



Moringa oleifera: A Review Article on its Nutritional Properties and Prospects in Nepal

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Abstract

Moringa is a plant that grows in warm climates. It is a member of the Moringaceae family and is native to India, Pakistan, Bangladesh, and Afghanistan. Moringa is sometimes called the "miracle tree" because of its many benefits to people, including being a source of protein, essential nutrients, and antioxidants. Moringa is also being studied for its potential to help prevent and treat many diseases.

Keywords: *Moringa oleifera*; Miracle Tree; Nutritional; Medicinal; Nepal

Introduction



Moringa oleifera is an Angiospermic plant often known as the 'drumstick' or 'horseradish' tree. It is a member of the Moringa genus, which has 13 distinct species. Among these, Moringa oleifera is the most frequently grown species endemic to the tropical and subtropical regions of the world [1]. Moringa oleifera is a tropical deciduous perennial dicotyledonous tree. It is known by several names in different places, including "Shiferaw" in Ethiopia, drumstick tree or horseradish tree in India, and 'Sitalchini', Munga, Sahijan or Saijan in Nepal.

It is a petite, elegant, deciduous tree with scant leaves of the Moringaceae family. The tree is 5 to 10 metres tall [2]. The leaves are alternating, the old ones fall off quickly, and each leaf can grow to be up to 90 cm long, with opposing petals. pinnae. They are 5cm

apart from the plant's centre stalk. Moringa has somewhat bigger terminal leaflets that are arranged in opposing pairs. Leaflets are dark green on top and pale on the bottom, and they vary in size and form, although they are usually rounded-elliptic and up to 2.5 cm long.

Throughout the year, flowers appear in loose axillary panicles up to 15cm long. Fruits are huge and unusual, up to 90 cm long and 12 mm wide, somewhat constricted at intervals, gradually tapering to a tip, 3- (4-) angled, and with two grooves on each face. They are also light brown in colour. It separates along each angle to disclose the rows of spherical blackish oily seeds, each with three papery wings [3]. The forests form forks from the base region. Smooth, dark grey slash thin, and yellowish bark. The tree's twigs and shoots are short and densely-haired. The Crown is composed of a single stem that is large, open, and often umbrella like. The tree has deep roots and soft wood [3]. Moringa oleifera is a bisexual plant that is extensively cross-pollinated due to heteromorphism.

Carpenter bees (*Xylocopa latipes* and *X. pubescens*) have been identified as the most dependable and suitable pollinators for Moringa. The main goal of this review was to highlight the nutritional, medicinal, and commercial properties of Moringa, to learn about the potential of Moringa cultivation in Nepal, to suggest future directions for research, market, and development strategies, and to evaluate a published scientific journal article on Moringa oleifera's multipurpose use.

Propagation

Moringa oleifera can be grown from seeds, cuttings, or both. Direct sowing is possible because to its high germination rate. Moringa seeds may sprout all year in well-drained soil. Cuttings of 1 m length and at least 4 cm diameter can be utilised for vegetative propagation.

"The spacing" is important for intense leaf production. Plants should be 15 × 15 cm or 20 x 10 cm in size, with alleys suitably spaced (e.g., every 4 m) to enable plantation maintenance and harvesting. Weeding and disease prevention might be challenging at times owing to high density. During semi-intensive production, the plants are separated by 50 cm* 1 m. This produces good outcomes while requiring minimal upkeep. Moringa trees are extremely useful as natural barriers since they may be planted in alleyways and are often related with other crops. In agroforestry, the space between Moringa rows is normally between 2m and 4m.

Moringa trees may be harvested when they reach 1.5m and 2m in height during high density gardening. Harvest the leaves by cutting the leaf stems using a knife. a sharp knife or by severing leaf stems from branches 20 cm to 45 cm above the ground. This approach encourages the growth of new branches [4]. It is collected after 35 to 40 days. In the event of fodder harvesting, however, the tree should be picked every 75 days. Because the gathered leaves decay quickly, they should not be piled together. Early morning is the optimal time for harvesting to avoid excessive water loss. Because fresh leaves lose moisture fast after harvesting, they should be sold the same day. Moringa may also be collected at a height of 50 cm above ground level, making automated harvesting possible [5].

The origin and spread

M. oleifera is indigenous to western and sub-Himalayan regions, India, Pakistan, Asia Minor, Africa, and Arabia [6]. However, it is currently available in the Philippines, Cambodia, Central America, North and South America. America, as well as the Caribbean Islands [7]. It is currently grown for a number of applications throughout the world's tropical and subtropical climates.

Cultivation situation

Moringa oleifera is a small to medium-sized deciduous or evergreen tree found mostly in Nepal's tropical, foothill, and midhill regions [8]. It may reach a height of 25-30 feet and grows best in the mid-hill, siwalik, and terai area [9]. It grows best in direct sunshine at elevations ranging from 0 to 1000 metres above sea level. Moringa tolerates a wide variety of soil conditions, but favours neutral to slightly acidic environments (pH. 6.3-7.0). This demonstrates its predilection for well-drained sandy or loamy soil. The minimum annual rainfall need is around 250mm, with a maximum of nearly 3,000mm required in waterlogged soil. The roots are prone to decay. Trees can be planted on tiny slopes in areas prone to excessive rainfall to enhance water run-off. Because of the presence of a large taproot, the plant is resistant to severe drought. The ideal temperature range is 12-40 degrees Celsius, however the tree can withstand temperatures as high as 48 degrees in the shade and can withstand mild frost [10]. It easily colonises stream banks and savannah regions with well-drained soils and a somewhat high water table all year. Although the plant is drought resilient, it produces much less foliage when subjected to prolonged water stress. Frost does not damage it, although it can be killed back to ground level. by a freeze. When cut, it immediately puts out new growth from the trunk, and when frozen, it sends out new growth from the ground [4].

Moringa oleifera Advantages

Nutritional benefits

Moringa oleifera is known as the "Miracle Tree" because of its numerous nutritional benefits and ability to treat a variety of ailments. Every portion of the plant has its own set of nutrients. Moringa oleifera leaves are high in minerals such as calcium, potassium, zinc, magnesium, iron, and copper. Because the Leaves have a low calorific content, they can be included in an obese person's diet. The leaves are extremely high in protein and minerals and contain all necessary amino acids [11]. Pods contain approximately 46.78% fibre and 20.66% protein and are highly appreciated for the treatment of digestive problems and colon cancer [12]. Vitamins such as vitamin A, Moringa oleifera has high levels of vitamin B, beta-carotene, pyridoxine, nicotinic acid, vitamin C, vitamin D, and vitamin E.

Moringa oleifera also contains significant amounts of phytochemicals such as tannin, sterols, terpenoids, flavonoids, saponins, anthraquinones, alkaloids, and reducing sugar, as well as anti-cancer substances such as glucosinolates, isothiocyanates, glycoside compounds, and glycerol-1-9-octadecanoate. Moringa leaves have been shown to have anti-nutrient factors such as oligosaccharides and oxalate [13]. After 4 and 3 months of storage, dried leaves (*M. oleifera*) preserved 87.5% and 50% of carotene, respectively, and could therefore be processed for practical use [14].

Nutrient compositions of leaves, leaf powder, seeds and pods is shown in given table.

Nutrients	Fresh leaves	Dry leaves	Leaf powder	Seed	Pods
Calories (cal)	92	329	205	–	26
Protein (g)	6.7	29.4	27.1	35.97 ± 0.19	2.5
Fat (g)	1.7	5.2	2.3	38.67 ± 0.03	0.1
Carbohydrate (g)	12.5	41.2	38.2	8.67 ± 0.12	3.7
Fibre (g)	0.9	12.5	19.2	2.87 ± 0.03	4.8
Vitamin B1 (mg)	0.06	2.02	2.64	0.05	0.05
Vitamin B2 (mg)	0.05	21.3	20.5	0.06	0.07
Vitamin B3 (mg)	0.8	7.6	8.2	0.2	0.2
Vitamin C	220	15.8	17.3	4.5 ± 0.17	120

(mg)					
Vitamin E (mg)	448	10.8	113	751.67 ± 4.41	–
Calcium (mg)	440	2185	2003	45	30
Magnesium (mg)	42	448	368	635 ± 8.66	24
Phosphorus (mg)	70	252	204	75	110
Potassium (mg)	259	1236	1324	–	259
Copper (mg)	0.07	0.49	0.57	5.20 ± 0.15	3.1
Iron (mg)	0.85	25.6	28.2	–	5.3
Sulphur (mg)	–	–	870	0.05	137

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Table 1

The use of different parts of *Moringa oleifera* is described as below:

Therapeutic properties

Moringa oleifera contains several therapeutic characteristics and has the ability to heal a wide range of ailments. Diabetes, heart disease, anaemia, arthritis, respiratory issues, skin problems, liver problems, paralysis, sterility, rheumatism, digestive disorders, and many more ailments are treated with it. The National Institute of Health and Family Care awarded it "plant of the year" in India in 2008. It is also used to treat ascites, pneumonia, and poisonous bites in other areas such as Africa. The leaves are anti-fungal, anti-viral, anti-abortion, and function as a flocculating agent and stimulant, according to several studies. Moringa powder can be used in place of iron tablets as a therapy for anaemia. This magnificent tree's health benefits appear to be limitless. Aside from all of the benefits listed above, Moringa is thought to assist even more.

It combats free radicals.

Antioxidants are popular because they combat free radicals, which cause oxidative stress, cell damage, and inflammation. Moringa also includes antioxidants such as flavonoids, polyphenols, and ascorbic acid in its leaves, flowers, and seeds, which are useful in a variety of ways. Leaf extracts had better antioxidant activity, free-radical scavenging capability, and suppression of lipid, protein, and DNA oxidation than flowers and seeds, according to one research. This implies that it inhibits the damage and degradation caused by free radicals in the cells of various organs in the body, keeping them healthy and operating optimally. [19]

Anti-inflammation

The most promising applications of Moringa extract are in the treatment of various chronic and acute inflammations.

Diabetes, respiratory issues, cardiovascular disease, arthritis, and obesity can all be caused by inflammation. Moringa decreases inflammation in the body by reducing inflammatory enzymes and proteins, and leaf extract can considerably reduce inflammation in cells. [20].

Anti-diabetic

Moringa has a significant anti-diabetic impact. Its leaf powder is particularly efficient in diabetic patients for lowering lipid and glucose levels as well as managing oxidative stress, which means it decreases blood sugar and cholesterol levels while also improving cell protection. Moringa has been proposed to heal both Type 1 and Type 2 diabetes patients suffering from insulin resistance, often known as Type 2 diabetes. Diabetes type 1. Insulin is a hormone that regulates the body's blood glucose levels. Diabetes type 2 is associated with insulin resistance. Type 2 diabetes is more likely to arise as a result of impaired beta cell activity. When a beta cell fails to detect glucose levels, signalling to insulin is reduced, resulting in excessive blood glucose levels. Moringa has been shown in several trials to be an anti-diabetic agent [20].

It safeguards the cardiovascular system.

Moringa leaf powder offers hearthealthy properties, including blood lipid regulation, artery plaque prevention, and lower cholesterol levels. This plant is extremely effective in cardiovascular problems because to its excellent mix of diuretic, lipid-lowering, and blood pressure-lowering components. The Moringa leaf Juice has an essential part in blood pressure regulation. Mustard oil glycosides and thiocarbamate glycosides have been extracted from Moringa leaves and have been shown to reduce blood pressure [20].

Promotes brain health

Moringa's antioxidant and neuro-enhancer properties greatly improve brain health and boost cognitive function. It has produced promising preliminary results as a therapy for Alzheimer's disease. The high amount of vitamin C and E helps to improve brain function and normalise the neurotransmitters serotonin, dopamine, and noradrenaline in the brain, which play important roles in memory, mood, organ function, responses to stimuli such as stress and pleasure, and mental health such as depression and psychosis.

Moringa has an important part in liver protection. Because to the high quantities of polyphenols in its leaves and blossoms, it protects the liver against damage, oxidation, and toxicity. Moringa oil can also restore normal levels of liver enzymes, reduce oxidative stress, and increase protein content in the liver. The liver is solely capable of performing blood detoxification, bile formation, fructose metabolism, fat metabolism, and nutrition processing. functions rely on liver enzymes, therefore maintaining normal levels is critical. Lower levels of hepatic enzymes, for example, can impede the liver's capacity to filter blood.

Antimicrobial and antibacterial properties

Moringa possesses antibacterial and antifungal characteristics that aid in the battle against illnesses. It's helpful against fungi that cause skin infections and bacteria that cause blood and urinary tract infections, as well as stomach issues [21]. Moringa oleifera roots have antibacterial properties and are said to be high in antimicrobial compounds. Moringa bark extract has antifungal properties, while the juice of the bark and stem has antibacterial properties against Staphylococcus aureus.

Improves wound healing

Moringa's leaves, roots, and seeds include blood-clotting qualities that are beneficial. It promotes wound healing and can shorten the time it takes for scratches, scrapes, or wounds to stop bleeding. V.I. Hukkeri described the antipyretic and wound healing effects of ethyl acetate and ethanolic extracts of Moringa oleifera leaves. In rats, ethanolic and ethyl acetate extracts of seeds have

considerable antipyretic effect, but ethyl acetate extract of dried leaves has wound healing activity (10% extracts in the form of ointment) on excision, incision, and dead space (granuloma) wound models [22].

Moringa's prospects in the setting of Nepal Combating Malnutrition

Moringa oleifera, an edible tree native to the arid tropics, is increasingly being utilised as a dietary supplement. *Moringa* is described by the Food and Agriculture Organization as a highly valuable plant with several health advantages. According to several studies, *Moringa* is a plant that can help reduce malnutrition in children and women. Malnutrition has been a major issue in Nepal, particularly among youngsters and pregnant women. According to the Nepal Demographic and Health Survey 2016 [23], 36% of children were stunted, 10% were wasted, and 27% were underweight. Even while the situation is improving, it is still not sufficient, and malnutrition is still a major cause of death in Nepal. As a result, *Moringa oleifera* may be the greatest alternative for reducing malnutrition.

Moringa oleifera has a variety of important phytochemicals in its leaves, seeds, and pods, and it is an excellent malnutrition treatment [12]. Over 143 million children are under the age of five. In developing nations, children under the age of five were undernourished in 2006 [24]. Food insecurity, a lack of access to health care, social, cultural, and economic status are all factors that contribute to the prevalence of undernutrition (West., et al. 2006). The climatic conditions in Nepal promote the growth and development of *Moringa oleifera*, which has the potential to be one of the finest options for reducing malnutrition. *Moringa* is also regarded as a vital famine food due to its excellent tolerance to drought and desert environments due to its tuberous roots [25]. *Moringa* is also believed to have 7 times the vitamin C of oranges, 10 times the vitamin A of carrots, 17 times the calcium of milk, 9 times the protein of yoghurt, and 15 times the potassium of bananas. than bananas and 25 times the iron content of spinach [16].

The overall number of individuals suffering from chronic food insecurity rose to about 821 million in 2017, up from roughly 804 million in 2016. Various international humanitarian organisations and the World Health Organization (WHO) have exploited *Moringa's* outstanding character to tackle the hunger crisis in many regions of the world. Malnutrition in teenagers has a long-term impact, and they are at a higher risk of developing infectious and metabolic illnesses. Adolescent girls are more vulnerable to malnutrition. Once teenage girls become mothers, persistent malnutrition has negative consequences on pregnancy, potentially resulting in preterm birth, maternal mortality, slowed foetal growth, and low birth weight (LBW), as well as neonatal mortality. Malnutrition in teenagers can affect intellectual aptitude and academic performance in addition to its health consequences.

Moringa has a lot of calcium, which is one of the most vital elements for human growth. While 8 ounces of milk has 300-400 mg, *Moringa* leaves contain 1000 mg, and *Moringa* powder contains around 4000 mg. As a result, it can be used to treat anaemia. It has been observed that *Moringa* has more iron than spinach [26]. A sufficient zinc intake is required for healthy sperm cell development as well as the production of DNA and RNA [27]. *M. Oleifera* leaves contain around 25.5-31.03 mg of zinc/kg, which is the daily need. Zinc is essential in the diet.

Linoleic acid and oleic acid are PUFAs that have the capacity to regulate cholesterol. *Moringa* seed oil contains around 76% PUFA, making it an excellent alternative for olive oil [28]. Depending on the area and time of year, The cultivation, the nutritional composition. The hot-wet season had a greater concentration of vitamin A, whereas the cool-dry season had a higher concentration of vitamin C and iron. Iron and vitamin A shortages, as well as infectious illnesses, continue to ravage the poor globe; noncommunicable diseases caused by obesity are becoming more widespread in both developed and developing countries. Diets high in vegetables and fruits, which include vitamins and health-promoting phytochemicals, have the potential to reduce both malnutrition and obesity. Inadequate vegetable and fruit eating kills 2.7 million people globally each year and is one of the top ten risk factors for death (Ezzati., et al. 2002). As a result, a miracle plant like *Moringa oleifera* is desperately needed to battle malnutrition in a country like Nepal.

The role of poverty alleviation and rural livelihood development

Poverty and hunger-related concerns have remained prominent on the front burner of global economic debate, and emerging countries face a variety of challenges in terms of nutrition, health, and standard of life. Poverty is defined as an individual's inability to achieve a minimal level of living. It is a social state characterised by an inadequacy of access to fundamental human necessities (food and non-food) for the maintenance of a socially acceptable quality of life in a given society.

Poverty is prevalent, as evidenced by [29], which estimated that 1.4 billion people out of the world's population of 6.8 billion live on \$1.25 per day or less [30], which revealed that an average of 22,000 children Every day, individuals die as a result of poverty-

related problems, and [31] estimates that there are 925 million hungry people in the globe. That is, one out of every seven people is hungry. It went on to say that 98% of the world's hungry reside in developing nations, mostly in Asia, the Pacific, and Sub-Saharan Africa. According to the 2010 MDG report, a child dies every five seconds from hunger-related illnesses, and three out of every four people who are most affected by poverty and hunger reside in rural regions (HDR, 2010). Despite the fact that agriculture is the backbone of rural areas, FAO [31] estimated that 50% of hungry individuals in rural communities are farm families. It is suggested that, while poverty is the primary cause of hunger, hunger is also a cause of poverty. Poverty is also caused by poor health and low energy levels, which impede production and result in poverty. In one hector of land, around 95,000 to 16 million plants may be grown with 2 kg of leaves every harvest and can be collected for up to 10 years [32].

Moringa's versatile application makes it an excellent alternative for rural poor, small-holder farmers, and marginalised communities seeking to better their livelihoods. It is a potential cash crop in Nepal's terai, foothills, and midhills. It can be intercropped with many other vegetables and has the potential to enhance rural income by creating jobs, increasing self-sufficiency, and alleviating poverty [8]. It is a drought-resistant plant. As a result, Less irrigation, as well as less manure and fertiliser. Moringa growing is not labour intensive; even family members may help maintain it in their spare time. In a short period of time, the crop shows to be more lucrative with minimal investment, even on a tiny plot of land. As a result, the crop can be a boon to Nepal's rural society.

Inadequate health care, poor nutrition, low income levels, and the usage of trees and their byproducts for food, medicine, and cosmetics are all widespread among rural populations in underdeveloped countries. The Moringa Tree has been described as a miracle plant that may be used for human and animal nourishment, health, cosmetics, biogas, and water purification, among other things. Economic evidence from empirical studies of its manufacturing indicates its potential as a strategy for increasing producer revenue.

Moringa's Potential in the Churia Region

Moringa has a good chance of growing in the Churia range. Because it is a rapid growing tree that is also drought resilient, it may thrive in poor soil conditions or on marginal regions with little rainfall. Moringa might be an excellent choice for recovering such marginal terrain. The majority of the land in Chure is marginal, with high vulnerability and low nutrient levels. Moringa grows well in temperatures ranging from 25oC to 35oC, although it can even withstand minor frosts and temperatures as high as 48oC. The plant is abundant in protein and can help impoverished farmers get enough nutrients. It lessens reliance on forests for fuel wood. It may also be used for windbreaks, living fences, trellises, and shade trees. It also has the ability to blossom freely and is a viable income crop for a variety of habitats, including marginal areas and farming systems. As a result, if planted in the Chure range, including flooded, waste land, and river banks, this plant might play a significant role in Nepal's environmental and economic growth.

Conclusions and Suggestions

The Moringa Tree's ability to tackle the combination of poverty and hunger remains unrivalled. However, low levels of understanding of the plants' intrinsic advantages have hampered their production in some regions of Nepal. Other threats to the The plant's cultivation includes market uncertainties and a lack of understanding regarding its production and usage. The proper use of the Moringa Tree solves many problems related to nutrition, health, and general well-being of the masses, as well as saving foreign exchange that is currently used in the importation of synthetic vitamins and minerals, putrefying chemicals, convectional drugs, body and hair care products, and making more funds available for Rural Development programmes. All rural farmers should be encouraged to cultivate Moringa trees in order to empower themselves. The government should develop numerous programmes to help resource-poor rural farmers by giving training and other resources, assisting them in harvesting and processing, and paying them based on their production. This type of empowerment will be beneficial. Reduce poverty and make the Moringa Tree available to all households. Finally, agricultural extension and advisory services can help rural farmers handle the obstacles and capitalise on the huge potential in the production and use of Moringa Tree. As a result, the Moringa tree will become one of the most promising income crops in the context of a developing country like Nepal.

Bibliography

1. Olson M. (n.d.). "Combining data from DNA sequences and morphology for a phylogeny of Moringaceae". In Systemic Botany 55-73.
2. Anwar F., *et al.* "Moringa oleifera: A Food plant with multiple Medicinal uses". Wiley Inter science (2006).

3. Orwa. "Agroforestry database 4.0". *World Agroforestry Center* (2009).
4. Fredalette. Moringa production: Production guidelines for the Miracle tree (2018).
5. Mabapa M., *et al.* "Effect of planting density and harvest Interval on the leaf yield and Quality of Moringa under diverse Agroecological condition of Northern south Africa". *International Journal of Agronomy* 9 (2017).
6. Somali M., *et al.* "Chemical composition and characteristics of Moringa peregrina seeds and seeds oil". *Journal of American oil Chemist's Society* (1984): 85-86.
7. Morton FJ. "The Horseradish Tree, Moringa pterygosperma (Moringaceae): A boon to arid lands". *Economic botany* (1991): 318-333.
8. Pokhrel P., *et al.* "Moringa oleifera- A potential cash crop in Nepal". *Healthy Society and Healthy World* (2016).
9. Singh M. "The tree of life: Moringa Oleifera". Online khabar (2017).
10. Leone A., *et al.* "Cultivation, Genetic, Ethnopharmacology, Phytochemistry and Pharmacology of Moringa oleifera Leaves: An Overview". *International Journal of Molecular Science* (2015).
11. Janick J and Paull R. *The Encyclopedia of Fruits and Nuts*. Walling ford, United Kingdom: Cabi Publishing (2018).
12. Gopalkrishan L., *et al.* "Moringa oleifera: A review on nutritional importance and its medicinal application". *Food Science and Human Wellness* 8 (2016).
13. Freiberger C., *et al.* "Nutrient content of edible leaves of seven wild plants from Niger". In *Plants Food for human Nutrition* (1998): 57-69.
14. Glover AM and F M. "Nutritional evaluation of Moringa oleifera Leaves using three drying methods". *Journal of Resistant Biology* (2012): 469-473.
15. Daba, M. "Miracle tree: A review on multipurpose of Moringa oleifera and its Implication for climate change mitigation". *Earth Science Climate Change* (2016).
16. Gandhi K., *et al.* "Status and Utilization of Moringa oleifera Lam: A review". *African crop science Journal* 26 (2018): 137156.
17. Ghazali H and AS M. "Moringa (Moringa oleifera) Seed oil: Composition, Nutritional Aspects and Health Attributes" (2011).
18. Silva F., *et al.* "The many health benefit of Moringa oeilifera". *Journal of Medical and Pharmaceutical Innovation* (2014).
19. Dixit S., *et al.* "Medicinal properties of Moringa oleifera: A Review". *International Journal of Education and Science Research Review* (2016).
20. Chaudhary K and Chaurasia, S. "Neutraceutical Properties of Moringa oleifera : A Review". *European journal of Pharmaceutical and medical research* (2017): 646-655.
21. Khor Z., *et al.* "The in- vivo and in-vitro anticancer properties of Moringa". *Hindawi* (2018).
22. VI H., *et al.* *Indian Journal of Pharma Science* (2006): 214-126.
23. Survey D. a. Nepal (2016).
24. UNICEF. Program for children: A world fit for children statistical Review Number (2008).
25. CN K., *et al.* "Nutritional evaluation of indigenous foods and potential food based solution to alleviate hunger and malnutrition in kenya". *Journal of Applied Biosciences* 67 (2013).
26. Fuglie L. "The Moringa tree: A local solution to malnutrition church world service in Senegal" (2005).
27. Braminas JC and Emmanuel D. "Mineral composition of nonconventional leafy vegetables". *Plant Foods Human Nutrition* (1996): 29-36.
28. Lalas S and Tsaknis J. "Characterization of Moringa oleifera seed oil variety periyakulam" (2002).
29. IFAD. Rural poverty report (2011).

30. UNICEF. Humanitarian Action Report (2010).
 31. FAO. The state of food and Agriculture (2010).
- Fadliyah Kartikasari RL., *et al.* "Malnutrition treatment of adloscent girls using Moringa Chocolate cookies. The 8th annual basic science International conference. American Bibliography
32. Olson M. (n.d.). "Combining data from DNA sequences and morphology for a phylogeny of Moringaceae". In *Systemic Botany* 55-73.
 33. Anwar F., *et al.* "Moringa oleifera: A Food plant with multiple Medicinal uses". Wiley Inter science (2006).
 34. Orwa. "Agroforestry database 4.0". *World Agroforestry Center* (2009).
 35. Fredalette. Moringa production: Production guidelines for the Miracle tree (2018).
 36. Mabapa M., *et al.* "Effect of planting density and harvest Interval on the leaf yield and Quality of Moringa under diverse Agroecological condition of Northern south Africa". *International Journal of Agronomy* 9 (2017).
 37. Somali M., *et al.* "Chemical composition and characteristics of Moringa peregrina seeds and seeds oil". *Journal of American oil Chemist's Society* (1984): 85-86.
 38. Morton FJ. "The Horseradish Tree, Moringa pterygosperma (Moringaceae): A boon to arid lands". *Economic botany* (1991): 318-333.
 39. Pokhrel P., *et al.* "Moringa oleifera- A potential cash crop in Nepal". *Healthy Society and Healthy World* (2016).
 40. Singh M. "The tree of life: Moringa Oleifera". Online khabar (2017).
 41. Leone A., *et al.* "Cultivation, Genetic, Ethnopharmacology, Phytochemistry and Pharmacology of Moringa oleifera Leaves: An Overview". *International Journal of Molecular Science* (2015).
 42. Janick J and Paull R. *The Encyclopedia of Fruits and Nuts*. Walling ford, United Kingdom: Cabi Publishing (2018).
 43. Gopalkrishan L., *et al.* "Moringa oleifera: A review on nutritional importance and its medicinal application". *Food Science and Human Wellness* 8 (2016).
 44. Freiberger C., *et al.* "Nutrient content of edible leaves of seven wild plants from Niger". In *Plants Food for human Nutrition* (1998): 57-69.
 45. Glover AM and F M. "Nutritional evaluation of Moringa oleifera Leaves using three drying methods". *Journal of Resistant Biology* (2012): 469-473.
 46. Daba, M. "Miracle tree: A review on multipurpose of Moringa oleifera and its Implication for climate change mitigation". *Earth Science Climate Change* (2016).
 47. Gandhi K., *et al.* "Status and Utilization of Moringa oleifera Lam: A review". *African crop science Journal* 26 (2018): 137156.
 48. Ghazali H and AS M. "Moringa (Moringa oleifera) Seed oil: Composition, Nutritional Aspects and Health Attributes" (2011).
 49. Silva F., *et al.* "The many health benefit of Moringa oeilera". *Journal of Medical and Pharmaceutical Innovation* (2014).
 50. Dixit S., *et al.* "Medicinal properties of Moringa oleifera: A Review". *International Journal of Education and Science Research Review* (2016).
 51. Chaudhary K and Chaurasia, S. "Neutraceutical Properties of Moringa oleifera : A Review". *European journal of Pharmaceutical and medical research* (2017): 646-655.
 52. Khor Z., *et al.* "The in- vivo and in-vitro anticancer properties of Moringa". *Hindawi* (2018).
 53. VI H., *et al.* *Indian Journal of Pharma Science* (2006): 214-126.
 54. Survey D. a. Nepal (2016).
 55. UNICEF. Program for children: A world fit for children statistical Review Number (2008).

56. CN K., *et al.* "Nutritional evaluation of indigenous foods and potential food based solution to alleviate hunger and malnutrition in kenya". *Journal of Applied Biosciences* 67 (2013).
57. Fuglie L. "The Moringa tree: A local solution to malnutrition church world service in Senegal" (2005).
58. Braminas JC and Emmanuel D. "Mineral composition of nonconventional leafy vegetables". *Plant Foods Human Nutrition* (1996): 29-36.
59. Lalas S and Tsaknis J. "Characterization of Moringa oleifera seed oil variety periyakulam" (2002).
60. IFAD. Rural poverty report (2011).
61. UNICEF. Humanitarian Action Report (2010).
62. FAO. The state of food and Agriculture (2010).
- Fadliyah Kartikasari RL., *et al.* "Malnutrition treatment of adloscent girls using Moringa Chocolate cookies. The 8th annual basic science International conference. American Bibliography
63. Olson M. (n.d.). "Combining data from DNA sequences and morphology for a phylogeny of Moringaceae". In *Systemic Botany* 55-73.
64. Anwar F., *et al.* "Moringa oleifera: A Food plant with multiple Medicinal uses". Wiley Inter science (2006).
65. Orwa. "Agroforestry database 4.0". *World Agroforestry Center* (2009).
66. Fredalette. Moringa production: Production guidelines for the Miracle tree (2018).
67. Mabapa M., *et al.* "Effect of planting density and harvest Interval on the leaf yield and Quality of Moringa under diverse Agroecological condition of Northern south Africa". *International Journal of Agronomy* 9 (2017).
68. Somali M., *et al.* "Chemical composition and characteristics of Moringa peregrina seeds and seeds oil". *Journal of American oil Chemist's Society* (1984): 85-86.
69. Morton FJ. "The Horseradish Tree, Moringa pterygosperma (Moringaceae): A boon to arid lands". *Economic botany* (1991): 318-333.
70. Pokhrel P., *et al.* "Moringa oleifera- A potential cash crop in Nepal". *Healthy Society and Healthy World* (2016).
71. Singh M. "The tree of life: Moringa Oleifera". Online khabar (2017).
72. Leone A., *et al.* "Cultivation, Genetic, Ethnopharmacology, Phytochemistry and Pharmacology of Moringa oleifera Leaves: An Overview". *International Journal of Molecular Science* (2015).
73. Janick J and Paull R. *The Encyclopedia of Fruits and Nuts*. Walling ford, United Kingdom: Cabi Publishing (2018).
74. Gopalkrishan L., *et al.* "Moringa oleifera: A review on nutritional importance and its medicinal application". *Food Science and Human Wellness* 8 (2016).
75. Freiberger C., *et al.* "Nutrient content of edible leaves of seven wild plants from Niger". In *Plants Food for human Nutrition* (1998): 57-69.
76. Glover AM and F M. "Nutritional evaluation of Moringa oleifera Leaves using three drying methods". *Journal of Resistant Biology* (2012): 469-473.
77. Daba, M. "Miracle tree: A review on multipurpose of Moringa oleifera and its Implication for climate change mitigation". *Earth Science Climate Change* (2016).
78. Gandhi K., *et al.* "Status and Utilization of Moringa oleifera Lam: A review". *African crop science Journal* 26 (2018): 137156.
79. Ghazali H and AS M. "Moringa (Moringa oleifera) Seed oil: Composition, Nutritional Aspects and Health Attributes" (2011).
80. Silva F., *et al.* "The many health benefit of Moringa oeifera". *Journal of Medical and Pharmaceutical Innovation* (2014).
81. Dixit S., *et al.* "Medicinal properties of Moringa oleifera: A Review". *International Journal of Education and Science Research Review* (2016).

82. Chaudhary K and Chaurasia, S. "Neutraceutical Properties of Moringa oleifera : A Review". *European journal of Pharmaceutical and medical research* (2017): 646-655.
 83. Khor Z., *et al.* "The in- vivo and in-vitro anticancer properties of Moringa". *Hindawi* (2018).
 84. VI H., *et al.* *Indian Journal of Pharma Science* (2006): 214-126.
 85. Survey D. a. *Nepal* (2016).
 86. UNICEF. *Program for children: A world fit for children statistical Review Number* (2008).
 87. CN K., *et al.* "Nutritional evaluation of indigenous foods and potential food based solution to alleviate hunger and malnutrition in kenya". *Journal of Applied Biosciences* 67 (2013).
 88. Fuglie L. "The Moringa tree: A local solution to malnutrition church world service in Senegal" (2005).
 89. Braminas JC and Emmanuel D. "Mineral composition of nonconventional leafy vegetables". *Plant Foods Human Nutrition* (1996): 29-36.
 90. Lalas S and Tsaknis J. "Characterization of Moringa oleifera seed oil variety periyakulam" (2002).
 91. IFAD. *Rural poverty report* (2011).
 92. UNICEF. *Humanitarian Action Report* (2010).
 93. FAO. *The state of food and Agriculture* (2010).
- Fadliyah Kartikasari RL., *et al.* "Malnutrition treatment of adloscent girls using Moringa Chocolate cookies. The 8th annual basic science International conference. American

