Leaflet No. 4/2022

The Republic of the Union of Myanmar
Ministry of Natural Resources and Environmental Conservation
Forest Department

Nutritional Value and Phytochemical Analyses of *Moringa oleifera L.* Naturally Grown in Myanmar

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February, 2023

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LIST OF ABBREVIATIONS

Hydrochloric Acid (HCl)
Ethyl Alcohol (EtOH)
Sulfuric Acid (H2SO4)
Argenitte (Ag)
Aluminum (Al)
Arsenic (As)
Gold (Au)
Calcium (Ca)
Copper (Cu)
Iron (Fe)
Mercury (Hg)
Potassium (K)
Molybdenum (Mo)
Lead (Pb)
Oxygen (O)
Sulfides (S)
Antimony (Sb)
Silicate (Si)
Zinc (Zn)
2-2 diphenyl-1-picryl-hydrazyl-hydrate (DPPH)

Nutritional Value and Phytochemical Analyses of *Moringa oleifera L.* Naturally Grown in Myanmar

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Abstract

Moringa oleifera is a tree distributed in whole Myanmar. *M. oleifera* is used in practice in the treatment of various diseases and in herbal food for our meal. Both of fruit and leave of *M. oleifera* was eat as food in curry. Later, there is many value added usage in personal care products production (soap, shampoo etc), some pesticide and cosmetic production (sun cream ect). The aim of the present study was to investigate the advantages and nutritional value of Moringa leaf and fruit in scientifically by analyzing the kind of biological organic compound and their activity of properties and to point out the effective utilization of *M. oleifera*. To know the various properties of *M. oleifera* leave and fruit, it was tested with standard methods by collecting the samples from three region that have different climate, topography of Myanmar (Sa-gaing region; Kaw-lin township, Shan State ; Nyaung-Shwe township, Nay-Pyi-Taw township, Yezin). Among the result, the significant fact is that the leaf of *M. oleifera* is stronger ability to against diabetic than fruit of *M. oleifera* in all samples of testing. The leaf sample from Shan State showed that the highest reducing blood glucose amount; 40 mg/dl. The Nay-Pyi-Taw's leave have highest ability to against *Agrobacterium tumerfacines* that cause infection disease to plant and highest amount of Alkaloid (phytochemical compound) among sample. And the best antioxidant capacity was observed in the leaf of NayPyiTaw and in the fruit of NayPyiTaw was observed the antioxidant capacity but it can have effective by making the test with highest sample concentration. According to the results of the present study, the natural nutritional value and compound of Moringa leaf and fruit are varied depend on the growing region and kind of chemical reagent.

Keywords; Antioxidant Activity, Antimicrobial Activity, Anti-diabetic Activity, *Agrobacterium tumerfacines*, *Moringa oleifera*, Phytochemical Compound

မြန်မာနိုင်ငံတွင်ပေါက်ရောက်သည့် ဒန့်သလွန်ပင်တွင်ပါဝင်သော အာဟာရဓါတ်တန်ဖိုးနှင့် အသုံးပြုနိုင်သည့်အော်ဂဲနစ်ဒြပ်ပေါင်းများ ဆန်းစစ်လေ့လာခြင်း

လွင်လွင်အောင်၊ လက်ထောက်သုတေသနအရာရှိ

သစ်တောသုတေသနဌာန၊ သစ်တောဦးစီးဌာန

စာတမ်းအကျဉ်း

ဒန့်သလွန်ပင်သည် မြန်မာနိုင်ငံအနှံ့အပြားတွင် ပေါများစွာပေါက်ရောက်လျက်ရှိသော အပင်တစ်မျိုးဖြစ်ပြီး ရောဂါအမျိုးမျိုးကုသပေးနိုင်သောဆေးများတွင် ထည့်သွင်းအသုံးပြု ကြပြီးဖြည့်စွက်အစားစာအဖြစ်လည်း အရွက်ရောအသီးကိုပါချက်ပြုတ်စားသောက်ကြသည်။ ယခုနောက်ပိုင်းတွင်မူ ဆပ်ပြာ၊ ခေါင်းလျော်ရည်အစရှိသော တကိုယ်ရေသုံးပစ္စည်းများ ထုတ်လုပ်ရာတွင်လည်းကောင်း၊ နေရောင်ခံခရင်မ်အစရှိသော အလှကုန်ပစ္စည်းများ ထုတ်လုပ်ရာတွင်လည်းကောင်း၊ ပိုးသတ်ဆေးထုတ်လုပ်ရာတွင်လည်းကောင်း အသုံးပြု လာကြပါသည်။ ဤစာတမ်းတွင် ဒန့်သလွန်ပင်၏အရွက်နှင့်အသီးတို့မှ ဇီဝအကျိုးပြု အော်ဂဲနစ်ဒြပ်ပေါင်းများနှင့် ၎င်းတို့၏ဂုဏ်သတ္တိများကို ထိရောက်စွာအသုံးချနိုင်သော နည်းလမ်းများ ကိုသိရှိနိုင်စေရန်အတွက် ဆောင်ရွက်ခဲ့ခြင်းဖြစ်ပါသည်။ သို့ဖြစ်ပါ၍ ဒန့်သလွန်အရွက်နှင့်အသီးတို့ကို မြန်မာနိုင်ငံ၏မတူညီသောရာသီဥတု၊ မြေမျက်နှာသွင်ပြင် ရှိ၊ ဒေသ (၃) ခု ဖြစ်သော စစ်ကိုင်းတိုင်း၊ ကောလင်းမြို့နယ် ၊ရှမ်းပြည်နယ်၊ ညောင်ရွေ နှင့် နေပြည်တော်၊ ရေဆင်း တို့မှစုဆောင်းရယူ၍ ပါဝင်သောဆေးဘက်ဝင်ဓာတ်ပေါင်း (phytochemical) အမျိုးအစားများ၊ ဓါတ်တိုးဆန့်ကျင်နိုင်မှုဂုဏ်သတ္တိ၊ အနုဇီဝပိုးမွှားများ အား ကာကွယ်နိုင်မှု နှင့် သွေးအတွင်း သကြားဓာတ်လျော့ချနိုင်မှုအား တိုင်းတာခြင်းစသည့် စမ်းသပ်မှု(၄) မျိုးဖြင့် Standard Method များအတိုင်းစမ်းသပ်ဆောင်ရွက်ခဲ့ပါသည်။ စမ်းသပ်တွေ့ရှိချက်များအရ ဒန့်သလွန် အရွက်သည် အသီးထက်သွေးတွင်း သကြားဓာတ်ကို ပို၍ လျော့ချပေးနိုင်ကြောင်းတွေ့ရသည့် အပြင်ရှမ်းပြည်နယ် မှဒန့်သလွန်အရွက်သည် သွေးတွင်းသကြားဓာတ်ကို ၄၀ mg/dl ထိ အများဆုံး လျော့ချပေးနိုင်ကြောင်းလည်း တွေ့ရှိရပါသည်။ နေပြည်တော်မှ ဒန့်သလွန်အရွက်သည်လည်းအပင်များတွင် ကူးစက်ရောဂါ ဖြစ်ပွားစေသောပိုး၊မြစ်ပွားနာ၊ ကင်ဆာအဖုအကြိတ် ရောဂါဖြစ်စေသောပိုး (*Agrobacterium tumerfacines*) ပိုးကိုဆန့်ကျင်နိုင်သော ဂုဏ်သတ္တိ နှင့် ဆေးဝါး ကုသရာ နှင့် အပင်များတွင်ကျရောက်တတ်သော ပိုးမွှားများအားကြီးထွားမှုမှ ကာကွယ်ပေး နိုင်ခြင်း (Alkaloid) ဓာတ်ပေါင်းပါဝင်မှုပမာဏ အများဆုံးပါဝင်နေကြောင်း တွေ့ရှိရသည်။ ထို့အပြင်မြန်မာ့မျိုးရင်းဖြစ်သော နေပြည်တော်မဒန့်သလွန်အရွက်မှာဓါတ်တိုး ဆန့်ကျင် နိုင်စွမ်း ဂုဏ်သတ္တိအမြင့်မားဆုံးဖြစ်ကြောင်းတွေ့ရှိရပြီး ဒန့်သလွန်အသီးနမူနာမှာ ဓါတ်တိုး ဆန့်ကျင်နိုင်စွမ်းဂုဏ်သတ္တိရှိကြောင်း တွေ့ရှိရသော်လည်း ပြင်းအားတန်ဘိုး အမြင့်မားဆုံး

အသုံးပြုမှုသာအကျိုးသက်ရောက်မှုရှိကြောင်း တွေ့ရှိခဲ့ရပါသည်။ စမ်းသပ် တွေ့ရှိခဲ့သော ရလဒ်များအရ ဒန့်သလွန်အရွက်နှင့် အသီးတို့၏ အဟာရဓာတ်တန်ဖိုးနှင့် ပါဝင်သော ဓာတ်ပေါင်းတို့သည်ပေါက်ရောက်ရာဒေသနှင့်စမ်းသပ်မှုတွင်အသုံးပြုသောဓာတုဗြပ်ပြု ပစ္စည်း (Chemical Reagent) များအပေါ်တွင် မူတည်နေကြောင်းတွေ့ရှိခဲ့ရပါသည်။

Nutritional Value and Phytochemical Analyses of *Moringa oleifera L.* Naturally Grown in Myanmar

1. Introduction

Moringa oleifera Lam is a plant that belongs to the family Moringaceae. It contains a single genus "Moringa" with thirteen species (Morton, 1991). Among these, the *M. oleifera* Lam tree is the most common and the others popular species are Moringaceae arborea, Moringaceae borziana and Moringaceae longituba. Myanmar name, it is known as Dan.Tha.Lwun and as common name it is also called the Drumstick tree, Horse raddish tree, ben oil tree. Moringa is a plant that is native to South Asia, the sub-Himalayan areas of India, Bangladesh, Pakistan, Africa, Saudi Arabia, the Caribbean Islands, and South America and Afghanistan. A fast growing deciduous **shrub or small tree** up to 12 m tall and 30 cm in diameter with an umbrella-shaped open crown (unless repeatedly coppiced). The **bark** is corky and gummy. **Leaves** are alternate, oddly bi- or tri-pinnately compound, triangular in outline and 20– 70 cm long. Each pinnate has 3–9 pairs of 1–2 cm long ovate leaflets, soft dark green above and whitish below. The white, fragrant **flower**s are in pendulous panicles 1.5–2 cm long from leaf corners. The **fruit pod**s are 15–45 cm long, 9-ribbed capsules opening by three valves to release the 3-winged seeds. Pollination is not required for *Moringa oleifera*. It has bisexual flowers, and animals such as bees and birds aid in pollination. A single tree can produce up to 400 fruits per year, and matured stage or after settling down , fruit's number could rise to 1000. The *Moringa oleifera* plant can grow well in the humid tropics or hot dry land , can survive in less fertile soils, and is also little affected by drought. It is known as the "miracle tree". Its leaves, bark, flowers, fruit, seeds, and root are used for natural or traditional medicine. This Miracle Tree is one of the most nutrient-rich plants on the planet. It is a big source of proteins, vitamins and minerals, thus, Moringa is becoming an increasingly important part of plans to combat malnutrition in underdeveloped countries. Moringa is also an excellent immunity booster. It helps in fighting against bacteria due to the ingredient of salmonella, E.coil in leave. It may lower blood sugar level and Moringa improve bone health and promote bone density because it contains essential minerals like calcium and phosphorus. *Moringa oleifera*'s anti-inflammatory properties are achieved through inhibiting inflammatory proteins and enzymes in the body. As it is more quickly absorbed by the body, *Moringa oleifera* is a more effective anti-inflammatory than turmeric. And Moringa extracts help to protect the kidney against problems that may be caused by toxin and heavy metals.

There are too many mineral and elements in Moringa like protein, aminoacid, carbohydrate, lipids, chlorophyll A and B, magnesium, iron, selenium, zinc, β-carotene and vitamin C. In this paper, we will also measure the total contact of that mineral and elements. Phytochemicals such as vanillin, omega fatty acids, carotenoids, ascorbates, tocopherols, beta-sitosterol, moringine, kaempferol, and quercetin have been found mainly in its flowers, roots, fruits, and seeds. The leaves, in particular, have been found to contain phenolics and flavonoids; these compounds have various biological activities, including antioxidant, anticarcinogenic, immunomodulatory, antidiabetic, antiatherogenic, and hepatoprotective functions and the regulation of thyroid status.

Common uses of different parts of *Moringa oleifera* Lam are as follows,

Table 1. Common Uses of Different Parts of *M. oleifera* Lam

Uses/ Application		
Parts of Plants	**Food and Others**	**Medicine**
Leaves	Salads, vegetables curries	Powder for treating tumors; poultice for sores, piles, reduce glandular swelling, headaches, or body cleanser, to promote digestion; hypocholesterolemic, juice lowering glucose levels, eye and ear infection
Flower	Extracts used for honey preparations	remedy for tumors, infections, muscle diseases, spleen enlargement and to lower cholesterol level
Pods / Flower	Salad, vegetable	treat malnutrition
Seeds	as a snack, oil for salads, cooking, cosmetics, lubricant; water purifying	To treat abdominal tumors and to remove harmful bacteria
Bark	For tanning	Promote digestion
Root	Used as a substitute for horseradish	To treat tumors, promote digestion, antilithic, antifertility and anti-inflammatory. Beneficial against rheumatism, constipation, kidney pain or back pain.

As above information, traditionally, the leaves, fruits, flowers, and immature pods of this tree are edible; they are used as a highly nutritive vegetable in many countries. The leaves are the most commonly eaten part of the Moringa. The long, skinny drumstick-shaped tree pods are best eaten when they are green and young. *Moringa oleifera* is particularly effective for crops when grown in a multistoried cropping design under the shade of this tree. Because the tree is less vulnerable to price changes, it can outperform mono-cropping. Agroforestry with *Moringa oliferia* also contributes significantly to soil and water conservation.

2. Objective

1) Investigation the advantages and nutritional value of Moringa leaf and fruit in scientifically by analysing the kind of biological organic compound and their activity of properties.
2) To promote the usage of Moringa leaf, not only in food but also in medicine and value added products manufacturing.
3) To study the effective utilization method of Moringa leaf and fruit in advance based on the result of researched data.
4) Based on the systematically researched data, it aim to support to the related fields to develop more and more.

3. Literature Review

3.1. Nutritional Fact of *Moringa oleifera*'s Leaf and Fruit

The nutrient concentration of *M. oleifera* leaves is notable, as they contain all the essential amino acids, including arginine and histamine, which are important for infant

development, as well as high concentrations of vitamins and minerals (Tree for life, 2005; Teixeira et al., 2014). Traditionally, *M. oleifera* leaves have been used to treat many ailments, such as nervous debility, paralysis, asthma, diabetes, blood pressure, diarrhea, fever, cough, cholera, spasms, enlarged liver and spleen, infection and ulcer, and inflammation, and to promote wound healing. A leaf powder from the plant can be used for children with malnutrition, pregnant and lactating woman (Price,1985). For example, In the Philippines, this plant is commonly used to increase the production of milk in lactating women, hence its name of "mother's best friend"; and it has also been prescribed to patients with anemia (Siddhuraju and Becker, 2003; Estrella et al., 2000).

The nutrient content value of the Moringa's leafe are

- 7 times as much calcium as milk
- 7 times as much vitamin c as oranges
- 15 times as much potassium as bananas
- 7 times as much B2 as yeast
- 6 times as much polyphenols as red wine
- 4.5 times as much folic acid as beef liver
- 4.5 times as much vitamin E as wheat seedlings
- 4 times as much vitamin A and
- 2.5 times as much carotene as carrots.

As the report of Helbal Goodness Journel, Moringa leaves are an excellent source of many vitamins and minerals and 25g of Moringa which when broken down contains :

Nutrient	Percentage (25 grams)
Protein	42%
Calcium	125%
Magnesium	61%
Potassium	41%
Iron	71%
Vitamin A	272%
Vitamin C	22%
Vitamin B6	19%
Riboflavin B2	11%

Fresh pods and seeds are an excellent source of oleic acid, a health-benefiting monounsaturated fat. Moringa, as a high-quality oilseed crop, can be grown alternatively to improve nutrition levels of populations in many drought-prone regions of Africa and Asia Fresh Moringa (drumstick) pods and leaves are an excellent sources of vitamin-C**.** 100 g of pods contain 145 µg or 235% of daily required levels of vitamin-C. 100 g of greens provide 51.7 µg or 86% of daily-recommended intake values of this vitamin. Research studies have shown that consumption of fruits/vegetables rich in vitamin C helps the body develop immunity to combat infectious agents, and scavenge harmful oxygen-free radicals from the body.

Principle	Nutrient value-Pods	Nutrient value-Leaves
Energy	37 Kcal (2%)	64 Kcal (3%)
Carbohydrates	8.53 g (6.5%)	8.28% (6%)
Protein	2.10 g (4%)	9.40 g (17%)
Total Fat	0.20 g (1%)	1.40% (7%)
Cholesterol	0 mg (0%)	0 mg (0%)
Dietary Fiber	3.2 g (8%)	2.0 g (5%)
Vitamins		
Foliates	44 µg (11%)	40 µg (10%)
Niacin	0.680 mg (4%)	2.220 mg (14%)
Pyridoxine	0.120 mg (9%)	1.200 mg (92%)
Riboflavin	0.074 mg (6%)	0.660 mg (51%)
Thiamin	0.053 mg (4.5%)	0.257 mg (21.5%)
Vitamin A	74 IU (2.5%)	7564 IU (252%)
Vitamin C	141 mg (235%)	51.7 mg (86%)
Electrolytes		
Sodium	42 mg (3%)	9 mg (0.5%)
Potassium	461 mg (10%)	337 mg (7%)
Minerals		
Calcium	30 mg (3%)	185 mg (18.5%)
Iron	0.36 mg (4.5%)	4.00 mg (50%)
Magnesium	45 mg (11%)	147 mg (37%)
Phosphorus	50 mg (9%)	112 mg (20%)
Selenium	8.2 µg (15%)	0.9 µg (1.5%)
Zinc	0.45 mg (4%)	0.60 mg (5%)

3.2 Activities and Properties of *Moringa oleifera* Lam

3.2.1. Pharmacological activity of different parts of *M. oleifera*.

The pharmacological activity of different parts of M. oleifera are as follows,

Leaves; Antiatherosclerotic , Anti-inflammatory, Anticancer, Antimicrobial, Antioxidant , Hepatoprotective , Hypocholesterolemic , Hypoglycaemic , Hypolipidaemic , Immunomodulatory , Nephroprotective , Neuroprotective

Roots; Anti-inflammatory, Antimicrobial, Hepatoprotective

Flowers; Antimicrobial , Hepatoprotective , Nephroprotective

Pods; Anticancer, Anti-inflammatory , Antimicrobial, Antioxidant , Hypo-cholesteromic

Seeds; Anti-inflammatory , Anti-cancer , Antimicrobial , Antioxidant, Antitumor Immunomodulatory

3.2.2. Antioxidant Properties and Activity

The antioxidant properties of this species is important to prevent of damage to important macromolecules such as DNA, proteins and lipids so cells can function properly (Ryter et al., 2007; Limon-Pacheco and Gonsebatt, 2009). The seeds and leaves of Moringa are a good source of antioxidants (Chumark et al., 2008) with 65.1 % in methanolic extracts and 66.8% in ethanolic extracts (Lalas and Tsaknis, 2002; Siddhuraju and Becker, 2003). Some studies have shown that quercetin and kaempferol seem to be responsible for this antioxidant activity (Bajpai et al., 2005; Siddhuraju and Becker, 2003). The qualitative properties of antioxidant in Moringa have been highlighted. Sreelatha and Padma (2009) indicated that the antioxidants in both mature and young leaves have a great potential to scavenge free radicals, along with nutritional antioxidants such as Vitamins A, C, and E (Limon-Pacheco and Gonsebatt, 2009). The highest therapeutic value of *M. oleifera* is further substantiated in terms of its high antioxidant level present in leaves, seeds, flowers and pods (Chumark et al., 2008; Verma et al., 2009; Atawodi et al., 2010). Kumar et al. (2007) demonstrated these antioxidant properties could be responsible for reduction of the chance of cancer development and other damage to the cell.

The antioxidant activity of *M. oleifera* is particularly strong in leaf, pod and seed extracts. The high content of flavonoids and phenols in different parts of the plant, especially leaves, favors the reduction of oxidative damage to the main biomolecules through the inhibition of lipid peroxidation and the action of nitric oxide and induction of deoxyribose degradation, preventing the generation of free radicals. Studies with normal and diabetic rats showed that treatment with aqueous *M. oleifera* leaf extracts significantly increased the activity of the enzymes superoxide dismutase, catalase and glutathione S-transferase and decreased lipid peroxidation.It has been suggested that the high phenolic and flavonoid content in the extract may protect against oxidative damage in normal and diabetic individuals. Additionally, a research with 60 postmenopausal women showed that supplementation with *M. oleifera* leaf powder for 3 months significantly decreased the serum levels of malondialdehyde, generated by lipid peroxidation, and increased the levels of ascorbic acid, superoxide dismutase and glutathione peroxidase, which are indicators of the antioxidant property of the plant. (Elsevier – 2017; Asian Pacifice Journal of Tropic Medicine)

3.2.3. Antimicrobial Properties and Activity

Virtually all parts of *Moringa oleifera* have shown antimicrobial properties (Caceres et al., 1991; Ali et al., 1999; Senthil Kumar and Reetha 2009); this includes leaves, bark, fruit, root and flowers (Khalil 1996; Tsaknis et al., 1999). This is important because there is a great need for antimicrobial compound in the medical community due to the development of antibiotic resistance. More studies need to be done to evaluate the use of this species and to isolate the proper compounds that can be use in allopathic medicine.

Also in vitro studies have demonstrated the inhibitory activity of *M. oleifera* root, stem, leaf, flower, pod and seed extracts on Gram-positive (Enterococcus faecalis, methicillin resistant Staphylococcus auras and Staphylococcus epidermis's) and Gram-negative bacteria (Salmonella enteric a, Pseudomonas aeruginosa, Klebsiella pneumoniae, Escherichia coli) isolated from clinical samples. The antimicrobial effect of the crude extracts on E. coli and K. pneumoniae strains has been compared to that of the antibiotic streptomycin. The in vitro antibacterial potential of *M. oleifera* has been demonstrated against other bacterial species. This potential is associated with the biocompound benzyl-isothiocyanate which inhibits bacterial growth by disrupting the mechanisms of membrane and enzyme synthesis. In addition, the antibacterial activity of *M. oleifera* extracts is also attributed to gallic acid and

tannins, which inhibit Vibrio spp., and saponins, tannins, isothiocyanates and phenolic compounds, such as alkaloids and flavonoids, which have inhibitory activity.

3.2.4. Anti-diabetic Activity

Experiments in Wistar and Goto-Kakizaki (GK) rats with type 2 diabetes show a positive effect of Moringa leaves, with a significant decrease in blood glucose levels (Ndong et al., 2007). In addition, in high-fat-diet mouse models, the extracts of this plant have shown improved glucose tolerance (Jaja-Chimedza et al., 2018). The lowering blood sugar levels within 3 h after ingestion has been observed (Mittal et al., 2007) and is likely to be due to extracts' inhibitory activity against α-Glucosidase enzyme (Natsir et al., 2018). It is possible that polyphenols such as 3-glycoside, kaempferol glycosides and others (Ndong et al., 2007) could have an effect in this anti-diabetic activity. Studies have shown the antioxidant activity of Moringa can rescue apoptosis of beta cells, therefore preventing damage to these cells, leading to the beneficial properties against diabetes (Al-Malki et al., 2015; Mbikay, 2012; Kaneto et al., 1999). Additional studies may lead to the commercialization of Moringa extracts for conventional treatment of diabetes.

3.2.5. Hypocholesterolemic Activity

Moringa leaves contain phytosterols (Jain et al., 2010); that seem to be implicated in the reduction of cholesterol uptake by the intestines (Lin et al., 2010). It is possible that this could result in a decrease in cholesterol levels and an increase in excreted cholesterol seen in experimental rodents (Mehta et al., 2003; Jain et al., 2010). The high-fiber content (12% w/w) may also play a role in the hypocholesterolemic effect due to enhanced excretion/gastric emptying (Bortolotti et al., 2008; Joshi and Mehta, 2010).

3.2.6. Anti-asthmatic Activity

The Moringa alkaloid moringine closely resembles ephedrine, inducing relaxation of the bronchioles (Kirtikar and Basu, 1975). The seeds and kernels of Moringa have been used successfully for the treatment of bronchial asthma, by decreasing the severity of the symptoms, resulting in the improvement of respiratory problems in patients (Agrawal and Mehta, 2008).

3.2.7. Analgesic Activity

Ethanolic extracts of Moringa fruits have shown good analgesic properties when tested in Male Sprague-Dawley rats (Rao etal., 2008). The authors used the Ugo Basile 37215 analgesia-meter to evaluate pain and adjuvant-induced arthritis to evaluate anti-inflammatory properties. They found strong analgesic activity and anti-inflammatory properties in this plant. Sutar et al. (2008) used Wister male albino rats and tested pain threshold using the licking or paw/jumping response of the animal and the tail immersion method. The authors found that Moringa seems to have a strong analgesic activity. There is a great potential for this plant to be used by people that may not have access to more expensive analgesics but have the plant available for their use. In addition, extracts of this plant could eventually be commercialized for medicinal uses.

3.2.8. Anti-inflammatory Properties

The pathophysiology of many diseases, such as diabetes, obesity, hypertension and others can involve immunological responses (Rana et al., 2007). Leaf extracts from Moringa leaf extracts seem to modulate cellular immunity in rats and mice (Sudha et al., 2010; Gupta et al., 2010). Leaf preparations have shown anti -inflammatory properties in rodent models (Sulaiman et al., 2008; Mahajan and Mehta, 2009). Studies suggest that the

anti- inflammatory properties are stronger in fruit and seed extracts (Mahajan and Mehta, 2010; Cheenpracha et al., 2010; Muangnoi et al., 2011).

3.2.9. Anti-urolithiatic Activity

The aqueous extract of bark of *Moringa oleifera* shows reduction in weight of stone produced using ethylene glycol (1%) induced urolithiasis model. It was proved that it process both preventive and curative property in this study.

3.2.10. Diuretic Activity

Hot water infusion of flowers, leaves, roots, seeds and bark of *Moringa oleifera* shows increased urine output in rats.

3.2.11. Anthelmintic Activity

Ethanolic extract of *Moringa oleifera* leaves shown more anthelmintic activity against Indian earthworm Pheritima posthuma, compare to Vitex negundo. Time for paralysis and time for death of worms with *Moringa oleifera* leaves were less compared to roots of Vitex negundo.

3.2.12. Antiulcer Activity

Aqueous extract of *Moringa oleifera* leaves exhibits antiulcer activity in various animal models on adult holtzman albino rats of either sex.

3.2.13. Wound Healing Activity

Aqueous extract of *Moringa oleifera* leaves shown wound healing property on male Swiss albino mice. It significantly increase wound closure rate, skin breaking strength, granuloma breaking strength as well as decrease in scar area. This was supported by Hukkeri et al. who investigated antipyretic and wound healing property of ethanolic and ethyl acetate extract of *Moringa oleifera* leaves.

3.2.14. Analgesic Activity

Methanolic extract of *Moringa oleifera* root bark shown analgesic activity in Acetic acid induced writhing model in mice.

3.2.15. CNS Activity

Treatment with *Moringa oleifera* leave extract restores mono amine levels of brain which may be useful in Alzheimer's disease. Methanolic extract of *Moringa oleifera* root bark was tested on frog and guinea pig and it shown local an aesthetic activity in both animal models.

3.2.16. Toxicity Activity

According one acute toxicity study of various extracts of *Moringa oleifera* roots, results of that study showed a safe range. The LD50 for the aqueous extract was 15.9 g/kg body weight while that of ethanol extract was 17.8 g/kg. The results were supported by the work done by Adedapo et al (2009). *Moringa oleifera* root peel is relatively non-toxic when given as a single dose. Using commonly used terms for toxicities along the dose equivalent for rats, *M. oleifera* root peels are relatively harmless => 1kg for probable lethal single dose for man(Gosh, 1984).

3.3. Ecological Aspects of M. oleifera

M. oleifera is considered ecologically viable for its several applications as an alternative to chemically developed products, reducing the risks associated with the accumulation of non- biodegradable chemical compounds that are harmful to human, animal and environmental health. Among the potential applications of the plant, the coagulating, flocculating and adsorbing properties are remarkable for their ability to clean contaminated water, reducing its turbidity, toxicity and microbial load. The treatment of water effluents with M. oleifera seeds has been proposed as a cheaper and more effective alternative to the use of aluminum sulfate, especially in rural areas, where the economical status and the accessibility to these products are key elements for maintaining the standards of fresh water treatment. Additionally, the use of M. oleifera seeds avoids the residual accumulation of chemical agents and maintains the optimum water pH values, after removing water turbidity, without requiring sophisticated equipments for pH dosing, nor special facilities for the treatment of drinking water. After treating effluent water with M. oleifera seeds, the sludge obtained after sedimentation, along with the seeds, can be used as biofertilizers, representing an additional benefitin rural areas [89].Other studies have also shown the biosorbent properties of the biomass of seed husks, seeds and pods of M. oleifera in water contaminated with lead, a heavy metal that is toxic to humans and animals and harmful to the environment. Moreover, the use of M. oleifera seeds in the treatment of effluents from coffee fermentation has been proposed as an ecologically viable alternative, once coffee production generates residual water rich in organic nutrients that are harmful for aquatic ecosystems [106]. Based on its ability of treating water effluents, M. oleifera has become an alternative for the improvement of public health in socially neglected communities.M. oleifera is considered an eco-friendly plant for its important applications in socio-environmental issues. This plant is resistant to drought and can be cultivated in low-quality soils, causing little alterations in the nutritional components of its different parts. In this context, M. oleifera is a promising tree for several applications, such as battling malnourishment and hunger and providing accessibility to therapeutical resources of social relevance. Besides social and medical applications, M. oleifera oil can be used to sustainably produce a high quality biodiesel. Therefore, M. oleifera is a sustainable resource for biotechnology, animal farming, medical sciences, and food industry, as it has mainly been cultivated as human and animal food source.

4. Material and Methods

4.1 Reagents and Chemical

All the chemicals, reagents, and solvents used in the assay protocols were of analytical grade. Ethanol, Ethyl Acetate, Acetone, n-hexane, Ninhydrin regaent, Ascorbic, Dragendroffs reagent , Benedict , HCl, EtOH, alpha-napthol, sulfuric acid, Ferrice chloride, H2SO4, Petether Acetic anhydride, Gelatin and Acetic anghydrite were bought from (Able Teaching Aids) , Mandalay.

Figure 1. Reagent Solvent Making

4.2. Sample Preparation

For this research paper, the sample of Moringa leaf and fruit was took from 3 different locals in Myanmar to compare the tested results. The first one; it is Sagaing Region, Kawlin Township and located between 23º28'48" and 23º54'53" north latitudes and between 95º17'51" and 96º0'36" east longitudes, tropical Savanna Climate and Elevation above sea level is 1302.49 ft. There are 3 main types of soils; Meadow Gley Soil, Yellow Brown Forest Soil and Red Brown Forest Soil. Forest types are mostly Mixed Deciduous Forest, In-daying forest and Swamp Forest. The Mineral List Contain in the ground of Kawlin , Ag, Al, As, Au, Ca, Cu, Fe, Hg, K, Mo, O, Pb, S, Sb, Si and Zn.

The second is Naypyitaw Regions, Pyinmana township and is located Latitude : 19.7378 and Longitude 96.2075 , between 19° 44′ 16″ North and 96° 12′ 27″ East. Elevation above sea level is 331 ft and tropical climate. The topography is flat and the area is well drained and the slope % is 2-5. The soils are mostly yellow brown forest soil of tropical monsoon forests (Rozanov,1961) , loamy sand and sandy loam soil with slightly acid reaction (pH 4.82-5.98).

The third place is Nyaung Shwe Township, Shan State. It located at Latitude : 22.66 North and longitude 96.93 East and average above sea level elevation is 2,938 ft with moist and warm year around. The area within *2 miles* of Nyaung-shwe is covered by *cropland* (*57%*), *trees* (*24%*), and *grassland* (*11%*), within *10 miles* by *cropland* (*53%*) and *trees* (*19%*), and within *50 miles* by *cropland* (*38%*) and *trees* (*28%*).

Figure 2. Sample Collecting at Naung Shwe Township, Shan State, Yezin, NayPyiTaw Region & Kawlin Township, Sagaing Region

4.3. Preparation of Leaf Extracts and Fruit Extracts

The extracting for Phytochemical, Antioxidant and Anti-diabetic Antimicrobial Activitiy Testing was processed at the Forst Research Institude(FRI) ,Yezin, NayPyiTaw.The extraction for Antimicrobial Activitiy Testing was processed at Department of Chemistry , University of Mandalay. Distilled water and ethanol were used for extraction process. leaves (20-30 gm) of M. oleifera were shade dried at room temperature (32 – 35 °C) to constant weight over a period of 5 days. The 40g of fruit, do the fruit meat out from the pod and dried at room temperature (32-35°C) till leak out moisture. The dried leaves were breaked into small pieses using hands and 25 g of the leaves were separately extracted in flasks with 90% ethanol (Ethanolic extraction) and water (Aqueous extraction).The conical flasks were covered with lid tightly , then kept it about 2 month for the Phytochemical analysing, Antioxidant activity and Antidiametic activity testing. For antimicrobical testing, the extract was made solution by using orgainic solvent like ethanol, n-hexane, ethyl acetate and acetone and kept the extract solvent about 1 month. The extracts were separately filtered using sterile Whatman no. 1 filter paper and dred at room temperature. These extracts (Ethanolic and aqueous) were used in further process.

Figure 3. Processing of Leaf and Fruit Preparing (Nipping Leaf Off and Husking Fruits) of Shan's Samples

Figure 4. Processing of Leaf and Fruit Preparing (Nipping Leaf Off and Husking Fruits) of NayPyiTaw's Samples

Figure 5. Processing of Leaf and Fruit Preparing (Nipping Leaf Off and Husking Fruits) of Sagaing's Sample

Figure 6. Keeping the Dry samples of Leave and Fruits at Glass Bottle after Weighting, Making Extracts with Ethanol about 2 Months & Drying the Filtered Extracts at Room Temperature

4.4. Preparing and Method of Phytochemical, Antioxidant and Antimicrobial Activitiy Testings

To do the experiment of Phytochemical analysing, it was performed according to the Harborne JB method at Labotrary of Chemisty Department, University of Mandalay, managed by Dr.Thinn Myat New, Professor and Head Department of Chemisty , University of Mandalay. Phytochemical analysis of extract for qualitative detection of amino acid, alkaloids, carbohydrates, flavonoids, glycoside,Phenolic, reducing sugar, saponins, steroid, tannins and Terpenoids was performed by the extracts.

The procedure and using methods are as follows,

Alpha-Amino Acid; Ninhydrin Test; To the extract , 0.25% W/v ninhydrin regaent was added and boiled for a few minutes.

Alkaloids; To the small amount of extract few drops of dilute HCl were added and then filteres. The filtrate is treated with Dragendroffs reagent.

Carbohydrates; Molisch's Test; To 1 ml of test solution added a few drops of 1% alpha-napthol and 2-3 ml concentrated sulfuric acid along the side of test tube.

Flavonoids; 3ml of each extract was added to 10ml of distilled water and the solution was shaken. 1ml of 10% HCL solution was added to the mixture.

Glycosides; 25ml of dilute sulphuric acid was added to 5ml extract in a test tube and boiled for 15 minutes, cooled and neutralized with 10% lead acetate.

Phenolic; 2ml of extract was dilute with 5% of Ferrice chloride and shaken well. Dark green formation indicidated the presence of phenolic.

Reducing Sugars; To the 0.5ml of plant extracts, 1ml of water and 5-8 drops of Benedict's solution was added and heated over water bath.

Saponins; Frothing Test: 3ml of each extract and dilute with 2ml of distilled water was added in a test tube. The mixture was shaken vigorously.

Steroids; Salkowski Test: 5 drops of concentrated H_2SO_4 were added to 1ml of extract in a test tube, then Petether Acetic anhydride was dilute in it.

Tannins; 2ml of extract were boiled gently for 2min and allowed to cool. 3 drop of Gelatin were added to extract.

Terpenoids; 2ml of Extract was shaken with 0.1ml dilute H_2SO_4 and add carefully Acetic anghydrite to form a layer.

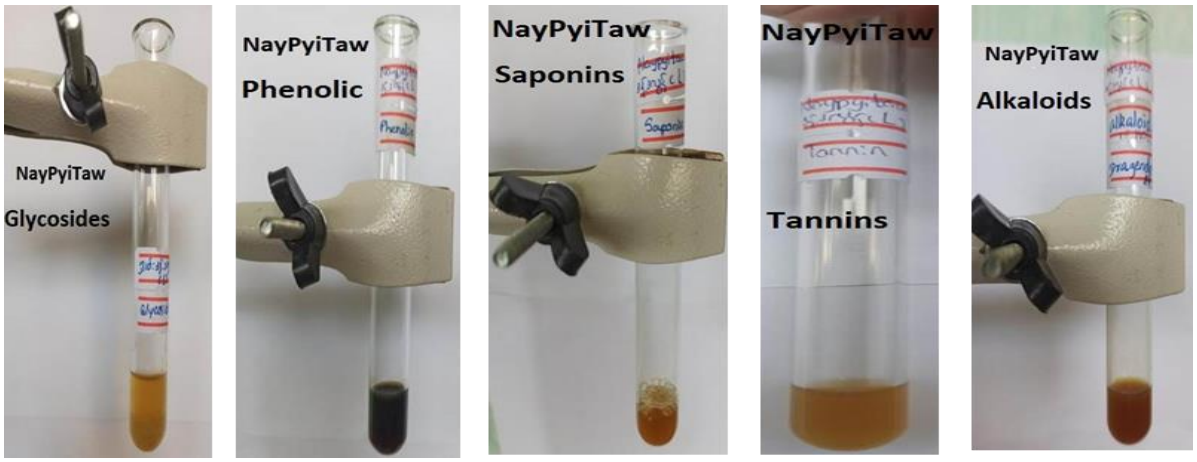

Figure 7. The Phytochemical Compounds of NayPyiTaw's Leaf Sample

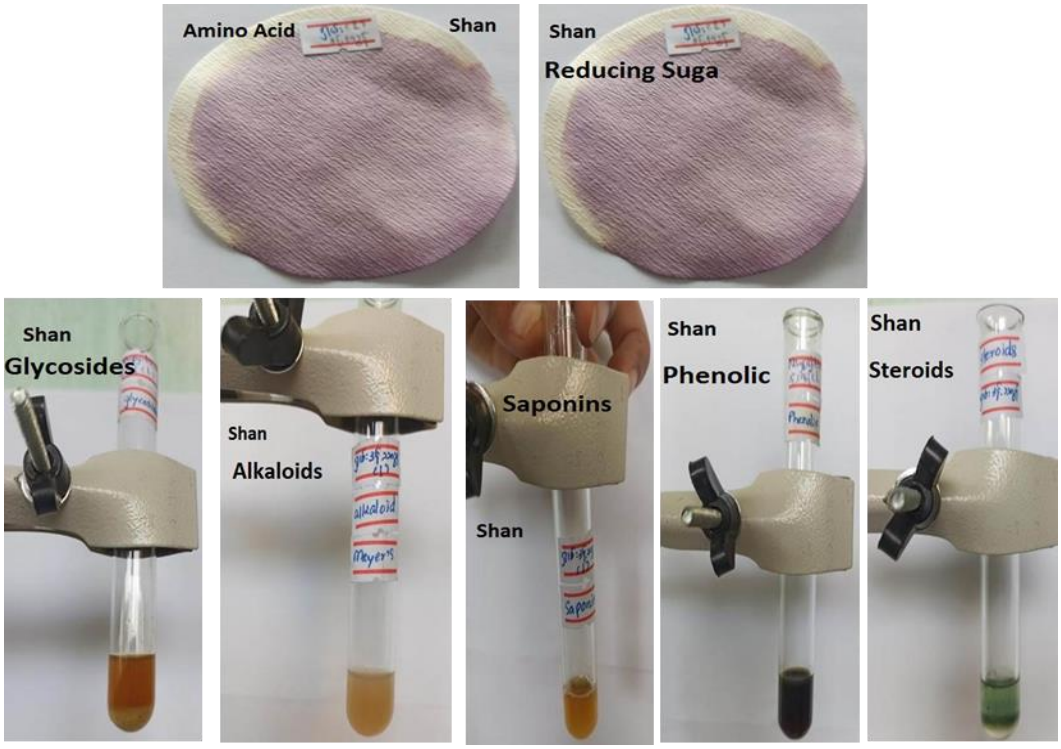

Figure 8. The Phytochemical Compounds of Shan's Leaf Sample

Figure 9. The Phytochemical Compounds of Sagaing's Fruit Sample

The antioxidant capacity of the *Moringa oleifera* leaf extracts were measured by UV-1800, SHIMADZU, UV spectrophotometer at (Wavelength 765 nm) using Folin-Ciocalteau reagent. Standard Solution is Ascorbic Acid. Firstly the require solution was made to do experiment. (1) DPPH (2-2 diphenyl-1-picryl-hydrazyl-hydrate) solution that have 60µM (2) Ascorbic acid solution in 6 difference concentration 1,2,3,4,5,6 µg/ml. Then, the mixture solution of leaf and fruit extracts 1ml and DPPH 3ml were diluted to concentrations of 30, 50, 70, 100, 150 and 200 µg/mL, then the solution was incubated in a dark room for 30 minutes. The mixture standard solution (Ascorbic acid 1ml and DPPH 3ml) was diluted to concentrations of 1, 2, 3, 4, 5, and 6 µg/mL and the solution was also incubated in a dark room for 30 minutes. The absorbance of the each solution was measured using a UV- 1800, SHIMADZU, UV spectrophotometer at (Wavelength 765 nm). Two additional controls, ascorbic acid solvent and leave and extract of 3 difference regions (known chemical and herbal antioxidants, respectively) were used to compare the extracts' antioxidant capacities.

The ability to reduce (inhabitation) DPPH radical can be calculated using the following equation;

$$\text{Inhibition (\%)} = \frac{\text{Abs Control} - \text{Abs Sample}}{\text{Abs Control}} \times 100$$

The concentration of the test solution to reduce 50% DPPH free radical activity is determined by the IC50 value as comparison.

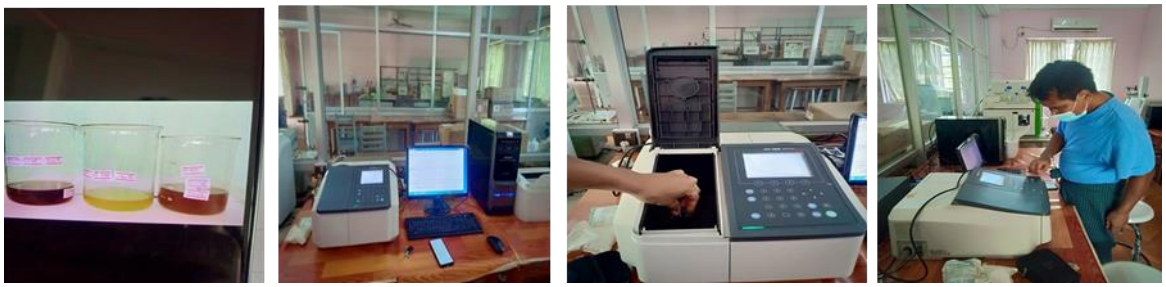

Figure10. Processing and Measuring of Antioxidant Activity

For the Antibacterial testing,_; Making the Moringa oleifera leaf and fruit extract with ehanol, n-hexane, ethyl acetate and acetone and it were tested against the MDR bacteria 1) *Agrobacterium tumerfaciens* 2) *Bacillus substilis* 3) *Micrococcus letueus* 4) *Pseudomonas fluorescens* 5) *Escherichia coli* and 6) *Staphylococcus aureus* by agar well diffusion method.Then 25ml Sterrilemolten Mueller Hinton Agar was loaded on the petri-dish and left at room temperature to solidify. After that, wells of 8mm were punched into the agar with a sterile cork bore(6mm in diametier). The extract mixture solution (all 6 sample extract of fruit and leaf of 3 different regions) was loaded into the wells and 100 ul ethanol and chloroform were used as a positive control in the same plate. All plate were kept in the incubator for 24 hours at 37 °C and the antimicrobial was assessed by measuring the diameter of the zone of inhibition. Test organisms used in antibacterial activity (NITE 2004) as follow;

Table 2. Test Organisms Used in Antibacterial Activity (NITE 2004)

No.	Test Organism	Infection
1.	*Agrobacterium tumerfaciens* (NITE 09678)	Plant disease
2.	*Bacillus substilis* (IFO90571)	Fever (DNA topoisomerase possessing bacterium)
3.	*Micrococcus luteus* (NITE 83297)	Skin disease (food spoilage bacterium)
4.	*Pseudomonas fluorescens* (IFO94307)	Rice disease
5.	*Escherichia coli* (AHU 5436)	Cholera, diarrhea & vomiting, urinary tract infections
6.	*Staphylococcus aureus* (AHU 8465)	Skin disease, food poison & wound infections (Methicillin Resistant Bacterium)

4.5. Selection of Animals and Dose Administration for Anti-diabetic Testing

The testing of anti-diabetic was experiment at Department of Bio-Technology, University of Technology Mandalay. For the study, 40 mice (*Mus musculus*) were taken and divided into 8 groups with weighting between 25 and 30 g. The animals were maintained at 22 ± 5°C with humidity control and also on an automatic dark and light cycle of 12 hours. Firstly the mice were cut out feeding about 24 hours. And then insert the hormone that increase blood glucose (Adrenaline Injection 0.2ml/kg) to all mice and provided 6% Solution in Distilled Water drinking water. Mice of group 1 were kept as positive control and group 2 as negative control and the left group as 3, 4, 5, 6, 7 and 8 were kept as experimental. The animals were acclimatized for 7 days in the experimental environment prior to the actual experimentation. Control (Negative) animals was keep without treating and Control (Positive) was gave treatment by feeding Glipized 0.5mg/kg that reduce the glucose in blood and the left group was feed just extract of *Moringa olifera* about 1g but control (positive) animals received Glipizide 0.5mg/kg .Treatment was continued for 2 week and measured the blood glucose about 6 time at the space time of 45 minutes by taking out the blood from tail with the device of Pre Care Brand. All the animals were sacrificed on the seventh day after the experimentation.

Figure 11. Step by Step Testing the Anti-diabetic Activity with Mice Specimen by Weighting, Grouping, Hormone Inserting, Blood Glucose Measuring

5. Results

5.1. Phytochemical Analysis of *M. oleifera*'s Leaf and Fruit

The present study reveals that *Moringa oleifera*'s leaf and fruit show the presence of phytochemical constituents like alkaloids, , glycoside,Phenolic, reducing sugar, saponins, steroid and tannins in different solvent extracts. But carbohydrates, flavonoids and Terpenoids was occure a little constituent in this study. The phytochemical evaluation of

various phytoconstituents in successive extracts of the leaves of M.oleifera along with control and it was graded as high (++) , moderate (+) and no sign is low constituent based on the intensity of the colored reaction products of the test compared to control in each case. Amond the results, the Alkaloids constituent of NayPyiTaw leaf is the highest and the sample of Shan state's leaf and Sagaing Fruit was occoured the low constituent of tannin but NayPyiTaw leaf have moderate amount of Tannin Constituent. However, NayPyiTaw leaf sample was been low Steroid constituent. All sample have moderate amount of $\propto -Amino\ Acid$, Glycoside, Phenolic, Reducing Sugar and Saponins constituent. The result are shown in table (3).

Table 3. The Result of Phytochemcial Compounds

No.	Test	Test Reagent	Peference	Obs; (NPT–Leaf)	Obs; (Shan-Leaf)	Obs; (Sag-Fruit)
1.	α-Aamino acid	Ninhydrin	Purple, All Amino acid, Yellow, Proline, Hydroxyl Proline	+	+	+
2.	Alkaloids	Mayer's Dragendroff's	White or Cream orange PPT	++	+	+
3.	Carbohydrates	α-Naphthol (conc.H2SO4)	Red-Cum-Violet			
4.	Flavonoid	(Conc: HCl) ,Mg turning	Pink Colour			
5.	Glycoside	10% Lead acetate	Bulky White	+	+	+
6.	Phenolic	5%Ferric chloride	Dark Green	+	+	+
7.	Reducing Sugar	Benedict's solution	Brick-Red		+	+
8.	Saponins	Shake	Frothing	+	+	+
9.	Steroids	Petether Acetic anhydride, (Conc.H_2SO_4)	Blue to Green		+	+
10.	Tannins	% Gelatin	White	+		
11	Terpenoids	Chloroform, Acetic anhydride , (Conc.H_2SO_4)	Red or Pinle			

5.2 Antioxident Activity

5.2.1. Antioxidant Activity of *M. oleifera's* Leaf

The antioxidant capacity was analyzed in terms of ascorbic acid and was best observed at an average concentration of 57µg/ml dose in leaf extract of NayPyiTaw Region, with significant Sample value of IC50 is the lowest among the sample of 3 difference region; 58.7 because the lesser sample value of IC50 the stronger the antioxidant activity.

Table 4. Antioxidant Activity Result of *M.oleifera's* Leaf from Shan State

No	Sample Concentration (µg/ml)	Inhibition (%)	IC50 ((µg/ml)	
1	250	53.70	Sample	Ascorbic Acid
2	200	43.70	230.42	3.16
3	150	34.60		
4	100	20.00		
5	50	12.30		

Table (5) Antioxidant Activity Result of *M. oleifera's* Leaf from Sagaing Region

No	Sample Concentration (µg/ml)	Inhibition (%)	IC50 ((µg/ml)	
1	150	65.43	Sample	Ascorbic Acid
2	100	48.40	103.73	3.16
3	70	39.36		
4	30	25.13		
5	20	22.05		

Table 6. Antioxidant Activity Result of *M. oleifera's* Leaf from NayPyiTaw Region

No	Sample Concentration (µg/ml)	Inhibition (%)	IC50 ((µg/ml)	
1	100	65.42	Sample	Ascorbic Acid
2	70	53.19	58.70	3.16
3	50	48.40		
4	35	43.61		
5	30	36.17		

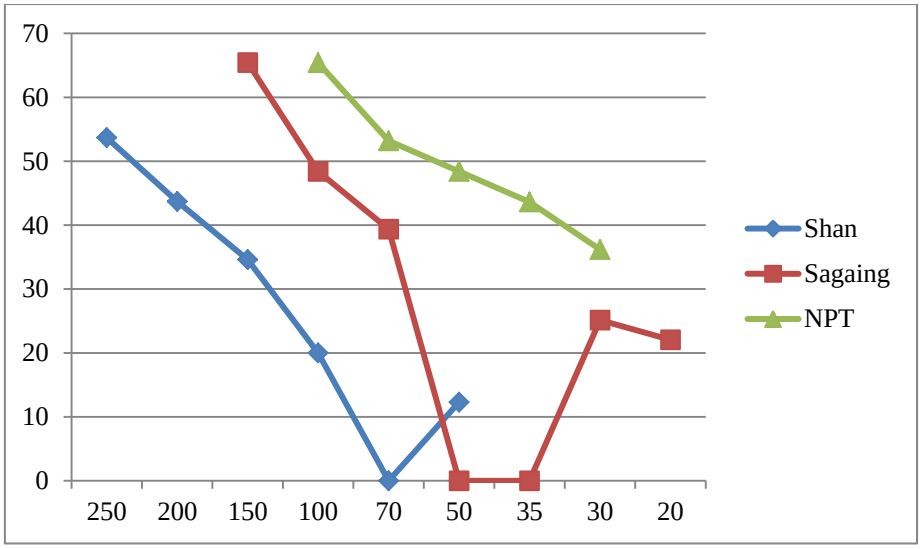

Figure 12. Antioxidant Activity of *M. oleifera's* Leaf

5.2.2. Antioxidant Activity of *M. oleifera*'s Fruit

The antioxidant capacity was analyzed in terms of ascorbic acid and was best observed at an average concentration of 106µg/ml dose in leaf extract of Sagaing Region , with significant Sample value of IC50 is the lowest among the sample of 3 difference region; 149.22 because the lesser sample value of IC50 the stronger the antioxidant activity.

Table 7. Antioxidant Activity Result of *M. oleifera's* Fruit from Shan State

No	Sample Concentration (µg/ml)	Inhibition (%)	IC50 ((µg/ml)	
1	900	60.31	Sample	Ascorbic Acid
2	700	48.63	732.67	3.16
3	500	35.95		
4	300	18.08		
5	200	12.76		

Table 8. Antioxidant Activity Result of *M. oleifera's* Fruit from Sagaing Region

No	Sample Concentration (µg/ml)	Inhibition (%)	IC50 ((µg/ml)	
1	900	57.57	Sample	Ascorbic Acid
2	700	42.65	784.49	3.16
3	500	35.73		
4	300	19.81		
5	200	15.85		

Table 9. Antioxidant Activity Result of *M. oleifera's* Fruit from NayPyiTaw Region

No	Sample Concentration (µg/ml)	Inhibition (%)	IC50 ((µg/ml)	
1	200	67.82	Sample	Ascorbic Acid
2	150	51.59	149.22	3.16
3	100	30.05		
4	50	16.48		
5	30	8.13		

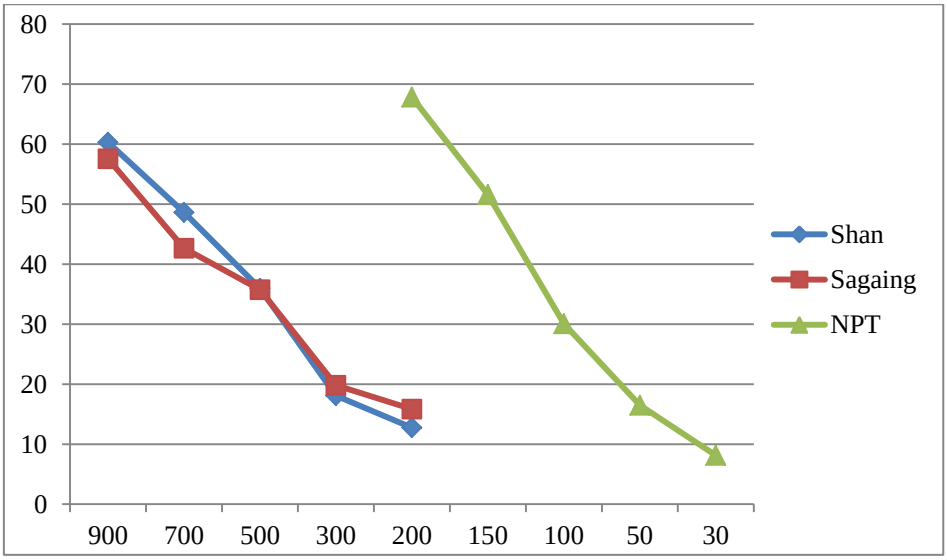

Figure 13. Antioxidant Activity of *M. oleifera's* Fruit

5.3. Antimicrobial Activity of *M. oleifera's* Leaf and Fruit

To know the antimicrobial activities of Moringa leaf and fruit tested by Agar Well Method at Chemistry Department, Mandalay University.

1. The ethanol leaf extract of Sagaing Region showed the high activity against *Pseudomonas fluorescens* and all fruit extract was absent to against the *Pseudomonas fluorescens.*
2. The ethanol leaf extract of NayPyiTaw showed maximum activity and the ethonl extrct of leaves and fruits from Shan showed against Agrobacterium tumerfaciens.
3. Among the ethanol fruit sample extract of 3 difference region, the fruit of NayPyiTaw was show the really highest activity againt the bacterial type ; *E.coli.* But the leaf extract of Sagaing was absent activity against E.*coli.*
4. On the other testing with *Bacillus substilis* , the ethanol leaf extract of Sagaing showed the highest activity among them. In case of fruit extract from Shan was absent antibacterial for *Bacillus substilis.*
5. Then, in the testing of *Staphylococcus aureus* , all ethanol leave and fruit extract showed high antibacterial activity and leaf of NayPyiTaw extract is the high one.
6. And all ethanol fruit extract are absent to against *Micrococcus luteus* and the leaf extract of

NayPyiTaw showed that has antibacterial activity to against *Micrococcus luteus.*

The reveal of testing results are as follow,

Zone of inhibition (mm) of six crude extract on the six-test organism

Table 10. The Result of Antimicrobial Activity

No.	Test organisms Names	Six Crude Extract					
		NPT		SG		SH	
		1. Leaves	2. Fruit	3. Leaves	4. Fruit	5. Leaves	6. Fruit
1.	*Pseudomonas fluorescens*	12.30mm	-	14.10mm	-	14.09mm	-
2.	*Agrobacterium tumerfaciens*	27.66mm	-	18.04mm	12.06mm	-	-
3.	*E.coli*	12.18mm	24.03mm	-	14.07mm	11.00mm	12.66mm
4.	*Bacillus substilis*	11.0mm	11.02mm	13.21mm	12.00mm	11.06mm	-
5.	*Staphylococcus aureus*	20.22mm	21.00mm	15.06mm	17.81mm	17.03mm	16.01mm
6.	*Micrococcus luteus*	12.09mm	-	10.00mm	-	10.00mm	-

Well size– 8mm

10-12mm = low activity (+)

13-17mm = high activity (++)

18- 27mm = very high activity (+++)

5.4. Anti-diabetic Activity

This experiment was operated by Mice specimen to know the capacity of anti-diabetic activity for all samples with same extract. After measuring the blood sample of the mice at regarding time space, the results are as follows;

Anti-diabetic capacity of *Moringa oleifera* leaf and Fruit.

After inserting the Adrenaline hormone, the initial blood glucose (without starting any treatment and without showing the effect of injection) of all specimen be happened almost normal rate around 110 mg/dl and the effect of hormone are increase and be higher the blood glucose till around 250 mg/dl. At 45 minutes, first time feeding is start to all group by regarded extract and tested medicine expect Negative control. And next 45 minutes second time feeding and till 5time feeding at same time spacing. After all treatment, the difference between the initial blood glucose and final blood glucose were ;

- The negative control specimen are still increasing till from 11.8 mg/dl to 180.8 mg/dl
- The positive control specimen that feed Gallicized medicine was low down rate from 109.8 mg/dl to 80.6 mg/dl (The amount of reducing blood glucose is 29.2 mg/dl)
- The specimen that treated with NayPyiTaw's leaf extract was low down rate from 153.8 mg/dl to 126.6 mg/dl. (The amount of reducing blood glucose is 27.2 mg/dl)

- The specimen that treated with Shan's leaf extract was low down rate from 119 mg/dl to 78.2 mg/dl. (The amount of reducing blood glucose is 40 mg/dl)
- The specimen that treated with Sagaing's leaf extract was low down rate from 132.6 mg/dl to 101.6 mg/dl. (The amount of reducing blood glucose is 31 mg/dl)
- The specimen that treated with NayPyiTaw's fruit extract was low down rate from 125 mg/dl to 110 mg/dl. (The amount of reducing blood glucose is 15 mg/dl)
- The specimen that treated with Shan's fruit extract was low down rate from 122 mg/dl to 114.6 mg/dl. (The amount of reducing blood glucose is 7.4 mg/dl)
- The specimen that treated with Sagaing's fruit extract was low down rate from 106.6 mg/dl to 93.4 mg/dl. (The amount of reducing blood glucose is 13.2 mg/dl)

Table 11. The Result of Anti-diabetic Activity

Mean	Negative Control	Positive Control	NPT		Shan		Sagaing	
			Leaf	Fruit	Leaf	Fruit	Leaf	Fruit
0 hr	111.8	109.8	153.8	125	119	122	132.6	106.6
45 Min	251.2	149	265.4	123.8	186.8	242.4	234.2	189.4
90 Min	205	138.8	169.4	117.4	124.6	137.2	134.6	133.4
135 Min	190.4	121.2	134.2	115.2	90.8	133.4	106.8	106
180 Min	186.6	104.2	127.6	112.6	86.6	118.4	104	102.6
225 Min	180.8	80.6	126.6	110.0	78.2	114.6	101.6	93.4

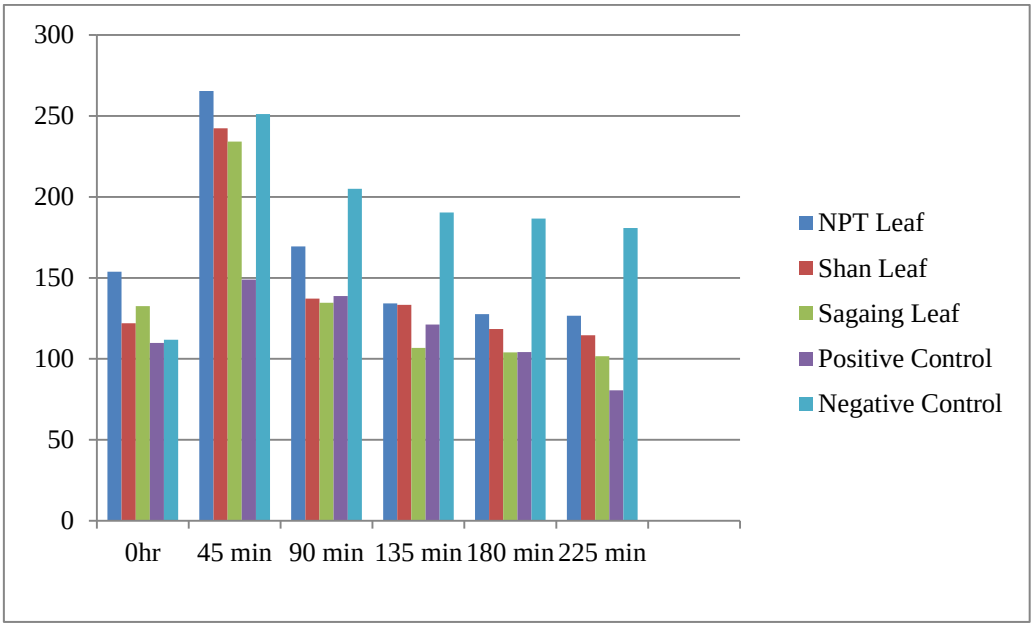

Figure 14. Comparing the Effect of Anti-diabetic of *M. oleifera*'s Leafs

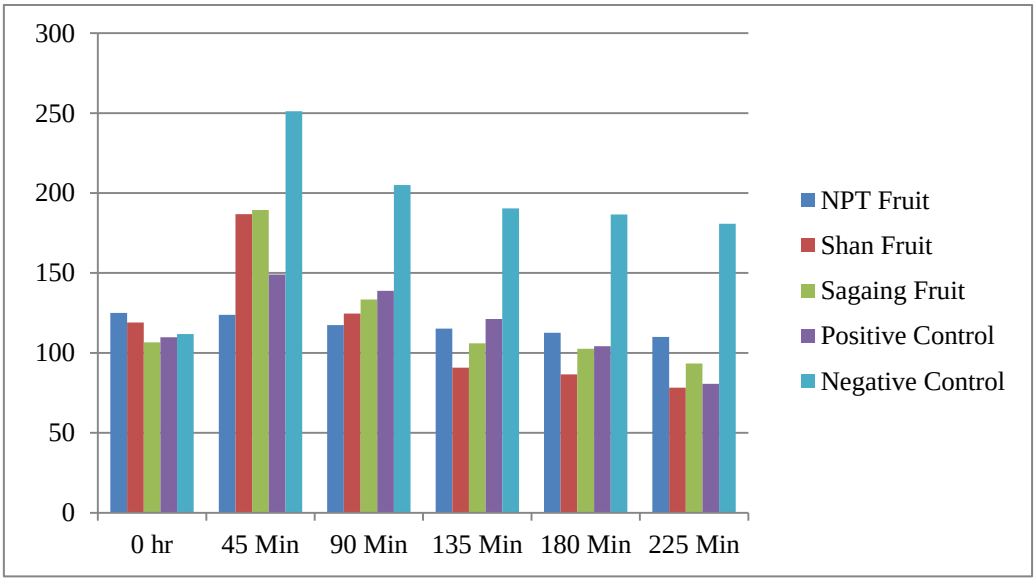

Figure 15. Comparing the Effect of Anti-diabetic of *M. oleifera*'s Fruits

6. Discussion

Basic phytoinvestigation of the extracts for their major phytocompunds is vital as the active principle of many drug in the diverse pharmacologically because of the secondary metabolities found in plants. Thus, this study was operated. Different extraction techniques and solvents decide the presence of phytochemicals present in the Moringa leaf and fruit extract. The present study reveals that Moringa oleifera plant shows the stronger presence of phytochemical constituents like alkaloids, amino acid, glycoside, Phenolic, reducing sugar, saponins, steroid and tannins. Carbohydrates, flavonoids and terpenoids was occurred less amount in leave and fruits of sample that we tested due to the extract method and using reagent difference.

The saponin present in *Moringa oleifera*, justifies the use of extracts of this to stop bleeding and in treating wounds because saponin has the property to precipitating and coagulating red blood cells. Glycosides contains antidiarrheal property, they inhibits release of autacoids and prostaglandins, thus antidiarrheal property is due to glycosides and terpenoids. Tannins contains anthelmintic property, increases supply of digestible proteins, forming complex in rumens interferes with energy generation by uncoupling oxidative phosphorylayton, so tannins are responsible for this property. Due to presence of alkaloids leaves of *Moringa oleifera* have antispasmodic and antibacterial properties. Hypolipidemic and antioxidant properties of this are due to presence of steroids.

The high content of phenols in different parts of the plant, especially leaves, favors the reduction of oxidative damage to the main biomolecules through the inhibition of lipid peroxidation and the action of nitric oxide and induction of deoxyribose degradation, preventing the generation of free radicals. Although phytochemicals have many uses, the most important is their antioxidant capacity. Several studies showed that various extraction of leaf and fruit exhibited strong in vitro and in vivo antioxidant activities (Lalas and Tsaknis, 2002b; Kumar and Pari, 2003; Iqbal and Bhanger, 2006; Chumark et al., 2008). And the method of extraction can all affect the antioxidant activity and these factors should be taken into account in order to optimize the antioxidant capacity of supplement derived from M.oleifera.

Studies with diabetic mice showed that treatment with ethanol *M. oleifera* leaf extracts significantly increased the activity of the enzymes superoxide dismutase, catalase and glutathione S-transferees and decreased lipid peroxidation. It has been suggested that the high phenolic and flavonoid content in the extract may protect against oxidative damage in diabetic individuals. When checking the results of this study, in comparison of leaf and fruit, leaf have higher activity to against diabetic in all 3 region sample. Among the higher result of leaf, Shan's leaf is the strongest activity in reducing the rate of blood glucose because there is 40 mg/dl (it is highest among all samples) the difference rate between initial and final measurement. Moreover Shan leaf extract is really low down in final measurement when compare with positive control (treated by medicine). After seeing this studies, the researcher can estimate the difference of growing region is how much important for the plants and it can point out the effective utilizing method in medicinal sector.

The medicinal plant *Moringa Oleifera* showed good antimicrobial activity. Antimicrobial activity of Moringa oleifera was seen against several bacteria namely Pseudomonas fluorescens, Agrobacterium tumerfaciens, E.coli, Bacillus subtilus, Staphylococcus aureus and Micrococcus luteus. When comparing leaf and fruit on antimicrobial effect, the leaf sample have higher activity to against bacterial. The strongest against power can occur at NayPyiTaw's leaf to the *Agrobacterium tumerfaciens, Micrococcus luteus* and can occur at NayPyiTaw's fruit to the *Staphylococcus aureus, E.coli.* For the left two kind of bacteria; *Pseudomonas fluorescens* and *Bacillus substilis* , the anti-bacterial activity of the Sagaing's leaf is the best. Thus, the relation discussion and suggestion deal with this study is even same extract experimental can difference the capacity depend on the region of sample collection and can notified at utilization in effective ways.

7. Conclusions

M. oleifera is a plant with many benefits for humans, nutritionally, medicinally and economically because of the presence of phytochemical compound likes the Alkaloids, Glycosides, Phenolic, Reducing Sugar, Saponins, Tannins , Carbohydrate, Amino Acid and Steroids. According to the former researches, testing the activity of Antioxidant of *M. oleifera* leaf and fruit by using ethanol was stronger than other extract using (2012, Andrea

E.S. Santos et al). Thus, the antioxidant activity of *M. oleifera* is also depended on the using of extract. In the present work it was found that *M. oleifera* ethanol extracts from 3 different regions are potential sources of antioxidant. The antioxidant properties of leave and fruit *M. oleifera* provide more useful application without un-sustainable action because leave and fruit is the most plenty parts we can get from a plant without effecting the live of plant but butt and stem are not like that. Thus, if we need to use antioxidant activity we can get and take many amounts from *M. oleifera* than other plants. Moreover, there is too much high rate of antibacterial/ antimicrobial activity from the leave and fruit of *M. oleifera*. In this study, it was tested and investigated the antimicrobial effects by using 6 kinds of bacteria enough. According to pointing out of this research's results, the antimicrobial effects of *M. oleifera* can be utilize in medicine manufacturing for the disease of lung, ovary and cervical related disease, urethral disease , ear and nose related disease due to the present of high ability to against *Pseudomonas fluorescens* , for the cancer and glands related disease due to the high ability to against *Agrobacterium tumerfaciens* and many others ability to against *E. coil* that can be diarrhea , vomiting disease, *Micrococcus luteus and Staphylococcus aureus* that can happen skin disease and protect wound infections.

By overall seeing this research results, the medicinal researcher can get the effective ways and methods deal with utilizing because the activity of *M. oleifera* depend on using of solution in extractive and the nutrient value and concentration of activity of *M.oleifera* also depend on the growing region. Nowadays, there is many area of *M. oleifera* for drug manufacturing. This research paper can help for plantation site-selection according to purpose of their projects.

8. Acknowledgement

Firstly, I would like to acknowledge the financial supportive of the Ministry of Natural Resources and Environmental Conservation and Forestry. And I would like to express my thankful person, Dr. Nyi Nyi Kyaw, (Director General, Forest Department, Ministry of Natural Resources and Environmental Conservation and Forestry) (Retired).

I am extremely thanking to Dr. Thinn Myat New (Professor and Head), Department of Chemistry, University of Mandalay and Dr. Saw Sandar Maw (Professor), Department of Biotechnology, Mandalay Technological University. I also thank U Moe Zaw, Director of Forest Research Institute, Yezin and the laboratory representative persons. Moreover I would like to say thanks to the all person (FRI Team) who give support deal with this research.

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