Petition to the National Organic Program and National Organic Standards Board For Ethiopian Pepper to be added To National List Section 205.606

Item A

We ask that you amend the National List, Section 205.606, to include non-organic Ethiopian pepper, and allow its substitution when an organic alternative is unavailable.

Item B

1. Common Name:	Ethiopian pepper
Botanical/Latin Name:	Xylopia Aethiopica
Other Names:	Negro Pepper
	Grains of Selim
	Moor Pepper
	Kani Pepper
	Senegal Pepper
	Uda

2. Manufacturers' Name, Address and Telephone

We are unable to find a supplier of certified organic Ethiopian pepper. However, our current non-organic manufacturer that we use for our Ethiopian peppers is Afrikan General Store. Their address is 1502 ½ N. La Brea Avenue, Los Angeles, California 90302. Their telephone number is (310)672-8684.

3. Intended Use

We use Ethiopian pepper in all three of our hot sauces: African Hot Pepper Sauce; Chipotle Pepper Sauce; and Chili Pepper Sauce. Ethiopian pepper is quite pungent and slightly bitter, comparable to a mixture of cubeb pepper and nutmeg. This fruit is often smoked during the drying process, resulting in an attractive smoky-spicy flavor. No other spices give the same bitter, yet aromatic, flavor.

4. A list of crop, livestock or handling activities for which the substance will be used. If used for handling (including processing), the substance's mode of action must be described.

The sole use of this pepper is as an ingredient in Brother Bru Bru's Hot Sauces.

The production method is as follows: The dried seed pods are milled by Threshold Enterprises. We then ship all ingredients, as well as labels and bottles, to CMS Fine Foods in Healdsburg, California. They combine the Ethiopian pepper with other peppers, spices, apple cider vinegar, and water and heat the mixture to 180 degrees Fahrenheit. The finished product is pumped into 5-ounce glass bottles; each is given a label, cap, and protective sleeve with a date stamp. The bottles are then packed in box containers.

5. The source of the substance and a detailed description of its manufacturing or processing procedures from the basic component(s) to the final product.

Ethiopian pepper is native to the rainforests of West Africa. The processing includes responsibly harvesting these wildcrafted seed pods, sorting, and selecting the fruits, which are generally smoked during the drying process. Ethiopian pepper is usually sold in dried form and we grind it before using this spice in our products.

6. Ancillary Substances

Not applicable.

7. A summary of any available previous reviews by State or private certification programs or other organizations of the petitioned substance.

None was found.

8. Information regarding EPA, FDA, and State regulatory authority registrations, including registration numbers.

None was found.

9. The Chemical Abstract Service (CAS) number or other product numbers of the substance and labels of products that contains the petitioned substance.

There is no Chemical Abstract Service number, nor are there other product numbers for the substance. We do not have labels of the products; however, we do have a letter from our Ethiopian Pepper supplier, which is located in Attachment 4.

10. The substance's physical properties and chemical mode of action.

See Attachment 1 and 2 for more detailed information.

11. Safety information about the substance including a Material Safety Data Sheet (MSDS) and a substance report from the National Institute of Environmental Health Studies.

No MSDS is available from the supplier.

12. Research information about the substance, which includes comprehensive substance research reviews and research bibliographies, including reviews and bibliographies, which present contrasting positions to those presented by the petitioner in supporting the substance's inclusion on or removal from the National List.

Unfortunately, this information does not exist, and, to repeat, we have been unable to find a supplier of certified organic Ethiopian pepper.

13. <u>Petition Justification Statement</u>

At the moment, the only organic Ethiopian Peppers we could find were sold as seeds through Downright Natural (http://www.downrightnatural.com/index.php?main_page=product_info&products_id=1479_). Growing our own peppers would not be practical, nor would it be time efficient. We could not find any suppliers of organic Ethiopian Peppers and there is no research as to why more organic Ethiopian peppers are not produced in large quantities, so we request that “Ethiopian Peppers” be added to the National List of non-organically produced agricultural products that can be allowed in products labeled as “organic.” Naturally, Brother Bru Bru’s will use an organic alternative as soon as it is available.

ATTACHMENT 1
DETAILED INFORMATION ON ETHIOPIAN PEPPER (ETHIOPIAN PEPPERS) INCLUDING PRODUCTION AND GROWING METHODS

Plant Profile: Xylopia aethiopica

Information source: http://www.pfidnp.org/crop_specs/XYLOPIA.pdf

Traditional and Modern Medicinal Uses

The fruits of Xylopia aethiopica tree are the parts most commomly used for commercial applications. Medicinally, the fruits are used as a cough-medicine, a calmative, purgative and repulsive to pain. The fruit is a common ingredient of the Yuroba. In Liberia, the spice is smoked and inhaled for respiratory ailments. The fruit is often incorporated in preparations for enema and external uses, calling on its repulsive properties for pains in the ribs, chest and generally for any painful area, lumbago (low back and waist pains), neuralgia (pains in the nerves) and in the treatment of boils and skin eruptions. The fruit decoction is useful in the treatment bronchitis and dysenteric conditions, and as a medicine for bulimia (eating disorder). The seeds of the plant are mixed with other spices, rubbed on the body as cosmetic and scent, and as perfume for clothing. The crushed, powdered fruit mixed with shea butter and coconut oil is used as creams, cosmetic products and perfumes. Even the odiforous roots of the plant are employed in tinctures, administered orally to expel worms and other parasitic animals from the intestines, or in teeth rinsing and mouth wash extracts against toothaches. The fruits mixed with its roots are used in the treatment of rheumatism. Despite all the medicinal applications, the dried fruits are important as flavorings to prepare local soups of West Africa, and is also known as African pepper.

Botanical Background

Xylopia aethiopica (Dunal) A. Rich is a slim, tall tree of about 60–70 cm in diameter that can reach up to 15– 30 m tall, with a straight stem and a slightly stripped or smooth bark. The fruits are rather small and look like twisted bean-pods. When dry, the fruit turn dark

brown, cylindrical, 2.5 to 5 cm long and 4 to 6 mm thick.
The contours of the seeds are visible from outside. Each pod contains 5 to 8 kidney-shaped seeds of approximately 5 mm in length. The hull is aromatic, but not the seeds.

Pharmacological Properties and Chemical Composition

The plant contains anonaceine, an alkaloid, and rutin, a volatile aromatic oil and a fixed oil. A pharmacological investigation of fruit extract against skin infection has shown modest activity against gram- positive organisms. The plant contains high amounts of copper, manganese, and zinc. Key constituents are diterpenic and xylopic acids, and these within the fruit extracts show activity as an antimicrobial against gram positive and negative bacteria. However, it has not been shown to be effective against E. coli (Iwu 1993). Xylopic acid has also demonstrated activity against the fungus Candida albicans. The essential oil has been well characterized with linalool, β-trans-ocimene, α-farnesene, α-pinene, β-pinene, myrtenol, β-phellandrene, and 3-ethylphenol as the major volatile constituents (Tairu et. al. 1999). Researchers describe that the intense 'pepperish note' of the oil of the fruit largely comes from linalool and provides that characteristic aroma of the ground, dried, smoked fruits of Xylopia aethiopica. The essential oil yield varies from 2.0% to 4.5%. The essential oils of the stem bark (0.85%) and the leaves (0.5%) of X. aromatica have also been investigated. The bark oil consists mainly of α-pinene, trans-pinocarveol, verbenone and myrtenol and differs significantly from that of the leaf oil (spathulenol, cryptone, beta-caryophyllene and limonene).

Ecology and Methods of Cultivation of Xylopia

Xylopia is native to the lowland rainforest and moist fringe forest in the savanna zones of Africa, but largely located in West, Central and Southern Africa. These trees are widely distributed in the humid forest zones of West Africa especially along rivers in the drier area of the region (Tairu, et. al., 1999). In tropical and highlands of Africa (from Ethiopia to Ghana), both species X. aethiopica and X. striata occur and both are used for local cooking. In South America, a third species is of interest, X. aromatica (burro pepper), which has found similar applications among Brazilian Indios. The tree prefers high rainfall areas and well-drained soils. While X. aethiopica thrives in the forest regions, the tree can also be found in transitional zones. Loamy and sandy loamy soils are conducive for the cultivation of the plant. The plant can successfully be intercropped with other staple food items in the first four years.
Propagation is easily accomplished by seeds. Seedlings are transplanted to the field within three to five months after sowing. The plant grows rapidly the first three years. Trees are planted eight meters apart. In West Africa, the tree flowers twice per year, in March to July and in October to December. Fruiting takes place in December to March and June to September. Harvesting time runs from February to May and again from August to October. The fruits are harvested with the inflorescence. After picking, the fruits are sun- dried for four to seven days. After drying, the fruits are removed from the inflorescence stalks. Fruits should not be dried on the ground, but on a protective cloth, net, screen or shelving system to minimize any microbial contamination. Typical fruit yields are about two to three metric tons per annum per hectare.

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Compiled by: Dan Acquaye, Marianna Smith, Wudeneh Letchamo and Jim Simon

ATTACHMENT 2
CHEMICAL COMPOUND OF XYLOPIA AETHIOPICA

Information source: http://www.pjbs.org/pjnonline/fin1391.pdf

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Characterization of Lipid Compounds of the Dried Fruits of *Xylopia aethiopica* (Dunal) A. Rich Growing in Sudan

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Abstract: Total lipids extracted from the seeds of *X. aethiopica* were found to be 10%. The oil was analyzed for fatty acids and sterols composition. Thirteen fatty acids were identified, with their methyl esters using GC/MS analytical method. The majority of fatty acids were unsaturated (72%). Oleic acid was the dominant unsaturated fatty acid (69.37%), while the saturated fatty acids represented about 27% of the total fatty acids present in oil from seeds, mainly palmatic acid (15.66%) and stearic acid (9.5 %). The sterols quantification and identification were preformed by analysis of the unsaponifiable matter of the seed oil using GC/MS technique. The level of sterols estimated in the oil was 4.2 g/kg oil. The main component was Sitosterol which represented about 58% of the total sterol content, followed by campesterol (23.5%) and **)**^{5}-Avenasterol (12.1%). Cholesterol was found at about 3% of total sterols.

Key words: *Xylopia aethiopica*, fixed oil, fatty acids, sterols

INTRODUCTION

Xylopia aethiopica (Annonaceae) is an ever green, aromatic tree, growing up to 20 m high. It is a native to the low land rain forests and moist fringe forests in the savanna zones and coastal regions of Africa (Dalziel, 1955; Irvine, 1961), largely located in west and central Africa, where it thrives in wet, swampy soils and in southern Africa (Hutchinson and Dalziel, 1955; Keita *et al*., 2003). In Sudan it is distributed in high rain fall Savanna and swampy forests (Elamin, 1990; Elgahazali *et al*., 2004). It is used under the name of Guinean pepper as spice and soup condiment and is valued for its carminative effect. It has been applied in ethnomedicine in Africa (Dalziel, 1955; Iwu, 1986; Oliver, 1986; Akendengue, 1992; Maurice, 1993; Mamoudoukande *et al*., 1994; Etkin, 1997; Suleiman *et al*., 2005).

MATERIALS AND METHODS

The dried fruits of *X. aethiopica,* were brought from a local market and authorized by Medicinal and Aromatic Plants Research Institute (MAPRI), Sudan.

Preparation of the oil: Total lipids were extracted from the seeds with petroleum ether (b.p.40-60^{o}C) using Soxhlet apparatus. The solvent was evaporated on a rotary evaporator under reduced pressure and the produced oil was dried in an oven at 105^{o}C to a constant weight (AOAC, 1990).

GC-MS Identification of fatty acids methyl esters: The fatty acids methyl esters were prepared as described in IUPAC (1964). They were identified using Gas Chromatography-mass Spectrometry Analysis (GC-MS), type HP 6890 (GC), HP 5973 (MSD).

Identification of sterols: In order to identify the sterols in oil sample under investigation, the unsaponifible matter was analyzed by gas chromatography-mass sepectrometry analysis (GC-MS).

Saponification of the oil: Five grams of the oil were dissolved in ethanol (30 mL), then 50 mL alcoholic KOH (50%) were added. The oil was saponified on a water bath for 30 min under reflux air condenser.

Isolation of unsaponifiable matter: The alcoholic solution was concentrated and quantitatively transferred into separatory funnel using a total of 50 mL distilled water and 50 mL petroleum ether. The unsaponifiable matter was extracted three times with petroleum ether, washed several times with distilled water, dried over anhydrous sodium sulphate and then filtered into a weighed flask. The solvent was evaporated using a boiling water bath and the flask was dried at 105^{o}C until constant weight was reached.

GC-MS Identification of sterols: Gas chromatography-mass spectrometry was performed using a gas chromatograph-mass spectrograph (GC-MS) (TRACE G C 2000/FINNGAN MAT SSQ7000 MASSSPECTROMETER) fitted with electron impact (EI detector, 70 eV)) mode. The analytical column was DB-5 (5%-phenyl-methylpolysiloxane) with internal diameter (ID) 30 m X 0.25 X 0.25. Helium was used as a carrier gas at a flow rate of 1 mL/min. The temperature was programmed at 50^{o}C for 5 min then increased to 300^{o}C at the rate of 5^{o}C/min. The temperature of injector was 250^{o}C. The total run time was 53 min.

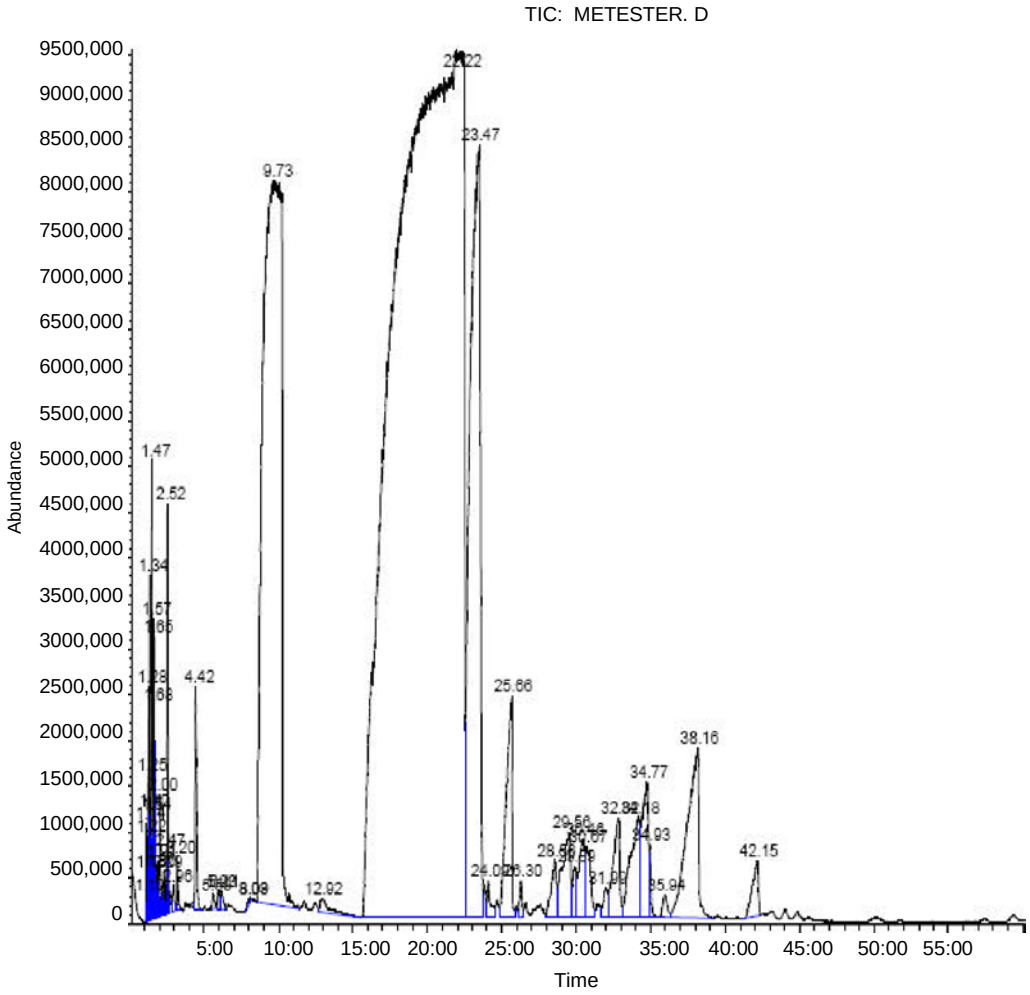

Fig. 1: Gas chromatogram of fatty acids methyl esters of *X. aethiopica* seeds oil

RESULTS

Thirteen fatty acids were identified, with their methyl esters, in the fixed oil of the fruit seeds of *X. aethiopica*. Their identification was established on the basis of chromatographic and mass spectral data. Figure 1 shows the gas chromatogram of the fatty acids methyl esters of *X. aethiopica* seeds oil, whereas the data about the qualitative and quantitative composition of fatty acids are summarized in (Table 1).

The main phytosterols identified in the oil of seeds of *X. aethiopica* were sitosterol, campesterol and **)**^{5}-Avenasterol. Cholesterol was found in small quantity among the total sterols. Figure 2 shows the gas chromatogram of the unsaponifiable matter of *X. aethiopica* seeds oil, whereas the data about the qualitative and quantitative of sterols composition are summarized in (Table 2).

Table 1: Fatty acids composition of *X. aethiopica* seed oil

Systematic name	Percentage
Saturated fatty acids	
Octanoic acid	00.36
Hexadecanoic acid	15.66
Heptadecanoic acid	00.33
Octadecanoic acid	09.47
Eicosanoic acid	00.59
Pentadecanoic acid	00.02
Tetradecanoic acid	00.60
Total	27.03
Unsaturated fatty acids with one double bond	
9-Hexadecenoic acid	00.20
9-octadecenoic acid	69.37
10-nonadecenoic acid	00.28
11-Eicosenoic acid	02.50
Total	72.35
Unsaturated fatty acids with two double bonds	
10, 13-Octadecadienoic acid	00.32
11, 14-Eicosadienoic acid	00.30
Total	00.62

DISCUSSION

Among the total lipids present in fixed oil of seeds of the *X. aethiopica* from Sudan, fatty acids profile evinces the lipids as a good source of essential fatty acids. Oleic acid (69.37%) was the dominating fatty acid, followed by

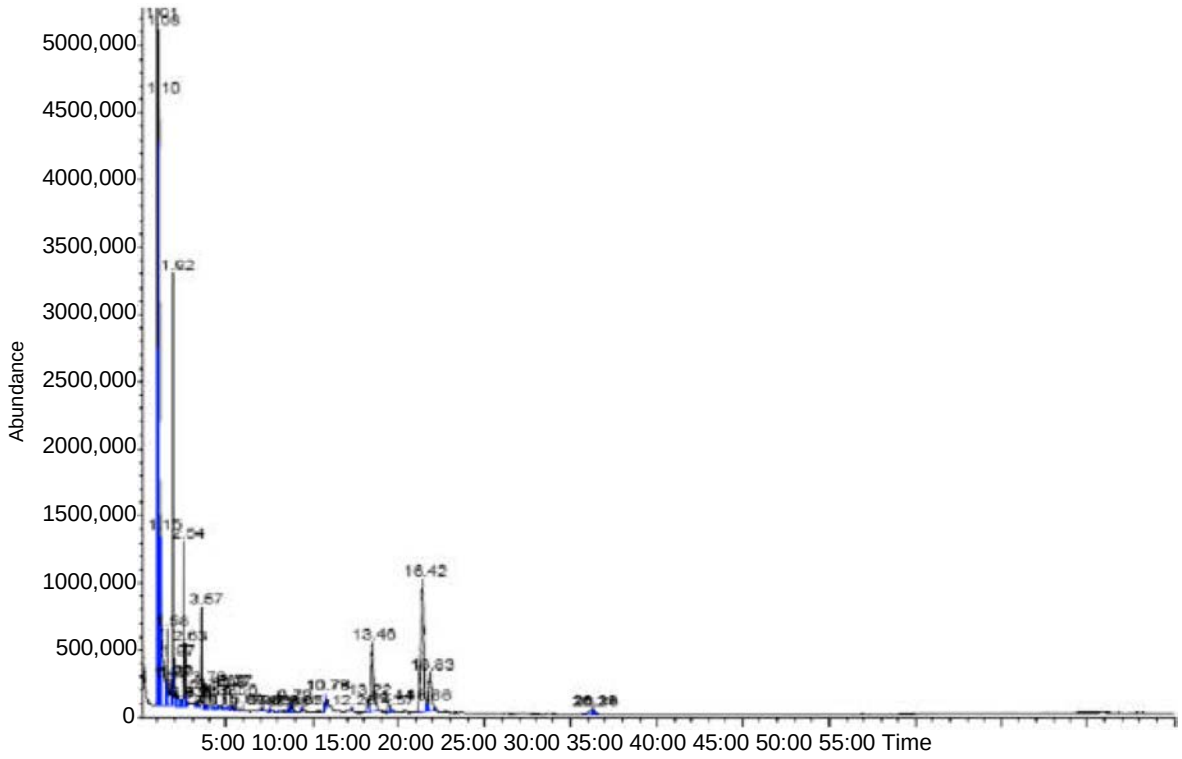

Fig. 2: Gas chromatogram of unsaponifiable matter of *X. aethiopica* seed oil

Table 2: Sterol composition of *X. aethiopica* seed oil

IUPAC name	Common name	Retention time (min)	Percentage
Cholest-5-ene-3 ß-ol	Cholesterol	10.78	03.20
Ergost-5,24-diene -3ß-ol	_____	13.22	03.30
Ergost-5-ene-3ß-ol	Campesterol	13.46	23.50
5"-Stigmast-5-ene-3ß-ol	Sitosterol	16.42	58.00
5"-Stigmasta-5,24(28)-diene 3ß-ol	)^{5}-Avenasterol	16.83	12.00

palmatic acid (15.66%) and stearic acid (9.47%). The majority of fatty acids were unsaturated fatty acids (72%), while the saturated fatty acids, mainly palmatic and stearic acids were about 27% of the total fatty acids present in fixed oil from seeds of the plant.

The fatty acids composition of oil from seeds of *X. aethiopica* from Sudan differ from fatty acids composition of oil from seeds of *X. aethiopica* from Nigeria (Barminas *et al*., 1999). Oleic acid is the predominant unsaturated fatty acid in the seeds oil of *X. aethiopica* from Sudan, whereas linoleic acid is the predominant unsaturated fatty acid in the seeds oil of *X. aethiopica* from Nigeria.

The level of sterols estimated in the oil was 4.2 g/kg oil. The main component was sitosterol which represented about 58% of the total sterol content, followed by campesterol (23.5%) and)^{5}-Avenasterol (12.0%). Cholesterol was found at about 3% of total sterols. Sterols content in the fruit seeds oil (4.2 g/kg) was similar to that in sunflower oil (4.3 g/kg); higher than that in extra virgin olive oil (having a median value of 1.5 g/kg) and soy oil (3.5 g/kg) and lower than those in crude corn oil (8.5 g/kg), rapeseed oil (8.2 g/kg). The amount of cholesterol in the fruit seed oil (ca. 0.014%) was very low compared to those in olive and soybean oils (ca.0.40%) and palm oil (2.30%) (Guderjan *et al*., 2005; Hafidi *et al*., 2005).

Conclusion: The lipid profile (fatty acids and sterols) of the seed oil of the fruits of *X. aethiopica* is a recent addition to the current literature available on the composition of the fruit of this important plant growing in several African countries.

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ATTACHMENT 3
THE RISING DEMAND OF MEDICINAL PLANTS ESPECIALLY ETHIOPIAN PEPPERS (XYLOPIA AETHIOPICA)

Information source:
http://img.modernghana.com/images/content/report_content/ghanas_herbal_market_van_andel_et_al_2012.pdf

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Ghana's herbal market

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abstract

Ethnopharmacological relevance: Medicinal plant markets not only provide a snapshot of a country's medicinal flora, they also reflect local health concerns and the importance of traditional medicine among its inhabitants. This study aimed to describe and quantify the Ghanaian market in herbal medicine, and the diversity of the species traded, in order to evaluate their economic value.

Materials and methods: Initial visual surveys on the markets were followed by a detailed quantitative survey of 27 stalls in August 2010. Market samples were processed into herbarium vouchers and when possible matched with fertile vouchers from the field.

Results: We encountered 244 medicinal plant products, representing 186–209 species. Fourteen species were sold at more than 25% of the market stalls. Seeds and fruits that doubled as spice and medicine (**Xylopia aethiopica**, **Monodora myristica**, **Aframomum melegueta**) were in highest demand, followed by the medicinal barks of **Khaya senegalensis** and **Pteleopsis suberosa**. Plants sold at the market were mostly used for women's health, in rituals, as aphrodisiacs and against sexually transmitted diseases. An estimated 951 tons of crude herbal medicine were sold at Ghana's herbal markets in 2010, with a total value of around US$ 7.8 million. Between 20 and 30% of the Ghanaian medicinal flora was encountered during this survey. Roots were less dominant at the market than in dryer parts of Africa. Tons of **Griffonia simplicifolia** and **Voacanga africana** seeds and **Fadogia agrestis** bark are exported annually, but data on revenues are scanty. None of these species were sold on the domestic market.

Conclusion: Our quantitative market survey reveals that the trade in Ghanaian herbal medicine is of considerable economic importance. Regarding the specific demand, it seems that medicinal plants are used to complement or substitute Western medicine. Further research is needed on the ecological impact of medicinal plant extraction.

1. Introduction

West Africa has a historically high human population density, concentrated settlements, and a history of well-developed long-distance trade. Medicinal plants are in high demand as trade goods, since their small size makes them easy to transport in countries with a defective transport system (Van der Geest and Reynolds Whyte, 1989). High levels of unemployment, rapid urbanization and low levels of formal education among rural to urban migrants are other reasons behind the increasing trade in herbal medicine in West Africa. This trade has a significant socio-economic impor-tance as it allows millions of people, especially women, to generate an income by plant collection and marketing (Cunningham, 2001; Sunderland and Ndoye, 2004; Williams, 2007).

Medicinal plant markets not only provide a snapshot of a coun-try's medicinal flora, but they also reflect the concerns about health and illness and the importance of traditional medicine among its inhabitants. Between 60 and 95% of the Africans are said to depend on traditional medicine for their primary health care needs (Anyinam, 1995; WHO, 2000; Cunningham, 2001). There exists a general concern that the trade in herbal medicine threatens the wild populations of popular West African plant medicines (Cunningham, 1993; Blay, 2004; Ndam and Marcelin, 2004), which can in turn affect their availability for primary health care (Grifo and Rosenthal, 1997; Hamilton, 2004). Overexploitation is a grow-ing problem for many West African medicinal species in areas where population growth, lack of access to western medicine, poverty, and growing markets fuel unsustainable harvesting prac-tices (Osemeobo, 1992; Cunningham, 1993; Hamilton, 2004; Boon and Ahenkan, 2008). Market surveys remain indispensable for sound conservation and development planning. Learning which

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species are sold, their prices, and the volumes marketed are the first steps in identifying species with conservation or resource management priorities. Wild species that are sold frequently and in high quantities are at greater risk of overharvesting (Cunningham, 1993; Williams, 2007). On the other hand, Padoch (1992) argues that knowledge on the commercialization of plant products can also increase the value of forest products, stimulate conservation efforts and enhance the income of rural people.

The marketing of medicinal plants is an important, but neglected area of research. Reliable official statistics are often limited to export figures, while the bulk of the plant material is sold locally (Padoch, 1992). People who harvest or sell medicinal plants are gen-erally self-employed and form part of a 'hidden economy', and thus remain unrecognized in government figures (Cunningham, 2001). As most transactions are only marginally legal and competition is high, vendors are reluctant to be questioned, and middlemen are notoriously difficult to interview (Padoch, 1992; Olowokudejo et al., 2008; Kadiri, 2009). Merchants of different ethnicities are present on the market, so products derived from a single botanical species may be sold under a variety of vernacular names (McMillen, 2008). Finally, when plants are sold in the form of roots, bark, wood or shredded leaves, botanical identification can be very difficult (Johnson & Johnson, 1976; McMillen, 2008; Mati and de Boer, 2010).

Few quantitative market surveys have been carried out in West Africa. The trade in herbal medicine has been studied in Benin (CENPREBAF, 1999; Vodouhê et al., 2008), Cameroon (Betti, 2002), Nigeria (Johnson and Johnson, 1976; Olowokudejo et al., 2008; Sonibare and Gbile, 2008; Kadiri, 2009), and Ghana (Falconer, 1994; Blay, 2004; Obiri and Addai, 2007). Although these researchers have interviewed vendors and listed (part of) the marketed species, none of them has estimated the frequency, volumes or value of the herbal medicine offered for sale, like it has been so thoroughly done for South Africa (Williams, 2007; Williams et al., 2005, 2007) and Tan-zania (McMillen, 2008).

This paper presents the results of a quantitative market survey conducted in Ghana in 2010. With an economic growth of about 20% for 2011, Ghana was listed as the world's fastest growing economy (Economy Watch, 2011). The country has 24.7 million inhabitants, and its capital Accra, with an annual growth rate of 3.4%, is one of Africa's most populated and fastest-growing cities today (CIA, 2011). Almost half of Accra's residents are migrants: either from the countryside or from neighboring states. The country has three dis-tinct ecological zones: closed canopy forest, a forest-savanna zone and dry savanna. As a result of population growth, logging and land clearing for cash crop agriculture, Ghana has lost one third of its forest cover between 1990 and 2010. The rain forest area in south-ern Ghana is now less than 25% of its original size (Repetto, 1990). Savanna trees are disappearing due to bush fires and the expansion of agricultural practices (Gyasi et al., 1995). At the same time, some 80% of the rural villagers in southern Ghana rely on wild plants as their main medicinal source (Falconer, 1994). Access to primary health care has a strong urban bias: the number of patients per public doctor varies between 6200 in Accra to 42,200 in remote rural areas (Van den Boom et al., 2008). As a rapidly urbanizing region with a high level of endemic plant taxa, and a population that heavily depends on herbal medicine, Cunningham (1993) has indi-cated Ghana has as a priority area for cooperative action between healthcare professionals and conservationists.

While the aim of the British colonial government was still to 'liquidate native practices of traditional medicine' (Twumasi and Warren, 1986), these practices were embraced as part of the national identity after independence in 1957 (Brown, 1995). From then onwards, Ghana's medicinal flora has been well docu-mented (Irvine, 1961; Ayensu, 1978; Abbiw, 1990; Brown, 1995; Mshana et al., 2000; Asase et al., 2005). Much research has been devoted to traditional healers and their possible cooperation with western-trained health personnel (e.g., Warren et al., 1982; Fink, 1990; Ventevogel, 1996). In 1974, the Center for Scientific Research into Plant Medicine was established to study the efficacy of local herbs, carry out domestication trials and serve as a traditional health clinic (www.csrpm.org, assessed 26 September 2011; Boon and Ahenkan, 2008). If Ghana wants to guarantee its residents their access to herbal medicine in the future, it needs to conserve the medicinal plants that are so critical for their health. However, before vulnerable species for conservation or management can be prioritized, it is necessary to know which species are sold and in what quantities. Apart from the domestic market in chewing sticks in Kumasi (Blay, 2004), an overview of forest products sold around Kumasi (Falconer, 1994) and the export of **Griffonia simpicifolia** and **Voacanga africana** seeds (Arthur, 2010; Gbewonyo, 2002), no quan-titative figures exist on the export or domestic market of medicinal plants from Ghana.

Our main objectives were to describe and quantify the Ghanaian market in herbal medicine, and the diversity of the species traded, in order to evaluate their economic importance. Additionally, we would like to answer the following questions: Which species are in highest demand? What role do these plants play in local health care? What percentage of Ghana's medicinal flora is being com-mercialized? The outcomes of this market survey can be used to identify species most susceptible to overharvesting due to their high demand in the (inter-) national trade. Data on the conser-vation priorities for Ghanaian species in trade will be published elsewhere.

2. Materials and methods

2.1. Market survey

This study formed part of the research project "**Plant Use of the Motherland: Linking Afro-Caribbean and West African Ethnobotany**", carried out by the Netherlands Center for Biodiversity Naturalis, in collaboration with the University of Ghana. Fieldwork was con-ducted in Ghana from 21 June till 7 September 2010 (in the rainy season), during which we regularly visited the five largest mar-kets in the capital Accra. We counted the number of market stalls on both quiet and busy days. From the first visit on, we bought fresh medicinal plants when they were available, processed them into herbarium vouchers and collected information on vernacu-lar names, processing methods, uses and prices. Living rhizomes and bulbs were propagated to produce leaves, after which they were pressed and dried into herbarium vouchers. After becoming familiar with most of the commercial species, we conducted a sys-tematic quantitative survey in August 2010 of in total 27 market stalls in the country's largest cities: Accra (pop. 3.9 million), Kumasi (pop. 1.6 million), and Tamale (pop. 390,730), and in Cape Coast (pop. 154,204), the 8th largest town (www.world-gazetteer.com, assessed 12 December 2011). Additionally, we surveyed a village market in Akoase (pop. ca. 3000), near Nkawkaw (see Fig. 1), an area where commercial extraction takes place.

Per stall, we counted all plant products offered for sale, the amount of sales units (bundles, bags, bottles or loose plant parts) per species, we observed whether material was sold fresh or dried, and estimated the volume of additional stock packed in bags behind the stalls. Additionally, we recorded the ethnicity and gender of the vendors and asked them to estimate their weekly sales of plant material and indicate species that were becoming expensive or increasingly difficult to obtain. Chewing sticks that were sold on medicinal plant stalls were included in our survey, but we excluded stalls selling only chewing sticks, since the marketing of this prod-uct was adequately described by Blay (2004). Unknown herbs and leafy twigs were purchased and pressed as herbarium specimens;

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Fig. 1. Map of Ghana.

Source: www.mapsofworld.com.

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ATTACHMENT 4
LETTER FROM AFRIKAN GENERAL STORE REGARDING ETHIOPIAN PEPPERS

Afrikan General Store

1502 ½ N. La Brea Avenue,
Inglewood, Ca. 90302.

African General Store supplies Brother Bru Bru's with an African spice which we call Uda. This spice, whose Latin name is Xylopia Aethiopica, is commonly referred to as Ethiopian Pepper. It is a seed pod that is harvested from trees in the rainforests of West Africa. These trees grow in the wild. They are not irrigated with water nor with any sewage sludge; neither are they fertilized. This is a non-GMO product.

After the harvest, the seed pods are sun-dried and sometimes smoked. These clusters of seed pods are then sent to us in the United States. They are not treated with any kind of radiation. We sell them to many customers including Brother Bru Bru's.

Signed by Management

Afrikan General Store.