems in Catholic Latin America, Santería and Candomblé adherents have a particularly powerful motivation to continue the ethnobotanical legacy of their distant homelands.

The main question that remains is why the majority of these AIVs, so prominent in African culinary traditions, failed to survive in the Americas. The answer is likely multifactorial and may include environmental (agroecological) conditions, economic opportunities and constraints (potential for cultivation and commercialization), and sociocultural perceptions and barriers (including changing taste preferences and negative associations of wild plants with poverty). Fusion cuisines that developed during the period of slavery in the Americas had to rely on the availability of and access to ingredients, as well as the time constraints of cultivation, harvest, storage, and preparation of these foods. In Afro-Caribbean communities in the Colombian Caribbean coast, availability of a food plant resource, access, and food preferences were identified as drivers of changes in food plant knowledge, together with the alienation of youth from diversified agricultural livelihoods (Pasquini et al. 2018b).

The degree of similarity in agro-ecological conditions between Africa and the Americas will determine how well a species will thrive in a new environment upon arrival, and whether there exist opportunities for cultivation and higher yields. Okra, for example, is quite a popular crop, owing to its easy cultivation, dependable yield, and adaptability to fluctuations in soil types and water conditions, resisting drought as well as flooding (Maurya et al. 2013). Species that represent economic opportunities for commercialization will have an elevated cultural importance, and these income-generating plants can quickly outcompete and replace vegetables that serve a mere subsistence role for household consumption, or those that are collected from the wild. In Africa and elsewhere, contemporary consumer preferences are oriented toward vegetables that are exotic, less bitter, quicker to cook and prepare, and representative of a more modern, urban lifestyle (Shackleton et al. 2009). These changing cultural preferences have a direct impact on the continuation of culinary traditions and the survival

of individual species. The negative perception of wild-collected vegetables as “poverty foods” has been well-documented in Africa and the Americas (Higman 2007; Lancaster and Brooks 1983; Pasquini et al. 2018b; Shackleton et al. 2009). Negative associations with a rural lifestyle, hunger, and famine can stigmatize the use of wild vegetables as being unfashionable, outdated, backwards, or humiliating. This is nicely illustrated by a Jamaican proverb: “If you cyaan get calaloo, tek junjo” (if you cannot get callaloo, take junjo, a wild edible mushroom). The meaning of this proverb is that in life, one cannot always get what one wants and must make do with what is available. Callaloo is a cultivated vegetable in Jamaica, while junjo grows wild, has no commercial value, and is altogether less desirable. One has to be in dire straits to resort to eating junjo, even though in the hierarchy of foods, Jamaican callaloo has had to face its own long uphill battle from weed to modern supermarket food (Higman 2007).

Conclusion

Our review of 12 well-established AIVs has shown that only two species, *Abelmoschus esculentus* and *Amaranthus viridis*, have left a persistent imprint in the culinary traditions of the African diaspora in tropical America. Consumption patterns for the remaining species can be identified as: (1) not or no longer eaten, (2) sparsely or occasionally eaten, or (3) only consumed locally. On the other hand, we found evidence of African-derived religious use associated with 9 of the 12 vegetables. These AIVs are part of the neglected and underutilized species (NUS) of the African diaspora in tropical America. Given their praised nutritional properties and the fact that they represent African biocultural heritage, these species as well as the culinary traditions they represent merit continued attention and conservation efforts.

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Literature Cited

- Abukutsa-Onyango, M. O. 2004. *Basella alba* L. [Internet] Record from PROTA4U. G. J. H. Grubben and O. A. Denton, eds. Wageningen, Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <https://www.prota4u.org/database/> (22 November 2018).
- Acevedo-Rodríguez, P. and M. T. Strong. 2007. Catalogue of seed plants of the West Indies. <http://botany.si.edu/antilles/westindies/catalog.htm> (9 July 2018).
- Achigan-Dako, E. G., M. Pasquini, F. A. Komlan, S. N'danikou, H. Yedomonhan, A. Dansi, and B. Ambrose-Oji. 2010. Traditional vegetables in Benin. Institut National des Recherches Agricoles du Bénin. Imprimeries du CENAP, Cotonou.
- Adams, C. D. 1972. Flowering plants of Jamaica. Glasgow, Scotland: University Press.
- Alcantara Rodríguez, M. A. 2015. Medicinal and other useful plants from Historia Naturalis Brasiliae (1648): Are they currently used in Brazil? M.Sc. thesis, University of Utrecht.
- . 2016. African origins of Papiamentu plant names. M.Sc. thesis, University of Utrecht.
- Allsopp, R. 1996. Dictionary of Caribbean English usage. New York: Oxford University Press.
- Alpern, S. B. 2008. Exotic plants of western Africa: Where they came from and when. *History in Africa* 35:63–102.
- Alvarez, L. 2014. Plantas promisorias de uso alimenticio del Darién, Caribe Colombiano. *Boletín de Antropología* 29(48):41–65.
- Balick, M. J. and R. Arvigo. 2015. Messages from the gods. A guide to the useful plants of Belize. New York: Oxford University Press.
- Barros, J. F. P. 2011. A floresta sagrada de Ossaim: O segredo das folhas. Rio de Janeiro: Pallas Editora.
- Bedigian, D. 2013. African origins of sesame cultivation in the Americas. In *African ethnobotany in the Americas*, eds. R. Voeks and J. Rashford, 67–120. New York: Springer.
- Bell, K. L., H. Rangan, C. A. Kull, and D. J. Murphy. 2015. The history of introduction of the African baobab (*Adansonia digitata*, Malvaceae: Bombacoideae) in the Indian subcontinent. *Royal Society Open Science* 2, 150370. (doi: <https://doi.org/10.1098/rsos.150370>).
- Borges, F. M. 2008. Acarajé: Tradição e modernidade. Unpublished Master's thesis, Universidade Federal da Bahia. https://repositorio.ufba.br/ri/bitstream/ri/8774/1/dissertacao_florismar.pdf.
- Bosch, C. H., K. Sié, and B. A. Asafa. 2004. *Adansonia digitata* L. [Internet] Record from PROTA4U. G. J. H. Grubben and O. A. Denton, eds. Wageningen, Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <https://www.prota4u.org/database/> (6 August 2018).
- Bourne, M. J., G. W. Lennox, and S. A. Seddon. 1988. Fruits and vegetables of the Caribbean. Caribbean natural history series. London: Macmillan Education Ltd.
- Brussell, D. E. 2004. A medicinal plant collection from Montserrat, West Indies. *Economic Botany* 58:S203–S213+S114+S215–S220.
- Bukenya-Ziraba, R. and K. O. Bonsu. 2004. *Solanum macrocarpon* L. [Internet] Record from PROTA4U. G. J. H. Grubben and O. A. Denton, eds. Wageningen, Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <https://www.prota4u.org/database/> (23 November 2018).
- Bullbrook J. A. 1949. The aboriginal remains of Trinidad and the West Indies. *Caribbean Quarterly* 1(1):16–21.
- Burkill, I. H. 1925. *Solanum macrocarpon*. *Bulletin of Miscellaneous Information (Royal Botanic Gardens, Kew)* 1925 (8):333–341.
- Cabrera, L. 1975. *El monte*. 4th edition. Miami: New House Publishers.
- Cacciatore, O. G. 1977. *Dicionário de cultos Afro-Brasileiros*. Rio de Janeiro: Instituto Estadual do Livro.
- Cano, J. H. and G. Volpato. 2004. Herbal mixtures in the traditional medicine of eastern Cuba. *Journal of Ethnopharmacology* 90:293–316.
- Cardim, F. 1939 [1584]. *Tratados da terra e gente do Brasil*. São Paulo: np.

- Carney, J. 2001. African rice in the Columbian exchange. *The Journal of African History* 42(3):377–396.
- . 2013. Fields of survival, foods of memory. In: *Geographies of race and food*, eds. R. Slocum and A. Saldanha, 61–78. Surrey, UK: Ashgate.
- and R. Rosomoff. 2011. In the shadow of slavery: Africa's botanical legacy in the Atlantic World. Berkeley: University of California Press.
- and R. Voeks. 2003. Landscape legacies of the African diaspora in Brazil. *Progress in Human Geography* 27(2):139–152.
- Carrasco, N. F., J. R. L. Oler, F. F. Marchetti, M. A. Carniello, M. C. M. Amorozo, T. L. Valle, and E. A. Veasey. 2016. Growing cassava (*Manihot esculenta*) in Mato Grosso, Brazil: Genetic diversity conservation in small-scale agriculture. *Economic Botany* 70(1):15–28.
- Cascudo, L. 1967. *História da alimentação no Brasil*. São Paulo: Companhia Editora Nacional.
- Cassidy, F. G. and R. B. Le Page. 2002. *Dictionary of Jamaican English*. 2nd Edition. Barbados, Jamaica: University of the West Indies Press.
- Chweya, J. A. and P. B. Eyzaguirre. 1999. The biodiversity of traditional leafy vegetables. Rome: International Plant Genetics Resources Institute.
- and N. A. Mnzava. 1997. Cat's whiskers. *Cleome gynandra* L. promoting the conservation and use of underutilized and neglected crops. 11. Institute of Plant Genetics and Crop Plant Research. Rome, Italy: Gatersleben/International Plant Genetic Resources Institute.
- Coe, F. G. and G. J. Anderson. 1996. Ethnobotany of the Garifuna of Eastern Nicaragua. *Economic Botany* 50(1):71–107.
- Costea, M., F. J. Tardif, and D. M. Brenner. 2003. The identity of a cultivated *Amaranthus* from Asia and a new nomenclatural combination. *Economic Botany* 57(4):646–649.
- Crepaldi, M. O. S. and A. L. Peixoto. 2010. Use and knowledge of plants by “quilombolas” as subsidies for conservation efforts in an area of Atlantic Forest in Espírito Santo State, Brazil. *Biodiversity Conservation* 19:37–60.
- Crosby, A. W. 1993. *Ecological imperialism: The biological expansion of Europe, 900–1900*. Cambridge, UK: Cambridge University Press.
- Dalziel, J. M. 1935. *The useful plants of west tropical Africa*. London: Crown Agents.
- De Lannoy, G. 2001. Vegetables. 5.1. Leaf vegetables. 5.2. Fruit vegetables. In: *Crop production in tropical Africa*, ed. R. H. Raemaekers, 403–511. Brussels, Belgium: Directorate General for International Co-operation (DGIC), Ministry of Foreign Affairs, External Trade and International Co-operation.
- de Oliveira Marques, H. A. 1971. *Daily life in Portugal in the late Middle Ages*. Seattle: University of Washington Press.
- Denton, O. A. 2004. *Celosia argentea* L. [Internet] Record from PROTA4U. G. J. H. Grubben and O. A. Denton, eds. Wageningen, Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <https://www.prota4u.org/database/> (22 November 2018).
- Dickel, M. L., S. M. K. Rates, and M. R. Ritter. 2007. Plants popularly used for losing weight purposes in Porto Alegre, South Brazil. *Journal of Ethnopharmacology* 109(1):60–71.
- Dos Santos, F. B. 2016. Igi osè no reino de Obaràyí: Uma etnografia acerca da presença do baobá no Ilê Axé Opô Aganju, Bahia. *Dissertação apresentada ao Programa de Pós-Graduação em Antropologia*. Universidade Federal de Pernambuco, Centro de Filosofia e Ciências Humanas, Recife, Brazil. <https://repositorio.ufpe.br/handle/123456789/17998> (28 November 2018).
- Earle, R. 2012. *The body of the conquistador: Food, race and the colonial experience in Spanish America, 1492–1700*. Cambridge: Cambridge University Press.
- Ehn, M. and T. A. Zanon. 2002. The herbarium and botanical art of Hendrik Elingsz van Rijgersma. *Taxon* 51(3):513–520.
- El Jack, A. E. 2004. *Portulaca oleracea* L. [Internet] Record from PROTA4U. G. J. H. Grubben and O. A. Denton, eds. Wageningen, Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <https://www.prota4u.org/database/> (18 July 2018).
- Eltis, D. 2007. A brief overview of the trans-Atlantic slave trade. *Voyages: The trans-Atlantic slave trade database*. <http://www.slavevoyages.org/assessment/essay> (21 April 2018).
- Esquivel, M. and K. Hammer. 1992. The Cuban homegarden ‘conuco’: A perspective environment for evolution and in situ conservation of plant genetic resources. *Genetic Resources and Crop Evolution* 39(1):9–22.
- , L. Castiñeiras, H. Knüpfper, and K. Hammer. 1989. A checklist of the cultivated plants of Cuba. *Kulturpflanze* 37:211–357.
- Fawcett, W. 1891. *Economic plants. An index to economic products of the vegetable kingdom in*

- Jamaica. Kingston, Jamaica: Government Printing Establishment.
- Ferreira, S. D. C., R. M. D. Carvalho-Okano, and J. N. Nakajima. 2009. The family Asteraceae in the forest fragment, Viçosa, Minas Gerais, Brazil. *Rodriguésia* 60(4):903–942.
- Fondio, L. and G. J. H. Grubben. 2011. *Corchorus olitorius* L. [Internet] Record from PROTA4U. In: M. Brink, E. G. Achigan-Dako et al., eds. Wageningen, Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <https://www.prota4u.org/database/> (15 July 2018).
- Freyre, G. 1986. The masters and the slaves. A study in the development of Brazilian civilization. Berkeley: University of California Press.
- Grubben, G. J. H. 2016. *Amaranthus* (PROSEA Vegetables). [https://uses.plantnet-project.org/en/Amaranthus_\(PROSEA_Vegetables\)](https://uses.plantnet-project.org/en/Amaranthus_(PROSEA_Vegetables)) (30 November 2018).
- and O. A. Denton. 2004. Plant resources of Tropical Africa 2. Vegetables. Wageningen, Netherlands: PROTA Foundation / Backhuys Publishers / CTA. <http://edepot.wur.nl/417517> (16 November 2018).
- Higman, B. W. 2007. Jamaican versions of Callaloo. *Callaloo* 30:351–368.
- . 2008. Jamaican food: History, biology, culture. Kingston, Jamaica: University of the West Indies Press.
- Hoff, M. and G. Cremers. 2005. Le jardin Guyanais. Inventaire des plantes cultivées et des adventices des jardins de Guyane française. *Journal de Botanique de la Société Botanique de France* 29:3–40.
- Irvine, F. R. 1956. The edible cultivated and semi-cultivated leaves of West Africa. *Materiae Vegetabiles* 2(1):35–42.
- Jansen, P. C. M. 2004. *Amaranthus viridis* L. [Internet] Record from PROTA4U. G. J. H. Grubben and O. A. Denton, eds. Wageningen, Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <https://www.prota4u.org/database/> (30 November 2018).
- Jean-Baptiste, J. 1994. Nutritional analysis of food/medicinal plants used by Haitian women to treat the symptoms [of] anemia. Thesis submitted to the Faculty of Graduate Studies and Research in partial fulfilment of the requirements for the degree of Master of Science. Montreal, Quebec: Macdonald Campus of McGill University, School of Dietetics and Human Nutrition.
- Kadiri, O. and B. Olawoye. 2016. *Vernonia amygdalina*: An underutilized vegetable with nutraceutical potentials—A review. *Turkish Journal of Agriculture—Food Science and Technology* 4(9):763–768.
- Katz, E., C. López, M. Fleury, R. Miller, V. Payé, T. Dias, F. Silva, Z. Oliveira, and E. Moreira. 2012. No greens in the forest? Note on the limited consumption of greens in the Amazon. *Acta Societatis Botanicorum Poloniae* 81(4): 283–293.
- Kays, S. J. and J. C. S. Dias. 1995. Common names of commercially cultivated vegetables of the world in 15 languages. *Economic Botany* 49(2):15–152.
- Kinupp, V. F. and H. Lorenzi. 2014. Plantas alimentícias não convencionais (PANC) no Brasil. São Paul, Brazil: Instituto Plantarum De Estudos Da Flora LTDA.
- Klein, H. S. 1990. African slavery in Latin America and the Caribbean. New York: Oxford University Press.
- Kumar, S., S. Dagnoko, A. Haougui, A. Ratnadass, D. Pasternak, and C. Kouame. 2010. Okra (*Abelmoschus* spp.) in West and Central Africa: Potential and progress on its improvement. *African Journal of Agricultural Research* 5(25): 3590–3598.
- Lancaster, P. A. and J. E. Brooks. 1983. Cassava leaves as human food. *Economic Botany* 37(3): 331–348.
- Latif, S. and J. Müller. 2015. Potential of cassava leaves in human nutrition: A review. *Trends in Food Science and Technology* 44(2):147–158.
- Léry, J. 1625. Extracts out of the historie of John Lerivs, a Frenchman who lived in Brazil (1557 and 1558). In: Purchas his pilgrimes, contayning a history of the world, in sea voyages & land-travells, by Englishmen & Others. Ed., S. Purchas. London: William Stansby.
- Liogier, H. A. 2000. Diccionario botánico de nombres vulgares de La Española. Santo Domingo, Dominican Republic: Jardín Botánico Nacional Dr. Rafael Ma. Moscoso.
- Liogier, H. A. and L. F. Martorell. 2000. Flora of Puerto Rico and adjacent islands: A systematic synopsis. Second edition revised. San Juan, PR: Editorial de la Universidad de Puerto Rico.
- Macfadyen, J. 1837. The flora of Jamaica; A description of the plants of that island, arranged according to the natural orders. Vol. I. Ranunculaceae-Leguminosae. London: Longman, Orme, Brown, Green and Longmans.

- Madamba, R., G. J. H. Grubben, I. K. Asante, and R. Akromah. 2006. *Vigna unguiculata* (L.) Walp. [Internet] Record from PROTA4U. M. Brink and G. Belay, eds. Wageningen, The Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <http://www.prota4u.org/search.asp> (24 November 2018).
- Maundu, P., E. Achigan-Dako, and Y. Morimoto. 2009. Biodiversity of African vegetables. In: African indigenous vegetables in urban agriculture, eds. Charlie M. Shackleton, Margaret W. Pasquini, and Axel W. Drescher, 65–104. London: Earthscan.
- Maurya, R. P., J. A. Bailey, and J. St. A. Chandler. 2013. Impact of plant spacing and picking interval on the growth, fruit quality and yield of okra (*Abelmoschus esculentus* [L.] Moench). *American Journal of Agriculture and Forestry* 1(4):48–54.
- McClintock, N. C. and I. M. El Tahir. 2011. *Hibiscus sabdariffa* L. [Internet] Record from PROTA4U. M. Brink, E. G. Achigan-Dako et al., eds. Wageningen, Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <http://www.prota4u.org/search.asp> (13 July 2018).
- Melander, M. 2007. Endangered plants on the market in Havana City, Cuba. Degree project in Biology. Department of Systematic Botany, Uppsala University, Sweden. <http://files.webb.uu.se/uploader/858/MFS-127melander-marie.pdf> (27 November 2018).
- Minier, C. C. 2015. Conucos en Barreras, Azua: Entornos de vida para la subsistencia y el estudio etnobotánico. *Ciencia y Sociedad* 40(4):823–863.
- Mintz, S. W. 2010. Food enigmas, colonial and postcolonial. *Gastronomica* 10(1):149–154.
- Minzava, N. A. and F. Chigumira Ngwerume. 2004. *Cleome gynandra* L. [Internet] Record from PROTA4U. G. J. H. Grubben and O. A. Denton, eds. Wageningen, Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <https://www.prota4u.org/database/> (23 November 2018).
- Neto, M. J., A. C. Maluf, and T. F. Boscaine. 2016. Plantas ruderais com potencial para uso alimentício. 2nd Seminario de Agroecologia da America do Sul.
- Nina Rodrigues, R. 1932. Os Africanos no Brasil. Rio de Janeiro. Np.
- Nunn, N. 2008. The long-term effects of Africa's slave trades. *Quarterly Journal of Economics* 123(1):139–176.
- Nweke, F. I. 2005. The cassava transformation in Africa. In: Proceedings of the validation forum on the global cassava development strategy. Vol. 2. A review of cassava in Africa with country case studies on Nigeria, Ghana, the United Republic of Tanzania, Uganda and Benin. Rome, Italy: International Fund for Agricultural Development. Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/a-a0154e.pdf> (27 November 2018).
- Ortiz, Fernando. 1924. *Glosario de Afronegrismos*. Havana: np.
- Padulosi, S. and N.Q. Ng. 1997. Origin, taxonomy, and morphology of *Vigna unguiculata* (L.) Walp. 1–12. In: Advances in cowpea research, eds. B. B. Singh, D. R. Mohan Raj, K. E. Dashiell, and L. E. N. Jackai. Ibadan: IITA-JIRCAS.
- Parry, J. H. 1955. Plantation and provision ground: An historical sketch of the introduction of food crops into Jamaica. *Revista de Historia de America* 39:1–20.
- Pasquini, M. W., J. S. Mendoza, and C. Sánchez-Ospina. 2018a. Traditional food plant knowledge and use in three Afro-descendant communities in the Colombian Caribbean coast: Part I. Generational differences. *Economic Botany* 72(3):278–294.
- Pasquini, M. W., C. Sánchez-Ospina, and J. S. Mendoza. 2018b. Traditional food plant knowledge and use in three Afro-descendant communities in the Colombian Caribbean coast. Part II. Drivers of change. *Economic Botany* 72(3): 295–310.
- Peckolt, T. 1871. *Historia das plantas alimentares e de gozo do Brasil*. Rio de Janeiro: Eduardo & Henrique Laemmert.
- Picking, D. and I. Vandebroek. 2019. Traditional and local knowledge systems in Jamaica. In: Tribal and indigenous knowledge for modern times, eds. D. Katerere and W. Applequist. CRC Press, Boca Raton.
- Piperno, D. R. 2011. The origins of plant cultivation and domestication in the New World tropics: Patterns, process, and new developments. *Current Anthropology* 52(S4):S453–S470.
- Piso, W. 1948 [1648]. *História natural do Brasil ilustrada*. (Translated by A. Taunay). São Paulo: Companhia Editora Nacional. Plants for the Future. <https://pfaf.org/user/Default.aspx>.
- A. F. Prévost, 1749. *Histoire générale des voyages*. Didot.
- Ramdwar, M. N., S. T. Chadee, and V. A. Stoute. 2017. Estimating the potential consumption

- level of amaranth for food security initiatives in Trinidad, West Indies. *Cogent Food and Agriculture* 3:1321475. <https://www.tandfonline.com/doi/abs/10.1080/23311932.2017.1321475> (29 November 2018).
- Rashford, J. 1996. The distribution, history and use of the African baobab in Barbados. *Proceedings, Caribbean Food Crops Society*.
- . 2001. Those that do not smile will kill me: The ethnobotany of the ackee in Jamaica. *Economic Botany* 55(2):190–211.
- Reijers, M. 2014. African heritage in Maroon agriculture. Multiple uses of Old World crops among Aucans and Saramaccans. Master's thesis, Biology, Biosystematics, Wageningen University and Research Centre, Chair Group Biosystematics. The Netherlands: Wageningen.
- Renne, E. P. 2007. Mass producing food traditions for West Africans abroad. *American Anthropologist* 109(4):616–625.
- Roig y Mesa, J. T. 1988. *Diccionario botánico de nombres vulgares Cubanos*. La Habana, Cuba: Editorial Científico-Técnica.
- Rowell, C. H., J. O'Neal, and L. Chase. 2007. Leah Chase on callaloo/gumbo z'herbes: An interview. *Callaloo* 30(1):182–185.
- Safo Kantaka, O. 2004. *Colocasia esculenta* (L.) Schott. [Internet] Record from PROTA4U. G. J. H. Grubben and O. A. Denton, eds. Wageningen, Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <https://www.prota4u.org/database/> (25 November 2018).
- Sander, L. and I. Vandebroek. 2016. Small-scale farmers as stewards of useful plant diversity: A case study in Portland Parish, Jamaica. *Economic Botany* 70(3):303–319.
- Schneider, J. T. 1991. *Dictionary of African borrowings in Brazilian Portuguese*. Hamburg: H. Buske.
- Sen, C. T. 2016. The food of the Indian diaspora. In: *История еды и традиции питания народов мира [The history of food and food traditions in the world]*. Moscow State University, 237–243.
- Shackleton, C. M., M. W. Pasquini, and A. W. Drescher, eds. 2009. *African indigenous vegetables in urban agriculture*. London: Earthscan.
- Sogbohossou, E. O., E. G. Achigan-Dako, F. A. Komlan, and A. Ahanchede. 2015. Diversity and differential utilization of *Amaranthus* spp. along the urban-rural continuum of southern Benin. *Economic Botany* 69(1):9–25.
- , T. van Andel, and M. E. Schranz. 2018. Drivers of management of spider plant (*Gynandropsis gynandra*) across different sociolinguistic groups in Benin and Togo. *Economic Botany* 72(4): in press.
- Sousa, S. G., N. Souza Neta, and L. C. Garcia. 2015. *Plantas alimentícias não convencionais oferecidas nas feiras e mercados de Manaus*, AM. LXI Reunião Anual da Sociedade Interamericana de Horticultura Tropical. Brasília, DF: Embrapa.
- Souza, G. S. 1851 [1587]. *Tratado descritivo do Brasil em 1587*. Madrid: Editora Varnhagen.
- Staden, H. 1928. *Hans Staden: The true history of his captivity, 1557*. (Translated by Malcolm Letts). London: George Routledge and Sons.
- Torres-Avilez, W., M. Mendez-Gonzalez, R. Duran-Garcia, I. Boulogne, and L. Germosen-Robineau. 2015. Medicinal plant knowledge in Caribbean Basin: A comparative study of Afrocaribbean, Amerindian and Mestizo communities. *Journal of Ethnobiology and Ethnomedicine* 11:18, doi <https://doi.org/10.1186/s13002-015-0008-4>.
- Towns, A. M., S. Mengue Eyi, and T. van Andel. 2014. Traditional medicine and childcare in Western Africa: Mothers' knowledge, folk illnesses, and patterns of healthcare-seeking behavior. *PLoS ONE* 9(8): e105972, <https://doi.org/10.1371/journal.pone.0105972>.
- Ucheck Fomum, F. 2004. *Vernonia amygdalina* Delile. [Internet] Record from PROTA4U. G. J. H. Grubben and O. A. Denton, eds. Wageningen, Netherlands: PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). <https://www.prota4u.org/database/> (3 August 2018).
- Van Andel, T. and S. Ruysschaert. 2011. *Medicinale en rituele planten van Suriname*. Amsterdam, The Netherlands: KIT Publishers.
- , P. Maas, and J. Dobreff. 2012. Ethnobotanical notes from Daniel Rolander's *Diarium Surinamicum* (1754–1756): Are these plants still used in Suriname today? *Taxon* 61:852–863.
- , A. Velden, and M. Reijers. 2016. The 'Botanical Gardens of the Dispossessed' revisited: Richness and significance of Old World crops grown by Suriname Maroons. *Genetic Resources and Crop Evolution* 63:695–710.
- Vandebroek, I. and D. Picking. 2016. *Popular medicinal plants in Portland and Kingston, Jamaica*. Kingston: Pear Tree Press.

- Vanderborght, T. and J-P Baudoin. 2001. Cowpea. *Vigna unguiculata* (L.) Walpers. In: Crop production in tropical Africa, ed. R. H. Raemaekers, 334–348. Brussels, Belgium: Directorate General for International Co-operation (DGIC), Ministry of Foreign Affairs, External Trade and International Co-operation.
- Verger, P. 1995. Ewe: O uso das plantas na sociedade Ioruba. São Paulo, Brazil: Companhia das Letras.
- Vicente do Salvador. 1931[1627?]. História do Brasil: 1500–1627. 3rd Edition. São Paulo: Companhia Melhoramentos.
- Voeks, R. A. 1997. Sacred leaves of Candomblé: African magic, medicine, and religion in Brazil. Austin: University of Texas Press.
- . 2013. Ethnobotany of Brazil's African diaspora: The role of the Columbian Exchange. In: African ethnobotany in the Americas, eds. R. A. Voeks and J. Rashford, 395–416. New York: Springer.
- . 2018. The ethnobotany of Eden: Rethinking the jungle medicine narrative. Chicago: University of Chicago Press.
- and A. Leony. 2004. Forgetting the forest: Assessing medicinal plant erosion in eastern Brazil. *Economic Botany* 58(1):S294–S306.
- Voyages: The Trans-Atlantic Slave Trade Database. <http://www.slavevoyages.org/assessment/essays> (21 April 2018).
- Walker, S. S., ed. 2001. African roots/American cultures: Africa in the creation of the Americas. Rowman and Littlefield.
- Watkins, C. 2018. Landscapes and resistance in the African diaspora: Five centuries of palm oil on Bahia's Dendê Coast. *Journal of Rural Studies*. 61:137–154.
- Winer, L. 2008. Dictionary of the English/Creole of Trinidad and Tobago. Montreal, Quebec: McGill-Queen's University Press.
- WinklerPrins, A. and P. S. de Souza. 2005. Surviving the city: Urban home gardens and the economy of affection in the Brazilian Amazon. *Journal of Latin American Geography* 4(1):107–126.
- Winterbottom, T. 1803. An account of the native Africans in the neighbourhood of Sierra Leone. Vol. 1. London: C. Whittingham.
- Yang, R. and G. B. Keding. 2009. Nutritional contributions of important African indigenous vegetables. In: African indigenous vegetables in urban agriculture, eds. C. M. Shackleton, M. W. Pasquini, and A. Dresche, 105–143. London: Earthscan.