INVESTIGATION OF PHYTOCHEMICAL CONSTITUENTS, PHYSICOCHEMICAL PROPERTIES AND ANTIMICROBIAL ACTIVITIES FROM THE LEAVES OF *SENNA AURICULATA* (L.) ROXB.

Ei Theingi Win[1], Aung Kyaw Min[2]

Abstract

The plant *Senna auriculata* (L.) Roxb., belong to the family Fabaceae (former Caesalpiniaceae). It is widely distributed in Myanmar. This plant is one of the famous medicinal plants that found in Mandalay, Magway and Sagaing Regions. In this paper, the preliminary phytochemical tests, physicochemical properties, nutritional value and antimicrobial activities of *Senna auriculata* (L.) Roxb. have been described. In Morphological study, this plant is a shrub which has cylindrical stem, brown in colour with several branches. The leaves are paripinnately compound with auriculate stipules. Inflorescences terminal or axillary, corymbose racemes, flowers are bright yellow. The fruits are oblongoid pods and flattened. The powdered leaves were tested for the phytochemical constituents and physicochemical properties. Alkaloid, glycoside, carbohydrate, α-amino acid, phenolic compound, flavonoid, terpenoid, steroid, tannin and reducing sugar were present but cyanogenic glycoside, starch and saponin were absent in samples. According to physicochemical examination, the powder of leaves were most soluble in water and moderately soluble in ethanol and methanol. The nutrient content of leaves were also studied. It revealed that the presence of protein, crude fiber and crude fat. Antimicrobial activities of *Senna auriculata* (L.) Roxb. were also tested by using agar-well diffusion method with six pathogenic microorganisms. In this experiment, acetone extract of leaves showed the most effective activities against *Pseudomonas aeruginosa* , *Bacillus pumalis* and *Escherichia coli* . The ethanol extract showed more antimicrobial activities against *Bacillus subtilis* and *Candida albicans. Senna auriculata* (L.) Roxb was observed to have antimicrobial activity and can be used for medicinal purposes.

Keywords: *Senna auriculata* (L.) Roxb., Phytochemical Test, Physicochemical properties, Nutritional values and Antimicrobial activities.

Introduction

Myanmar is well known for its wealth of natural plant resources for there are still many valuable plant materials to be explored. Among these, *Senna auriculata* (L.) Roxb., is also included. *Senna auriculata* (L.) Roxb.,

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which has enormous traditional uses against various diseases. The specimens were collected from Nyaung Oo Township, Mandalay Region. . This plant is located in North Latitude 21˚15'75" and East Longitude 94˚87'71". The medicinal plant, *Senna auriculata* (L.) Roxb. belong to the family Fabaceae and subfamily Caesalpinioideae. This subfamily has 27 genera and 124 species in Myanmar (John Kress, 2003) and 152 genera and nearly 2,800 species, mostly tropical and sub-tropical regions of the world (Purseglove, 1969).

In Myanmar, most of plants are growing wild and some species are cultivated as ornaments, but they are best known as medicinal plants. It has a long history of use as a folk medicine and its therapeutic efficacy is well recognized. In local use of *Senna auriculata* (L.) Roxb., some people cooked the fresh leaves of this plant as medicine. The dried leaves and flowers are boiled in water and then used to control the blood sugar level for diabetic patients.

Most of the Myanmar people familiar with the *Senna* as a popular genus that not only used as traditionally medicinal plant but also the leaves are used as vegetables since immemorial time (Kirtikar and Basu, 1933). This plant is native of tropical regions Southeast Asia and Africa. The leaves are used in the form of "Ceylon tea", or "Matara tea"; the bark is "Avaram bark" important in tanning; the plants are used medicinally and as ornamentals (Dassanayake, 1991).

Plants could be considered as biosynthetic laboratory of chemical compounds like glycoside, alkaloids, terpenoids, phenols, resins and tannins etc. The plants have not only therapeutic potential but also provide carbohydrates, proteins and lipids as food for man. These are synthesize or deposited in specific parts of the plant body (Harbone, 1984).

Phytochemicals are nonnutritive plant chemicals that have protective or disease preventive properties. Plants produces these chemicals to protect itself, that many phytochemicals can protect humans against diseases. There are many phytochemicals in fruits and herbs and each works differently (Murugan and Wins, 2013). Many plant extracts have been shown to inhibit the growth of microorganisms. These extracts consist of chemicals and are usually considered to play a role in defence reactions of plants against infections by pathogenic microorganisms (Fawcett and Spencer,1976).

Senna auriculata (L.) Roxb. commonly known as Tanners sanna, is distributed throughout hot deciduous forests of India. The plant has been reported to possess antipyretic, hepatoprotective, antidiabetic, antiperoxidative and microbicidal activity (www. Pelagiaresearchlibiary.com & Journal's URL:www.bepls.com).

According to the Ashin Nargathein (1972), the root is used antidote, skin diseases, fever, asthma and diseases of urinary system. The leaves have laxative properties, which cures constipation. Leaves are anthelmintic and also used to treat ulcers, skin diseases, diabetes and leprosy. The dried flowers and flower buds are used as substitute for tea in case of diabetes patients and to improve the complexion in women. The bark and seed are to give relief in rheumatism, eye diseases, gonorrhea, diabetes and gout.

Senna auriculata (L.) Roxb. is used in the traditional system of medicine for urinary disorders, diabetes to control the blood sugar level, leprosy, worm infestation, diarrhoea, conjunctivitis; bark as astringent and used in skin conditions; leaves, flowers and fruits as anthelmintic; seeds for eye troubles, diabetes (www.ijpbs.net). For these valuable information, *Senna auriculata* (L.) Roxb., was selected, analyzed, tested and evaluated its activities.

The aim of the study is to know the valuable information of *Senna auriculata* (L.) Roxb. and medicinal uses. To achieve this aims, the objectives are to verify the morphological characters of *Senna auriculata* (L.) Roxb., to investigate the preliminary phytochemical and physicochemical properties, to determine the nutritional values and to examine the antimicrobial activities from leaves of *Senna auriculata* (L.) Roxb.

Materials and Methods

For morphological study, the plant materials were collected from Nyaung Oo Township, Mandalay Region, during the flowering period from September to February, 2016. The collected specimens were photographed to record the data and identified by using available literatures; (Kurz, 1877), (Hooker, 1879), (Kirtikar and Basu, 1933), (Burkill, 1935), (Backer, 1963), (Lawrance, 1964), (Purseglove, 1969), (Dassanayake, 1991), (Key to the Family of the Flowering Plants, 1994). The leaves of *Senna auriculata* (L.) Roxb. used in this research were collected from Nyaung Oo Township,

Mandalay Region from July to August, 2016. The leaves were washed thoroughly and air-dried in room temperature for two weeks. After that, the dried samples were pulverized by grinding to get powder and stored in air tight containers .

Preliminary Phytochemical investigation of *Senna auriculata* (L.) Roxb.

The preliminary phytochemical investigation has been undertaken on the leave of *Senna auriculata* (L.) Roxb**.,** to determine the presence or absence of organic constituents such as alkaloid, glycoside, reducing sugar, saponin, steroid, terpenoid, carbohydrate, tannin, flavonoid, cyanogenic glycoside, phenolic compound, starch and α-amino acid. The tests were carried out according to the standard method of (British Pharmacopoeia, 1968), (Marini Bettolo *et al*., 1981), (Harbone, 1984), (Central Council for Research in Unani Medicine, 1987) and (Trease and Evans, 2002). Preliminary phytochemical examination was carried out at the Pharmaceutical Research Department (PRD).

Physiocochemical properties of *Senna auriculata* (L.) Roxb.

Physicochemical investigation was conducted at the Department of Chemistry, West Yangon University. In this analysis, moisture content, total ash, acid insoluble ash, water soluble ash, water soluble matter and extractive values of leaves from *Senna auriculata* (L.) Roxb. were undertaken by using non-polar and polar solvents such as petroleum ether, chloroform, acetone, ethyl acetate, methanol, ethanol and distilled water. These values were determined according to the standard procedure given in (British Pharmacopoeia, 1968) and (Trease and Evans, 2002).

Nutrient Values of *Senna auriculata* (L.) Roxb.

Nutritional values of leaves were investigated according to the method for food analysis (AOAC, 2000). The analyses of nutritional values were performed at Food Industries Development Supporting Laboratory (FIDSL), Myanmar Food Processors and Exporters Association (MFPEA), Yangon.

Antimicrobial activities of *Senna auriculata* (L.) Roxb.

The powder was extracted by using pet-ether, chloroform, acetone, methanol, ethyl-acetate, ethanol and water. The various solvent extracts were

tested against six pathogenic microorganisms *(Bacillus subtilis,, Staphylococcus aureus, Pseudomonas aeruginosa, Bacillus pumalis, Candida albican and Escherichia coli)* by using agar-well diffusion method (Cruickshank *et.al*., 1975). This test was conducted at the Pharmaceutical Research Department (PRD).

Table 1. Types of test organisms, their respective code numbers and effects.

No.	Type of test organisms	Code number	Effects
1.	*Bacillus subtilis*	N.C.T.C -8236	Pathogenic group, food poisonous, anthrax in man and animals.
2.	*Staphylococcus aureus*	N.C.P.C -6371	Boils, abscesses, wound, sepsis, burns, food poison, staphylococal pneumonia
3.	*Pseudomonas aeruginosa*	N.C.T.C -6749	Urinary tract infection, bone and joint infection, soft tissue infection, burns, ear infection, surgical wounds, ocular and gastro intestinal infection, respiratory system infections, chronic lung.
4.	*Bacillus pumalis*	N.C.I.B-8982	Eye infection, soft tissue infections
5.	*Candida albicans*	I.F.O-1060	Pneumonia like illness, meningitis, cardiac infection, sinus irritation, sores, ringworm
6.	*Escherichia - coli*	N.C.I.B-8134	Urinary - tract infections, dysentery, abscess, wounds and bed-sores

Results

Morphological characters of *Senna auriculata* (L.)Roxb.

Perennial shrubs up to 1.5-2.5 m high; younger stems cylindrical and pubescent (figure 1). Leaves are alternate, 5.0-12.0 cm long, 1.5-3.0 cm wide, unipinnate and paripinnately compound; petioles stout, cylindrical, 0.7-1.5 cm

long and 0.5-1.5 mm in diameter, slightly canaliculate above, tomentose; the racheae 5.5-9.0 cm long, 0.5-1.0mm in diameter, slightly canaliculated above, tomentose, glands present in between each pair of the leaflets, filiform, yellow or brown; leaflets 8-12 pairs, oblong to elliptic- oblong , 1.5-3.0 cm long, 0.5-1.4 cm wide, mucronate, the margins entire, the bases rounded or oblique, the upper surfaces rigidly subcoriaceous, both surfaces pubescent; petiolules about 1 mm long, dark brown, tomentose; stipules auriculate or lunate-reniform, 1.3-2.5 cm long and 1.0-1.8 cm wide, with pointed appendages curved towards the leaves, the appendages 0.1-0.4 cm long, green, veins distinct, reticulate, pubescent, persistent are shown in figures (2 and 3). Inflorescences terminal or axillary, corymbose racemes, 5 to 10 flowers, 4.5 - 7.0 cm long and 4.0-5.0 cm wide, the peduncles 5.0-7.0 cm long and 1.0-2.0 mm in diameter, pubescent, bracts ovate-acuminate, 5-7 mm long, 3-4 mm wide, green, pubescent, persistent, pedicels 2.0-3.5 cm long and 0.8-1.0 mm in diameter, pubescent; bracteoles linear, 3.0-3.5 mm long and about 2 mm wide, green, pubescent, caduceus are shown in figures (4 and 5). Flowers bright yellow, 2.5-3.0 cm long, 2.5-3.5 cm wide, complete, bisexual, irregular, zygomorphic, 5 merous, cyclic, hypogynous are shown in figures (6 ,7 and 8). Calyx; sepals-5, aposepalous, the two outer sepals obovate, cucullate, 7-10 mm long, 4-5 mm wide, the two inner ones ovate oblong, hooded, 1.2-1.4 cm long and 8-10 mm wide, the remaining one obovate, 1.0-1.2 cm long and 8.0-9.0mm wide, imbricate, brownish-yellow, coriaceous, glabrous, persistent, inferior (figure 9). Corolla; petals 5, apopetalous, rosaceous, the posterior petal broadly ovate or oblicular, the limbs 1.5-1.8 cm long, 1.0-1.4 cm wide, the claws 2.5- 3.0 mm long, the two lateral ones obovate oblong, the limbs 1.5- 1.8 cm long and 1.3-1.4 cm wide, the claws 4.0-5.0 mm long, the two anterior ones ovate- oblong, the limbs 1.8-2.0 cm long and1.2-1.5 cm wide, the claws 5.0- 6.0 mm long, valvate, bright yellow, membranous, veins reddish brown, reticulate, glabrous (figure 10). Stamens 10, apostamenous, 7 fertile and 3sterile, the fertile stamens 3 long and 4 short, the long filaments 1.2-1.5 cm long, the short ones 8.0-9.0 mm long, the larger anther lobes oblongoid, sickle shaped, 0.8-1.0 cm long, 1.2-2.0 mm in diameter, curved, the small ones rectangularly oblongoid, 5-6 mm long, 1.0-1.5 mm in diameter, straight or slightly curved, the anther tips truncate, brown or reddish-brown, dithecous, introse, basifixed, dehiscence by terminal pores, glabrous, the sterile filaments 2-2.5 mm long, the another lobes rounded and flattened,

2-3 mm long, about 2mm wide, light brown or yellowish-brown, glabrous, inferior are shown in figure (11). Pistil monocarpellary, unilocular (figure 12), the ovary oblongoid ,0.9-1.2 cm long, 0.8-1.0 mm in diameter, one ovule in each locule, marginal placentation , ovary superior, light brown, tomentose, hairs white; the styles 5-10 mm long, slender, curved, glabrous; the stigma filiform, 0.8-1.5 mm long, pubescent; the gynophores present are shown in figures (13 and 14). The pods dehiscent, oblongoid, flattened, 7-15 cm long, 1.2-1.8 cm in diameter, the tips mucronate, dark green, flexible, glabrous (figure 15). Seeds 10-20, ellipsoid, 8.0-12.0 cm long, 3.0-5.0 cm in diameter, brown to dark brown, hard and glabrous (figure 16).

Morphological characters of *Senna auriculata* (L.) Roxb.

Figure 1. Habit of flowering plant

Figure 2. Leaves

Figure 3. Leaves with stipules and glands

Figure 4. Inflorescence as seen

Figure 5. Inflorescence

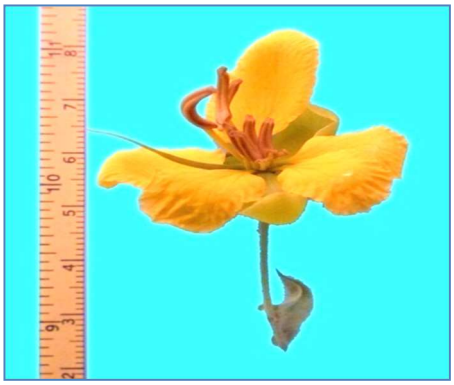


Figure 6. Flower with bract

Figure 7. Flower

Figure 8. L.S of Flower

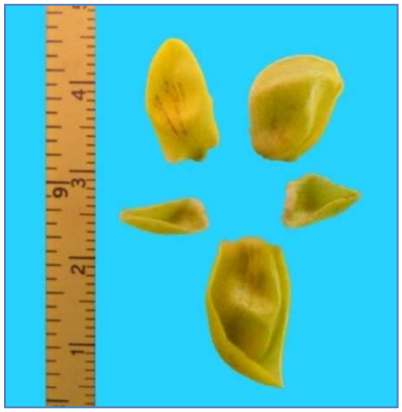


Figure 9. Sepals

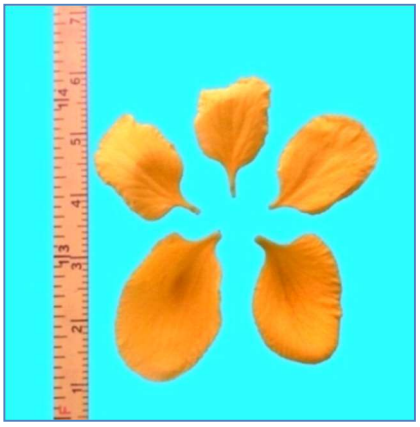


Figure 10. Petals

Figure 11. Stamens

Figure 12. Pistil

Figure 13. T.S of Ovary

Figure 14. L.S of Ovary

Figure 15. Fruits

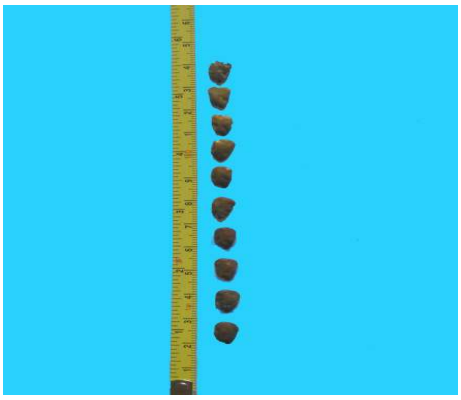


Figure 16. Seeds

Preliminary phytochemical investigation of *Senna auriculata* (L.) Roxb.

In preliminary phytochemical investigation, alkaloids, glycosides, reducing sugars, α-amino acids, carbohydrate, tannin, steroid, terpenoid, flavonoid, phenolic compound were observed in leaves. The tests have shown that cyanogenic glycoside, saponin and starch were absent. The results were shown in Table 2.

Table 2. Preliminary phytochemical investigation on leaves of *Senna auriculata* (L.) Roxb.

No.	Test	Extract	Test reagent	Observation	Results
1	Alkaloid	1 % HCl	1. Mayer's reagent 2. Dragendorff's reagent 3. Wagner's reagent 4. Hager's reagent	White ppt. Yellowish brown ppt. Deep blue ppt. Yellow ppt.	+ + + +
2	Glycoside	H_2O	10 % Lead acetate solution	White ppt.	+
3	Cyanogenic glycoside	H_2O	1. H_2O, Conc; H_2SO_4 2. Sodium picrate paper	No colour change	-
4	Saponin glycoside	H_2O	Distilled water	No persistent foam	-
5.	Starch	H_2O	Iodine solution	Brown ppt.	-
6	α-amino acid	H_2O	Ninhydrin reagent	Purple colour	+
7	Carbohydrate	H_2O	1. 10 % α naphthol , Conc: H_2SO_4	Red ring	+
8	Reducing sugar	H_2O	1. Fehling's solution	Brick red ppt.	+ +
9	Tannin	H_2O	1% gelatin & 10% NaCl solution	White ppt.	+

No.	Test	Extract	Test reagent	Observation	Results
10	Phenolic Compound	H_2O	5% $FeCl_3$	Brownish green colour	+
11	Flavonoid	70% EtOH	Conc: HCl/ Mg ribbon	Pink colour	+
12	Steroid	PE	Acetic anhydrite and conc: H_2SO_4	Bluish green colour	+
13	Terpenoid	PE	Acetic anhydrite and Conc: H_2SO_4	Pink colour	+

(+) = present, (-) = absent, ppt = precipitated

Physicochemical properties from *Senna auriculata* (L.) Roxb.

In physicochemical properties, moisture content, total ash, acid-insoluble ash, water-soluble ash content were determined and recorded. The extractive values of powdered leaves was investigated by using different solvents such as acetone, chloroform, ethyl acetate, petroleum ether, methanol, ethanol and distilled water. The leaves were most soluble in water and moderately soluble in ethanol and methanol as shown in Table 3.

Table 3. Physicochemical properties of *Senna auriculata* (L.) Roxb

No	Physicochemical characters	Contents (%)
		Leaves
1.	Moisture content	7.48
2.	Total ash	2.38
3.	Acid insoluble ash	6.43
4.	Water soluble ash	24.66
5.	Pet-ether soluble matter	2.77
6.	Chloroform soluble matter	0.74
7.	Ethyl acetate soluble matter	4.68

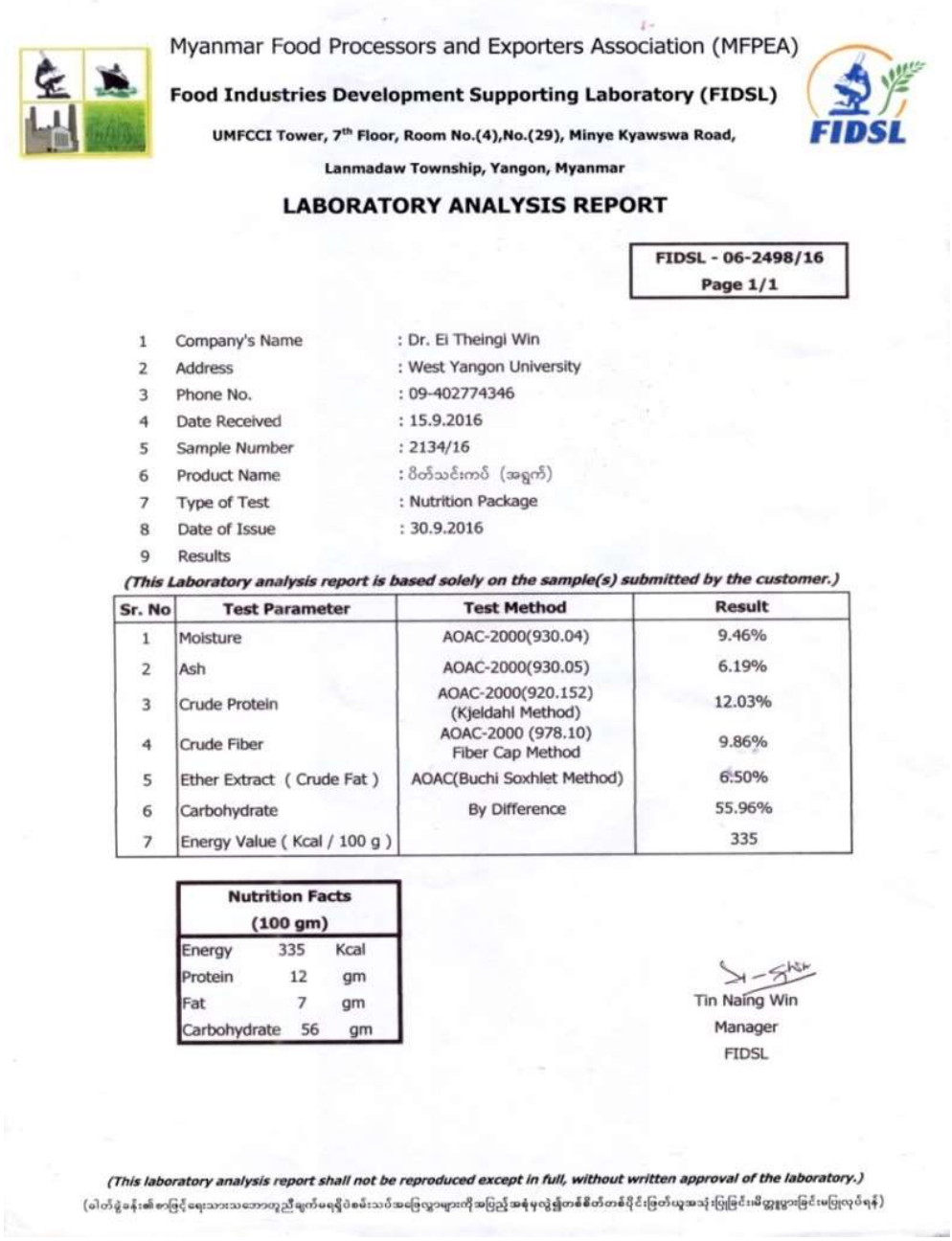
No	Physicochemical characters	Contents (%)
		Leaves
8.	Acetone soluble matter	4.11
9.	Ethanol soluble matter	10.14
10.	Methanol soluble matter	9.69
11.	Water soluble matter	15.35

Nutritional values on leaves of *Senna auriculata* (L.) Roxb.

The Nutritional value such as moisture, ash, crude protein, crude fiber, crude fat and carbohydrate values in the leaves of *Senna auriculata* (L.) Roxb. were found. It was also observed that energy value was 335 Kcal per 100g. The results were shown in Table 4.

Table 4. Nutritional values on leaves of *Senna auriculata* (L.) Roxb.

No	Test parameter	Amount of contents (%)
1.	Moisture	9.46
2.	Ash	6.19
3.	Crude protein	12.03
4.	Crude fiber	9.86
5.	Ether Extract (Crude Fat)	6.50
6.	Carbohydrate	55.96
7.	Energy value (Kcal / 100g)	335



Myanmar Food Processors and Exporters Association (MFPEA)

Food Industries Development Supporting Laboratory (FIDSL)

UMFCCI Tower, 7th Floor, Room No.(4),No.(29), Minye Kyawswa Road,

Lanmadaw Township, Yangon, Myanmar

FIDSL

LABORATORY ANALYSIS REPORT

FIDSL - 06-2498/16
Page 1/1

1	Company's Name	: Dr. Ei Theingi Win
2	Address	: West Yangon University
3	Phone No.	: 09-402774346
4	Date Received	: 15.9.2016
5	Sample Number	: 2134/16
6	Product Name	: ဝိတ်သင်းကပ် (အရွက်)
7	Type of Test	: Nutrition Package
8	Date of Issue	: 30.9.2016
9	Results	

(This Laboratory analysis report is based solely on the sample(s) submitted by the customer.)

Sr. No	Test Parameter	Test Method	Result
1	Moisture	AOAC-2000(930.04)	9.46%
2	Ash	AOAC-2000(930.05)	6.19%
3	Crude Protein	AOAC-2000(920.152) (Kjeldahl Method)	12.03%
4	Crude Fiber	AOAC-2000 (978.10) Fiber Cap Method	9.86%
5	Ether Extract (Crude Fat)	AOAC(Buchi Soxhlet Method)	6.50%
6	Carbohydrate	By Difference	55.96%
7	Energy Value (Kcal / 100 g)		335

Nutrition Facts (100 gm)		
Energy	335	Kcal
Protein	12	gm
Fat	7	gm
Carbohydrate	56	gm

Tin Naing Win
Manager
FIDSL

(This laboratory analysis report shall not be reproduced except in full, without written approval of the laboratory.)

(ဓါတ်ခွဲခန်းဆိုင်ရာဖြင့် ရေးသားသောအာတူညီချက်မရရှိပဲစမ်းသပ်အဖြေလွှာများကိုအပြည့်အစုံမဟုတ်ဘဲစီတိုင်းဖြတ်ယူအသုံးပြုဖြင့်းမြဘူးများဖြင့်းမပြုလုပ်ရန်)

Figure 17. Nutritional value from Leaves of *Senna auriculata* (L.) Roxb

Antimicrobial activities of different solvent extracts from Leaves of *Senna auriculata* (L.) Roxb.

In this study, the different solvent extracts of leaves were tested with six pathogenic microorganism such as *Bacillus subtilis, Staphylococus aureus, Pseudomonas aeruginosa, Bacillus pumalis, Candida albicans and Escherichia coli* by using agar well diffusion method. In this experiment of leave extracts, chloroform, acetone, methanol, ethyl acetate and ethanol showed antimicrobial activities against all tested microorganisms but acetone extracts was most effective activities against *Pseudomonas aeruginosa, Bacillus pumalis and Escherichia coli* . The ethanol extract showed more antimicrobial activities against *Bacillus subtilis* and *Candida albicans.* Petroleum ether extract showed weak activity against *Escherichia coli* and did not show any against other tested microorganisms. The results were shown in Table (5) and Figures (18 and 19).

Table 5. Antimicrobial activities against different solvent extracts from leaves of *Senna auriculata* (L.) Roxb.

Solvents	Organisms					
	Bacillus subtilis	*Staphylococcus aureus*	*Pseudomonas aeruginosa*	*Bacillus pumalis*	*Candida albicans*	*Escherichia coli*
Pet-ether	-	-	-	-	-	11 mm
Chloroform	12 mm	13 mm	12 mm	11 mm	13 mm	13 mm
Acetone	15 mm	14 mm	17 mm	17 mm	14 mm	18 mm
Methanol	16 mm	17 mm	15 mm	14 mm	14 mm	15 mm
Ethyl acetate	13 mm	13 mm	13 mm	13 mm	13 mm	14 mm
Ethanol	17 mm	15 mm	15 mm	15 mm	16 mm	15 mm
Water	11 mm	-	-	-	-	11 mm

Agar well - 10 mm

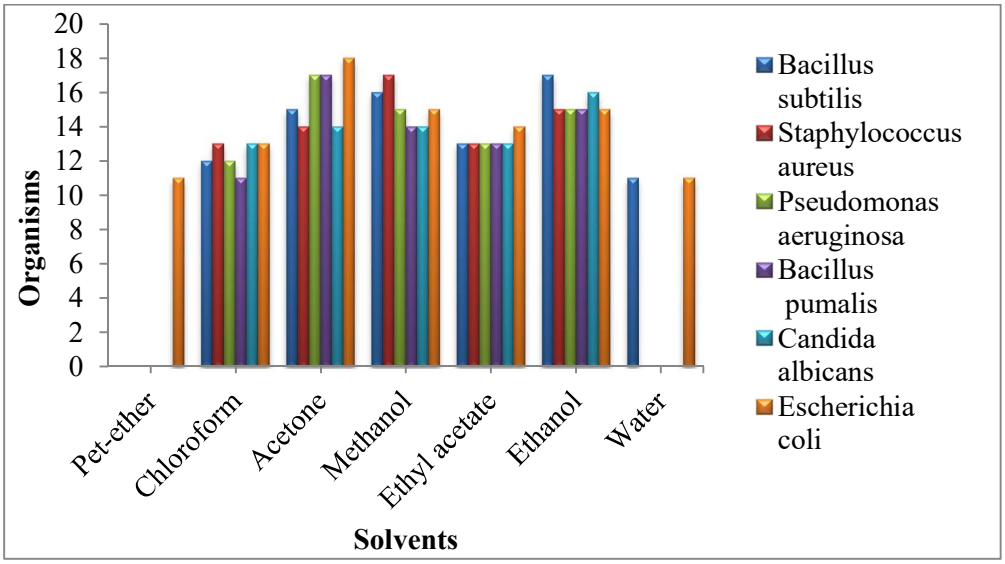
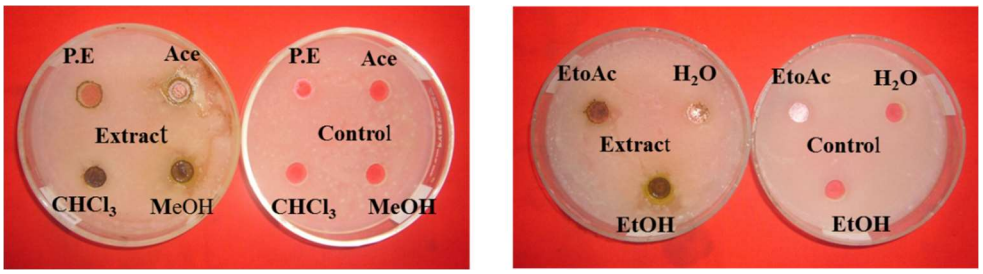
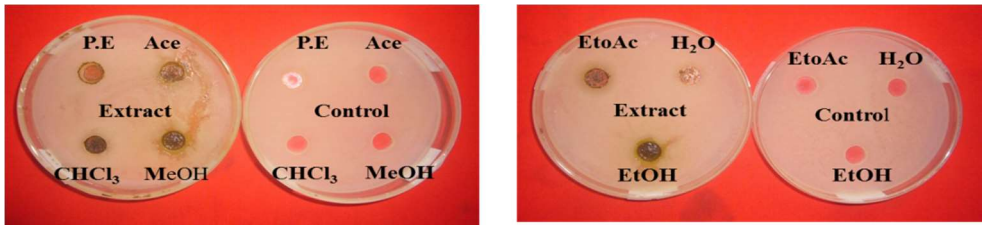


Figure 18. Antimicrobial activities against different solvent extracts from leaves of *Senna auriculata* (L.) Roxb.

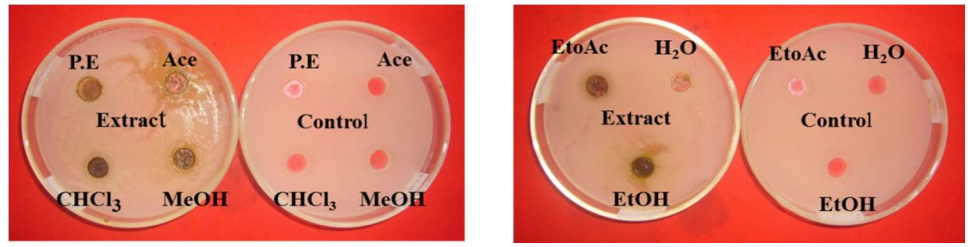
Antimicrobial activities of Leaves extracts from *Senna auriculata* (L.) Roxb.



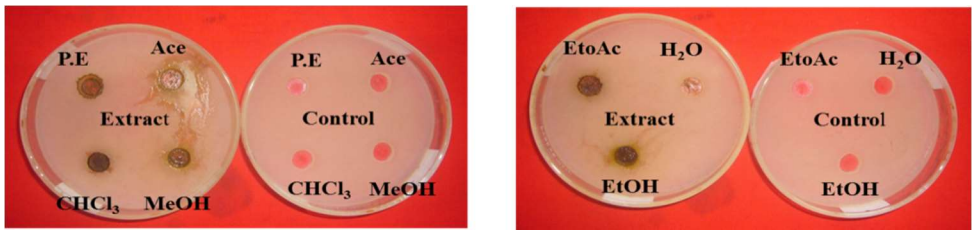
Bacillus subtilis



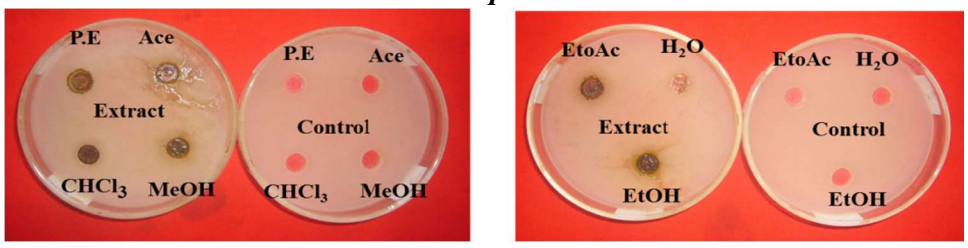
Staphylococcus aureus



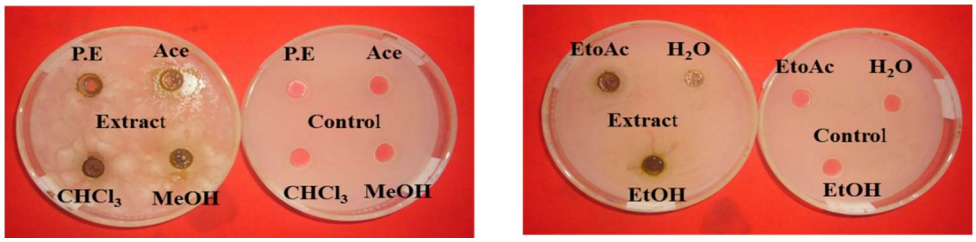
Pseudomonas aeruginosa



Bacillus pumalis



Candida albicans



Escherichia coli

Figure 19. Antimicrobial Activities from Leaves of *Senna auriculata* (L.) Roxb.

Discussion and Conclusion

The present study deals with the collection, identification and macroscopical studies of *Senna auriculata* (L.) Roxb. This plant belong to the family Fabaceae and commonly known as Mataran tea, Tanner's tea and locally known as Peik-thin-gat.

The plant are perennial shrubs, younger stems cylindrical and pubescent. The flowering time is September to February. The leaves are paripinnately compound, filiform glands present in between the leaflets and stipules auriculate or lunate-reniform. Inflorescences are terminal or axillary corymbose raceme, the flowers are bright yellow, bisexual and hypogynous. Stamens 10, 7 fertile and 3 sterile, dithecous, basifixed. The pistil monocarpellary, unilocular and gynophore present. The fruits are dehiscent pod, dark green and flattened; seeds ellipsoid (Figures 1 to 16). These outstanding characters are in agreement with those mentioned by (Hooker, 1879), (Kirtikar and Basu, 1933), (Burkill, 1935), (Cooke, 1958), (Backer, 1963), (Lawrence, 1964), (Purseglove, 1969), (Kurz, 1877) and (Dassanayake, 1991).

According to phytochemical tests (Table 2) , the results revealed that alkaloids, glycosides, phenolic compounds, reducing sugar, carbohydrates, tannins, flavonoids, terpenoids, steroids and α- amino acids were distinctly found and starch, cyanogenic glycosides and saponins were absent. The results showed that it consists of secondary metabolites have shown to be responsible for the therapeutic activity of plants (Trease and Evans, 2002).

The solubility tests were carried out to find the amount of total solid soluble in solvents. The powder of leaves were most soluble in water and moderately soluble in ethanol and methanol (Table 3). This results justifies it use in Myanmar Folkloric that the decoction of sample is remedy for the treatment of diabetes and skin diseases (Ashin Nargathein, 1972).

In the nutritional value evaluation, protein, crude fiber and crude fat were present in leaves of *Senna auriculata* (L.) Roxb. It was observed that energy value was 335 Kcal per100g (Table 4).

The antimicrobial activity was investigated by agar well diffusion method with six pathogenic microorganisms. Antimicrobial activities of extracts were evaluated by measuring the zone of inhibition. The acetone

extract and ethanol extract of leaves exhibit strong antimicrobial activity against all the tested microorganisms. The methanol extract showed good activity against all the tested microorganisms. The chloroform and ethyl acetate extracts showed moderate activity against on six pathogenic microorganisms. The aqueous extract of leaves showed weak activity against *Bacillus subtilis* and *Escherichia coli* and also the petroleum ether extract showed weak activity against *Escherichia coli* and did not show any against other tested microorganisms (Table 5 and Figures 18 and 19). The antimicrobial activity may be due to the presence of phytochemical constituents like terpenoid, flavonoid and phenolic compound present in the leaves of *Senna auriculata* (L.) Roxb. as secondary metabolites (Murugan and Wins, 2013).

In conclusion, The plant products plays an important role in the treatment of diseases without any side effects, there is a need to search new drugs from natural sources. Phytochemical screening revealed that the terpenoid and phenolic compounds might be responsible for the better inhibitory activity from the leaves extracts of *Senna auriculata* (L.) Roxb. The antimicrobical activity of *Senna auriculata* (L.) Roxb. leaves suggests that the extract contains the effective active phytochemicals responsible for the elimination of microorganisms. The inhibitory effect of the extract justified the medicinal use of *Senna auriculata* (L.) Roxb. and further study is required to find out the active component of medicinal value.

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