

SURVEYING *MUCUNA*'S UTILIZATION AS A FOOD IN ENUGU AND KOGI STATES OF NIGERIA

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SUMMARY

Mucuna pruriens is used as a minor food crop in several countries of Asia and Africa but its traditional preparation methods have been little studied. This work was conducted to better understand the cultivation patterns, trends in utilization, and recipes utilized to cook *Mucuna*, as well as benefits and problems associated with its use. The study was conducted as a survey of 230 households in the Nigerian states of Enugu and Kogi. *Mucuna* cultivation in the area is widespread, with 60% of respondents indicating that few and 20% that most people cultivate it. Most commonly, the white type is cultivated and preferred for consumption (67 and 85% of the responses, respectively), although in two towns, only the black type is cultivated, and in five other towns, there were individuals who preferred the black type. It is commonly perceived as a crop grown by women (45%) and poor people (25%). *Mucuna* is grown in homegardens (40% of responses) and in fields (40%), and is typically intercropped (92%) with major food crops.

Most commonly, it is cultivated as a food crop, but other less common uses, such as a feed, soil fertility improver, medicine, and dye are widely known. Over 90% of the respondents said they eat *Mucuna*. Most respondents cultivate *Mucuna* for home consumption (55%) or for both home consumption and sale (40%); for very few, it is solely a cash crop. Quantities sold in the local market are small. Over 80% of the respondents considered that its consumption is decreasing. Mature beans are prepared in a wide variety of dishes. To prepare flour, the method most used is a brief (5-10 min) toasting before grinding, and this flour is subsequently added to a sauce or soup (i.e., stew). In soups, the *Mucuna* flour is used as a thickener (83% of responses). It often is mixed with or replaces egusi, a common thickener. A number of other foods are prepared with *Mucuna* with less frequency, particularly in Kogi state.

The preparation methods used are typically insufficient to greatly reduce or eliminate L-Dopa in

the *Mucuna* product. Although about 56% of the respondents thought that eating *Mucuna* is associated with problems, the remaining thought that there were no problems associated with its use. Dizziness is the most frequently mentioned problem (56% of the responses), followed by vomiting (16%) and weakness (6%). About 84% of the respondents considered that these problems affect certain people and there was no consensus regarding a causal relationship with a certain processing method or *Mucuna* type. The most commonly mentioned remedy for curing *Mucuna*-induced digestive problems was that of drinking palm oil, a typical remedy for intestinal problems.

Key words: traditional food, L-Dopa, food processing.

INTRODUCTION

Mucuna is used as a minor food crop in several countries of Asia and Africa. In India, where such food uses have probably been studied most in-depth, the beans of the *Mucuna* species are consumed by a number of ethnic groups in the south (wild species, *M. gigantea* by Onges, Great Andamans and Xompens) (Rajaram and Janardhanan, 1991) and by Mundari and Davidian groups (*M. utilis*; Mary Josephine and Janardhanan, 1992). The Kanikkars, a hilltribe of Kerala in South India, consume the seed after repeated boiling (Janardhanan and Lakshmanan, 1985). In large parts of Sri Lanka, *M. pruriens* is consumed primarily by low-income groups after an overnight soaking and long cooking (Ravindran and Ravindran, 1988). *Mucuna*'s use as a minor food crop has also been reported from the Philippines (*M. pruriens* or *cochinchinensis*; Laurena *et al.*, 1994) and in Java, Indonesia, where it has been widely used in a fermented staple, *tempe* (K. Hairiah, personal communication).

In Sub-Saharan Africa, *Mucuna* is also a minor food crop. In Nigeria, *M. sloanei* is used by the Igbos, among others, of eastern Nigeria as a condiment or as a part of the main dish (Afolabi *et al.*, 1985; Ukachukwu *et al.*, 2002), and *M. urens* is used as a

soup thickener or condiment (Achinewhu, 1984; Ukachukwu *et al.*, 2002). In the forest region of Ghana, *Mucuna* has been consumed in small amounts in a daily soup for which beans are boiled for at least 40 minutes, the water discarded, seed coats removed, and the endosperm ground into a fine paste (Osei-Bonsu *et al.*, 1995). Ten to 15 beans are consumed per meal. Immature beans are reportedly preferred due to their reduced cooking time. Food use of *Mucuna* has also been reported from Mozambique (Infante *et al.*, 1990), from Malawi (Gilbert, 2002), and from Zambia (J. Peterson, personal communication).

Such traditional preparation methods of *Mucuna* have not been widely studied nor have their effects on the anti-nutritional factors and nutritional value. A more in-depth understanding of traditional utilization of *Mucuna* as a food could benefit current research efforts to increase its utilization as a food and feed. Among other contributions, it could give insights into effective ways to extract or metabolize the anti-nutritional factors present in *Mucuna* and to thereby to reduce the symptoms of intoxication that is caused by the presence of L-Dopa (3,4-dihydroxy-L-phenylalanine).

The general objective of this study was to examine how *Mucuna* is utilized as a traditional food crop in an area where it has been utilized for generations. More specifically, this study attempted to understand the cultivation patterns, trends in utilization, and recipes utilized to cook *Mucuna*, as well as benefits and problems associated with its use. The study was conducted as a survey of 230 households in the Nigerian states of Enugu and Kogi.

MATERIALS AND METHODS

Most of the rural population in southeastern Nigeria (Figure 1) are subsistence farmers, growing mainly cassava, maize, yams, cocoyams, and a variety of legumes. Although farming forms the base of subsistence in the region, many inhabitants are also engaged in other income-generating activities, such as petty trading, artisanship, and transportation. Most of the area's inhabitants are Igbos, who speak diverse dialects; communication among people speaking different dialects can be difficult. In areas of Kogi state where the survey was conducted, the Igala ethnic group predominates.

A preliminary survey was conducted in several states of southeastern Nigeria through informal inquiries regarding knowledge of *Mucuna* in different communities. Within Enugu State, utilization of *Mucuna* was found to be concentrated in the North East zone and in the border towns between Enugu and Kogi States. The survey was therefore focused on this zone (Figure 2). In total, the survey was conducted in 21 towns in Enugu State: Amokwe, Okpatu, Agbudu-Udi, Ukpata, Amagu, Abbi, Akpugo, Aku, Edem, Itchi, Nguru, Nimbo, Nkpologu, Nrobo, Obollo Afor, Obollo Eke, Obukpa, Okutu, Ovoko, Unadu, Orba. In Kogi State, the survey was conducted in Ogugu and in numerous towns in the areas surrounding Akpanya and Odoru; due to the limited number of surveys per location, the latter responses were pooled together as if they came from one town. Because many dialects are spoken in the region, villages were chosen where the dialect spoken was the same as that of the surveyor.

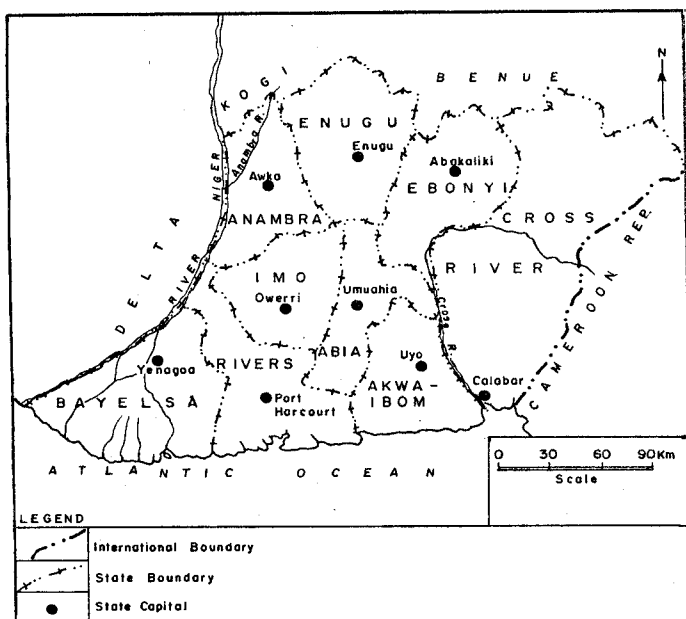


Figure 1. Map of eastern Nigeria.

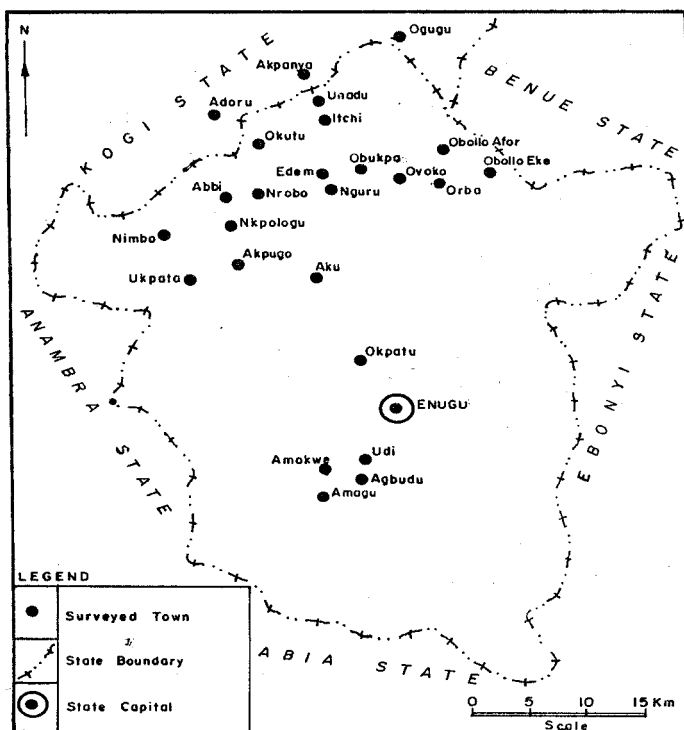


Figure 2. Location of the surveyed towns in the Enugu and Kogi states.

To prevent communication problems and to ensure better cooperation of interviewees, local people with at least teacher training or some university education were hired as field assistants. Before surveying, they were trained in interviewing techniques and on filling in the surveys.

The survey utilized a formal, 11-page questionnaire with 88 questions. It included the following sections: socioeconomic background of the respondent, patterns of *Mucuna* cultivation, past trends in its utilization, recipes utilized, and benefits and problems associated with the use of *Mucuna* as well as ways to remedy the problems. Because of the lengthiness of the questionnaire, at times the interview was either interrupted to allow the interviewee to complete work, or it was done while the interviewee was working. Not all interviewees answered all questions while for some questions, several answers were possible.

The questionnaire was pre-tested in 15 households located in five of the selected villages. Following the pre-testing, it was modified slightly, to include questions on the preliminary processing methods and on the popularity of *Mucuna* relative to other alternatives.

Within the villages, random households were visited.¹ An adult member of the household (typically the mother or father of the family) was chosen as the respondent, although other household members who were present also participated. In total, 10 households were surveyed in each of the 21 towns of Enugu State; an additional 20 were surveyed in Kogi State. Frequency histograms were used to present the data.

RESULTS AND DISCUSSION

Characterization of the respondents

Altogether, 230 households were interviewed. While three-fourths of the respondents were women, there was a spread in age, with middle-aged persons forming the largest group. About two-thirds of the respondents were married, and about one-sixth were widowed.

Almost a third of the respondents had had no schooling, and a similar share had attended only primary school at least for some time. One fifth of the respondents had attended either university or teacher training college; such a high proportion presumably

¹ Note, however, that a relatively high number of respondents were educated, indicating that the interviewers were seeking out certain individuals within the towns.

indicates that the interviewers sought out individuals in their own peer group. About 40% of the respondents were farmers, while almost one fourth were engaged in trading. Almost one third of the respondents were either teachers or civil servants.

Mucuna cultivation in the area

The preliminary survey revealed that in many parts of the region, *Mucuna* is either not known as a human food or it has been previously used as a food but that such use had been discontinued of late. Consistent and prevalent consumption of *Mucuna* was found in Enugu State and in parts of Kogi state. The survey was therefore focused on those areas.

Mucuna cultivation is widespread in these areas. While only about 7% of the responses indicated that everybody in their immediate area cultivates it, about 20% of them affirmed that most people cultivate it. A majority, about 60%, estimated that “few” people cultivate it, and only about one sixth of the respondents said that no one cultivates *Mucuna* in the area. Since it is eaten also in those locations where no one cultivates it, wild *Mucuna* types are presumably utilized. There was quite a disagreement among the respondents regarding the extent of *Mucuna* cultivation in their area, and in most towns, at least two, often three, different responses were found. However, in no village did all respondents say that everybody cultivates *Mucuna*. In two towns, all respondents said that “few” people cultivate *Mucuna*. These differences are at least partly caused by the social and economic differentiation in *Mucuna* cultivation. Respondents’ assessment was presumably mainly based on what they observe within their own peer group.

Mucuna cultivation is often seen as women’s and poor people’s work. Forty five percent of the respondents stated that it is mainly grown by women, and about 25%, that it is grown by poor people (Figure 3). Less than about 13% considered *Mucuna* an old people’s crop. Various reasons were given for these patterns: women use it for cooking (and therefore cultivate it), it is cheap and easy to cultivate, and “because poor people like it.” Of note, in the study area, most of the crops cultivated – except for yams – are considered women’s crops.

The white-seeded *Mucuna* is clearly the most prevalent, such that in six communities, cultivation of only the white variety was reported. Although in eight communities, two types, typically the white and black, are cultivated simultaneously, an overwhelming majority (over 80%) preferred the white type (Figure 4). These consumption patterns contradict with those in Malawi where the black type is the most commonly used (Phiri, 2002). A number of reasons were given for this preference, particularly taste, appearance, edibility, ease of processing, and aroma. Many people in those communities where the white variety is preferred consider the black variety toxic and about two thirds of the respondents did not regard the black variety as edible. Interestingly, however, in two towns in Udi agricultural zone (Amokwe and Agbudu), the black type is the only one cultivated and is also the preferred type. In five other towns, there were respondents who preferred the black type. Except in the few locations where the mottled variety is used for medicinal purposes, its cultivation and consumption are very rare.

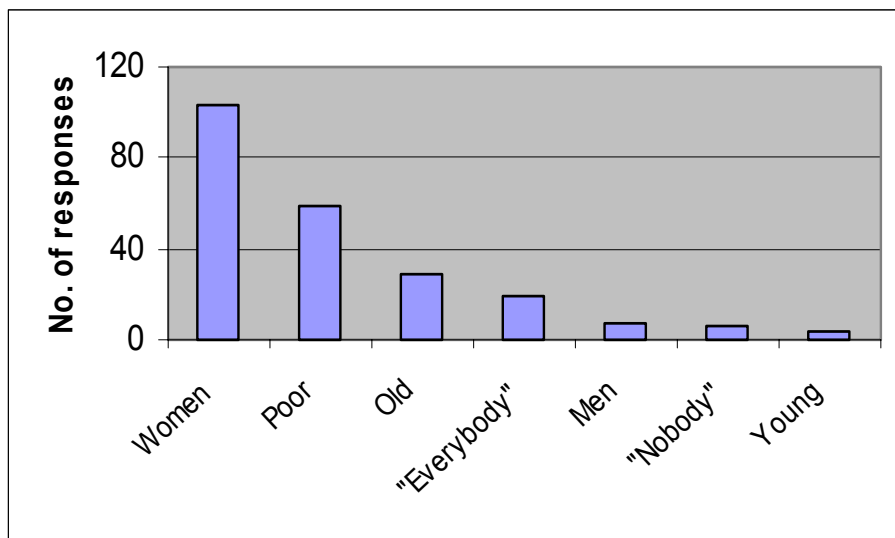


Figure 3. Groups who cultivate *Mucuna* in the respondent's location (n=277).

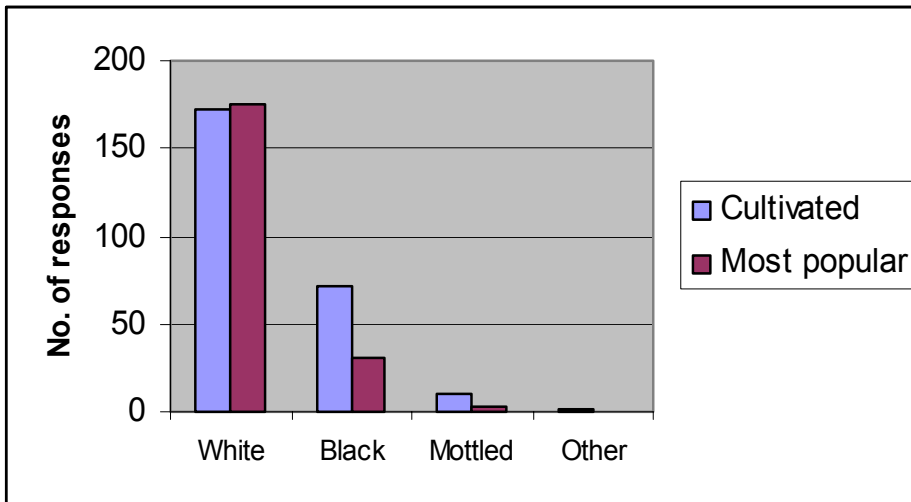


Figure 4. *Mucuna* type cultivated and the most popular type in the surveyed locations (n=255 and 209, respectively).

Almost one half of the respondents themselves cultivated *Mucuna*, typically in areas from 0.5 to 1 ha, but both larger and smaller areas were reported. Questions regarding different aspects of *Mucuna* cultivation focused either on the respondent's farm (if the respondent was a *Mucuna* cultivator) or on the neighbor's farm (if s/he was not a *Mucuna* cultivator). Most commonly mentioned locations for cultivation were home gardens and fields (40% each). Other locations mentioned were field borders and fences. Almost all *Mucuna* (92% of responses) is intercropped to save on labor (35%) and space (26%). Interestingly, only one sixth of the respondents mentioned improved soil fertility as a reason for intercropping. *Mucuna* is most often intercropped with cassava (39%), yams (25%), maize (14%), cocoyams (11%), and beans (7%), roughly coinciding with the frequency of these crops in the area. Due to the prevalence of intercropping, the relatively large cultivated areas in *Mucuna* do not therefore directly reflect *Mucuna*'s importance (i.e., although *Mucuna* cultivation was mentioned to occur on 1 ha of land, that space may have included several other crops also).

Almost 60% of the respondents (or their neighbors) indicated that they cultivate *Mucuna* every year and only one sixth mentioned that cultivation takes place

occasionally or in alternate seasons. In one fourth of the cases, *Mucuna* grows wild. The overwhelming majority of the responses cultivated *Mucuna* as a food crop (Figure 5). Other, minor purposes included animal feed (almost 10%) and soil fertility (5%). For feed, foliage is used in a cut-and-carry system. In another question, half of the 134 responses indicated *Mucuna*'s use as a feed, and over one fourth, as a medicine. Thus, it seems that other uses, while well known, are relatively uncommon. *Mucuna*'s medicinal uses include the use of leaves as a "blood tonic" (to "strengthen" blood) and as an anti-venom preparation. About 5% of the responses also mentioned use as a dye. *Mucuna*'s cultivation patterns are in many ways similar to those of other legumes in southeastern Nigeria: it is cultivated by women, intercropped with the major food crops, and grown either in the home garden or in more distant fields. As in India (Rajaram and Janardhanan, 1991), wild types are also used for food, although in southeastern Nigeria, mostly cultivated types are consumed. It is clear that some of *Mucuna*'s other uses (such as feed, medicine, dye, and for soil fertility maintenance) were seemingly well known to many respondents, those uses were clearly minor compared to its utilization as a food.

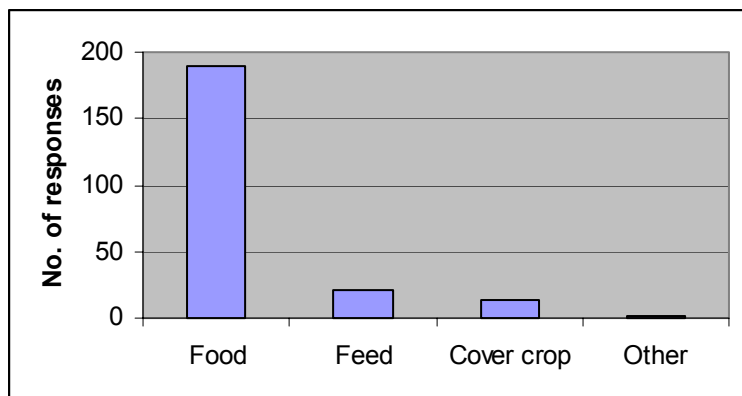


Figure 5. Purpose of *Mucuna* cultivation in the study locations (n=226).

Patterns of *Mucuna* utilization

Mucuna is typically stored as threshed beans, although a sizeable group (14%) indicated that it is stored in pods. Almost no respondents store *Mucuna* flour. Only 20% of the respondents indicated mold and pest problems in storage. *Mucuna*'s resistance to most pests and diseases is well known and has been attributed to its high content of L-Dopa (Takahashi and Riperton, 1949).

The importance of *Mucuna* as a marketable crop in the area was confirmed by the respondents, of whom 40% produce it for both home consumption and sale and 5% solely for sale (Figure 6). About three fourths of the respondents indicated that it is sold in the local market. The remaining one fourth came mainly from west-central Enugu state, where *Mucuna* apparently is not sold. About two thirds of the responses indicated that beans sold in the market are harvested from the same village. Almost 60% reported that not all *Mucuna* types are available at the market, while others assessed that all types can be bought. The white and, to a lesser degree, black varieties are the major varieties sold.

Even though markets for *Mucuna* exist, it is clearly not an important commercial commodity. About three

fourths of the respondents indicated that quantities sold are much lower than those of the third most common grain or legume in the area. Two thirds stated that *Mucuna* prices fluctuate within a year and that certain *Mucuna* types are not available throughout the whole year, with the two less common types, black and mottled, being the least available.

A full 80% of the respondents considered that *Mucuna* consumption in the region is decreasing (Figure 7) and only 11% thought that it is increasing. The exploratory work conducted prior to the survey and work by Ukachukwu (2002) also lend support to the fact that *Mucuna*'s importance in southeastern Nigeria is decreasing. Ukachukwu (2002) attributed the unpopularity, particularly with young people, to soybean, which has recently become quite popular in the region. However, the two legumes do not have the same culinary roles, and therefore other factors may be important. Financial constraints are likely not a cause either, as a number of respondents considered cheapness as one of *Mucuna*'s benefits. While a majority of the respondents said they eat *Mucuna*, they preferred egusi melon, which is more expensive, but is also considered tastier. Perhaps *Mucuna* consumption has become "old fashioned," which may partially account for the decrease.

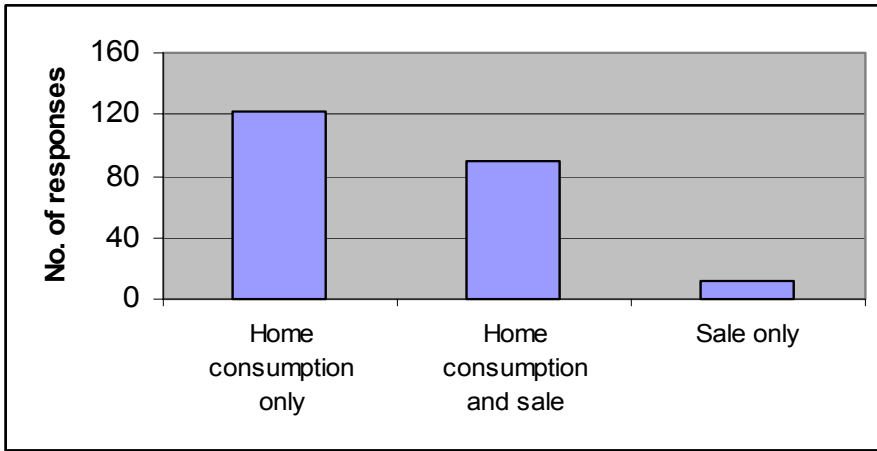


Figure 6. Production of the cultivated *Mucuna* beans for home consumption and sale (n=224).

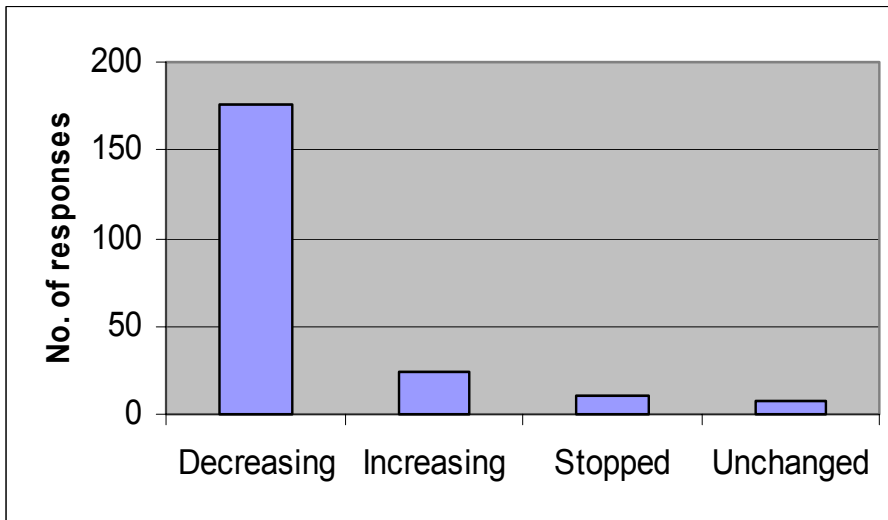


Figure 7. Trend in the food utilization of *Mucuna* (n=219).

***Mucuna* as a food**

Over 90% of the respondents indicated that they eat *Mucuna*. While about a third considered that *Mucuna* is eaten by everybody, sizable numbers of responses indicated its use as a food of either poor people (29%), farmers (17%) or old people (12%) (Figure 8). Several respondents indicated that more than one group (but not all) ate *Mucuna*. Seemingly, eating *Mucuna* is widespread but it is eaten more by certain groups. Although most (71% of responses) thought that *Mucuna* is eaten throughout the year, the others considered it mainly as a food for the dry season when *Mucuna* is harvested. During the period of consumption, it is typically used either occasionally (64%), or, at most, once in 2-4 days (20%) or weekly (13%).

Mature beans are most commonly eaten (92% of the responses) but 6% of the responses indicated that they eat the immature pods. Only a handful mentioned that they eat the leaves or the immature beans. Most respondents had eaten *Mucuna* either for “many years” (60%) or from infancy (38%) and most (80%) had therefore learnt of its consumption from parents.

No evident cultural barriers or social restrictions regarding *Mucuna* consumption were detected. Most respondents considered that women can eat *Mucuna* at all times (97%) and that no illnesses prevent the consumption of *Mucuna* (90%). Only 10% of the respondents (located in six communities) considered that people with certain illnesses do not usually eat *Mucuna*.

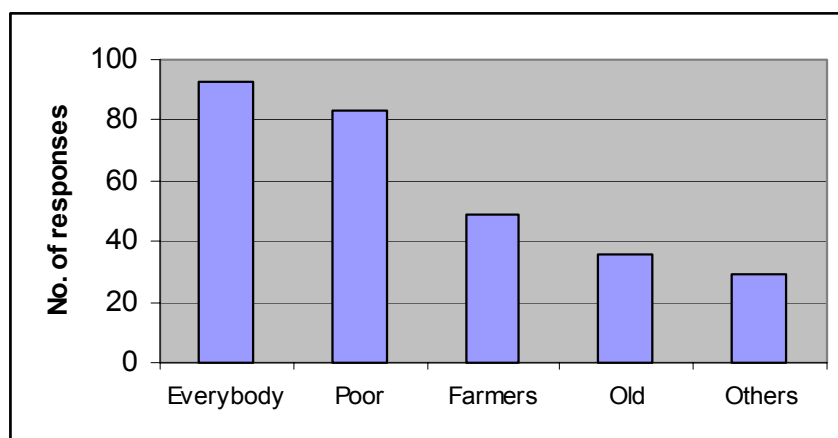


Figure 8. Group that eats *Mucuna* in the respondent's location (n=290).

Dishes prepared with *Mucuna*

A number of dishes are prepared with *Mucuna* beans in the region. Almost all the respondents (98%) indicated that *Mucuna* is eaten in foods together with other ingredients and its most common role is that of an occasionally used thickener (83%); in less than one fifth of cases is it considered an ordinary ingredient of foods. Interestingly, *Mucuna* substitutes in different categories of food: egusi melon or legume (56% of responses), cereals (28%), and roots and tubers (14%). Approximately one third considered that certain dishes are only made with a certain type (typically the white), but the majority thought that there is no association between type and dish. However, only 31 respondents answered this question.

Surprisingly, most (89% of responses) thought that there is no need for certain processing methods for *Mucuna*. Most remove seed coat during processing (79% of responses) and use the beans immediately after processing (72%). About a half of the respondents assess readiness by physical appearance (typically defined as the point when foaming ends), another one tenth by aroma, and less than tenth by taste. The foaming suggests the presence of saponins, which are anti-nutritional factors present in many plant foods. Only one tenth indicated that they assess the readiness of a *Mucuna* dish by pressing the beans between the fingers.

There was some differentiation in the dishes by area, and in the following, the dishes prepared are discussed by locality. Recipes for the dishes are given in Text Box 1.

Several dishes contain *Mucuna* flour (*Omu akpaka*), which is prepared in a relatively uniform way. *Mucuna* beans are first toasted in a hot pan, after which they are cracked (in a village mill or in a

mortar), winnowed, and the seed coats removed. The beans are then ground and sieved. The time of toasting *Mucuna* is very short, as most respondents said they only toast *Mucuna* 5-10 minutes before continuing the processing. Some respondents reported significantly longer toasting times. When used as a thickener – the most common consumption pattern – flour is typically used. Other, less common, preliminary processing methods (e.g., parboiling and soaking) were mentioned by a few respondents.

Mucuna is mainly used in the study area either as a sauce or so-called “soup” (stew). Many of the same ingredients are used for the two dishes, but in most study locations, no vegetables are added into a sauce while they are common in a soup. Consumption as a sauce or soup was encountered in all study locations:

- *Mucuna* sauce: This dish is referred to as *Akpoko ji/nkashi/una* in some parts of the Nsukka area, while in some other areas of Nsukka it is called *Obobo ji* or *Obobo nkashi*, and in Udi agricultural area the dish is referred to as *Otokono*. In the surveyed areas of Kogi state, the sauce is referred to as *Enwu ejuobo*. It is served with boiled or roasted roots and tubers and *Mucuna* serves as an alternative to maize, pigeon pea, or even vegetables.
- Soup (i.e., stew): *Mucuna* is used in soups as a thickener, with or without *egusi*. If it is the sole thickener, the soup is referred to as *Mucuna* soup with a local name of *Ofe egbara* (or *Ofe agbara*); it can also be referred to with the name of the vegetable that was added to it. When used to augment *egusi*, *Mucuna* both increases the volume of the soup and further thickens it. If *egusi* is used, the soup is called *egusi* soup even if it also contains *Mucuna*.

Additionally, in the towns surveyed in Enugu state, two other preparations were encountered:

- Gel (*Okpa*): Little information was received concerning the use of *Mucuna* in this dish. Okpa is a steamed preparation resembling *moi-moi* (see below), but with a slightly harder texture. It is normally made with Bambara groundnut (*Voandzeia subterranean*).
- Roasted snack: In Nsukka area, African yam beans (*Sphenostylis stenocarpa*) and breadfruit (*Treculia africana*) are eaten roasted as a snack. At times, *Mucuna* is used the same way.

In the towns surveyed in Kogi State, several additional dishes were encountered:

- Porridge (*Efolo akpaka/Akpaka ehi*): This dish, typically prepared throughout Nigeria with cowpea, can be eaten as lunch or supper with boiled yam (that is added in the cooking porridge), rice, fried plantain, *gari* (fermented cassava flour) drink, or bread. In this dish, *Mucuna* is used as whole beans.
- Moi-moi (*Akpaka elele*): These are snacks or light meals of pudding consistency typically made with cowpea and commonly sold on the roadside. In this area, *Mucuna* is at times used as a cowpea substitute.
- Fried cake (*Akpaka akara*): *Akaras* are eaten as a snack or main meal and are typically made of cowpea and eaten with fermented maize drink (*ogi*). In Kogi area, *Mucuna* is used to substitute for cowpea.
- Roasted snack (*Akpaka ide*): Roasted snacks of African yambean and Bambara groundnut are popular in the Kogi area. At times, *Mucuna* is used to substitute.

- *Fufu*: This is a staple dish with consistency of a thick paste, made with cassava, pounded yam or *gari*. It eaten throughout West Africa with sauce or stew. In Kogi, *fufu* can also be made with *Mucuna*.

In all the dishes, reported times for heat treatment were quite low. Most commonly, the respondents estimated that *Mucuna* dishes took 40-60 minutes of heating. It is clear that the cooking methods utilized do not reduce the L-Dopa content of *Mucuna* to tolerable levels. Typically, no higher than a 50% reduction in L-Dopa content can be expected with roasting (Myhrman, 2002). With an initial L-Dopa content of 4-6%, the flour would have at least 2-3% L-Dopa. Most likely, the reduction in L-Dopa would be less in eastern Nigeria, since most respondents reported very short roasting times (5-10 minutes). The flour prepared from roasted beans is further cooked, but since the water is not discarded, most of the L-Dopa extracted from the flour would remain in the food. Such extraction is typically quite effective when *Mucuna* is in powdered form, as determined by Myhrman (2002) in various experiments. A number of other, less common methods were used to cook *Mucuna*, some of them involving cooking and eating of whole beans. A few respondents in Kogi State reported soaking and parboiling as a preliminary processing method. Reported periods were short, most commonly 20 to 30 minutes. Only a few reported a period over 2 hours, and less than 10% reported soaking for up to 24 hours. Soaking and parboiling are common methods used to decrease anti-nutritional factors in legumes (Jaffe, 1975) and are known to reduce L-Dopa content of *Mucuna*. For example, an 8-hour boiling, the traditional *Mucuna* processing method in Malawi, eliminates L-Dopa almost completely (Gilbert, 2002; Szabo and Tebbett, 2002).

Text Box 1. Dishes prepared with *Mucuna* in the surveyed towns.

The quantities are approximations of average amounts used since different amounts were reported by the respondents.

I. Dishes in northern Enugu State

1. Sauce:

- Bring water (5 cups) to boil with palm oil (1½ cups).
- Stir in *Mucuna* flour (1½ cups; in Kogi, paste or cracked seeds are used at times) mixing vigorously to avoid lumps.
- Add pepper, salt, Maggi, mashed oil bean and locust bean cake.
- Continue boiling the slurry/sauce until foaming stops.

2. Soup:

- Bring water (2 liters) to boil and stir in *Mucuna* flour (2 cups) or a mixture of *Mucuna* and *egusi* flour. The ratio of *egusi* to *Mucuna* flour typically is 2 cups of *egusi* to 1-1 ½ cups of *Mucuna*. Mix thoroughly to

avoid lumps. Alternatively, first mix *Mucuna* or egusi in oil to avoid lumps and then add to the boiling water.

- b. Allow to boil for about 20 minutes and add already boiled meat or fish, spices, crayfish, fermented locust bean cake, Maggi, and salt.
- c. Heat for about 30 minutes. Add shredded vegetables and cook for another 3-5 minutes.

3. *Mucuna* in Bambara groundnut gel (*Okpa*):

Normally, *Mucuna* is added to steamed Bambara Groundnut gel to increase quantity. A ratio of 3 cups of Bambara flour to 1 cup of *Mucuna* flour is used and mixed with palm oil, pepper, and salt and spices. The mixture is steamed in pouches, containers, or banana leaves and resembles the *moi-moi* described below but has a slightly harder texture.

4. Roasted snack (*Akpaka ide*):

- a. Soak *Mucuna* beans in excess water for 24 h.
- b. Drain, wash, and sun dry.
- c. Toast or fry in a heated pot.

II. Dishes in Ogugu Agricultural Area, Kogi State

1. Sauce (*Enwu ejuobo*) - *Mucuna* in this dish can be used as flour, paste, or *dhal*:

- a. If paste is prepared, soak whole *Mucuna* seeds, wash, dehull, and grind.
- b. If *dhal* is prepared, *Mucuna* beans are cracked (in the village mill or in the mortar), winnowed, and cooked until soft and mashed with a wooden spoon.
- c. Add paste or *dhal* or *Mucuna* flour (2 cups) to boil in water (3 cups) and boil for 30 minutes. Add palm oil (1 cup), onion (1 medium), crayfish, Maggi cubes (2), pepper and salt to taste to the boiling slurry and boil for a few minutes.

2. Soup: see description of soup made in Enugu state, above.

3. Porridge (*Efolo akpaka/Akpaka ehi*):

- a. Parboil *Mucuna* in excess water for about 30 minutes.
- b. Drain the water and wash.
- c. Repeat the process two times.
- d. During the second time, after boiling for 20 minutes, add a pinch of *trona* (a complex salt) and boil for 30 minutes.
- e. Add salt to taste, sliced onion (one medium), ground pepper (2 teaspoons) and, if desired, Maggi.
- f. Add palm oil (2 cups) and stir to a thick consistency.
- g. Heat for another couple of minutes.

4. *Moi-moi* (*Akpaka elele*):

- a. Soak whole uncooked *Mucuna* beans (5 cups) in excess water for 24 hours.
- b. Wash and dehull the seeds.
- c. Grind with fresh pepper (1/2 cup), onion (3 medium sized) and crayfish (1 cup).
- d. Pour into a mortar, mix, and add 4 Maggi cubes, salt to taste, and palm oil (2 cups).
- e. Mix thoroughly to a slightly thick slurry and divide into cups, pouches, or banana leaves.
- f. Steam for about 1½ hours.

5. Fried cake (*Akpaka akala*):

- a. Parboil *Mucuna* seeds for about 30 minutes, wash and dehull.
- b. Grind with pepper and onion and mix to a smooth consistency.
- c. Drop with spoon into a hot oil and deep fry.

6. Roasted snack (*Akpaka ide*): See the recipe above, as for Enugu state.

7. *Fufu*:

- a. Soak, wash, and dehull *Mucuna* beans.
- b. Grind to a thick slurry.
- c. Heat with water, stirring continuously to avoid burning, until it gelatinizes to a thick consistency.
- d. Serve with a soup/stew

Benefits and problems from the use of *Mucuna*

Almost three quarters of the respondents felt that they had benefited from *Mucuna* use, with wide variety of benefits reported. The majority considered that they had benefited by getting food, although good flavor and snack uses of *Mucuna* were also mentioned as benefits. The socioeconomic benefits included *Mucuna*'s low price and the cash from its sales. Other benefits mentioned included improved soil fertility, fodder, and medicine.

The respondents disagreed on whether there were problems associated with eating *Mucuna* (Figure 9). Of those who considered that there were problems, three fourths believed that they affect only certain people (Figure 10). Less than half attributed the problems to a cooking method and only one fifth to a particular *Mucuna* type. Clearly, despite the awareness of problems, most respondents were not able to identify their cause. Among the frequently identified problems were dizziness (56% of responses), vomiting

(6%), and weakness (6%) (Figure 11); they were seen to manifest either immediately (one third of responses) or a few hours after eating *Mucuna*. Other problems, such as heartburn and diarrhea, were also mentioned (12% of the responses). The problems reported were those typically reported in the literature, i.e., both gastro-intestinal and neurological (Szabo and Tebbett, 2002). Only about one fifth had experienced these problems personally although 90% of the respondents eat *Mucuna* regularly. Given the short duration of the processing, the incidence of side effects seems surprisingly low.

Perhaps due to the rarity of the problems, only 51 respondents mentioned possible remedies for *Mucuna* intoxication. The most frequently mentioned remedy was drinking palm oil (one third of the respondents), which is a common local treatment for a number of gastrointestinal problems. Other remedies proposed were visiting the clinic, taking drugs or herbs, and sleeping.

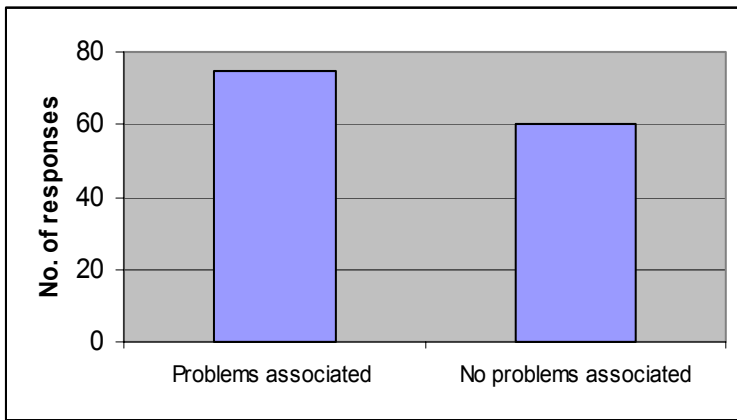


Figure 9. Respondents beliefs about the association of eating *Mucuna* with problems (n=135). The question asked was open-ended, and did not specify what the problems may be.

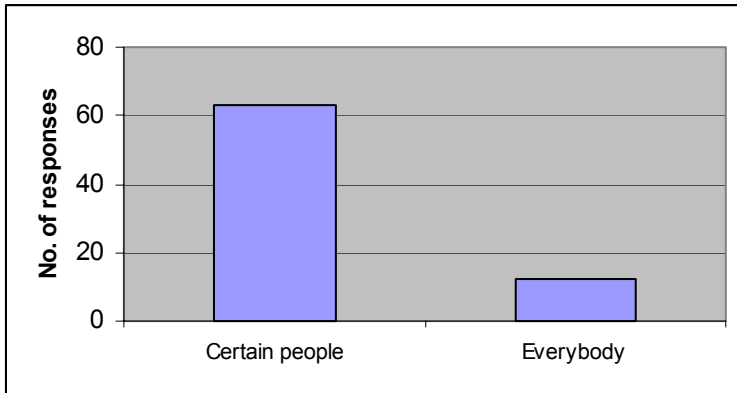


Figure 10. Group who experiences "problems" after eating *Mucuna* (n=75). The question asked was open-ended, and did not specify what the problems may be.

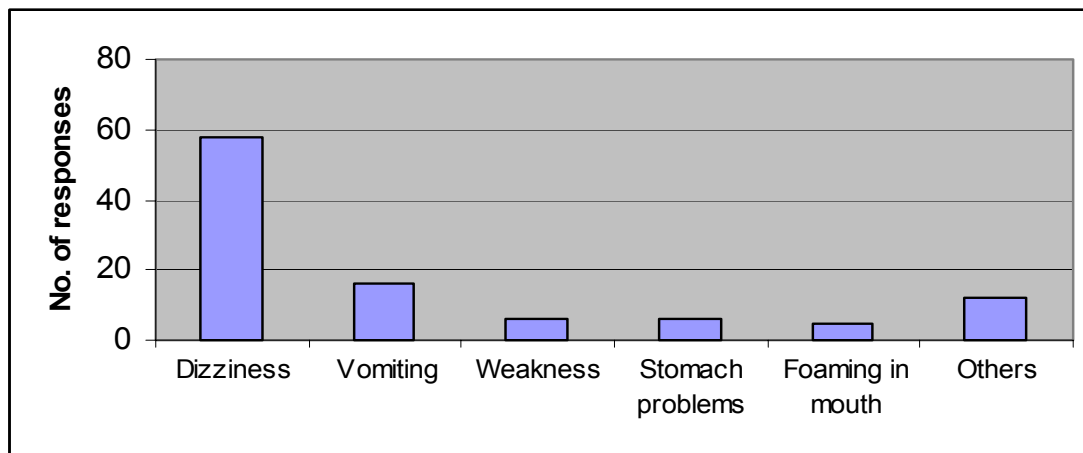


Figure 11. "Problems" associated with eating of *Mucuna* (n=103).

CONCLUSION

While *Mucuna* is widely known and utilized as a food crop in the surveyed locations, the processing methods utilized are seemingly insufficient to rid *Mucuna* of its anti-nutritional factors. Other factors must therefore explain the continued use of *Mucuna* as a food, such as small amounts consumed at any given time and/or the development of a certain tolerance to the L-Dopa contained in *Mucuna*. *Mucuna* is clearly not gaining importance as a food and in fact, the contrary seems to be the trend in many locations of the study area. *Mucuna*'s utilization varies especially with socio-economic status (with the poor being the likely consumers) and also with age (with the old being the likely consumers). In most locations, it is less popular than the crop it most commonly replaces, *egusi* melon.

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