

## Moringa (Moringa Oleifera): Sustainable Farming for North East India's Circular Economy

Ranjit Singha<sup>1</sup> and Surjit Singha<sup>2</sup>

<sup>1</sup>PGDBA, MBA (IB), MSc Psychology (Counselling), (Ph.D.) (PGDHE), Research Scholar, Christ Deemed to be University

<sup>2</sup>MCom, MBA, MPhil, NET, (Ph.D.), (PGDHE), Assistant Professor, Kristu Jayanti College (Autonomous), Bengaluru

### ABSTRACT

*Moringa is a miracle magic plant and it can bring financial wellness as well as physical wellness to one's own personal and professional life. It can bring the health revolution and economic revolution in North East India if it is used scientifically and systematically. Moringa is used in Indian medicine since 5000 yrs ago and was known across several parts of the ancient world. Moringa is a wild tree that grows till the altitude of 1200 meters. It can tolerate pH 5.0 to 9.0, the botanical name of Moringa is Moringa Oleifera.*

*North East India is the most suitable area for Moringa cultivation because of its favorable climatic and geographical conditions. It is observed in the North East Area that Moringa leaf is consumed to reduce High Blood Pressure (Taken in Paste formate) and also Moringa leaf paste is applied over the middle portion of the head to reduce the High blood pressure. However, it is yet to be explored if it can be used as a commercial medicine in the North East Area. Moringa leaves are sold in the market of Assam which is of very high demand, one small bundle ideally of 150-gram leaf costs around 30 INR.*

*This study provides a light on the potential benefits as well as the usefulness of moringa leaves in our daily life, further if it is grown commercially the farmers of the area will be benefitted from the cultivation.*

*Keywords: Circular Economy, Moringa, Moringa Oleifera, Organic, North East India, North East, Moringa Oil, Moringa Dry leaf, Drumsticks, Moringa seeds.*

### INTRODUCTION

Moringa Oleifera is a multipurpose Indian vegetable. It is a medium-sized plant and belongs to Moringaceae family. The botanical name is *Moringa oleifera* Lam. Ideally known as Moringa, The Local Name of Moringa Oleifera in Assam is Sazana. Ideally, Sazana is consumed with Potato and Mustard seeds paste called (Sazana Chorchori). There are around 10 varieties of Moringa Oleifera. The article discusses about PKM1-annual Moringa, Moringa plant flowering starts within 12 to 15 weeks of planting. Moringa fruits (pods) size (1.5 to 2.5-foot length). Ideally, Moringa plant yielding can be two times a year (ideally 200 days) and leaves can be harvested every 90 days.

Along with the Moringa, short duration vegetable plants like Cowpea, Bhendi, and Tomato can be grown as an intercrop with moringa plantation. Moringa plantation needs irrigation before sowing and on the third day after sowing and subsequently at least 10 to 15 days interval according to the soil type. Moringa farm is free from harmful chemicals, pesticides, and herbicides. Moringa leaf powder needed to be manufactured under hygienic conditions protecting ingredients, packaging, intermediate and finished moringa products from contamination from the processing environment hygienic factory under stringent conditions. Moringa oil has to be extracted through the cold-pressed oil extraction process only.

Moringa seeds are dried under sunlight to decrease the moisture level. Out of Moringa tree, we can sell Raw moringa leaf, Raw Moringa Pod or drumstick. Dry moringa leaf powder, moringa seeds, moringa oil, Moringa Kernels. All parts of the moringa tree are including moringa seeds, pods, flowers, leaves, which are the rich storehouse of nutrients and antioxidants. The benefits of consuming Moringa leaf, Kernal, flower, use of moringa oil and drumstick, Moringa seeds powder, wingless moringa seeds, moringa seeds cake, is that it Improves sleep quality, It has Rich fiber source, it Control Blood Glucose Levels, it Regulate blood

sugar levels, it has Natural source of Iron, Natural Remedies for Bone and Joint Pain, Lower cholesterol naturally, Support Death Of Cancer Cells, Heart-Healthy Foods, Powerhouse of Antioxidants, Boost Healthy Skin. Moringa Powder or leaf is also used for weight management, Moringa oil is also used for Skin Care. Moringa oil can be also used in any mechanical device as a lubricant. It is specially used in rocket, watch, trimer because of its special property and since moringa oil is odorless oil, it becomes one of the best oil to absorb any fragrance, thereby it has high demand in the perfume industry.

The cultivation of Moringa in the North East area is yet to be explored on a larger scale. During a visit to North East India, it was found that many of them are not aware of the commercial cultivation of Moringa, neither people are aware of the drying process, production process, large scale commercial cultivation process, market demand, packaging process, licensing process. Further, the local people from North East India stated that most of the youth are not aware of the health benefits of Moringa. It is only the old generation who are aware of the Moringa leaf and its benefits. They expressed that there can be a possible demand for the Moringa leaf and its byproducts if the natives become aware of its benefits, but they are aware that Moringa cultivation is possible.

The retail price and price listed in the e-commerce portal in India range from Rs 600 to Rs 1800 for per kg of dry moringa powder. Data from the other states of India reveals that per acre by cultivating Moringa plant one can produce approximately Moringa Dry Leaves of up to 1814 kg to 7256 kg per acre, Retail Price of dry leaves per acre can go up to 32,65,200 to 1,30,60,800 INR (Only from dry leaves). Drumstick can be produced approximately 16 ton per acre, Retail price one can get up to (14512 kg= Approx 1451200 INR to 20,31,680 INR)

Moringa seeds can be produced up to 1360.5 kg per acre, the retail price can go up to approximately 8,97,930 INR to 10,88,400 INR. Around 408 lit of moringa oil can be produced per acre and the retail price of the oil can be approximately 40,80,000 INR to 61,20,000 INR per acre in a one year duration time.

### **THE OBJECTIVE OF THE STUDY**

Objective 1: To understand the economic benefits of Moringa cultivation

Objective 2: To analyze the market potential of moringa based product

Objective 3: To examine the possibility of Moringa cultivation in the North East Area

Objective 4: To study the medicinal benefits of the moringa plant and its products

Objective 5: To evaluate the cultivation process of moringa plant

### **METHODOLOGY**

- Systematic Literature Review Qualitative and quantitative on the basis of Gough's 2007 review Model, Primary Observation, Market survey, SWOT analyses.
- Area of observation: Kokrajhar, Basugaon, Bongaigaon located in the state of Assam.
- The number of observations: 5 Field visit.
- Secondary data was used for getting the results of market surveys.

### **REVIEW QUESTIONS AND SEARCH TERMS**

The review question includes what is the possible economic benefits of Moringa cultivation, What is the market potential of moringa based products. What is the possibility of Moringa cultivation in the North East Area, What are the medicinal benefits of the moringa plant and its products, What is the cultivation process of the moringa plant.

To find out the suitable literature, the below mentioned attributes were used

Table-1: Literature search Terms

Main Concepts	Search terms/Keywords
<b>Moringa (Moringa Oleifera): Sustainable Farming</b>	Moringa Cultivation, Moringa based product, North East areas Cultivation and habitation, Morina and medicinal benefits.

### Search Strategy

A systematic search of the published and unpublished national and international literature was performed using various bibliographic databases, selected journals, and articles. Published literature was sorted from the database such as EBSCO, JSTORE, ProQuest, Google Scholar, Research Gate, and DOAJ. Copies of journals and articles from 1991 to 2019 were reviewed.

### Study Selection Process

In this paper, both the title and abstract were evaluated based on the following criteria:

Table-2: Details of Inclusion and Exclusion criteria for the study

Feature	Inclusion Criteria	Exclusion Criteria
Nature	Peer-reviewed journals, Articles, reports.	Nonpublished, Conference proceeding, Working papers.
Language	English	Other than English
The theme of the Articles	Moringa Cultivation, Moringa based product, North East areas Cultivation and habitation, Morina and medicinal benefits.	Irrelevant studies apart from the topic of this study.

### LIMITATION OF THE RESEARCH

Primary commercial production data of the Northeast is not available, other states data is used for the possible output of Moringa cultivation in the study area.

### VERNICULAR NAMES

**Sanskrit:** Sobhanjana; **Hindi:** shajmah, shajna, segra; **Oriya:** munigha, sajina; **Punjabi:** sanjna; **Marathi:** sujna; **Tamil:** murungai; **Malayalam:** moringa, muringa., **Assamese:** Sazana, **Koch Rabongshi:** Sazana, Sazana Gashar pata(leaves), Sazana Gash(Moringa tree), Sazana er tal(Moringa oil), Sazana er guti( Morina Seeds). **Kamatapuri:** Sazana, Sazana Gashar pata(leaves), Sazana Gash(Moringa tree), Sazana er tal(Moringa oil), Sazana er guti( Morina Seeds). **Mandarin:** LaMu, **FRENCH:** Ben ailé, Ben ailée, Ben oléifère, Moringa ailée, Pois quénique, **JAPANESE:** Marungai, **THAI:** Ka naeng doeng, Ma khon kom, Ma rum (bean / pod), Phak i huem, Phak i hum (Phak eehuem), Phak nuea kai, Phak ma rum (leaves), Se cho ya., **German :** Behenbaum, Behennussbaum, Meerrettichbaum, Pferderettichbaum. **Hungarian :** Lóretékfa, **Italian :** Been, Bemen. **Portuguese :** Acácia branca, Moringa, Muringueiro. **Russian :** Moringa oleifera, Perla de la India (Mexico), Perlas del oriente (Mexico), Perlas (Guatemala), Resada (Puerto Rico). **Czech :** Moringa olejná, Danish : Behennødræ, Dutch : Benboom, Peperwortel boom. Portuguese:Acácia branca, Cedra (Brazil), Marungo, Moringuiero, Muringa **Cantonese:** Lat mok , **Myanmar:** Dandalun, **Chinese** LaMu.

### Objective 1: To understand the economic benefits of Moringa cultivation Commercial Plantation of Moringa Oleifera

Particulars	Basic information
Variety	PKM1-annual Moringa
Method of Cultivation	Organic
Diversity of cultivation	Leaves 1000 to 4000 plants/acer Seeds 1200 plants/acer
First Harvest	Leaves 90 days Drumsticks and seeds 200 days
Harvest Frequency	Leaves –every 45 to 50 days(for 9 to 10months in a yr) Drumsticks & Seeds- every 15 days(for 9 months in a yr)

Particulars	Basic information	Price
Cultivated for	Moringa leave /Drumsticks/ Seeds and Oil	<b>Moringa leaves:</b> 100 Kg Dry Powder Moringa Leaf min Retail Price 1,80,000 INR to 2, 50,000(In a packed container of 50 gram each with fssai number) <b>Drumsticks:</b> 1000 drumsticks Retail price is 5000 to 7000 INR(Retail Price as per market per pice ) <b>Dry Seeds Price:</b> 100kg dry moringa seeds price 6600 to 8000INR(Retail price, per Packet pack of 50 gram) <b>Moringa Oil:</b> 100 lit oil price 100000 to 150,000(Retail price, per bottle pack of 50 ml)
Annual Yield	Dried leaves 2 to 8 tones/acre/per year.	Moringa Dry Leaves: 1814kg to 7256 kg/ acre Price of dry leave per acre, Retail price you can get up to 3265200 INR to 13060800 (Only from dry leaves )
	Drumsticks 16 tons/acre/per year	Drumstick 16 ton per acre Retail price you can get up to (14512 kg= Approx 1451200 INR to 2031680 INR). Seeds 1360.5 kg per acre, Retail price you can get up to =897930 INR to 1088400 INR
	Seeds 1.5 tone/Acer	Moringa Oil 408 lit per acre. The retail price you can get up to 4080000 INR to 6120000 INR.

## Objective 2: To analyze the market potential of moringa based product

### Moringa Seeds

Moringa seeds can also act as a detoxification medicine as it is antioxidants in several medicinal preparations.

### Moringa Oil

A Popular cooking oil due to the high percentage of healthy polyunsaturated fatty acid

To extract ben oil which in turn is used in the cosmetic industry due to presence of high % of oleic acid and behenic acid make

- Soaps, Shampoos, moisturizing
- Anti-aging creams
- Hair oil
- Used in exotic spas as a massage oil
- Extensive applications in perfumery
- Excellent to moisture human skin & texture

### Moringa Dry Leaf Powder

- Used to create special tea flavor
- Used for detoxification
- Processed as a nutraceutical ( eg Moringa peptide) to supplement food intake

- Made into capsules/tablets /Powder which can be used to address malnutrition in India or any country
- Used in Ayurvedic and Chinese Medicine /Alternative Medicine

**Industrial Applications****Moringa Oil**

- It is also used as an additive in rockets and aircraft fuel due to its anti-freezing property.
- Used as lubricants in watches and high precision machinery as it does not become rancid.

**Animal Consumption**

- It can be an Animal Supplement with 15 to 17 kg of fresh moringa leaves

**Objective 3: To examine the possibility of Moringa cultivation in the North East Area**

Moringa cultivation is highly possible in the study area because Moringa trees are already available in the N.E area, however, it's not been commercially cultivated. Most of the North East area is high land which is very conducive for the Moringa tree as water stagnation does not happen in those Land. If in any land water stagnation happens then it's highly impossible for moringa cultivation.

**Objective 4: To study the medicinal benefits of the moringa plant and its products**

The benefits of consuming Moringa leaf, Kernel, flower, use of moringa oil and drumstick, Moringa seeds powder, wingless moringa seeds, moringa seeds cake, is that it Improves sleep quality, It has Rich fiber source, it Control Blood Glucose Levels, it Regulate blood sugar levels, it has Natural source of Iron, Remedies for Joint Pain and Bone, Lower cholesterol naturally, helps to Destroy Cancer Cells, Heart-Healthy Foods, Powerhouse of Antioxidants, Boost Healthy Skin. Moringa Powder or leaf is also used for weight management, Moringa oil is also used for Skin Care.

**Objective 5: To evaluate the cultivation process of moringa plant**

There are around 10 varieties of Moringa Oleifera. In this research we are only discussing, PKM1-annual Moringa, Moringa plant flowering starts within 12 to 15 weeks of planting. Moringa fruits(pods) size (1.5 to 2.5 foot length). Ideally, Moringa plant production two times a year (ideally 200days) and leaves can be harvested every 90 days. Moringa pkm1 is ideally grown in deep sandy loam soil with a pH of 6.5 – 8. Soil pH is a measure of the acidity or basicity (alkalinity) of a soil. pH is defined as the negative logarithm (base 10) of the activity of hydronium ions ( $H^+$  or, more precisely,  $H_3O^{+aq}$ ) in a solution. In soils, it is measured in a slurry of soil mixed with water (or a salt solution, such as 0.01 M  $CaCl_2$ ), and normally falls between 3 and 10, with 7 being neutral. Acid soils have a pH below 7. Alkaline soils have a pH above 7. Ultra-acidic soils ( $pH < 3.5$ ) and very strongly alkaline soils ( $pH > 9$ ) are rare. Moringa pkm1 needs to dig pits of size 45 cm x 45 cm x 45 cm with a spacing of 2.0 – 2.5 m either way. Apply 15 kg of compost or Farmyard Manure to each pit after mixing with topsoil. Post cultivation Gap filling needs to be done within 30 days of the plantation. Manuring Pinch off the moringa seedlings when they are about 75 cm in height to facilitate more branching. Short duration vegetable plants like Cowpea, Bhendi, and Tomato can be grown as an intercrop with moringa plantation. Moringa plantation needs irrigation before sowing and on the third day after sowing and subsequently at least 10 to 15 days interval according to your soil type. Moringa farm is free from harmful chemicals, pesticides, and herbicides. Moringa leaf powder needed to be manufactured under hygienic conditions protecting ingredients, packaging, intermediate and finished moringa products from contamination from the processing environment hygienic factory under stringent conditions. Moringa oil has to be extracted through the cold-pressed oil extraction process only.

Moringa seeds are collected from matured moringa pod or fruit, which are edible for consumption. Moringa seeds pods are green in color. This is a good stage for human consumption. Moringa pods become brown color pods. Older mature green pods begin to turn gray or light brown as the seeds are maturing inside the pod.

Moringa seed contains nearly 8% to 30% of moisture. This moisture level high in fresh seeds and days goes moisture level will lower. Moringa seeds are dried under direct or indirect sunlight to reduce the moisture level. Out of Moringa tree, we can sell Raw moringa leaf, Raw Moringa Pod or drumstick. Dry moringa leaf powder, moringa seeds, moringa oil, Moringa Kernels. All parts of the moringa tree are a rich storehouse of nutrients and antioxidants. The benefits of consuming Moringa leaf, Kernal, flower, use of moringa oil and drumstick, Moringa seeds powder, wingless moringa seeds, moringa seeds cake, is that it Improves sleep quality, It has Rich fiber source, it Control Blood Glucose Levels, it Regulate blood sugar levels, it has Natural source of Iron, Lower cholesterol naturally, Heart-Healthy Foods, Powerhouse of Antioxidants, Boost Healthy Skin. Moringa Powder or leaf is also used for weight management, Moringa oil is also used for Skin Care.

## RESULTS

### SWOT Analyses

#### Strength

- Traditional skill-based of organic cultivation with ample manpower resources in North East India
- Fertile Soil
- High land Area

#### Weakness

- Lack of market acumen.
- Access only to the local market.
- Low or minimum profit margin.
- Farmers are socially, financially backward and vulnerable.
- The industry is not well linked to global markets
- Most of the farmers are unaware of the potential of Moringa cultivation.
- Lack of seasonal forecast.

#### Opportunity

- Moringa oil/powder should be encouraged for exports.
- Increasing demand for Moringa powder/oil across the globe.
- Moringa cultivation and production can be adapted to current trends.
- Development of an export market for Moringa.
- Adaption of traditional medicine
- Get a global positioning for its impressive quality product.
- On the basis of our observation, we can Moringa cultivation helping many families for sustainable financial growth

#### Threats

- Limited cultivation of Moringa and competing demand from other country
- Production of Moringa powder/oil very less
- Politically and Culturally Sensitive
- Foreign Production
- Sale of low priced moringa powder/oil in the market
- Limited scale and poor visibility/awareness
- lack of quality seeds available for the formers
- Farmers are dependent on Hybrid seeds
- No awareness of different moringa product

## SUGGESTION AND RECOMMENDATION

- The government should facilitate subsidy, financial incentives, technology, subsidized loan to the farmers for the cultivation of moringa and develop an AI-based app for easy access to information.

- Research Institute needs to be established at all the Regional levels for Training, production of saplings, quality hybrid seeds, preservation, drying, cool press oil, and technological innovation for drying the moringa leaves.
- Integration of medical science, clinical research, Bio-technology and microbiology, Social research to explore the possibility and potential of moringa by-products for medical treatment.
- Moringa is highly demanded in Europe, farmers should be able to export the products to the potential customers directly without any intervention of middleman for which a special online platform or special commodity exchange should be integrated or need to build in order to list the moringa by-products in the online platform so that customer can buy it directly and moringa should be considered as one of the commodity.
- The legal process of selling, exporting, listing should be made simple and easy, ease of business model needs to be integrated within the policy framework.
- Barriers, bureaucracy, barriers created by government employees, should be eliminated by not indulging any human intervention in the business process, rather modern technology, Artificial Intelligence (AI) should be integrated and embedded in the total process.
- The government should give tax-free or tax exemption or subsidy for any business directly or indirectly related to moringa and its by-product whether cultivation, production, packaging, selling, exporting etc.
- There should be a special CSR funding policy for Moringa cultivation, Moringa grower, Moringa based Training and development, Moringa based by-product training and development.
- Modern technology for cultivating Moringa needs to be implemented.
- There is a need for training of cool press moringa oil production, moringa powder and organic moringa cultivation.
- A special subsidized loan should be sanctioned for Moringa Cultivation or Moringa based business.
- The Land tax should be exempted if anyone is cultivating moringa and Tax rebate should be given those who are associated in the business of moringa based products.
- Trade promotion and special events need to be organized specifically for organic moringa based products.
- High-quality seed should be produced for strengthening the moringa cultivation and quality standards need to be established.
- Special Research and Development Institute needed to be established for Moringa.
- Research Fellowship should be allocated in different institutes and University for Moringa based agriculture or Product development research.
- Barren waste land should be effectively used for the purpose of Moringa cultivation with no royalty or subsidized royalty.

**Research Gap:** Very limited research is available focusing on Indian Based Moringa.

## CONCLUSION

The economic benefits from the moringa cultivation is beneficial for the farmers, it was found that 100 Kg Dry Powder Moringa Leaf min Retail Price 1,80,000 INR to 2, 50,000 (In a packed container of 50 gram each with fssai number) and 1000 drumsticks Retail price is 5000 to 7000 INR (Retail Price as per market per pice ), 100kg dry moringa seeds price 6600 to 8000INR (Retail price, per Packet pack of 50 gram) 100 lit oil price 100000 to 150,000(Retail price, per bottle pack of 50 ml), 1814kg to 7256 kg/ acre, Price of dry leave per acre, Retail price you can get up to 3265200 INR to 13060800 (Only from dry leaves ). Drumstick

16 tones per acre Retail price you can get up to (14512 kg= Approx 1451200 INR to 2031680 INR), Seeds 1360.5 kg per acre, Retail price you can get up to =897930 INR to 1088400 INR, Moringa Oil 408 lit per acre Retail price you can get up to 4080000 INR to 6120000 INR. The medical benefits include blood glucose control, improves sleep quality, destroys cancer cells, regulate blood sugar levels, natural source of Iron, reduces cholesterol, it can also be used as a skincare product. In North-East India Moringa cultivation is possible, which can bring an economic revolution for North East India.

**REFERENCE**

- Cáceres, A., Freire, V., Girón, L. M., Avilés, O., & Pacheco, G. (1991). Moringa oleifera (Moringaceae): ethnobotanical studies in Guatemala. *Economic Botany*, 45(4), 522-523.
- Desa, D. (1985). Water purification with Moringa seeds. *Waterlines*, 3(4), 22-23.
- Dubin, R. E. (1982). Behavioral interactions between Caribbean reef fish and eels (Muraenidae and Ophichthidae). *Copeia*, 1982(1), 229-232.
- Harriman, N. A. (1998). (1376) Proposal to conserve the name *Gymnocladus* (Leguminosae: Caesalpinioideae) with a conserved gender and type. *Taxon*, 47(4), 875-876.
- Jahn, S. A. A. (1988). Using Moringa seeds as coagulants in developing countries. *Journal-American Water Works Association*, 80(6), 43-50.
- Jahn, S. A. A. (1991). The traditional domestication of a multipurpose tree Moringa stenopetala (Bak. f.) Cuf. in the Ethiopian Rift Valley. *Ambio*, 244-247.
- Lev-Yadun, S., & Gophna, R. (1992). Exportation of plant products from Canaan to Egypt in the Early Bronze Age I: A rejoinder to William A. Ward. *Bulletin of the American Schools of Oriental Research*, 287(1), 89-90.
- Morton, J. F. (1991). The horseradish tree, Moringa pterygosperma (Moringaceae)—a boon to arid lands?. *Economic botany*, 45(3), 318-333.
- Munyanziza, E., & Sarwatt, S. V. (2003). Evaluation of Moringa oleifera for food security and environmental rehabilitation in Tanzanian rural areas. *Journal of tropical forest science*, 450-456.
- Olson, M. E. (2002). Combining data from DNA sequences and morphology for a phylogeny of Moringaceae (Brassicales). *Systematic Botany*, 27(1), 55-74.
- Olson, M. E. (2002). Intergeneric relationships within the Caricaceae-Moringaceae clade (Brassicales) and potential morphological synapomorphies of the clade and its families. *International Journal of Plant Sciences*, 163(1), 51-65.
- Olson, M. E. (2003). Ontogenetic origins of floral bilateral symmetry in Moringaceae (Brassicales). *American Journal of Botany*, 90(1), 49-71.
- Ramachandran, C., Peter, K. V., & Gopalakrishnan, P. K. (1980). Drumstick (Moringa oleifera): A multipurpose Indian vegetable. *Economic Botany*, 34(3), 276-283.
- Rosell, J. A., Olson, M. E., Aguirre-Hernandez, R., & Carlquist, S. (2007). Logistic regression in comparative wood anatomy: tracheid types, wood anatomical terminology, and new inferences from the Carlquist and Hoekman southern Californian data set. *Botanical Journal of the Linnean Society*, 154(3), 331-351.
- Saini, R. K., Saad, K. R., Ravishankar, G. A., Giridhar, P., & Shetty, N. P. (2013). Genetic diversity of commercially grown Moringa oleifera Lam. cultivars from India by RAPD, ISSR and cytochrome P 450-based markers. *Plant systematics and evolution*, 299(7), 1205-1213.



- Steinitz, B., Tabib, Y., Gaba, V., Gefen, T., & Vaknin, Y. (2009). Vegetative micro-cloning to sustain biodiversity of threatened Moringa species. *In Vitro Cellular & Developmental Biology-Plant*, 45(1), 65.
- Stephenson, K. K., & Fahey, J. W. (2004). Development of tissue culture methods for the rescue and propagation of endangered Moringa spp. germplasm. *Economic botany*, 58(1), S116-S124.
- Verdcourt, B. (1958). Moringa: A Correction. *Kew Bulletin*, 13(3), 384-386.
- Verma, S. C., Banerji, R., Misra, G., & Nigam, S. K. (1976). Nutritional value of Moringa. *Current Science*.
- Young, R. F., & Winn, H. E. (2003). Activity patterns, diet, and shelter site use for two species of moray eels, *Gymnothorax moringa* and *Gymnothorax vicinus*, in Belize. *Copeia*, 2003(1), 44-55.