



ETHNOBOTANICAL SURVEY AND PHYTOCHEMICAL COMPOSITION OF SPONGE GOURD (*Luffa cylindrica* (L) Roem IN IGABI AND KADUNA NORTH LOCAL GOVERNMENT AREAS OF KADUNA STATE, NIGERIA.

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ABSTRACT

Luffa cylindrica (L) Roem is known for its essential constituents required for good health of humans and arrays of indigenous uses, pharmacological and phyto-pharmacologicals for the treatments and prevention of several ailments and medical conditions. Hence, the study is aimed at documenting and unravelling the Medicinal utilization and phytochemical composition of sponge gourd (*Luffa cylindrica* L.) plant in 2 Local Government Areas of Kaduna State. Multistage sampling technique was used after the sampling locations has been stratified to wards in 2 Local Governments Areas to 5 each in the first stage. Random sampling technique was used in the second stage to administered 20 questionnaires in each of the stratified wards to make 100 questionnaires in each, and 200 questionnaires in all. 105 were retrieved. The data collected were analyzed using simple descriptive statistics and ANOVA. The results revealed that the plant parts can be used in treatment and prevention of various diseases such as malaria; stomach ache; tumors, skin problem; facilitation of child birth; etc. Demographic characteristic of the respondents was also examined. The percentage of male was 46.7% while that of their female counterpart was 53.3%. 34.3% of the respondents were between 21 – 30 years' age bracket and 49.52% are married with 38.1% having 11-15 house hold size. 41.9% of the respondents had secondary education and 52.4% are herbs trader. Quantitative phytochemical analysis revealed the presence of tannins; alkaloids flavonoids; terpenoids; saponins and phenolic acid in various concentrations as there were significant differences ($p < 0.05$) between these phytochemicals and their plants parts. The presence of varied active ingredients in the different parts of these plants explains their diverse use in the treatment of different disease conditions. However, due to the increased interest in medicinal utilization of sponge gourd plant, there is need to create awareness about its conservation.

Keywords: Phytochemicals, Utilization, Sponge gourd, Kaduna State, active

Introduction

Traditional medicine refers to the knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultural uses in the maintenance of health and in prevention, diagnosis improvement and treatment of physical

mental illness (Dalhatu, 2015; Sodimu, *et al.*, 2020). Traditional medicine covers a wide variety of therapies and practices which varies from country to country and region. In some countries, it is referred to as alternative or complementary medicine. Traditional medicine has been used for



thousands of years with a great contribution made by practitioners to human health particularly as primary health care providers at the community level. Traditional medicine has maintained its popularity worldwide since 1990s, its use surged in many developing countries and interest has increased by researchers on the use of plant medicinally both for traditional uses and as potential new source of drugs and treatment. (Sodimu, *et al.*, 2019). In the quest for conservation of lower scale of production of medicine and other important products, attention is being on indigenous flora species from graduation opinion; drugs are not readily available and affordable especially within the rural places.

One of the indigenous plant species that constitute major sources of medicine uses in Nigeria is *Luffa cylindrica* (smooth luffa) commonly called sponge gourds plants belong to the family *Cucurbitaceae*. It is an herbaceous plant, which thrives commonly with twining tendrils (Ajiwe *et al.*, 2005). It is a large succulent tendril climber with slender, slightly hairy furrowed stem. The interior is cucumber-like when immature, but quickly develops into network of fibre surrounding large number of flat blackish seeds (Burkill, 1985). The plant is reported to have originated from India but grows predominantly as weed in most parts of Nigeria. The seeds have been reported to be useful in the asthma, sinusitis and fever, abortifacient proteins such as luffaculin which possess ribosome-inhibiting properties have been isolated from luffa species. The effect of the ribosome inhibiting properties on the replication of HIV infected lymphocyte and phagocyte cells explain its potential as therapeutic agents for AIDS (McGrath *et al.*, 1989; Nagao *et al.*, 1991). It is reported to possess antiviral, anti-tumor, antioxidant, anti-inflammatory and immunomodulatory

activities, up till date, there has been no report of toxicity, adverse effects or drug interactions associated with consumption of luffa (Tannin-Spitz *et al.*, 2007).

Luffa cylindrica has alternate and palmate leaves comprising petiole. The leaf is 13cm and 30cm in length and width respectively and has the acute-end lobe. It is hairless and has serrated edges. The flower of *Luffa cylindrica* is mono-ecious and the inflorescence of the male flower is a raceme and one female lower exists. Its fruit, a gourd, is green and has a large cylinder-like shape. The outside of the fruit has vertical lines and a reticulate develops inside of the flesh. *Luffa cylindrica* grows about 12cm long. The stem is green and pentagonal and grows climbing other physical solid (Lee and Yoo,2006). It persists in old cultivations and near dwellings, frequently becoming naturalized in forest, woodland, bush land, thicket and grassland, from sea-level up to 1500 (1800) m altitude. In cultivation the crop grows well in tropical regions. In temperate regions it is suitable for summer growing conditions. The plant is sensitive to frost. Excessive rainfall during flowering and fruiting adversely affects fruit yields. A deep sandy loam is preferred.

The matured fruits are used for domestic purposes as sponges. It is an excellent fruit in nature containing all the essential constituents required for good health of humans (Rahman, 2003). Its kernel contains between 45 – 51% oil which is composed of mainly oleic and linoleic acids (Rahman, 2003). The seeds have laxative properties due to their high oil content. It contains a wide range of secondary metabolites with distinct biological activities. Knowledge of all these properties is limited due to the consumers and researchers (Sodimu *et al.*, 2019). This research focused on phytochemical analysis, medicinal



utilization, preparation and methods of administering the herbal of sponge gourd. It also focuses on the constraints faced by the traditional medicinal practitioners and forms in which the plant is used during herbal preparation. The medicinal values of plant and their component phytochemical such as alkaloids, tannin, flavonoids, phenolic and other compounds have been found to produce a definite physiological action on human body (Liang *et al.*, 1993) *Luffa cylindrica* L. is one of the indigenous flora species in which its ethnobotanical values cannot be over emphasized. Here in Nigeria, little of its ethnobotanical utilization has been documented. The people (herbalist, herb sellers and trade medical centres who have the insight of these medicinal utilization of the plant learnt it by heart now that systematic search for useful bioactivities from medicinal plants is now considered to be a rational approach in pharmaceutical and drug research. Thus, it is impetus to documents some of its medicinal utilizations for future generations. Therefore, the research is aimed at documenting and unravelling the ethnomedicinal utilization of the part of the plant (leaves, roots and the stem) and phytochemical composition of sponge gourd (*Luffa cylindrica* L.) in Igabi and Kaduna North Local Government Areas of Kaduna.

Methodology

Study Area

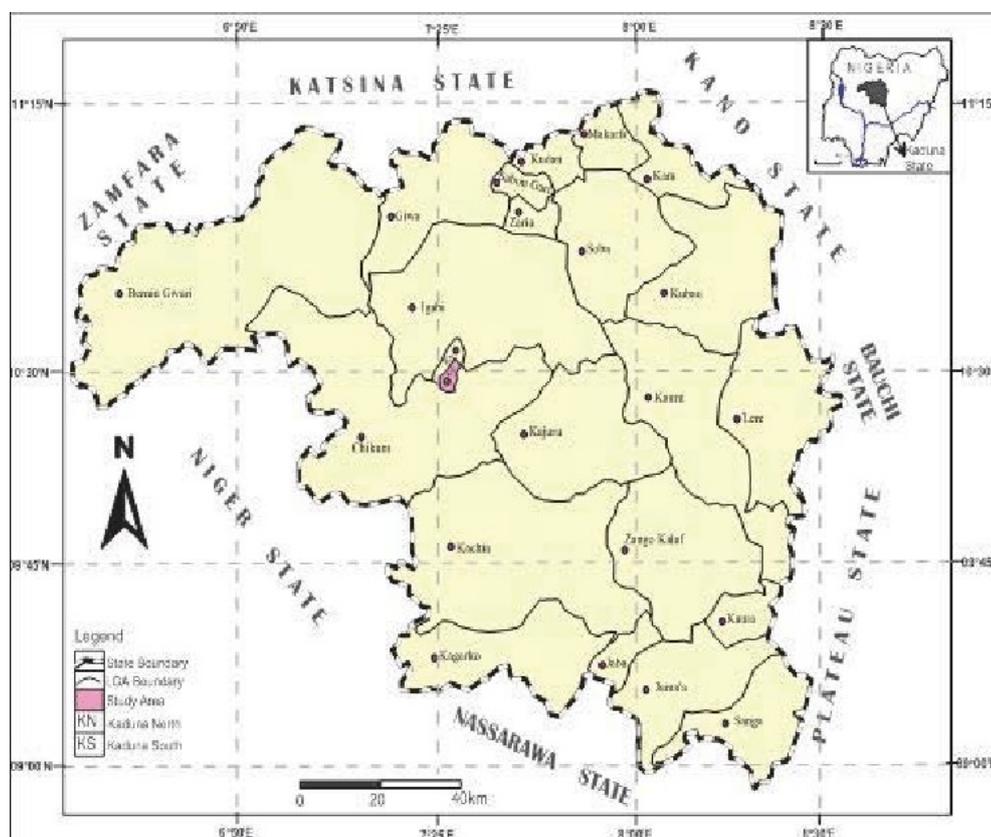
The study was conducted in two (2) Local Government Areas of Kaduna State. Igabi and Kaduna North Local government areas

Igabi Local Government Area

Igabi Local Government is located in the Guinea Savannah zone of Nigeria. It is located on latitude $10^{\circ}47'55''$ and $10^{\circ}46'41''$ N / longitude $7^{\circ}31'29''$ and $7^{\circ}30'26''$ E (Figure:1). The indigenous people of Igabi are predominantly Muslims with exception of Gbagyi's who were non-Muslims or traditionalist and they later accepted Christianity. It has an area of $3,222\text{km}^2$ and density of $180.5/\text{km}^2$. The area has a projected population of 581,500 people with annual rainfall of 1000mm – 1500mm (KDBS, 2016).

Kaduna North Local Government Area

The Kaduna North Local Government is located on latitude $10^{\circ}35'43''$ and $10^{\circ}34'39''$ N / longitude $7^{\circ}28'24''$ and $7^{\circ}27'20''$ E of the prime meridian. It is bordered by Igabi local government to the South, West and Southeast by Kaduna South, Chikun, Kajuru and Kaura local government to the Northeast (Figure:1). It has an area of 70.2km^2 and density of $7,010/\text{km}^2$. The vegetation in the local government area is guinea savanna. The area has a projected population of 492,100 and annual rainfall of 1500mm – 2000mm (KDBS, 2016)



Source: Sodimu, 2016

Figure1: Map of Kaduna State Showing the two study Areas.

Data Collection and Source

Primary data were used for the study. The primary data were collected using structured questionnaire. The questionnaire was designed to collect the following types of information.

Demographic Characteristics of the sample respondents such as sex; age; marital status and so on. Different diseases / ailment the species can cure; part used; mode of preparation and administration. Constraints confronting the traditional healers / practitioners and so on

Data Collection and Sampling Techniques

Multistage sampling technique was used after the sampling locations has been stratified to wards in the two (2) Local

Governments Areas to five (5) each in the first stage. The stratification was based on the activities and concentration of the respondents in each of the local Government Areas. Random sampling technique was used in the second stage to administered twenty (20) questionnaires in each of the stratified wards in the two (2) local Governments to make one hundred questionnaires (100) in each, and sum total of two hundred (200) questionnaires in all. In Kaduna North the chosen wards include Badarawa; Hayin Banki; Kawo; Unguwan Shanu and Sardauna while in Igabi the chosen wards include Afaka, Rigachikun; Igabi; Rigasa and Jaji. The questionnaire was designed in English language and administered in two ways, some are distributed to the respondents and retrieved later while others are administered by group



of interviewers who could speak and write in local dialects. Face-to-face method of interviews was adopted by the group.

Processing of Plant Materials for Phytochemical Analysis

Luffa cylindrical leaves, stem and root were collected from Federal College of Forestry Mechanization, Afaka and her environs. They were identified at the herbarium Department of Forestry Technology, Federal College of Forestry Mechanization, Afaka. The different parts of the selected plant materials were air dried in the College laboratory. The dried sample was chopped into pieces and ground separately to powdered form using blender. The powdered samples were stored in small plastic air-tight containers which were taken for analysis at Natural Research Institute of Chemical Technology (NRICT) Zaria, Nigeria.

Phytochemical Screening.

The extract was examined for the presence of the following phytochemicals: Alkanoids, saponins, cardiac glycosides and flavonoids. The method described by Harborn (1998) was used to ascertain the presence of alkanoids and cardiac glycoside. The presence of saponins was detected using the method adopted from Odebiyi and Sofowora (1978), while flavonoids and terpenoids was screened using the method of Trease and Evans (1985).

Data analysis

Simple descriptive statistics such as percentage, frequency distribution tables, Mean, and Standard error was used.

Two-ways Analysis of variance (ANOVA) using GLM procedure (Proc. GLM) of SAS (Statistical Analysis System) was used to show the comparison between the Phytochemical composition of the leaf, stem

and root of the plant and differences were considered significant at $p < 0.05$.

Results and Discussion

Demographic Characteristics of Respondents

Some demographic characteristics are known to influence the ethnobotanical survey of medicinal utilization and phytochemical composition of sponge gourd (*Luffa cylindrical*) in Kaduna North and Igabi Local Government Areas of Kaduna State. The variable employed in this study includes: age, sex, marital status, house hold sizes and level of education.

Results in Table 1 below, revealed that 34.3% of the sampled respondents were between the age brackets of 21-30 years. This implies that they were at middle and economically active age which could have positive effect on their standard of living. Most of the respondents are married (49.52%), 33.3% are single, 3.81% are divorced. It was observed that 9.52% are widow while 3.81% are widower. This is an indication that most of married people in the study area know the value and economic importance of the medicinal utilization of sponge gourd plant for curing and prevention of diseases. Gender distribution further revealed that women are the majority (53.3%) in the ethnobotanical survey of medicinal utilization of *Luffa cylindrical* against their men counter parts (46.7%). 41.9% of the sampled respondents had Secondary education and 4.8 % had tertiary education, 36.2% had primary education, 0.9% had Arabic education, 11.4% had adult education. Njoku, (1991) observed that formal education has positive influence on one's life. Furthermore, 9.5 % of the respondents were between the household size of 1-5 while 38.1% of the respondents were in the household 11 - 15



Table 1: Demographic Characteristics of Respondents

S/No	Variable	Respondents	Percentage (%)
1	Age in Years		
	10-20	05	4.80
	21-30	36	34.3
	31-40	35	33.3
	41-50	19	18.1
	Above 51	10	9.50
	Average	105	100
2	Marital Status		
	Married	52	49.5
	Single	35	33.3
	Divorce	04	3.81
	Widower	04	3.81
	Widow	10	9.52
	Average	105	100
3	Gender		
	Female	56	46.7
	Male	49	53.3
	Average	105	100
4	Educational Level		
	Tertiary	05	4.80
	Secondary School	44	41.9
	Primary School	38	36.2
	Arabic School	01	0.90
	Adult School	12	11.4
	Non Formal Education	05	4.80
	Average	105	100
5	Occupation		
	Traditional Healer	29	27.6
	Herbs Trader	55	52.4
	Civil Servant	21	20.0
	Average	105	100
6	House Hold Size		
	1-5	10	9.50
	6-10	39	37.1
	11-15	40	38.1
	Above 15	16	15.2
	Average	105	100



Methods of Herbal Preparation of Sponge Gourd (*Luffa cylindrica L*) Using Leaf, Stem, Root, Seed and Sponge).

Over the decades, various methodologies have been adopted by the traditional healers, herbs trader, people knowledgeable about the ethnobotanical utilization of baobab tree etc. in herbal preparation of the part of the tree (roots, sponge, seed, leaf and stem etc.) for prevention and curing of various disease in Igabi and Kaduna North Local Government Areas of Kaduna State. However, Result in Table 2 below revealed that 36.19% of the respondents adopted infusion methods of preparation. This

implies that either or any of the parts of the tree are boiled or soaked in hot water before used. This is closely followed by grinding method with 30.48% while 5.71% used crushing. However, majority of advocate of alternative medicine hold that various alternative methods are effective in treating a wide range of major and minor medical condition. This result is in accordance with that of Michalsen *et al.* (2003); Gonsalkorale *et al.* (2003); Berga *et al.* (2013) and Sodimu *et al.* (2020) whose research proves the effectiveness of specific alternative treatments.

Table 2: Responses to Methods of herbal preparation of Baobab Leaf, Root, Seed and Stem

Methods	Frequency	Percentage (%)
Infusion	38	36.19
Maceration	29	27.62
Crushing	06	5.71
Grinding	32	30.48
Total	105	100.00

Herbal Forms and Method of Administration of the plant

The respondents claimed that all the parts of sponge gourd (leaf, root, fruits, and stem) can be used to prevent and cure various ailments, forms and methods of preparing the parts varies depending on the ailments. However, advocate of alternative medicine

hold that various methods of administration are effective in treating a wide range of major and minor medical conditions (Abubakar, 2012; Sodimu *et al.*, 2020). Table 3 shows various ailments form of preparation and method of administering *Luffa cylindrica* (herbs) in the study areas.

Table 3: Ailments Forms, Preparation and Method of Administering Sponge Gourd (*Luffa Cylindrica*) Plant Parts (Leaf, Root, Sponge, Seed and Stem) Herbal.

S/No	Diseases	Part used	Preparation	Status	Method of Use
1	Malaria	Leaves	Immerse in water and boiled for about 30-40 Minutes Air dry the leaves and blend to powdered form, mix with pap.	Fresh and Dry	1Ghasi per day 2 tea spoon for children 2 times daily. 1 table spoon to be taken in the morning and night
2	Facilitate Child Birth	Leaves and Sponge	Cook the leaves in form of vegetable and eating. Also soaking of leaves in water for 30 – 60 minutes. and using it to bath with the sponge	Fresh and Dry	Dilute with water for bathing in the morning and night for 7 days.



3	Stomach Ache	Leaves	Place the leaves in a boiled water and remove the leaves and let the water cool a little before drinking	Fresh	2 times daily. Two table spoon to be taken in the morning and night
4	For Tumors, Swelling, Wound healing and to maturate Abscesses	Leaves and some other parts of the plant	The Leaves and other parts are being crushed and the fruit pulp is being extracted and applied as emollient to the parts affected.	Fresh	Administration or application by rubbing small or little quantity to the wounded or swollen part
5	Skin Problem	Seeds	The seed from the fruit is being crushed and the oil from the seed is extracted to cure the skin problem or ailments	Fresh or Dry	Apply the oil to your cream or Vaseline or used ordinarily after bathing.
6	Filarial and Whooping cough	Leaves	The leave juice is extracted and maceration of fresh leaves is gotten	Fresh	1 tea spoons to be taken only in the Morning for children and 1 ghasi for adult only in the morning also.
7	Constipation	Stem	The stem of the plant is being crushed after the leaf have been detached from it	Fresh	1 teaspoons to be taken only in the Morning for children and 1 ghasi for adult only in the morning also.
8	Measles	Leaves and sponge	Leaf soaked in water together with the sponge (Sliced into two) for 40 – 50 minutes	Fresh and Dry	Dilute with water for bathing in the night. 2 table spoon is taken in the morning by Adult and 1 table spoon for children.
9	Breast Pain	Leaves and sponge	The leaf is being grinded and crushed with other leaves of other plants and the extract is applied to the part affected. The leaves can also be boiled for 30 – 40 minutes diluted with water for bathing.	Fresh and Dry	For bathing in the morning and night for 5 days.
10	Stomach Cleaning	Leaves	leaves; wash the leaves with salt gently and soak it in hot water for 20-30 minute	Fresh	Soak clean rag with the water and place it on the joint 3 times daily add the extracted powdered (2-teaspoon) in pap 3 times daily.
11	Hair dandruff	Leaves	Immersion of the leaf inside hot water for 40-30 minutes before use	Fresh	Wash the hair with the water 3 times daily.

However, most of the practitioners learn and inherited the practices from their forefathers. Thus, they were very reluctant in disclosing some of the preparation and administration. Similar observation was reported by Dalhatu (2015) and Sodimu *et al.*, (2020) The diseases that can be cured by this species include malaria; measles; skin diseases; constipation; Breast Pain; Tumors and so on. However, some of the parts of the tree were used in fresh while other are used in dry condition during the preparation

of the herbs. The table further revealed that there is standardization of measurement in taking the herbs with the use of table spoon, tea spoon and sometimes with the use of short glass cup called “gasi” in Yoruba language.

Constraints Confronting Traditional Medicine Practitioners

Various constraints were identified from the respondent’s confronting traditional medicine practitioners in the study area (Table 4).



Table 4: Constraints of Traditional Medicine Practitioners

S/No	Constraints	Frequency	Percentage (%)
1	Deforestation	29	27.62
2	Illiteracy	32	30.48
3	Transportation	06	5.71
4	Government Policy	38	36.19
Total		105	100.00

It was revealed that government policy is the major (36.19%) constraint confronting traditional medicine practitioners in the study area, this is closely followed by illiteracy (30.48%), deforestation (27.62%) while transportation issues is the least with 5.71%. These observations were also reported in the work of Sodimu, *et al.*, (2009) that government law and policies are the major challenges facing herbal practitioners.

Quantitative Phytochemical Composition of the Sponge gourd (*Luffa cylindrical*) Plants (leaf, root and Stem)

Phytochemical constituents of sponge gourd (*Luffa cylindrical*) plants show the presence of medicinally active compositions in various quantities in different plant part. However, the quantitative estimation of the crude constituents in the plants parts study are presented in Table 5.

Table 5: Quantitative Phytochemical Composition of Sponge Gourd Plant (*Luffa cylindrical*).

S/N	Parts	Flavonoids Mg/kg	Alkanoids Mg/kg	Terpernoids Mg/kg	Saponins Mg/kg	Cardiac Glycosides Mg/kg
1.	Leaf	14537.5±7.1a	3300.3±1.5 a	156.01±0.1 a	645.0±0.1 b	110±0.1 b
2.	Root	2518.6±5.1b	1235.4±2 b	116.1±1.6 b	149.0±2.2 c	6.5±0.1 c
3.	Stem	182.1±0.5c	770.0±0.1 c	61.0±1.5 c	1240.0±4.9 a	6.7±2.1 a

Values are expressed as mean ± SD. Mean with different alphabets differ significantly (p<0.05)

Result in Table 5 shows that significant differences (P<0.05) exists between the plant parts. Leaves of *Luffa cylindrical* had the highest composition of flavonoids, alkanoids and terpenoids while the stem had the highest composition of saponin and cardiac glycosides. However, *Luffa cylindrical* stem had the least composition of alkanoids, flavonoids and terpenoids while the roots had the least composition of saponins and cardiac glycoside. Suradkar *et al.*, (2017) reported the presence of

terpernoids, saponins, alkanoids and cardiac glycoside in the leaves and the stem of the extract of *Luffa cylindrical*. They thus, concluded that the presence of these chemical could possibly explain the scientific basis of the plants in the medicinal utilization by the traditional healers in treatment and prevention of various diseases across West African Countries. The results are also in agreement with the work of Schneider and Wolfing, (2004) and Okwu and Omodamiro, (2005) who documented



that the presence of saponin, alkanoids and cardiac glycosides in *Luffa cylindrica* has contributed to the medicinal utilization of the plant in treatment of congestive heart failure allergies and ulcers.

Conclusion

In this study, ethnomedicinal utilization and phytochemical analysis of the iconic sponge gourd (*Luffa cylindrica* (L) Roem) plant revealed that the whole plant (stem, root, leaves and the sponge) can be used in the treatment and prevention of arrays of chronic/acute ailments due to adequate presence of phytochemical compounds which serve as active ingredient in the utilization of the plant. Furthermore, the species addressed an important health care need. Thus, its integration with conventional medicine should be promulgated.

Recommendations

The Federal Ministry of Health should identify and encourage the traditional healers and herbs trader who are knowledgeable about the medicinal utilization of *L. cylindrica* at various local levels to develop their recipes and give incentives to motivate them. However, the local population particularly the youth should be educated through capacity building, organized workshop and encouraged to learn more about the traditional medicinal knowledge in order to preserve it from being lost with the old generation.

There is need to create awareness of environmental conservation and protection of medicinal plant species biodiversity. Government should regulate indiscriminate destruction of forest and encourage cultivation of medicinal plants. Similarly, sustainability of biodiversity and biological resources should be ensured so that individual plants like *L. cylindrica* do not go into extinction.

Finally, the research institutes in collaboration with tree arms of government should carry out further research into traditional medicine and other multipurpose uses of the plant and due to the increased interest in medicinal utilization of sponge gourd plant, there is need to create awareness about its conservation.

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