PHARMACOLOGY RESEARCH DIVISION

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Research activities of the division involve traditional and herbal medicine research as well as research on Western medicines. Research concerning traditional and herbal medicines includes basic research and clinical research. Basic researches include botanical identification, phytochemical and physico-chemical investigations, experimental pharmacology and toxicity studies of selected medicinal plants. Clinical researches are conducted to test the therapeutic potential of reputed medicinal plants. Research on Western medicines include pharmacokinetic study of the western drugs in human. Additional activities performed are toxicological, physico-chemical, phytochemical tests and assessment of pharmacological activities of locally available traditional medicines.

RESEARCH PROJECTS

1. NON-COMMUNICABLE DISEASES

1.1 DIABETES MELLITUS

1.1.1. Effect of cephalexin on pharmacokinetics of metformin in healthy volunteers

Metformin is the most commonly used oral agent to treat type 2 diabetes mellitus. Metformin is cleared from the body by tubular secretion via organic cationic transporter and excreted unchanged in the urine. Cephalexin is useful in the treatment of infections frequently encountered in clinical practice. Cephalexin is excreted by both organic cationic transporter and anionic transporter systems of the proximal tubules. The aim of the study was to explore the effect of cephalexin on pharmacokinetics of metformin in healthy volunteers. Comparison of the pharmacokinetic parameters of metformin was made between metformin alone and metformin with cephalexin. Each subject was instructed to take single oral dose of metformin 500 mg after overnight fasting and then single oral dose of 500 mg metformin with cephalexin 500 mg after one week washout period. The blood samples were taken at 0, 0.5, 1,

2, 3, 6 and 10 hours after administration of metformin. Samples were analyzed by High Performance Liquid Chromatography (HPLC) and the pharmacokinetic parameters of metformin were compared. In comparison between metformin alone and combination of metformin and cephalexin, metformin combination showed significant increase in peak plasma concentration C_{max}(1.38 ± 0.22 to 1.72 ± 0.23 μg /mL), area under concentration $AUC_{(0-\infty)}$ (9.02 ± 1.70 to 12.03 ± 1.56 μg/mL.hour) and elimination half life $T_{1/2el}$ (3.22 ± 0.61 to 3.84 ± 0.51 hr). There was significant reduction of elimination rate constant K_{el} (0.22 ± 0.05 to 0.18 ± 0.02 hr^{-1}) and clearance Cl (0.53 ± 0.13 to 0.39 ± 0.08 L/hr/kg) ($p< 0.05$). From the results, co-administration of cephalexin with metformin increased the plasma concentration of metformin, most probably by decreasing elimination. Therefore, in patients regularly taking metformin, cephalexin co-administration may cause accumulation of metformin. It may be lead to increased risk of lactic acidosis in such patients. Therefore, dosage adjustment of metformin may be needed when metformin and cephalexin are used together in type 2 diabetes mellitus patient with renal failure.

1.2. HYPERLIPIDEMIA

1.2.1. Hypolipidemic activity of combination of *Zingiber officinale* Rosc. rhizomes (ချင်း) and *Citrus aurantifolia* fruits (သံပုရာ) on triton induced hyperlipidemic rat model.

The study was aimed to find out the hypolipidemic activity of combination of watery extract of *Zingiber officinale* Rosc. rhizome (ချင်း) and *Citrus aurantifolia* fruits (သံပုရာ) on triton induced hyperlipidemic rat model. *Zingiber officinale* Rosc. rhizomes and *Citrus aurantifolia* fruits were purchased from market in Yangon. *Zingiber officinale* Rosc. rhizomes were cut into small pieces. Then, they were extracted with water to get watery extract. Fresh juice of *Citrus aurantifolia* fruits were obtained by squeezing. Watery extract of *Zingiber officinale* rhizomes and fresh juice of *Citrus aurantifolia* fruits were used in this study(1:1 combination). Yield percent of watery extract of *Zingiber officinale* was 4% of fresh rhizomes. Acute toxicity test was done on mice according to the method of Litchfield and Wilcoxan (1949). The doses used were 2.5 gm/kg, 5 gm/kg and 10 gm/kg body weight. The result showed that combination of watery extract of *Zingiber officinale* Rosc. rhizomes and fresh juice of *Citrus aurantifolia* fruits showed no toxic effect and lethality on mice up to the maximum dose level of 10 g/kg body weight. Therefore, Median Lethal Dose (LD_{50}) was more than 10 g/ kg body weight. Determination of hypolipidemic activity of this combination was done on Triton induced hyperlipidemic rats. Adult healthy albino rats (Wistar strain) of either sex weighing (200-250 gm) were used. 24 rats were divided into 4 groups and each group was contained 6 animals. Group I was given distilled water only (Control group). Group II was hyperlipidemic group which did not receive any treatment. Group III was given orally combination of watery extract of *Zingiber officinale* Rosc. rhizomes and fresh juice of *Citrus aurantifolia* (10 g/kg) respectively. Group IV was orally given standard drug, Atorvastatin 30 mg/kg (Standard group). Test samples were administered orally once daily for 14 days. On day 14 of treatment, after the animals were kept fasting for 18 hours, Group II to Group IV were given single dose intraperitoneal injection of Triton (1339)(400 mg/kg body weight) to induce hyperlipidemia. After 24 hours of intraperitoneal injection of Triton, the rats were sacrificed and blood samples were collected by cardiac puncture. Fasting serum lipid levels (Total cholesterol (TC), Triglyceride (TG) and High Density Lipoprotein (HDL) were measured with Semi Auto Chemistry Analyzer. Estimation of serum Low Density Lipoprotein (LDL) level was done by using formula. In this study, serum LDL could not be calculated by using formula because the formula is valid only if triglyceride level is not more than 400 mg/dl. There were significant decrease in serum total cholesterol level ($p<0.001$) but

triglyceride level was not decerased in combination of plant receiving group . Mean serum HDL level was increased but it was not significantly increased. It was found that combination of watery extract of *Zingiber officinale* Rosc. rhizomes and fresh juice of *Citrus aurantifolia* fruit 10 g/kg body weight had significant blood lipid lowering effect (hypolipidemic effect) on Triton induced hyperlipidemic rats.

Table (1) Effect of Combination of watery extract of *Zingiber officinale* Rosc. rhizomes and juice of *Citrus aurantifolia*.fruit on serum lipid profile level of triton induced hyperlipidemic rats

	Group	TC (mg/dl)	Triglyceride (mg/dl)	HDL (mg/dl)
1.	Control group	65.65±10.55	101.27±91.16	67.22±12.2
2.	Triton induced hyperlipidemic group	363.63±41.46	64389	97.57±14.04
3.	Triton+ Combination of watery extract of *Zingiber officinale* Rosc. rhizomes and juice of *Citrus aurantifolia*.fruit (10g/kg)	254.84 ±24.31 ***	60260	131.74±54.01
4.	Triton + Atorvastatin 30 mg/kg	375.04±98	64389	140.82±42.08 ***

Results were shown in mean ±SD
Statistical comparison was made between the triton induced hyperlipidemic group and treated group.

2. TRADITIONAL MEDICINE

2.1 HYPOGLYCAEMIC ACTIVITY

2.1.1 Analysis of essential metals from fifteen parts of medicinal plants which have reputed hypoglycaemic activity

Modern clinical research suggests that the body's balance of mineral trace elements is disrupted by diabetes. Among them, fifteen selected different parts of medicinal plants on which already laboratory animal tests have been done to show that these plants parts have hypoglycaemic effect. The aim of this study is determination of eight essential elements calcium (Ca), magnesium (Mg), manganese (Mn), iron (Fe), copper (Cu), zinc (Zn), chromium (Cr), potassium (K) from selected fifteen parts of medicinal plants by Flame Atomic Absorption Spectrophotometer . Leaves of *Morus alba* Lin (ပိုးစာရွက်), leaves of *Ocimum sanctum* Linn (ပင်စိမ်းနက်ရွက်) and stem of *Tinospora cordifolia* wild (ဆင်တုံးမနွယ်) were collected from Mandalay Region, leaves of *Cephalandra indica* Naud (ကင်းပုံရွက်) from Sagaing Region, fruit of *Cephalandra indica* Naud (ကင်းပုံသီး) from Magway Region, bulb of *Allium cepa* Linn (ကြက်သွန်နီဥ) from Bago Region, and leaves of *Momondica charantia* Linn (ကြက်ဟင်းခါးရွက်), fruit of *Momondica charantia* Linn (ကြက်ဟင်းခါးသီး), leaves of *Andrographis paniculatus* Nees (ဆေးခါးကြီးရွက်), leaves of *Orthosiphon stamineus* Benth (ဆီးချဲရွက်),whole plant of *Scoparia dulcis* Linn (ဒန္တသုခပင်), whole plant of *Vinca rosea* Linn. (သဘော်ဓမည်သုံးပင်), leaves of *Adhatoda vasica* Nees (မုရာကြီးရွက်), bark of *Ficus benghalensis* Linn. (မြည်ညောင်အခေါက်) and bark of *Eugenia jambolona* Lamk. (သပြေအခေါက်) from Yangon Region. The

plants were collected from previous collected area for efficacy test on animal study. Because elements content is varied depend on localities or geographic region. Then, botanical identification was done by taxonomy and microscopic characters of part use of plant samples. Concentration of seven elements (Cu, Zn, Mn, Fe, Mg, K, Ca) were present in these medicinal plants and Chromium (Cr) was absent, as shown in table (1). The WHO recommended level of copper is 10 mg/kg, zinc is 50 mg/kg, iron is 20 mg/kg, manganese is 200 mg/kg and chromium is 1.5 mg/kg in medicinal plants.

Table (1) Concentration of the elements in fifteen parts of medicinal plants (mean± SD)

No.	Samples	Cu (mg/kg)	Zn (mg/kg)	Mn (mg/kg)	Fe (mg/kg)	Mg (g/kg)	K (g/kg)	Ca (g/kg)
1	*Morus alba* Lin. (leaves)	4.71 ± 0.05	19.8 ± 0.77	45.96 ± 0.06	41.85± 0.67	0.88± 0.21	15.84± 2.1	10.91± 0.94
2	*Ocimum sanctum* Linn. (leaves)	9.49 ± 0.03	24.85± 0.57	25.0± 0.09	46.08± 0.21	0.92± 0.12	14.96± 1.1	11.21± 2.26
3	*Tinospora cordifolia* wild (stem)	6.81± 0.05	20.87± 0.005	36.1± 0.25	128.6± 0.4	1.26± 0.12	8.54± 0.6	17.47± 3.5
4	*Cephalandra indica* Naud. (leaves)	15.47± 0.09	117.3± 0.89	65.17± 0.3	102.8± 0.76	0.89± 0.17	32.14± 0.05	5.9± 1.25
5	*Cephalandra indica* Naud. (fruit)	11.1± 0.04	24.83± 0.19	7.41± 0.09	59.49± 0.13	0.84± 0.56	26.75± 0.37	2.42± 0.37
6	*Allium cepa* Linn. (bulb)	3.73± 0.04	17.38± 0.54	8.37± 0.07	38.37± 0.50	0.34± 0.15	17.8± 0.25	0.67± 0.57
7	*Momondica charantia* Linn. (leaves)	11.98± 0.03	81.0± 0.87	178.7± 0.16	278.6± 3.83	0.9± 0.13	32.78± 0.11	5.49± 2.9
8	*Momondica charantia* Linn (fruit)	4.14± 0.04	24.0± 0.005	34.7± 0.15	37.7± 0.3	0.84± 0.17	47.8± 0.36	1.64± 0.67
9	*Andrographis paniculatus* Nees. (leaves)	6.67± 0.05	39.49± 0.01	37.29± 0.42	298.6± 0.3	1.74± 0.07	28.33± 0.5	16.45± 1.18
10	*Orthosiphon stamineus* Benth(leaves)	11.03± 0.06	83.2± 0.65	50.71± 0.15	98.47± 1.5	7.78± 0.38	19.68± 0.8	12.29± 2.8
11	*Scoparia dulcis* Linn. (whole plant)	14.76± 0.03	48.71± 0.31	104.9± 0.4	813.5± 5.88	0.86± 0.08	15.27± 0.5	3.44± 2.1
12	*Vinca rosea* Linn. (whole plant)	8.66± 0.06	85.29± 0.79	36.05± 0.14	80.52± 0.45	2.15± 0.28	19.98± 0.02	4.28± 0.3
13	*Adhatoda vasica* Nees. (leaves)	5.23± 0.07	64.43± 1.89	37.02± 0.14	73.33± 0.87	20.8± 0.19	20.02± 0.04	15.36± 0.64
14	*Ficus benghalensis* Linn. (bark)	1.88± 0.04	12.01± 0.3	13.4± 0.17	63.29± 2.89	0.82± 0.18	18.33± 0.5	10.84± 0.36
15	*Eugenia jambolona* Lamk. (bark)	4.92± 0.01	5.29± 0.003	6.99± 0.13	215.8± 0.3	0.92± 0.11	3.87± 0.5	11.34± 0.5

2.2 HEPATOPROTECTIVE ACTIVITY

2.2.1 Hepatoprotective activity of *Tinospora cordifolia* Miers. (ဆင်တုံးမန္ဓယ်) stem on CCl_4-induced hepatotoxicity in albino rats

This study was done to find out the hepatoprotective activity of *Tinospora cordifolia* Miers. stem (Sin-don-manwe) in carbontetrachloride induced hepatotoxicity in albino rats. In this study, phytochemical analysis and acute toxicity test of 70% ethanolic extract of stems of the plant on albino mice were also carried out. The study was experimental animal study. Phytochemical analysis of the 70% ethanolic extract of the stem showed the presence of alkaloid, glycoside, amino acid, polyphenol, saponin, carbohydrate, and steroid/terpene. Acute toxicity test was done in albino mice according to OECD guideline 423. It was found that median lethal dose (LD_{50}) of 70% ethanolic extract was found to be more than 5g/kg. In hepatoprotective activity test of 70% ethanolic extract of the plant, tested rats were grouped into 6 groups and each group contained 6 rats. Group I was negative control group (distilled water only) and Group II was CCl_4 intoxicated group. Group III, IV and V were tested groups which received 70% ethanol extract (0.75g/kg, 1.5g/kg and 3g/kg) respectively and group VI received standard drug, Silymarin (50 mg/kg) daily by oral route upto 7 days. On 8^{th} day, Group II to VI received single dose of CCl_4 1ml/kg per orally. After 24 hours of CCl_4 administration (i.e on 9^{th} day), they were sacrificed. The blood samples were collected by cardiac puncture. Liver Function Tests of the serum and histological examination of liver tissue were done. In this study, there were significant decrease in liver enzymes such as ALT, AST, ALP and total bilirubin in 0.75g/kg, 3g/kg of the extract treated group when compared with those of carbontetrachloride intoxicated group ($p<0.01$). Significant decreases in AST, ALP, and total bilirubin levels except ALT were found at 1.5g/kg of the extract. No significant changes in histopathological findings of liver at 3 doses of the extract but significant decrease in fibrosis was found at 1.5g/kg of the extract when compared with CCl_4 intoxicated group. The hepatoprotective effect of the extract is lower than that of silymarin . In conclusion, 70% ethanolic extract of the stem of *Tinospora cordifolia* Miers. had some degree of hepatoprotective effect in rats.

2.3 ANTIOXIDANT ACTIVITY

2.3.1 Evaluation of antioxidant activity of *Ocimum basilicum* Sim. (ပင်စိမ်း) and *Ocimum sanctum* Linn. (ပင်စိမ်းနက်) leaves.

In the present study, the antioxidant activity of 50% ethanolic extract of *Ocimum sanctum* Linn. and *Ocimum bascilicum* Sim. leaves was studied. The antioxidant activity of these extracts were determined by using 1, 1-diphenyl-2-picryl-hydrazyl (DPPH) assay method. Phytochemical screening of dry leaf powder of the plants showed the presence of alkaloids, flavonoids, polyphenols, tannins, saponins, amino acids, glycoside and carbohydrates. But dried leaf powder did not contain saponins and cyanogenic glycoside. The results of physicochemical characterization of dried leaf powder of *Ocimum sanctum* Linn. and *Ocimum bascilicum* Sim. were swelling index (14 ml and 14.5ml) foaming index (<100 and <100), water and volatile matter content (9.1% and 17%). Total ash (12.98% and 12.97%), water soluble ash (9.87% and 5.08%), acid insoluble ash (0.5% and 0.91%), pet-ether soluble matter (8.8% and 2.35%), ethanol soluble matter (27.51% and 39.27%) by using the method of WHO, Quality control method for medicinal plant materials (1998). The percent inhibitions of 250 µg/100µl of 50% ethanolic extract of *Ocimum sanctum* Linn. leaves and 50% ethanolic extract of *Ocimum bascilicum* Sim. leaves were 85.02% and 70.27% respectively. The percent inhibitions of standard drug ascorbic acid (16 µg/100µl)

was 83.29%. The IC_{50} value of 50% ethanolic extract of *Ocimum sanctum* Linn. leaves was (1.22 mg/ml), *Ocimum bascilicum* Sim. leaves was (1.91 mg/ml) and standard drug ascorbic acid was 0.095 mg/ml. The findings suggested that 50% ethanolic extract of *Ocimum sanctum* Linn. and *Ocimum bascilicum* Sim. leaves were not toxic up to 5g/kg and have antioxidant activity.

2.4 HAIR GROWTH ACTIVITY

2.4.1 Hair growth activity of *Angiopteris evecta* (ဇေးမြင်းခွာ) in rabbit

One of the problems often experienced by human is baldness or hair growth that is not normal. *Angiopteris evecta* (Say-myin-khwar) is one of the traditional indigenous medicinal plants which have many pharmacological properties. Researchers reported that extracts of *Angiopteris evecta* had hair growth activity. Therefore, in this study hair growth activity of *Angiopteris evecta* was determined in adult rabbit. Four male albino rabbits were used as test animals.The rabbit were sheared back and divided into four plots with a size of 2x2 cm. 1 mL of *Angiopteris evecta* extract was given 2 times a day, for 18 days. A total of five strands of hair were used to measure the length of hair and average length of the five strands was calculated. In this study, safety of ethanol and watery extract of *Angiopteris evecta* was examined by means of skin irritation test on rabbit skin and the result showed that the irritation degree was categorized as negligible. Mean length of hair growth for negative control was 0.74 cm and that of standard minoxidil was 1.47 cm. Mean length of hair growth at doses of 10%, 20% and 40% of watery extract were 0.82 cm, 1.28 cm and 1.46 cm, respectively. For ethanolic extract, mean length of hair growth for doses 10%, 20% and 40% were 0.81 cm, 1.29 cm and 1.45 cm,respectively.The rabbit treated with ethanolic and watery extract of *Angiopteris evecta* (Say-myin-khwar) showed increased in hair length when compared with those of control group ($p<0.01$). Therefore, it can be concluded that ethanolic and watery extract of *Angiopteris evecta* (Say-myin-khwar) increased in hair growth activity.

2.5 WOUND HEALING ACTIVITY

2.5.1 Effect of traditional drug “Eve (ဧဝ)” on wound healing in laboratory rat model

Eve is traditional medicine lotion produced from naturally occurring plant resources and prepared for wound care. This study was done to determine the antibacterial activity of Eve by *in vitro* test and to determine the effects of Eve on wound healing in laboratory rat model. Forty five healthy adult male albino rats of average weight 270±35g were used. Antibacterial activity was measured on (*Escherichia coli, Staphylococcus aureus and Pseudomonas species*) using the standard method of agar disc diffusion (Mullar Hinton Broth). Ciprofloxacin was used as standard. *In vitro* test showed Eve has obvious antibacterial activity on *Staph. aureus* (zone of inhibition 13mm) and then followed by *E. coli* (zone of inhibition 12mm) and *Pseudomonas* (zone of inhibition 10mm) species. For *in-vivo* test the albino rats were divided into three groups of fifteen animals. Group I animals were kept without treatment. Group II animals were treated with standard antiseptic (Povidone iodine).Group III animals were treated with Eve lotion. Application mode was topically, once daily for 14 days. First, each rat was anaesthetized with ketamine intraperitoneally. An excision was done about 1.5-2 cm in highest diameter on the disinfected area of the inter-scapula skin surface. The wounds were also infected by the bacteria described (one strain for one group) of the rats. After 48 hours incubation period of wound, the wound area of each animal was measured daily by ruler for progressiveness. Wound healing activity of Eve was

not statistically different from wound healing activity of standard drug (Povidone Iodine) on wound infected with *Staph. aureus* (p=1) and *E. coli* (p=0.08). However, wound healing activity of Eve was statistically better than that of Povidone Iodine on wound infected with Pseudomonas species (p=0.01).According to *in-vivo* and *in-vitro* tests, Eve has antibacterial activity in *in-vitro* test and wound healing activity in *in-vivo test*. Therefore the traditional medicine lotion (Eve) can also be used as antiseptic solution in wound caring procedures especially in Pseudomonas infected wounds.

SERVICES PROVIDED

ACADEMIC

Sr.	Name	Course	Responsibility
1.	Dr. Khine Khine Lwin	PhD (Botany) MMed Sc (Pharmacology) and M. Pharm 1st year MMedSc (Pharmacology) 1st year M Pharm M.Pharm (Yangon)	Co-supervisor Teaching, training demonstration Co -examiner
2.	Daw Mu Mu Sein Myint	PhD (Botany) 1st year MMedSc (Pharmacology) 1st year M Pharm	Co-supervisor Teaching, training demonstration
3.	Dr. Khin Tar Yar Myint	PhD (Pharmacy) M. Pharm 1st year MMedSc (Pharmacology) 1st year M Pharm	Co-supervisor Teaching, training demonstration

PHARMACOLOGY RESEARCH DIVISION (POL)

Research Scientist	…	Daw Khin May Thi BSc, MSc (Botany) (MU)
	…	Daw Ei Ei Htway BSc (Hons:), MSc, M.Res(Chemistry), (MU)
Research Officer	…	Daw Wai Mi Aung BPharm(UOP,Mandalay), MPharm (UOP,Yangon)
Research Assistant (2)	…	Daw Aye Aye Phyu BPharm (UOP, Mandalay)
	…	Daw Aye Thida Htun BPharm, MPharm (UOP, Yangon)
	…	Daw May Thandar Htun BPharm(UOP, Mandalay),MPharm (UOP, Yangon)
	…	U Kyaw Min Aung BA (History) (Meikhtila University)
	…	Daw Aye Aye Htun BSc (Zoology)(MU), EGTI (Civil) GTI (POL)
	…	Daw Moh Moh Lwin BSc (Chemistry) (MU)
	…	Daw Swe Zin Aung Dip in TM (Institute of Traditional Medicine)
Research Assistant (3)	…	Daw Thiri Hlaing BPharm (UOP, Mandalay)
	…	U Min Zaw Oo
Research Assistant (4)	…	Daw Zin Nwe Soe BSc (Q), MSc (Botany)(Pakokku University)
Laboratory Attendant	…	Daw Rai Kit

Pharmacology Research Division has been actively engaged in conducting a number of research projects in areas of quality, efficacy and safety of medicinal plants and traditional medicine. The qualitative and quantitative analysis of food products and chemical constituents of medicinal plants were also done by using HPLC and GC-MS. The division contributes academic services to postgraduate students from the other universities.

RESEARCH PROJECTS

1. TRADITIONAL MEDICINE

1.1 ANTI-DIABETIC

1.1.1 Blood glucose lowering effect of *Luffa acutangula* (L.) Roxb. (ခရဲ) on adrenaline induced acute hyperglycemic rats

Diabetes mellitus is one of the health problems with high incidence and mortality. The burden of diabetes is increasing globally, particularly in developing countries. Insulin and oral hypoglycemic agents are used to control the blood sugar level in diabetes mellitus. *Luffa acutangula* (Linn.) Roxb.is called Myanmar name 'Kha-we' and has several traditional uses such as anti-diabetic, anti-inflammatory, anti-malaria, etc. The present study aimed to evaluate blood glucose lowering effect of seed of *Luffa acutangula* (Linn.) Roxb. on adrenaline induced acute hyperglycemic albino rats. Laboratory based experimental animal study was done at Pharmacology Research Division, Department of Medical Research (Pyin Oo Lwin), from October 2015 to October 2016. A total of 30 hyperglycemic albino rats were randomly allocated into five groups of six animals in each. They were fasted for 18 hours (hr) and then baseline fasting blood sugar levels were measured in all groups. Group I, group II and group III were treated with three doses of the seed powder of the test plant (250 mg/kg,

500 mg/kg, 1000 mg/kg), respectively. Group IV received 0.5 mg/kg of the drug glibenclamide (positive control) and group V received 10 ml/kg of vehicle (negative control). All the drugs were administered in an oral single dose. After giving the corresponding drugs and vehicle, rats were immediately induced adrenaline 0.2 ml/kg by subcutaneous route. Then the blood glucose levels were measured at 1 hr, 2 hr, 3 hr and 4 hr intervals after injecting of adrenaline. The highest dose (1000 mg/kg)of the seed of *Luffa acutangula* (Linn.) Roxb. had significant blood glucose lowering effect at 2 hr, 3 hr and 4 hr (p<0.05), compared to that of negative control group. The study showed that seed of *Luffa acutangula* (Linn.) Roxb. had revealed the blood glucose lowering activity for the test period.

1.2 ACUTE TOXICITY

1.2.1 Evaluation of the acute toxicity of *Caturanga* (စတုရင်္)and *Vijjadho* (ဝိဇ္ဇာဓိရ်) on albino mice

Traditional systems of medicine are playing major role in providing primary health care in many countries around the world, including Myanmar. Acute toxicity investigations in animal are required to supplement human experience in defining possible toxicity. In this study, the test drug *Caturanga* is useful for the treatment of malaria, asthma, numbness, etc. and *Vijjadho* is used in stroke, numbness, carbuncle, etc. in Myanmar traditional medicine. These drugs have been used for several years but there is no evaluation for the acute toxicity of two drugs *Caturanga* and *Vijjadho* on albino mice. This study was conducted at Pharmacology Research Division, Department of Medical Research (Pyin Oo Lwin), from October 2015 to July 2016. Laboratory based experimental animal study was done according to the OECD (Organization for Economic Co-operation and Development) guideline No. 425. According to that guideline, main test was chosen because there was no previous toxicity data for the test drugs. All animals were fasted food but not water prior to dosing. The fasted body weight of each animal was determined and the dose was calculated according to the body weight. A single oral dose was started at 175 mg/kg and the next doses, 550 mg/kg, 2000 mg/kg, 5000 mg/kg body weight of each test drug were administered according to up and down procedure. Animals were observed individually at least once during the first 30 minutes after dosing, periodically doing the first 24 hours (with special attention given during the first 4 hours) and daily thereafter, for a total of 14 days. All observations were systematically recorded with individual work sheet for each animal. The LD_{50} was calculated by the AOT 425 Stat Pgm program. At the end of study, all animals were alive and any toxic symptoms were not showedatthe highest dose up to 5000 mg/kg body weight of *Caturanga* and *Vijjadho*. So, the LD_{50} of the two test drugs were greater than 5000 mg/kg body weight. Therefore, the results of this study showed that the two test drugs were non-toxic in test doses for the test period.

SERVICES PROVIDED

LABORATORY

Sr.	Laboratory Tests	Tested samples
1.	Acute toxicity test	4 samples
2.	Sub-acute toxicity test	1 sample
3.	Extraction of medicinal plants	7 samples
4.	Phytochemical tests on medicinal plants	2 samples
5.	Essential Oil Production	1 sample
6.	HPLC analysis	1 sample
7.	GC-MS analysis	4 samples
8.	FTIR analysis	5 samples
9.	Anti-inflammatory activity	1 sample
10.	Anti-diarrhoeal activity	1 sample

HERBAL GARDENS

There were two herbal gardens in Department of Medical Research (Pyin Oo Lwin Branch) in which the medicinal plants were collected and cultivated from different areas of Myanmar. In herbal garden (1), the plants were cultivated according to the usage for specific diseases. The herbal garden (2) was established with the attention of different phytochemical constitution of medicinal plants. The Pharmacology Research Division provides plants identification, collection of new species of plant and maintenance of these herbal gardens which are supportive for traditional medicine research.

MINI-HERBAL MUSEUM

A mini-herbal museum was also attached by Pharmacology Research Division. In this mini-herbal museum, the identified samples of medicinal plants and some ingredients of traditional medicine formulation in Myanmar were displayed.