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# INTERNATIONAL CONFERENCE ON PHARMACEUTICAL AND HEALTH SCIENCES

# ICPHS 2024

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**DHAKA, BANGLADESH**

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**6-7 DECEMBER 2024**
Friday & Saturday

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| Presenter (International) | USD 150 |
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| Presenter (Local Student) | BDT 2000 |

## IMPORTANT DATES

| | |
|---|---|
| Abstract Submission Opening | 01 August |
| Registration Opening | 01 August |
| Abstract Submission Deadline | 15 September |
| Early Bird Registration Deadline | 15 September |
| Final Registration Deadline | 20 September |

**CONFERENCE DINNER**
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74/A, Green Road, Farmgate, Dhaka-1205, Bangladesh

icphs@uap-bd.edu

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# Next-Gen Mpox Vaccine Delivery: Harnessing 3D-Printed Microneedles for Global Impact

**KHADIZA AKTER LUBNA[1], AFSANA AKTHER DINA[1], MILI AKTER[1], MD JASIM UDDIN[2,3]***

*[1]Drug Delivery & Therapeutics Lab, Dhaka 1212, Bangladesh*

*[2]Department of Pharmaceutical Technology, Faculty of Pharmacy, Universiti Malaya, 50603 Kuala Lumpur, Malaysia*

*[3]School of Pharmacy, Brac University, Kha 224 Bir Uttam Rafiqul Islam Ave, Dhaka 1212, Bangladesh*

**j.uddin@um.edu.my*

## ABSTRACT

**Background:** Mpox (Monkeypox), a zoonotic Orthopoxvirus, produces a disease in humans similar to smallpox but with a significantly lower death rate. The largest outbreak in history began in May 2022 and has since spread rapidly worldwide, with over 70 countries reporting cases.

**Objective:** The objective of this research work is to highlight the significant role of 3D-printed microneedles in the delivery of Mpox vaccines.

**Materials and methods:** Vaccines can be administered before and after exposure to the virus, with optimal protection achieved through pre-exposure vaccination. Data indicate that vaccination within 4 days after first exposure to Mpox can reduce the risk of disease by up to 85%. Even individuals who have previously received smallpox vaccines remain at risk for Mpox. The MVA-BN (Modified Vaccinia Ankara-Bavarian Nordic) vaccine, approved in 2019 for the prevention of smallpox and monkeypox in the USA and Canada, is administered subcutaneously in the upper arm. Recent studies show that 3D-printed microneedles, measuring a few hundred micrometers in height, can penetrate the skin's outer layer without reaching deeper tissues, thereby delivering therapeutics effectively and minimally invasively.

**Results:** Research demonstrates that 3D-printed microneedle delivery systems enhance skin cargo retention by up to 50% compared to traditional injection methods, activate immune cells more effectively, and elicit stronger immune responses. Microneedles minimize discomfort and are suitable for self-administration, which reduces reliance on healthcare providers and enhances vaccination accessibility.

**Conclusion:** Health systems must continuously enhance awareness and update preparedness plans for Mpox outbreaks. This includes establishing clear protocols for surveillance, testing, vaccination, and treatment, along with strategies for communication and coordination among various stakeholders.

**Keywords:** Microneedle; Mpox; MVA-BN; transdermal delivery; vaccine

# Phytochemical and Pharmacological Evaluation of Ethanol Leaf Extract of *Dracaena trifasciata* (Family: Asparagaceae)

**MD. MIZAN, AMIR HOSSAIN***

*Department of Pharmacy, Dhaka International University, Satarkul Rd, Badda, Dhaka-1212, Bangladesh*
*hellotoamir@gmail.com

## ABSTRACT

**Background:** *Dracaena trifasciata* Prain is a plant with a range of ethnobotanical uses, including medicinal ones. It is often referred to as the mother-in-law's tongue or snake plant. Previous research on pharmacology revealed that this plant possesses several abilities, including anthelminthic, antibacterial, cytotoxic, and wound-healing capabilities.
**Objective:** The study aimed to evaluate the phytocompounds present in the ethanol extracts of *D. trifasciata* and their possible pharmacological action.
**Materials and methods:** DPPH, nitric oxide, ferric reducing, reducing power, and hydroxyl radical scavenging capacities were used to quantify the *in vitro* antioxidant qualities. Thrombolytic and antibacterial activities were also evaluated. In addition, the leaf extract was also tested for some in vivo screenings, including analgesic, antihyperglycemic, antipyretic, antidiarrheal, and antidepressant activities in different methods. Possible relationships between extract concentrations and the percentage of free radical inhibition were observed across all antioxidant testing methodologies.
**Results:** In the antibacterial test, *Vibrio mimicus, Pseudomonas aureus,* and *Salmonella paratyphi* showed the highest sensitivity among 16 other organisms. Moreover, in thrombolytic activity, the extract displayed 22.42% clot lysis compared to the standard (31.17%). However, every in vivo test conducted on mice demonstrated substantial potential action in a dose-dependent manner.
**Conclusion:** In sum, *D. trifasciata* demonstrated potent antioxidant, antimicrobial, analgesic, antipyretic, anti-hyperglycemic and antidiarrheal, and antidepressant activity with significant results.
**Keywords:** Antibacterial; antidepressant; antihyperglycemic; antioxidants; thrombolytic

# Unveiling the Dual Anxiolytic and Analgesic Properties of *Heritiera fomes* Bark: Insights from Behavioral and Pain Model Assessments.

**MD. FARSHID HOSSEN, LATA RANI MOLLIK, SUMAYA JANNAT, MD. TANJIR AHAMMED, MD. ASADUJJAMAN, MD. IQBAL HOSSAIN NAYAN***

*Department of Pharmacy, Faculty of Health Science, Northern University Bangladesh, 111/2 Kawlar Jame Mosjid Road, Dakshinkhan, Dhaka-1230, Bangladesh*

**ihnayan93@gmail.com*

## ABSTRACT

**Background:** *Heritiera fomes*, a common mangrove tree in Bangladesh, is traditionally used to treat gastrointestinal disorders and diabetes. The phytochemical analysis revealed that significant amounts of flavonoids, alkaloids, tannins, saponins, steroids, and phenols in the extract likely contributed to these observed effects.

**Objective:** This study has been designed to evaluate the anxiolytic and analgesic activities of *H. fomes* bark ethanolic extract (HBEE).

**Materials and methods:** Elevated Plus Maze (EPM), Hole board Test (HBT), Hole Cross Test (HCT), Light-Dark Box (LDB), and Open Field Test (OFT) were employed to assess anxiolytic activity, while acetic acid-induced writhing and formalin-induced pain methods were used for analgesic evaluation. The mice were divided into three groups: the control group received distilled water, while the test group received the extract (500 mg/kg, orally) and the standard group received diazepam (1 mg/kg), indomethacin (10 mg/kg), and ibuprofen (100 mg/kg) that were used as references for behavioral assessments, acetic acid-induced analgesic test and formalin-induced pain method respectively.

**Results:** The result showed significant ($P < 0.01$) CNS depressant effects, evidenced by reduced locomotor activity in OFT and increased time spent in open arms of EPM, suggesting an anxiolytic effect. Additionally, exploratory behavior was significantly reduced ($P < 0.01$) in HBT and HCT, with increased time in the dark area during the LDB test, indicating sedative properties. HBEE notably inhibited ($P < 0.01$) writhing (82%), nearly comparable to indomethacin (84%), highlighting its analgesic potential. HBEE significantly reduced formalin-induced pain in both early and late phases, closely resembling the effect of ibuprofen. These findings suggest that HBEE possesses both peripheral and central analgesic properties, likely due to the presence of high flavonoid contents that may interact with GABAergic pathways and modulate inflammatory mediators.

**Conclusion:** This study demonstrates that HBEE possesses potent CNS depressant and analgesic activities. However, further research, including clinical trials, is needed to explore its therapeutic potential fully and to clarify the exact molecular mechanisms.

**Keywords:** Analgesic; anti-inflammatory; anxiolytic; CNS depressant; *Heritiera fomes*

# Development and Evaluation of Metformin-Gabapentin Combination: Optimizing Release Profile for Diabetic Neuropathy Treatment

**MD. MEHEDI HASAN, MST. FATEMA TUZ ZOHURA, REDUAR HASAN LIMON, SUMIYA AFRIN ZUMUR, MD. IQBAL HOSSAIN NAYAN***

*Department of Pharmacy, Faculty of Health Science, Northern University Bangladesh, 111/2 Kawlar Jame Mosjid Road, Dakshinkhan, Dhaka-1230, Bangladesh*

**ihnayan93@gmail.com*

## ABSTRACT

**Background:** Diabetic neuropathy, a common complication of type 2 diabetes, severely affects quality of life. Metformin, a key antidiabetic drug, lowers blood glucose by reducing hepatic gluconeogenesis and improving insulin sensitivity. Gabapentin relieves neuropathic pain by inhibiting excitatory neurotransmitter release. In Bangladesh, both are available as tablets, but their separate use may cause patient inconvenience.

**Objective:** This study aims to develop a combination formulation of metformin HCl and gabapentin to investigate how gabapentin influences metformin's release profile and vice versa.

**Materials and methods:** Comet®500 and Gabapen®100 were purchased locally for impact analysis. Dissolution testing was conducted with USP apparatus-II in distilled water at 100 rpm for 60 minutes, analyzed by UV spectroscopy at their λmax. Both individual tablets and combined formulations were evaluated.

**Results:** Comet® showed dissolution percentages of 58.24 to 96.03% ($R^2$=0.917) at different time intervals of 15 to 60 minutes, but the release increased by 14.02% average ($R^2$=0.987) after combining with Gabapen®, where a maximum of 28.81% impact was observed at 30 minutes. Similarly, Gabapen® showed 85.60% release after 60 minutes ($R^2$=0.906), rising to 90.12% ($R^2$=0.984) when combined with Comet®. Three formulations were developed with varying excipients and amounts. Formulation (F3) prepared with a glidant, lubricant, diluent, and binder with API (filled weight 690mg), exhibited the highest release rates of metformin (100.06%, $R^2$=0.992) and Gabapentin (99.38%, $R^2$=0.984) after 45 minutes, compared to the release of individual tablets. This enhanced dissolution profile with the combined formulation suggests a synergistic interaction between metformin and gabapentin, indicating potential benefits in their concurrent administration.

**Conclusion:** The study shows that the combined capsule formulation enhances drug release, offering a more effective approach to managing diabetic neuropathy and improving patient adherence.

**Keywords:** Comparative dissolution study; neuropathic pain; synergistic effect; type II diabetes

# Antibacterial Efficacy of Varied-Sized Silver Nanoparticles Synthesized by Different Combinations of Reducing Agents against Methicillin-Resistant *E. coli*

**FARHANA AKTER[1], MUHAMMAD SALEHUDDIN AYUBEE[2], MD. MAHBOOB HOSSAIN[3], MOHSIN KAZI[4], MD. ABDUL MAZID[5]***

*[1]Department of Pharmacy, East West University, Dhaka-1212, Bangladesh*

*[2]Department of Pharmacy, Northern University Bangladesh, Dhaka-1230, Bangladesh*

*[3]Microbiology Program, Department of Mathematics and Natural Sciences, BRAC University, Dhaka-1212, Bangladesh*

*[4]Department of Pharmaceutics, College of Pharmacy, King Saud University, Riyadh-11421, KSA*

*[5]Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*ma.mazid@du.ac.bd

## ABSTRACT

**Background:** Recent studies have suggested significant antimicrobial properties of some metallic nanoparticles, offering a ray of hope during the height of antibiotic resistance. The silver nanoparticle (AgNPs) is one of the most promising candidates due to its noble nature and better tolerance profile in humans.

**Objectives:** This study, conducted with attention to detail, aims to evaluate how different combinations of reducing agents affect the antibacterial activity of AgNPs against methicillin-resistant *E. coli* through particle size variation.

**Materials and methods:** The synthesis of AgNPs was carried out by chemical reduction method using silver nitrate through the five different combinations of reducing agents, and their activity was compared with that of silver nitrate, also known to possess antimicrobial properties. Following the purification by centrifugation, the freeze-dried AgNPs were subsequently characterized by UV-visible spectroscopy, thermogravimetric analysis (TGA), scanning electron microscopy (SEM), and dynamic light scattering (DLS). The minimum bactericidal concentration (MBC) for the AgNPs formulations was investigated by the plate counting method, and their zone of inhibition was determined by the well diffusion method against the methicillin-resistant *E. coli.*

**Results:** AgNPs synthesized with trisodium citrate exhibited an average diameter of 87.15 nm and a zeta potential of -39.4 mV. In contrast, AgNPs produced with sodium borohydride had a diameter of 91.71 nm and a zeta potential of -29.1 mV. Additionally, AgNPs synthesized by both trisodium citrate and sodium borohydride showed a diameter of 65.07 nm and a zeta potential of -41.1 mV, while the addition of hydrogen peroxide resulted in AgNPs with diameters of 30.91 nm and 93.85 nm. Finally, polyethylene glycol and polyvinyl pyrrolidone yielded AgNPs with a diameter of 93.85 nm and a zeta potential of -8.0 mV. Microbiological study reveals that the AgNPs synthesized with trisodium citrate were found to be the most effective against the methicillin-resistant *E. coli* with a 99.75% bactericidal efficacy at 20 ppm concentration and a zone of inhibition of 12.5 mm owing to their optimal particle size and stability.

**Conclusion:** The reducing agents affect the particle size and stability of synthesized AgNPs, which results in significant variations in their antibacterial activity against methicillin-resistant *E. coli.*
**Keywords:** Antibacterial activity; *E. coli*; silver nanoparticle

# *Mikania micrantha* Derived AgNPs as a Biogenic Solution for Anxiety and Analgesia: An In-Vivo Pharmacological Evaluation

**MD. ABUL BASAR SOIKOT, MST. FARZANA SULTANA, CHAMON AKTER, MD. NAHID HASAN, IQBAL HOSSAIN NOYON, MD. MOHIBUL ALAM***

*Department of Pharmacy, Faculty of Health Science, Northern University Bangladesh, 111/2 Kawlar Jame Mosjid Road, Dakshinkhan, Dhaka-1230, Bangladesh*

*mohibmdalam@gmail.com

## ABSTRACT

**Background:** Silver nanoparticles (AgNPs) from plant extracts offer therapeutic potential with fewer side effects. *Mikania micrantha*, known for its anticancer, anti-diabetic, and wound-healing properties, is traditionally used for insect bites, influenza, and stress.

**Objective:** This study has been designed to elucidate the biosynthesis of AgNPs using *Mikania micrantha* leaf extract and evaluate pharmacological action against pain and anxiety in the Swiss albino mice model.

**Materials and methods:** 1 mM $AgNO_3$ was used to synthesize AgNPs from *Mikania micrantha* leaf extract. DPPH scavenging activity was analyzed to measure antioxidant activity. Anxiolytic behavior was assessed using the Elevated Plus Maze (EPM), Hole Board (HBT), Hole Cross (HCT), Light-Dark Box (LDB), and Open Field (OFT) tests. Mice were categorized into control, test (500 mg/kg and 1000 mg/kg, orally), and reference. Analgesic effects were evaluated through acetic acid-induced writhing and formalin-induced paw-licking tests. Overdose toxicity was tested in Long-Evans rats at 20 times the lowest dose.

**Results:** The biosynthesis of AgNPs from *Mikania micrantha* was confirmed by UV Spectrophotometry, which indicated a surface plasmon resonance peak at approximately 410 nm. Structural characterization through SEM/EDX, FT-IR, and XRD confirmed the morphology of the AgNPs. In antioxidant assays, AgNPs exhibited significant free radical scavenging activity, with $EC_{50}$ values of 20.64 µg/mL for DPPH compared to Ascorbic acid (16.06 µg/mL). Behavioral assays revealed that AgNPs had significant sedative and anxiolytic effects, with dose-dependent reductions in the number of movements by mice in the OFT and HCT ($p<0.001$). Mice demonstrated increased time in the open arms of the EPM and light box of LDB, indicating reduced anxiety ($p<0.001$). Additionally, AgNPs reduced writhing (84%) and formalin-induced pain in both early and late phases, highlighting their peripheral and central analgesic properties ($p<0.001$). Notably, no lethality was observed in rodents even at higher doses compared to the standard drug group that demised after 04 hours on average.

**Conclusion:** *Mikania micrantha*-AgNPs showed promise for pain and stress management, likely due to high flavonoid content interacting with GABAergic pathways and inflammatory mediators. Future research should address long-term toxicity, dosage optimization, and clinical trials to explore their medical potential fully.

**Keywords:** Analgesic; anxiolytic; anti-inflammatory; scavenging activity; silver nanoparticles

# Exploring the Pharmacological Potential of *Murraya koenigii* on Postprandial Glucose Absorption In-Vivo

MD. AHSANUL HAQUE BASHAR, MD. MOHIBUL ALAM, FUHATUN NOOR, MD. ASADUJJAMAN, MD. IQBAL HOSSAIN NAYAN*

*Department of Pharmacy, Faculty of Health Science, Northern University Bangladesh, 111/2 Kawlar Jame Mosjid Road, Dakshinkhan, Dhaka-1230, Bangladesh*

*ihnayan93@gmail.com

## ABSTRACT

**Background:** Hyperglycemia, the pivotal characteristic of diabetes mellitus, is a major concern. *Murraya koenigii* has traditionally been used to treat hyperglycemia in Bangladesh for many years due to its minimal side effects, contrary to available antidiabetic drugs.

**Objective:** This study has been designed to investigate the hypoglycemic potential of *Murraya koenigii* by assessing its effects on postprandial glucose absorption through a series of in vivo and in-vitro assays.

**Materials and methods:** *Murraya koenigii* leaf extract (MKEE) was prepared using ethanol, and doses of 500 mg/kg ($ED_{min}$) and 1000 mg/kg ($ED_{max}$) were selected through a pilot study for in-vivo assays, such as gastrointestinal motility (GIM), oral glucose tolerance, residual gut sucrose content, and intestinal disaccharidase activity in both diabetic and non-diabetic rats. For overdose toxicity, a dose twenty times higher than $ED_{min}$ was selected. In-vitro assays included glucose uptake and adsorption capacity, as well as DPPH scavenging activity.

**Results:** Phytochemical screening revealed significant levels of phenols (12.75 mg/g), flavonoids (8.16 mg/g), and tannins (3.08 mg/g), all known for their potent ability to neutralize free radicals associated with diabetes. In the DPPH scavenging assay, MKEE exhibited dose-dependent radical scavenging activity, with an $IC_{50}$ of 237.10 µg/ml, comparable to ascorbic acid's $IC_{50}$ of 144.86 µg/ml. MKEE significantly reduced ($p < 0.001$) postprandial glucose absorption in a dose-dependent manner and improved glucose tolerance. The extract enhanced GIM and decreased disaccharidase activity compared to reference. It also reduced unabsorbed sucrose levels in the GI tract and increased insulin secretion from isolated rat islets. Glucose uptake in yeast cells increased, highlighting the potential to enhance glucose utilization. Safety data showed that MKEE was non-lethal, and no significant histopathological changes were observed in rodents, unlike metformin and miglitol, which caused the death of all populations.

**Conclusion:** The study showed that MKEE reduces hyperglycemia by delaying carbohydrate digestion, enhancing insulin secretion, and improving glucose absorption. However, compound isolation and clinical trials are required for an effective comparison with current therapies.

**Keywords:** DPPH scavenging; GI motility; *Murraya koenigii*; postprandial hyperglycemia

# Prevalence and Antibiotic-Resistant Patterns of *Klebsiella Pneumoniae* in Street Foods of Dhaka, Bangladesh: Implications for Public Health and Safety

ZANNATUL FIRDAUS[1], TULI BASAK[1], MD. SADDAM HOSSAIN[1], MD. ABU HASHEM[2], SURAIA NUSRIN[1]*

[1]*Department of Genetic Engineering and Biotechnology, East West University, A/2, Jahurul Islam Avenue Jahurul Islam City, Aftabnagar, Dhaka-1212, Bangladesh*

[2]*Microbial Biotechnology Division, National Institute of Biotechnology, Ganakbari, Ashulia, Savar, Dhaka-1349, Bangladesh*

*sunewu@ewubd.edu

## ABSTRACT

**Background:** In Bangladesh, street foods have often been found to harbor pathogenic microbes like *Klebsiella pneumoniae*, which represents a major environmental health hazard because of its ability to develop and spread antibiotic resistance easily. This opportunistic pathogen can rapidly exchange antimicrobial resistance genes with other organisms. Recent reports from Southeast Asia indicate a death toll of nearly 2.5 million people in 2019 due to sepsis caused by antibiotic-resistant strains of *K. Pneumoniae*.

**Objective:** This study aimed to investigate the presence and antibiotics resistant pattern of *K. Pneumoniae* from distinctive street foods sold by numerous street stalls in Dhaka, Bangladesh.

**Materials and methods:** All the isolates of *K. pneumoniae* were identified using microbiological and biochemical tests, and MALDI-TOF. The antibiotic disk diffusion test was performed using 6 different antibiotics (Ampicillin, Erythromycin, Chloramphenicol, Nalidixic Acid, Tetracycline, and Trimethoprim) according to CSLI -2020. Further confirmation of the species was conducted through 16S rRNA PCR amplification, and sequencing using Sanger method.

**Results:** Among 19 samples, 5 isolates of *K. pneumoniae* were detected in 4 samples with concentrations ranging from 1.5 x 104 to 3.4 x 104 CFU/ml. The highest and lowest concentrations of *K. pneumoniae* were found in aloe vera juice and lacchi, respectively. Antibiotic resistance properties of the selected *K. pneumoniae* strains were analyzed using disk diffusion methods. All 5 isolates were resistant to Ampicillin and Erythromycin while sensitivity was recorded for Chloramphenicol, Nalidixic Acid, Tetracycline, and Trimethoprim with a maximum zone diameter of 27mm.

**Conclusion:** *K. pneumoniae* are potential pathogens. Thus, this study suggests that a strong risk analysis arrangement is crucial for the risk management of street foods to ensure public health and safety in Bangladesh.

**Keywords:** Antibiotic resistance; biochemical test; *Klebsiella pneumoniae*; microbial contamination; public health safety

# Risk of Obesity in Relation to Vitamin D Receptor (VDR) Gene Polymorphisms in Bangladeshi Population: A Case-control Study

**MD. HIJBULLAH, ANNUR FERDOUS[1], MUNIRA JAHAN RAISA, NAFIZ IMTIAZ SIAM, SHATABDY BARUA, MD SHAKI MOSTAID***

*Department of Pharmaceutical Sciences, Faculty of Health and Life Sciences, North South University, Plot 15, Block B, Bashundhara R/A, Dhaka-1229, Bangladesh*

*shaki.mostaid@northsouth.edu

## ABSTRACT

**Background:** Obesity is a chronic metabolic disorder and its prevalence in Bangladesh is increasing at an alarming rate. It has also been associated with increased cholesterol levels in the blood and is suggested to be responsible for cardiovascular diseases and various metabolic disorders. Previous reports have suggested a significant association between Vitamin D receptor (VDR) gene polymorphisms and obesity but with inconsistent results.

**Objective:** Our study objective was to investigate the relationship between two single nucleotide polymorphisms (SNPs) (ApaI, rs7975232 and TaqI, rs731236) of the VDR gene and the risk of obesity in the Bangladeshi population.

**Materials and Methods:** We recruited 124 obese people and 126 healthy individuals for this case-control study. Anthropometric and clinical parameters were measured. Genotyping was performed using Polymerase Chain Reaction-Restriction Fragment Length Polymorphism (PCR-RFLP). Data analysis was done by using SPSS version 25. Multivariate logistic regression analysis was used to determine the adjusted odds ratio (OR) with 95% confidence intervals (CI) and p-values.

**Results:** For ApaI, rs7975232 (C>A) polymorphism, CA Heterozygous genotype carried 1.93 folds more risk of developing obesity (OR=1.93, 95% CI= 1.10-3.41, p=0.023). On the contrary, in the case of TaqI, rs731236 (T>C), no genotype has shown a significant association with the risk of obesity in the Bangladeshi population. In addition, we found that the presence of hypertension (p=.002), and a family history of obesity (p=0.018) increase the risk of obesity. The analysis of obese and non-obese patients with varied clinicopathological features revealed no significant relationship for both polymorphisms.

**Conclusion:** We found that polymorphism of ApaI (rs7975232 C>A) in the VDR gene increases the risk of developing obesity in the Bangladeshi population.

**Keywords:** Bangladesh; obesity; rs7975232; rs731236; VDR

# Evaluation of Membrane Stabilizing, Thrombolytic, Anti-Diarrheal and Antipyretic Activities of Ethanolic Extracts of *Hoya parasitica* Variegata and *Crotalaria pallida* Aiton

**JUBAYER HOSEN, PUJA PAL, AFIFA PARVIN SHANTA, NISRAT JAHAN, ZEBUNNESA AHMED, ISRAT JAHAN BULBUL***

*Department of Pharmacy, Southeast University, Tejgaon, Dhaka-1208*

*israt.bulbul@seu.edu.bd

## ABSTRACT

**Background:** Traditional medicine has long utilized plant-based remedies to treat a variety of ailments, including inflammation, fever, and blood-related disorders. Despite their widespread use, there is a critical need for scientific validation to substantiate the therapeutic claims associated with these plants. *Hoya parasitica* Variegata (Apocynaceae) and *Crotalaria pallida* Aiton (Fabaceae) are two plants reputed for their medicinal properties, yet their pharmacological potential remains largely unexplored.

**Objectives:** This study aimed to systematically evaluate the membrane-stabilizing, thrombolytic, anti-diarrheal, and antipyretic activities of crude ethanolic extracts from *H. parasitica* and *C. pallida* using a combination of in vitro and in vivo models.

**Methods and Materials:** The thrombolytic activity of the extracts was assessed using an in-vitro clot lysis assay, with streptokinase serving as a positive control. To evaluate membrane-stabilizing effects, hypotonic buffer- and heat-induced hemolysis tests were performed on red blood cells (RBC), with acetylsalicylic acid used as the standard. The anti-diarrheal effects of the extracts were tested using a castor oil-induced diarrhea model in mice, while antipyretic activity was assessed using a brewer's yeast-induced pyrexia model, also in mice. The extracts were administered at doses of 100, 150, and 200 mg/kg body weight.

**Results:** The thrombolytic activity of *H. parasitica* and *C. pallida* extracts demonstrated clot lysis rates of 75.93% and 73.64%, respectively, compared to 85.17% for streptokinase. In the hypotonic buffer-induced hemolysis test, the extracts inhibited RBC hemolysis by 64.53% and 68.23%, while in the heat-induced hemolysis test, they exhibited inhibition rates of 62.89% and 68.14%, respectively, which are comparable to acetylsalicylic acid's inhibition rates (79.68% and 74.49%). In the castor oil-induced diarrhea model, both extracts significantly ($P<0.05$) reduced the frequency of diarrheal feces at all tested doses. Additionally, in the brewer's yeast-induced pyrexia model, the extracts significantly ($P<0.05$) reduced elevated temperatures in a dose-dependent manner, particularly during the 21st, 22nd, and 23rd hours of treatment.

**Conclusion:** The findings suggest that the crude ethanolic extracts of *H. parasitica* and *C. pallida* possess significant thrombolytic, membrane-stabilizing, anti-diarrheal, and antipyretic properties, supporting their potential use in treating these conditions. Further research should focus on isolating and characterizing the active compounds responsible for these effects.

**Keywords:** Antipyretic; anti-diarrheal; *Crotalaria pallida; Hoya parasitica;* membrane stabilizing

# Evaluation of Anxiolytic and Sedative Activities of Methanolic Extracts of *Actephila excelsa* (Dalzell) Muell Leaves

**SADIA UZMA SIDDIQUA, SABIHA FERDOWSY KOLY, SHEREJAD SANAM[1], ISRAT JAHAN BULBUL***

*Department of Pharmacy, Southeast University, Tejgaon, Dhaka-1208, Bangladesh*

**israt.bulbul@seu.edu.bd*

## ABSTRACT

**Background:** Plant-based products, particularly those derived from medicinal herbs, have been utilized in traditional medicine for centuries due to their therapeutic properties. These natural compounds often exhibit a broad spectrum of biological activities and have the potential to manage various health conditions, including central nervous system (CNS) disorders, with fewer side effects compared to synthetic drugs. *Actephila excelsa*, a plant native to Southeast Asia, is traditionally used for its medicinal properties, but its CNS and analgesic effects remain underexplored.

**Objective**: This research focuses on the evaluation of the CNS depressant and analgesic activities of the methanolic leaf extract of *Actephila excelsa* (MEAE) in animal models.

**Materials and Methods**: Fresh leaves of *Actephila excelsa* were collected, dried, and processed into a methanolic extract. The CNS depressant activity was assessed using hole-cross, open-field, forced swimming, and rota-rod tests, while the analgesic activity was evaluated through acetic acid-induced writhing and Eddy's hot plate tests. Swiss albino mice were used as the experimental subjects, divided into control, standard, and test groups receiving 200 mg/kg and 400 mg/kg of MEAE. Diazepam and diclofenac served as the reference drugs for CNS and analgesic studies, respectively. Data were statistically analyzed using GraphPad Prism 8.

**Results**: The results for both open field and hole cross tests showed a significant ($P < 0.001$) reduction of motor activity and exploratory behavior compared to standard. In an open field test, plant extract at 200 mg/kg showed maximum inhibition at the 90-minute interval (24.26%), while at 400 mg/kg, it was at the 120-minute interval (40.29%). In the hole cross method, the plant extract at doses of 200 mg/kg and 400 mg/kg body weight demonstrated the highest inhibition rates at a 90-minute interval, with values of 48.21% and 75%, respectively. Besides, it also decreased rota rod performances and showed remarkable CNS depression in the forced swim method. In the rota rod test, compared to diazepam, plant extract at 200 mg/kg showed a maximum 75.65% of inhibition at 3$^{rd}$ observation (30 minutes), which was increased at 400 mg/kg dose with 85.59% inhibition.

**Conclusion**: The findings suggest that *Actephila excelsa* possesses substantial CNS depressant and analgesic activities, supporting its traditional use in managing CNS-related disorders and pain. Further studies are warranted to isolate and characterize the active constituents responsible for these effects.

**Keywords:** *Actephila excelsa*; analgesic; CNS depressant

# The Effects of Environmental Heat Stress on The Toxicity of Imidacloprid During Cartilage Formation

**ALAM KHAN***

*Department of Pharmacy, University of Rajshahi, Rajshahi-6205, Bangladesh*
*alamkhan@ru.ac.bd

## ABSTRACT

**Background:** Rising temperatures due to global warming may enhance the toxicity of certain pesticides, potentially causing greater harm to non-target organisms, including humans.
**Objective:** We aimed to study the impact of imidacloprid (IMI), a neonicotinoid insecticide, on embryonic development under various heat stress conditions.
**Materials and methods:** Zebrafish (Danio rerio) were used as a model animal to evaluate the effects of imidacloprid (5-200 ppm) at different temperatures (32˚C, 34˚C, and 37˚C). Cartilage development was assessed using alcian blue staining, while cell death was monitored using acridine orange staining.
**Results:** Our results showed that embryonic development accelerated at 32˚C but significantly slowed at higher temperatures (34˚C and 37˚C), particularly when exposed to imidacloprid (50, 100, 200 ppm) in elevated heat (IMI + 34˚C and IMI + 37˚C). All treatment groups exhibited shortening of the lower jaw, with head cartilage length and width significantly reduced under the combined influence of heat and IMI. Eye depth and intraocular distance increased significantly under these conditions. Additionally, cell death increased with higher IMI concentrations at elevated temperatures.
**Conclusion:** Thermal stress from global warming heightened the harmful effects of imidacloprid on cartilage formation during zebrafish embryogenesis. This suggests that human fetuses and infants, particularly in agricultural areas, may be at risk, especially during the extreme heat of summer.
**Keywords:** Cartilage; embryonic development; global warming; imidacloprid; zebrafish

# Patterns of Antimicrobial Resistance in Bacteria Isolated from Hospital Settings in Dhaka City, Bangladesh

**SAMSUNNAHAR BEGUM, SANJIDA CHOWDHURY IVY, HUMAYRA ZAMAN HIMI, SALSABIL ISLAM SABILA, MOHAMMAD SHAHRIAR***

*Department of Pharmacy, School of Medicine, University of Asia Pacific, 74/A, Green Road, Dhaka-1205, Bangladesh*

*shahriar@uap-bd.edu

## ABSTRACT

**Background:** Identifying antimicrobial resistance (AMR) patterns helps in choosing effective antibiotics for treating infections and plays a crucial role in global health initiatives aimed at curbing the rise of drug-resistant infections.

**Objective:** The study identified bacterial isolates and antibiotic sensitivity patterns of the bacterial isolates of different hospital environments in Dhaka City, Bangladesh, from July 2023 to December 2023.

**Materials and methods:** A sum of 58 samples (surfaces, inanimate objects and medical devices swab) from outdoor areas, ICUs and OTs from four different hospitals in Dhaka city, from the period of July 2023 to December 2023. The samples were aseptically and carefully transferred to the laboratory for further testing. The isolates were examined using bacterial culture techniques and different biochemical tests. According to the CLSI guidelines, testing for antimicrobial resistance using the disk diffusion method was applied to each isolate, and antibiogram profiles were determined.

**Results:** Among the isolates Gram-positive and negative were 67.02% and 32.97%, respectively. *Staphylococcus aureus, S. epidermidis, Staphylococcus* spp., *Streptococcus* spp., *Micrococcus* spp., *Bacillus* spp., *Salmonella Typhi, Salmonella Paratyphi, Salmonella* spp. were characterized in the outdoors, ICUs, and OTs (33.30%. 27.27%, 42.42%), (38.88%, 44.44%, and 16.66%), (30.76%, 30.76% and 38.46%), (36.36%, 18.18% and 45.45%), (45%, 20% and 35%), (31.25%, 25% and 43.75%), (25% and 75%), (50%, 25%, and 25%), (25% and 75%), and (20%, 30% and 50%) respectively. *Enterobacter* spp., *Klebsiella* spp., *Shigella* spp., *Proteus mirabilis* and *Acinetobacter* spp. were also examined. The isolates resisted ceftriaxone, aztreonam, nalidixic acid, and cefepime.

**Conclusion:** Detecting harmful bacteria in hospital settings in this research suggests they can act as carriers for disease spread.

**Keywords:** Antibiotics resistance; drug-resistant infections; hospitals

# Knowledge, Awareness, and Practice of Contraceptive Methods among Married Women in Outpatient Department of Tertiary Hospital in Dhaka

AFROZ SABRINA*, FARAH SHAYELA, TANZINA AHMED CHAKLADER

*Department of Community Medicine, Dhaka Community Medical College, 190/1, Boro Mogbazar, Dhaka-1217, Bangladesh*

*afrozsabrina1234@gmail.com

## ABSTRACT

**Background:** Population explosion is a global issue, particularly in developing countries like Bangladesh. Effective family planning can prevent mortality and pregnancy-related problems. Bangladesh's reproductive behavior has changed over the past three decades, but variations exist across regions and socioeconomic strata.

**Objective:** To determine the awareness and practices of contraceptive use among married women in an outpatient department of a tertiary hospital in Dhaka.

**Materials and methods:** A descriptive cross-sectional study was conducted at Dhaka Community Medical Hospital, where 161 reproductive age groups of females were selected purposively from the gynea and obs outpatient department. A pre-tested, semi-structured questionnaire was employed, and data was gathered via in-person interviews for 3 weeks.

**Results:** Out of 161 respondents, 86 (53.4%) were in the age group of 30-49 years (female reproductive age). Most of them knew about contraceptive methods. About 60% of them knew that the contraceptive method prevents unwanted pregnancy, and three-fourths had knowledge of the efficacy of various family planning methods. Regarding the practice of contraceptive methods, nearly 80% used family planning methods. Half of the people use oral contraceptive pills, but unfortunately, most people don't know the side effects of these pills.

**Conclusion:** In Bangladesh, a large proportion of women are proficient in the use of contraceptive methods. Healthcare professionals must encourage women who do not currently have coverage to opt for contraception. Improved awareness would result from easily available counseling and services related to contraception. Adopting a consistent contraceptive regimen requires positive behavioral change.

**Keywords:** Awareness; contraceptive pill; family planning; practice; pregnancy

# Prevalence of Hypertension among the Rohingya Refugee of Bangladesh

**FARAH SHAYELA[1]*, MOHAMMAD SHAKIL[2], MAHEJABIN FARZANA[1]**

*[1]Department of Community Medicine, Dhaka Community Medical College, 190/1, Boro Mogbazar, Dhaka-1217, Bangladesh*

*[2]Department of Community Medicine, Army Medical College, Cumilla Cantonment, Cumilla-3500, Bangladesh*

*shayela.farah@gmail.com*

## ABSTRACT

**Background:** Since 2017, around 750,000 Rohingya refugees have fled violence in Myanmar into Cox's Bazar District in Bangladesh. It is important to know their current health status because, without this information, equal and equitable health service provision is not possible.

**Objective:** To assess the prevalence and influencing risk factors of hypertension among Rohingya refugees in Bangladesh.

**Materials and methods:** This study was conducted as a cross-sectional descriptive study from December 2020 to February 2020. The study population was all age groups over 18 years, and the study place was Rohingya refugees in Ukhiya camp, Cox's Bazar. The sample size was 474. Data were collected using a self-administered semi-structured questionnaire with face-to-face interviews.

**Results:** In our study, less than half of the respondents had proper hypertension knowledge. In concern of family history of hypertension, we found that 30.4% of respondents had a family history of hypertension. The prevalence of hypertension among the Rohingya refugees was 21.9%, and among them, 61.5% were taking antihypertensive drugs. Still, of them, only 40.62% were taking anti-hypertensive drugs regularly. Regarding risk factors for hypertension, most of them told about a family history of hypertension (28.85%), followed by smoking (27.88%), a sedentary lifestyle (13.46%), overweight/obese (12.50%), age over 35 (9.62%), use of OCP (4.81%), and others (2.88%). Regarding complications of hypertension, most of them talked about heart attack (41.35%), followed by stroke (38.46%), and heart failure (14.42%).

**Conclusion:** Hypertension is a significant public health burden today, and its treatment and control are inadequate. Several modifiable lifestyle activities have been linked to hypertension and should be evaluated as potential therapeutic targets. The study's findings can be utilized to inform public health programs aimed at controlling hypertension in Rohingya refugee camps.

**Keywords:** Awareness; hypertension; prevalence; risk factors; Rohingya refugee camp

# Elucidation of Molecular Mechanism Underlying Protective Effects of Delphinidin and Related Glycosides Against Colon Cancer: A Network Pharmacology and Molecular Docking Based Approach

**NAZIFA TABASSUM*, SAJJAD HOSSEN SOURAV, NURUN NAHAR, SK. SALMAN ARAF, BASRAT JAHAN DEEA**

*Department of Pharmacy, East West University, Dhaka-1212, Bangladesh*
*nazifa.tabassum@ewubd.edu*

## ABSTRACT

**Background:** Delphinidin and its glycosides are well-known pigments of the anthocyanin family, which impart blue-red hue to a wide variety of flowers and fruits. Grapes, beets, pomegranates and brinjal etc. are common sources of the coloring agent and its glycosides. Several research has established its anti-cancer potential against colon, endothelial, breast, prostate and skin cancers.
**Objective:** The present study aimed at elucidating the underlying mechanism by which delphinidin and its glycosides impart their anti-cancer effects against colon cancer using a network pharmacology-based approach.
**Materials and methods:** The putative targets of delphinidin and nine of its reported glycosides were collected from SwissTargetPrediction, whereas the genes involved in colon cancer were obtained from GeneCards and DisGeNet. STRING database (version 12.0) was used to construct a protein-protein interaction (PPI) network for genes common to both delphinidin and its glycosides and colon cancer. Node degree analysis using Cytoscape (version 3.10.1) revealed the top five genes of the PPI network. DAVID 6.8 was utilized to perform gene ontology (GO) functions and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway enrichment analysis. The likelihood of causing colon carcinoma by the identified target proteins was evaluated by VarElect. Finally, to validate the findings, molecular docking against top five proteins obtained from PPI was done.
**Results:** In total, 216 target genes of delphinidin, its glycosides and 1570 genes of colon cancer were analyzed, of which 72 common genes were identified. The PPI network identified TP53, SRC, PTK2, PIK3R1 and EGFR as highly possible targets. In total, 360 biological processes, 61 cellular components and 97 molecular functions were GO enriched, and 144 KEGG pathways (including HIF-1, transcriptional misregulation, colorectal cancer) were found to be associated with common genes. Phenotype analysis confirmed the association of top five genes with 72.8%, 92%, 83%, 54.4% and 77.6% likelihood of causing the disease. Docking studies revealed docking scores ranging from -7.5 kcal/mol to -8.4 kcal/mol between the ligand and the top five selected proteins.
**Conclusion:** The present work provides encouraging results for considering delphinidin as a potential candidate for the treatment and prevention of colon cancer. Further research is required to establish a detailed application of delphinidin and its glycosides.
**Keywords:** Colon cancer; delphinidin; molecular docking; network pharmacology

# Susceptibility of Bangladeshi University Going Students to Gastroesophageal Reflux Disease (GERD) and Evaluation of Its Associated Factors: A Cross-sectional Study

**TASHFIA HOSSAIN[1], IPSHITA FARIHA MAHMOOD[1], NAZIFA TABASSUM[2], SOWKAT JAHAN SHIPA[2], MD. SABBIR HOSSAIN[3]***

*[1]School of Pharmacy and Public Health, Independent University, Dhaka-1229, Bangladesh*

*[2]Department of Pharmacy, East West University, Dhaka-1212, Bangladesh*

*[3]Department of Clinical Pharmacy and Pharmacology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*mdsabbir@du.ac.bd

## ABSTRACT

**Background:** Gastroesophageal reflux disease (GERD) is a well-known clinical condition that is associated with significant morbidity and affects the quality of the patient's life. Heartburn, regurgitation, chest discomfort, and belching are some common symptoms of GERD. Globally, nearly 800 million people suffer from this disease, including many Bangladeshis. The disease is prevalent among the population of all ages, including young adolescents like university-going students.

**Objective:** Considering the high prevalence and variety of associated factors, the study was conducted to determine the GERD prevalence among Bangladeshi university-going students using the frequency scale for the symptoms of gastroesophageal reflux disease (FSSG) score and to find out what sociodemographic, dietary, and lifestyle-related factors are linked to the disease.

**Materials and methods:** The study was based on descriptive cross-sectional analysis. After a comprehensive literature review, a questionnaire was developed with some pre-structured options kept in the sociodemographic, FSSG parameters (FSSG score > 8 indicated GERD), dietary, and lifestyle sections. The tool was disseminated among students of different universities in Bangladesh. After receiving the responses, all the data was analyzed using SPSS software (version 26).

**Results:** Among the 402 study participants, 57.2% (n = 230) were female and 42.8% (n = 172) were male. The GERD prevalence was 45.5% (n = 183), which indicated the FSSG score was more than 8 among 45.5% of the individuals. Logistic regression analysis revealed that female gender (OR=1.60, CI=1.07-2.38), consumption of analgesic medications (OR=2.24, CI=1.37-3.65), presence of other GI disorder (OR=3.416, CI=1.650-7.072), anxiety (OR=2.35, CI=1.53-3.61), being stressed (OR=2.25, CI=1.46-3.49), being alone most of the time (OR=1.51, CI=1.02-2.26), fast food consumption (OR=1.61, CI=1.08-2.40), eating sour and spicy food regularly (OR=1.61, CI=1.07-2.42), quick eating habit (OR=1.85, CI=1.24-2.75), eating beyond fullness (OR=2.86, CI=1.81-4.52), less interval between dinner and sleep (OR=1.56, CI=1.02-2.39), poor sleep quality (OR=1.76, CI=1.18-2.62) were significantly associated with the occurrence of GERD symptoms.

**Conclusion:** GERD symptoms were seen among a large percentage of university students. Various sociodemographic, dietary, and lifestyle-related factors had an impact on the disease. These contributing factors should be positively modified to alleviate the burden of GERD symptoms.

**Keywords:** Associated factors; Bangladesh; GERD; prevalence; university students

# Toxicity and Clinical Outcome of AC-T Chemotherapy Regimen among Bangladeshi Breast Cancer Patients: A Follow-up Research

**MD. SHALAHUDDIN MILLAT[1,2], MD. SAIFUL ISLAM[2], MOHAMMAD SAFIQUL ISLAM[1]***

*[1]Department of Pharmacy, Noakhali Science and Technology University, Noakhali-3814, Bangladesh*

*[2]Department of Clinical Pharmacy and Pharmacology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*research_safiq@nstu.edu.bd

## ABSTRACT

**Background:** Chemotherapy-treated breast cancer individuals frequently experience severe drug reactions, which worsens the situation in developing countries like Bangladesh where the safety profile of the medication is inadequate.

**Objective:** The focus of this research was to assess the toxicity and clinical outcomes of the doxorubicin, cyclophosphamide, and taxane-based (AC-T; either paclitaxel and docetaxel) regimen among Bangladeshi breast cancer patients.

**Materials and methods:** The National Institute of Cancer Research and Hospital (NICRH), located in Dhaka, Bangladesh, recruited patients for this potential follow-up research, which lasted from October 2022 to April 2024. AC-paclitaxel was administered to over 80% of patients, whereas AC-docetaxel was administered to the other patients. Clinical responses were estimated based on Response Evaluation Criteria in Solid Tumors version 1.1 (RECIST v1.1), whereas chemotherapy-associated toxicities were graded according to the Common Terminology Criteria for Adverse Events version 5.0 (CTCAE v5.0).

**Results:** The most common non-haematological adverse medication events recorded for both regimens were nausea, Vomiting, diarrhea, constipation, fever, edema, dry mouth, mouth sores, fatigue, dysgeusia, skin hyperpigmentation, gastritis, peripheral neuropathy, and myalgia/arthralgia. The most prevalent haematological toxicity was anemia, then neutropenia, leukocytosis, lymphocytosis, leukopenia, febrile neutropenia, neutrophilia, lymphocytopenia, thrombocytosis, and thrombocytopenia. Study participants experienced a range of organ-specific toxicities, including hepatotoxicity, nephrotoxicity, cardiotoxicity, lung toxicity, and bone toxicity. In the case of both AC-paclitaxel and AC-docetaxel regimens, more than 50% of patients responded positively. Less than 20% of our study participants died within or after five years of their cancer diagnosis.

**Conclusion:** In Bangladesh, people with breast cancer undergoing an AC-T regimen are frequently experiencing toxic consequences, especially haematological and non-haematological. Therefore, they may require previous support and strict monitoring during chemotherapy, based on their age, body surface area, and initial blood levels.

**Keywords:** Bangladesh; breast cancer; chemotherapy; clinical outcome; toxicity

# *In Vivo* and *In Silico* Anxiolytic and Sedative Activities of Ethanol Extract of *Aegiceras corniculatum* (L.) Blanco Leaves

H. M. SHADID HOSSAIN SNIGDHA*, SHAIKH JAMAL UDDIN

*Pharmacy Discipline, Khulna University, Khulna-9208, Bangladesh*
*shadidhossain89@gmail.com

## ABSTRACT

**Background:** *Aegiceras corniculatum* (L.) Blanco, a species of shrub or tree mangrove in the Pimulaceae family known as Khalsi time and again, is widely distributed in coastal estuarine areas extraordinarily in the Sundarbans. The abundance of secondary metabolites in crude leaf extracts has proclaimed *Aegiceras corniculatum* (L.) Blanco as an influential source of anxiolytic and sedative medicine.

**Objective:** The prime objectives of this study were to evaluate the anxiolytic and sedative activities of the ethanol extract of *Aegiceras corniculatum* (L.) Blanco leaves.

**Materials and methods:** Pulverized leaves of the plant were subjected to ethanol extraction, and the extract (ACEE) was subsequently used for evaluating anxiolytic and sedative activities at 250 mg/kg and 500 mg/kg body weight in mice model. The anxiolytic activity was performed using the open-field test, swing test, hole cross test, tail suspension test, and marble bury test. Furthermore, the sedative activity was appraised using a sodium thiopental-induced sleep time test, dark light test, and forced swim test.

**Results:** The results stipulated that, at both 250 mg/kg and 500 mg/kg body weight, ACEE had a vigorous anxiolytic effect compared with an invariably recognized anxiolytic agent, diazepam. However, ACEE showed a very notable sedative impact at 500 mg/kg, with a 26.95% decrease in latency period and a 17.86% rise in sleep duration. Moreover, the experimental animals treated with the same dose of flumazenil and diazepam showed the most immobility (140.83 $\pm$ 4.76 seconds). In contrast, only ACEE at 500 mg/kg indicated the longest dark residence period (154.83 $\pm$ 8.23 seconds) exclusively. Additionally, the outcomes demonstrated that the impacts of the different treatment groups were significant ($p < 0.0001$). *In silico* studies of the leaf extract have revealed Corniculatolide A and 11-O-methylcorniculatolide A as potent anxiolytic and sedative compounds because of their interactions with the GABA receptor.

**Conclusion:** Overall, the findings suggest that in the future, *Aegiceras corniculatum* (L.) Blanco leaf will be a potential source of anxiolytic and sedative chemicals.

**Keywords:** *Aegiceras corniculatum*; anxiety; anxiolytic; sedation; Sundarbans

# Detection of Association of Vitamin D Receptor (VDR) Gene Polymorphism (rs731236) with Colorectal Cancer Risk in Bangladeshi Population

**MARINA AKTER, MOHAMMAD SAFIQUL ISLAM***

*Department of Pharmacy, Noakhali Science and Technology University, Noakhali-3814, Bangladesh*
*research safiq@yahoo.com

## ABSTRACT

**Background:** Colorectal cancer (CRC) ranks as the third most prevalent cancer globally. Vitamin D insufficiency is correlated with CRC, and VDR gene polymorphisms might clarify the inverse associations. Genome-wide association studies have shown multiple SNPs that increase the risk of CRC.

**Objective:** This study aimed to explore the relationship between CRC and the VDR rs731236 polymorphism in the Bangladeshi population and to create a present socio-demographic, clinic-pathological and genotyping data of colorectal cancer patients in Bangladesh.

**Materials and methods:** The VDR rs731236 variant was genotyped in 374 subjects (182 cases, 192 controls) using the PCR-RFLP method. The genotype frequency deviation under HWE was assessed through the $\chi 2$-test. The MedCalc software estimated the p-value, odds ratios, and 95% confidence intervals.

**Results:** The research discovered a link between VDR rs731236 variants and a higher risk of CRC in several genetic inheritance models. These are additive model 1 (AG vs. AA: OR = 1.77, $p < 0.05$); additive model 2 (GG vs. AA: OR = 2.17, $p < 0.05$); dominant model (AG+GG vs. AA: OR = 1.83, $p < 0.05$); over-dominant (AG vs. AA+GG: OR = 1.49, $p < 0.05$); and allelic model (A vs. G: OR = 1.59, $p < 0.05$). The recessive model showed a 1.66-fold higher risk, but the outcome was insignificant (GG vs. AA+AG: OR = 1.66, $p > 0.05$). Individuals with the AG+GG genotype living in urban areas are more susceptible to CRC (OR = 2.01). The rs731236 carriers aged > 50 (OR = 2.00) and with a family history of cancer (OR = 7.77) were linked to CRC, but for those with grade 2 cancer, it demonstrated a protective association (OR = 0.05).

**Conclusion:** Our analysis revealed that the VDR rs731236 polymorphism is associated with a significantly greater risk of CRC in the Bangladeshi cohort. More investigation with a bigger sample size should be conducted to substantiate the current outcome.

**Keywords:** Colorectal cancer, PCR; polymorphism, rs731236; vitamin D receptor

# Knowledge and Awareness of Antiplatelet Drugs among Pharmacy Students in Bangladesh: A Cross-Sectional Study

**TAMIMA ISLAM ANI, MAMUNUR RAHMAN*, SHAWKAT M ISLAM, TAREK AZIZ HRIDOY, SHAMSUDDIN SIKDER SUN, TAHIA RAHMAN, OMAR FARUK, AHAD ALAM**

*Department of Pharmacy, East West University, Jahurul Islam Avenue, Aftabnagar, Dhaka 1212*

*mnr@ewubd.edu

## ABSTRACT

**Background:** Currently, unhealthy lifestyles obligate many people in Bangladesh to take anti-platelet drugs, which reduce the chance of fatal thromboembolic events such as heart attack and stroke. Being a part of an integral healthcare system, pharmacy students need to keep updated with basic knowledge on the evolving antiplatelet drugs.

**Objective:** The objective of this study is to assess the knowledge and awareness of Bangladeshi pharmacy students on antiplatelet drugs and to correlate the outcome with various sociodemographic factors such as gender, study level, staying with family, the presence of health workers in friends or family, whether family members have cardiovascular diseases and reading journals or not.

**Materials and methods:** This cross-sectional study was conducted between May 2024 to August 2024; about 385 pharmacy students from different universities in Bangladesh took part in this research. Participants responded through in-person interviews and an online survey; a set of 12 questions, structured and general knowledge-based, related to antiplatelet drugs was distributed among the participants through a stratified sampling method. The outcome was categorized as "High" if the participants correctly answered a minimum 10 questions out of 12; "Medium" if the correct answer was between 6 to 9 questions and "Low" if the number of correct answers was below 6. Multinomial logistic regression and descriptive statistics were performed using STATA-16.

**Results:** About 19.87% (33) male participants and 20.54% (45) female participants scored high, while total 51.42% (198) participants scored low. Roughly 34.48% (10) of M. Pharm students scored high, but the percentage was only 19.10% (68) for B. Pharm students. Among the high scorers, 80.76% (63) students have at least one family member suffering from cardiovascular disease and 58.97% (46) students have a healthcare professional in their circle. Furthermore, journal readings and studying at M. Pharm level were found to be significantly associated ($p < 0.05$) with high scores compared to the low level of knowledge and awareness of antiplatelets.

**Conclusion:** Most of the Bangladeshi pharmacy students showed inadequate knowledge and awareness towards antiplatelet drugs. This finding suggests that more hands-on experiences are needed to strengthen the knowledge and awareness of updated insights on the drugs.

**Keywords:** Antiplatelets; awareness; Bangladesh knowledge; pharmacy students

# Lipid Nano-formulation of *Gynura procumbens* Leaf Extract Protects Liver and Kidney in Cisplatin-intoxicated Experimental Rats

**TAZREENA RAHMAN FAREEBA[1], MD. FAISAL BIN JALAL[1], PATRICIA PROVA MOLLICK[1], SHIMUL HALDER[2], MANIK CHANDRA SHILL[1]***

*[1]Department of Pharmaceutical Sciences, School of Health and Life Sciences, North South University, Dhaka-1229, Bangladesh*

*[2]Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*manik.shill@northsouth.edu

## ABSTRACT

**Background:** People with a history of liver disease are experiencing a rising incidence of chronic kidney disease (CKD). There is also a growing preference for herbal remedies due to their affordability and safety. However, their pharmacological potential is often questioned due to challenges with biopharmaceutical parameters. The same applies to a plant, namely *Gynura procumbens*, utilized traditionally in tropical Asia for its anti-hepatotoxic, anti-inflammatory, anti-hypertensive, and anti-diabetic properties. Although there are different nano-formulations to improve pharmacological effects, lipid-based drug delivery can be a potential alternative.

**Objective:** To enhance the hepatic and renal protective effects of *Gynura procumbens* leaf extract (GLE) through a simple, efficient lipid nano-formulation, this study aims to develop a self-microemulsifying drug delivery system (SMEDDS)

**Materials and methods:** *Gynura procumbens* leaves were collected, identified and extracted using ethanol. HPLC-DAD was used to analyze the phenolic components. SMEDDS-GLE were prepared by optimizing the ratio of oil, surfactants, and co-surfactant ratios, followed by characterization using electron microscopy (TEM) and dynamic light scattering (DLS). Organ protective efficacy of both GLE and SMEDDS-GLE were investigated in a cisplatin-induced hepatorenal injury rat model by analyzing the hepatorenal biochemical markers in the plasma (BUN, Creatinine, ALP, ALT and AST) alongside histopathological assessments. We have performed one-way ANOVA using GraphPad Prism-6 to analyze our results where p  0.05 was considered significant.

**Results:** Tiny micelles were formed by SMEDDS-GLE, with 231 nm being the mean droplet size, which improved GLE's water dispersion by at least 4.8 times compared to GLE alone. Hepatic injury in the cisplatin-induced (7.5 mg/kg; i.p.) rats was significantly reduced by oral treatment (75 mg-GLE per kg and 150mg/kg; p.o.) with SMEDDS-GLE shown by lower plasma biomarkers (ALT, AST, ALP). Similarly, GLE's nephroprotective effects were amplified by SMEDDS-GLE in the cisplatin-induced rats. Additionally, histopathological observation depicted clear improvement in the cellular structure of the liver and kidney in the SMEDDS-GLE-treated rats.

**Conclusion:** From the overall results, we can summarize that SMEDDS-based formulation can perhaps be considered a strategic option to improve the protective effect of GLE on the organs.

**Keywords:** *Gynura procumbens*; hepatoprotective; nephroprotective; self-microemulsifying drug delivery system

# Development of Immediate Release Vonoprazan Fumarate Tablet Utilizing the Quality by Design Approach and Its Comparative Analysis with Marketed Products

**SUMAYA AKTER, LAMIA AKHTER, AHASAN PASHA ARAF, MD. AMIRUL ISLAM, MD. JAHID HOSSAIN***

*Department of Pharmacy, Faculty of Sciences and Engineering, East West University, Dhaka-1212, Bangladesh*

**jahid.hossain@ewubd.edu*

## ABSTRACT

**Background:** Gastritis is a medical condition characterized by inflammation of the stomach lining, which can progress to larger open sores and is known as ulcers. Vonoprazan fumarate, approved by the US FDA in 2023, provides more rapid and sustained acid suppression compared to traditional anti-ulcer drugs. However, current literature reveals a significant gap in the development of suitable dosage forms using the quality by design (QbD) approach.

**Objective:** This study aims to develop and evaluate immediate-release tablets of newly approved vonoprazan fumarate using QbD approach. Additionally, it involves assessing the developed formulation by comparing its dissolution rate with marketed products.

**Materials and methods:** A $3^2$ full factorial design was employed for formulation using Design Expert software. In that study, croscarmellose sodium (CCS) and pregelatinized starch were taken as independent variables. The percent of drug release in 0.1 N HCl obtained after 15 minutes was selected as a response. Pre-formulation tests were carried out using FTIR and DSC to check the Drug-excipient interaction. After that, powder mixtures and granules were evaluated for precompression parameters. The tablets were then prepared by wet granulation method and post-compression parameters like disintegration time & in-vitro dissolution were assessed for the evaluation. The dissolution profile of the optimized formulation was subsequently compared with five commercially available products of vonoprazan fumarate.

**Results:** The analysis of FTIR spectra and DSC thermograms revealed no evidence of drug-excipient interactions or incompatibilities. Batches F1-F9 were prepared according to the parameters outlined by the software based on the design. Statistical data analysis of the response surface methodology distinguished an optimized formulation that employed the use of 20% CCS and 6% pregelatinized starch. The optimized formulation demonstrated a 95.02% release in acid media, exhibiting an identical or better release profile compared to the marketed formulation.

**Conclusion:** The study successfully demonstrated the application of the QbD approach in developing an immediate-release tablet of vonoprazan fumarate and compared its performance with marketed products. Future research should prioritize conducting clinical trials to validate the therapeutic efficacy and safety of the developed formulation.

**Keywords:** Design expert; full factorial design; quality by design; response surface methodology; vonoprazan fumarate

# Subcutaneous Delivery of Doxorubicin-loaded Gelatin Nanoparticles with NIR-triggered for Intense Skin Cancer Therapy

**TASMIHAW TANHA OISHI, SAODA ISLAM, MD. ANNUR SADMAN, FORHAD BIN FARUK, SHAZID MD. SHARKER***

*Department of Pharmaceutical Sciences, School of Health and Life Sciences, North South University, Block # B, Bashundhara R/A, Dhaka-1229, Bangladesh.*

*shazid.sharker@northsouth.edu

## ABSTRACT

**Background:** The subcutaneous (SC) administration of chemotherapeutic agents, combined with near-infrared (NIR) light, can target skin tumours by promoting localized drug release and enhancing the effectiveness of chemotherapy.

**Objective:** This study aims to explore the potential of subcutaneous delivery of doxorubicin (Dox)-loaded gelatin nanoparticles (NPs) alongside NIR-induced photothermal therapy to improve localized Dox release and cytotoxic effects in skin cancer therapy.

**Materials and methods:** Gelatin nanoparticles (NPs) loaded with doxorubicin (Dox) and the NIR-responsive agent indocyanine Green (ICG) were synthesized using ionic interactions. These Dox/ICG-loaded gelatin NPs were evaluated for their efficacy in DMBA/TPA-induced in vivo mice tumor model with NIR laser (808 nm) irradiation.

**Results:** The gelatin NPs size and surface properties were confirmed in FE-SEM/EDX and zeta potential analysis. Histological analysis (H&E staining) confirmed sustained Dox release following subcutaneous administration of the Dox/ICG-loaded gelatin NPs. Both in vitro and in vivo studies demonstrated that these NIR-responsive nanoparticles generated photothermal heat, which facilitated precise, localized therapeutic activity.

**Conclusion:** The findings offer that SC administration of chemotherapy, combined with NIR-triggered photothermal activation, may concentrate cytotoxic agents at skin tumor site to enhance chemotherapy efficacy.

**Keywords:** Area-specific chemotherapy; doxorubicin delivery; NIR-laser; photothermal-responsive; subcutaneous route

# Pharmacological Investigation of Ethanolic Leaf Extract of *Chassalia curviflora*: A Medicinal Plant of Bangladesh

**SURAIYA AKTHER KEYA, TASMIA ISLAM PROGGA, ISRAT JAHAN BULBUL, YESMIN BEGUM***

*Department of Pharmacy, Southeast University, Tejgaon, Dhaka-1208, Bangladesh*

*yeasmin.begum@seu.edu.bd*

## ABSTRACT

**Background:** The natural properties of plants that improve health outcomes and develop new therapeutic options are of great importance in medical science. New phytochemicals with potential pharmacological effects will be one of the major areas of ethnopharmacology.

**Objective:** The study aimed to evaluate phytochemicals, analgesic, anxiolytic, cytotoxicity, & thrombolytic potentials of the ethanolic leaf extract of *Chassalia curviflora* (EECC), a flowering tropical shrub from the family Rubiaceae, predominantly found in South and East Asia.

**Materials and Methods:** The phytochemical screening was carried out using standard protocols. The analgesic efficacy was evaluated using the acetic acid-induced writhing test, with indomethacin (10 mg/kg) acting as a reference. The anxiolytic activity was investigated using the hole cross and open field tests (clonazepam 1 mg/kg as control). Test dosages were 100 and 200 mg/kg of body weight for the analgesic and anxiolytic in mice models. The cytotoxicity was evaluated using the brine shrimp lethality test. Human blood was used to measure thrombolytic potential utilizing streptokinase as standard.

**Results:** Phytochemical screening of EECC indicated the presence of flavonoids, steroids, terpenoids, tannins, phenols, and carbohydrates. EECC significantly ($p<0.05$) inhibited writhing in mice at doses of 100 mg/kg (18.84%) and 200 mg/kg (36.23%) body weight, with a 40.58% inhibition compared to indomethacin. In CNS tests, open field method, EECC demonstrated significant ($p<0.001$) and dose-dependent anxiolytic effects, with 63.35% and 84.35% movement inhibition at 100 and 200 mg/kg body weight, & in hole cross tests, EECC showed significant ($p<0.001$) and dose-dependent anxiolytic effects, with 40%, and 80% movement inhibition at 100 and 200 mg/kg body weight, compared to standard clonazepam (100% movement inhibition). In the brine shrimp assay, EECC showed cytotoxic properties with the LC50 of 48.19 µg/ml, compared to 21.26 µg/ml for the standard vincristine sulphate. At 10 mg/ml, EECC had 84.86% thrombolytic activity, while streptokinase demonstrated 84.87%.

**Conclusion**: The significant research accomplished by the *Chassalia curviflora* will improve our understanding of Bangladeshi species and necessitate the identification of chemicals possessing analgesic, anxiolytic, cytotoxic and thrombolytic properties that would add an ethnopharmacological value.

**Keywords:** Analgesic; anxiolytic; *Chassalia curviflora*; thrombolytic

# *In Vitro* and *In Vivo* Investigation of Pharmacological Potentials of *Gynura procumbens*

**TASMIA ISLAM PROGGA, SURAIYA AKTHER KEYA, YESMIN BEGUM, FARHANA RUMI, NUSRATUN NAHAR***

*Department of Pharmacy, Southeast University, Tejgaon, Dhaka-1208, Bangladesh*

*nusratun.nahar@seu.edu.bd*

## ABSTRACT

**Background:** *Gynura procumbens*, an ancient medicinal plant from tropical Asia, is known for its antioxidant, analgesic, and anti-inflammatory properties. However, its pharmacological potential has not been fully investigated.

**Objective**: The purpose of this study is to assess the phytochemical composition and pharmacological activity of *Gynura procumbens* leaf extract (MEGP), including its analgesic, anxiolytic, antioxidant, cytotoxic, and thrombolytic properties.

**Materials and Methods**: The conventional procedures were used for phytochemical screening. The acetic acid-induced writhing test was used to evaluate the analgesic activity of MEGP, with indomethacin (10 mg/kg) serving as a reference. The hole cross and open field tests were conducted to examine anxiolytic potential (clonazepam 1 mg/kg as control). Doses of 100 and 200 mg/kg were used to investigate the analgesic and anxiolytic properties. The assay for free radical scavenging with DPPH was utilized to ascertain the antioxidant capacity. The brine shrimp lethality bioassay was used to evaluate cytotoxicity. Human blood was used to assess the thrombolytic potential (using 100 µl of streptokinase as a reference).

**Results**: Phytochemical screening of MEGP revealed the presence of flavonoids, steroids, tannins, phenols and carbohydrates. MEGP reduced acetic acid-induced writhing by 16.67% at 100 mg/kg and 28.27% significantly ($P < 0.05$) at 200 mg/kg, compared to 40.58% for indomethacin. In CNS tests, MEGP showed dose-dependent anxiolytic effects, significantly ($P < 0.001$) reducing movement by up to 40% at 100 mg/kg and 80% at 200 mg/kg in the hole cross test and in the open field test, significantly ($P < 0.001$) compared to clonazepam's 88.23% and 85.10% inhibition, respectively. The DPPH assay showed an IC50 value of 39.77 µg/ml indicated moderate antioxidant activity when compared to the standard (IC50 3.79 µg/ml). The LC50 value in the brine shrimp assay was 48.21 µg/ml, where 21.26 µg/ml for the standard vincristine sulphate. MEGP exhibited 38.3% thrombolytic activity at 10 mg/ml, compared to 84.3% for streptokinase.

**Conclusion**: These findings indicate *Gynura procumbens* pharmacological potential and highlight the need for additional research to extract active chemicals and better understand their mechanisms.

**Keywords:** Analgesic property; antioxidant property; cytotoxicity; *Gynura procumbens*; thrombolytic activity

# Antibiotic Resistance Patterns and Presence of Resistance Genes in *Escherichia coli* isolates from Street Foods in Dhaka, Bangladesh

**MEHERUN NESSA POPY, SRIPARNA SARKER, RABIUL HUSSAIN CHOWDHURY, ESFAT M. SAIM BRISTHY, PREETI JAIN***

*Department of Pharmaceutical Sciences, School of Health and Life Sciences, North South University, Plot #15, Bashundhara R/A, Dhaka 1229, Bangladesh*

*preti.jain@northsouth.edu

## ABSTRACT

**Background:** The rapid emergence and global spread of antimicrobial-resistant bacteria pose a serious threat to public health. Street foods are key contributors to foodborne infections, often harboring pathogenic bacteria like *Escherichia coli*. The presence of various antibiotic-resistant bacteria in these foods can promote the transmission of antibiotic-resistant bacteria (ARB) and antibiotic-resistance genes (ARGs) to humans.

**Objective:** The purpose of this study was to isolate *E. coli* from street food samples collected from different areas in Dhaka, Bangladesh, and to examine their antibiotic resistance patterns. The study also aimed to detect genes responsible for multidrug resistance among the selected isolates.

**Materials and methods:** A total of 100 *E. coli* isolates were obtained from 50 street food samples. Kirby-Bauer disk diffusion technique was used to test the resistance pattern of the isolates against 14 antibiotics on Muller Hinton agar media. PCR Analysis was carried out to identify resistance genes.

**Results:** Among the isolates, 99% showed resistance to both cefoxitin & ampicillin. In addition, a high percentage of resistance was observed against vancomycin (93%), imipenem (88%), cefotaxime (72%), meropenem (66%) and colistin (56%). Moreover, all the isolates exhibited a multiple antibiotic resistance (MAR) index of 0.2 or above. MAR index 0.7 or above was observed in 4% of the isolates. PCR was used to identify the presence of antibiotic-resistance genes in the isolates that exhibited the highest percentage of resistance. Among the tested isolates, 80% were positive for the $bla_{NDM}$ and tetB genes, and 40% of the isolates tested positive for the ampC and aadA genes.

**Conclusion:** Street foods are regularly consumed by a large portion of population in Bangladesh. The high prevalence of antibiotic resistance in *E. coli* isolates obtained from the food samples, as well as the presence of resistant genes, emphasize the emergence of antibiotic resistance. The results obtained in this study significantly indicate the need to carry out regular surveillance programs to prevent the surge of this health concern.

**Keywords:** Antibiotic resistance genes; Bangladesh; *E. coli;* street foods

# Association of Vitamin D Receptor (VDR) Gene Polymorphisms with Obesity: A Meta-Analysis

**KAZI FARHIN LAMISA, MAHIMA AKHTER, LUBABA NAWAL, MUHAMMED MAHFUZUR RAHMAN, MD SHAKI MOSTAID***

*Department of Pharmaceutical Sciences, Faculty of Health and Life Sciences, North South University, Plot-15, Block-B, Bashundhara R/A, Dhaka-1229, Bangladesh*

*shaki.mostaid@northsouth.edu*

## ABSTRACT

**Background:** Obesity has emerged as a global health problem which increases the risk of many dangerous diseases, including diabetes, high blood pressure, cardiovascular diseases, and stroke. Vitamin D receptor (VDR) gene polymorphisms have been reported with obesity susceptibility, but results have been inconsistent.

**Objective:** In this present study, we carried out a meta-analysis to investigate the association of two VDR gene polymorphisms ApaI (rs7975232, A/C) and TaqI (rs731236, A/G), with risk of obesity.

**Materials and methods:** We searched PubMed, Embase, Google Scholar databases to find relevant articles. Our search yielded 9 research articles consisting of 1438 cases and 1245 controls covering years 2001 to 2024. Pooled odds ratio (OR) with 95% confidence intervals was calculated to find out the effect of both polymorphisms using both fixed and random effect models. Heterogeneity was calculated using Q test. Subgroup analysis, publication bias, and sensitivity analysis were also performed.

**Results:** We found that ApaI polymorphism provides a protective effect for obesity in the homozygous model (OR= 0.68, 95% CI= 0.54-0.68, P=0.003), heterozygous model (OR= 0.81, 95% CI= 0.98, P=0.03), and dominant model (OR= 0.76, 95% CI=0.64-0.92, P=0.004). Subgroup analysis showed that this protective effect is significant in Asians but not in Caucasians. In addition, we did not find any significant association for TaqI polymorphism with obesity in both Caucasians and Asians.

**Conclusion:** Polymorphism of ApaI on VDR gene provides a protective effect for obesity susceptibility especially in Asian populations.

**Keywords:** ApaI; meta-analysis; obesity; TaqI; vitamin D receptor

# Phenolic Compounds from *Justicia gendarussa* (Burm. f.) Leaf: Investigating Pharmacological Efficacy Against Analgesia, Oxidation, Hyperglycemia, Diarrhea and Microbes Through Phyto-Pharmacological and Computational Methods

FARZANA AKTER MUNNY[1], MAHAFUZA AKTER[2], MUSHTAHSIN FERDOUSI[3], MD. SOLAIMAN HOSSAIN[4], MEHEDI ISLAM[3]*

[1]*Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

[2]*Department of Pharmaceutical Technology and Biopharmaceutics, School of Health and Life Sciences, North South University, 74/A, Bashundhara, Dhaka-1229, Bangladesh*

[3]*School of Pharmacy, BRAC University, Kha-224, Bir Uttam Rafiqul Islam Avenue, Merul Badda, Dhaka-1212, Bangladesh*

[4]*Department of Pharmacy, School of Pharmaceutical Sciences, State University of Bangladesh, 696 Kendua, Kanchan, Rupganj, Narayanganj, Dhaka-1461, Bangladesh*

*mehedi.islam@bracu.ac.bd

## ABSTRACT

**Background:** Commonly referred to as willow-leaved Justicia, *Justicia gendarussa* (Burm. f.) is a member of the Acanthaceae family. It has been employed for the treatment of several health issues in multiple countries globally, including asthma, rheumatism, paediatric colics, eczema, and human immunodeficiency virus.

**Objective:** This research aimed to investigate the pharmacological potential of *J. gendarussa* leaf extract and to isolate several secondary metabolites as mediators of these activities.

**Materials and methods:** The study extracted and analyzed compounds from *J. gendarussa* leaves collected in Gazipur, Bangladesh. A methanolic extract was fractionated via the Kupchan method. Dichloromethane fraction compounds were isolated and identified using chromatography and  H NMR data. Pharmacological assays on Swiss albino mice assessed analgesic, antioxidant, hypoglycemic, and antidiarrheal activities. *In silico* molecular docking and visualization were performed using RCSB-PDB, PubChem, PyMOL, AutoDock Vina, and Discovery Studio Visualizer.

**Results:** The chemical analysis of *J. gendarussa* methanolic extract identified three compounds: lupeol, β-sitosterol, and 1-monostearin. Molecular docking studies for antioxidant, analgesic, hypoglycemic, antimicrobial, and antidiarrheal activities revealed strong binding affinities (–2.9 to –10.0 kcal/mol). Central analgesic activity showed 233.47%-time elongation ($p<0.001$), with peripheral activity showing 61.96% inhibition of writhing ($p<0.001$), compared to diclofenac sodium (585.20% and 79.35%), respectively. Hypoglycemic activity at 400 mg/kg reduced blood glucose by 48.84% ($p<0.01$), while standard (glibenclamide) achieved 71.06% reduction rate. Antidiarrheal activity showed a 36.36% reduction at 600 mg/kg ($p<0.01$), compared to loperamide (54.55%). The ethyl acetate fraction exhibited strong antioxidant activity (IC50 = 24.207 µg/ml) versus tert-butyl-1-hydroxytoluene (BHT) (23.159 µg/ml). The dichloromethane fraction was active against

gram-positive bacteria, while the hexane fraction showed activity against fungi and gram-positive/gram-negative bacteria.

**Conclusion:** The results suggest *J. gendarussa* leaves as a potential natural remedy for oxidative stress, arthritis, hyperglycemia, and diarrhea. However, further research is needed to elucidate the mechanisms of its bioactive compounds and their broader molecular targets.

**Keywords:** Antioxidant; *Justicia gendarussa*; molecular docking; pharmacological; phytochemicals

# Synthesis of Dimethoxyphenyl Acetamide Derivatives for Evaluating Antimicrobial Activity and *In Silico* Analysis

MD. TOUFIQUL ISLAM[1,2]*, ZIAUL ALAM TAREQ[2], MD. MOFAZZAL HOSSAIN[2], SUKUMAR BEPARY[1]*

[1]*Department of Pharmacy, Jagannath University, Dhaka-1100, Bangladesh*

[2]*Department of Pharmacy, University of Information Technology and Sciences, Vatara, Dhaka1212, Bangladesh*

**riyadtoufiq002@gmail.com*, *Sukumarsb@yahoo.com*

## ABSTRACT

**Background:** Microbial resistance is leading to treatment failures, thereby resulting in continuous efforts to discover novel antimicrobial agents. This led to this project to search for newer antibacterial scaffolds.

**Objective:** The main objective was to synthesize dimethoxyphenyl acetamides to evaluate the antimicrobial potency against some commonly occurring microorganisms.

**Materials and methods:** Dimethoxy aniline was subjected to N-acetylation to get 3-chloro-N-(3,5-dimethoxyphenyl)propanamide (**ST0A**). This was further coupled with isoamylamine and furanyl methyl amine to get, N-(3,5-dimethoxyphenyl)-3-(isopentylamino) propanamide (**ST01**) and N-(3,5-dimethoxyphenyl)-3-(furan-2-ylmethyl)amino) propanamide (**ST02**). The compounds were characterized by the nuclear magnetic resonance (NMR). The study evaluated antimicrobial effects using the disc diffusion method. The test organisms included three Gram-positive bacterial species (*B. megaterium, B. cereus and S. aureus*), five Gram-negative bacteria species (*P. aeruginosa, S. typhimurium, E. coli*, *S. typhi* and *V. cholerae*), and two fungal species (*A. niger* and *A. flavus*). For *in silico* analysis, ChemDraw, PyMol, Autodock tools and Autodock Vina were used.

**Results:** The synthesized compounds were tested for the zone of inhibitions using a dose of 400 µg/disc. Compound **ST0A** showed a zone of inhibition of 8 mm against *E. coli*. At the same dose, compound **ST01** showed inhibition against various microorganisms though of mild potency. This derivative showed zone of inhibitions against both the Gram-positive and Gram-negative organisms, including, *S. aureus* (7 mm), *E.coli* (10 mm), *B. megaterium* (9 mm) and *S. typhi* (7 mm). It showed an 8 mm zone of inhibition against the fungi *A. flavus*. Compound **ST02** showed a zone of inhibitions against *B. megaterium* (8 mm), *S. aureus* (7 mm), and *A. flavus* (7 mm). Kanamycin was the reference standard applied at a dose of 5 µg/disc and showed the zone of inhibitions against *A. flavus* (25 mm), *B. megaterium* (26 mm), *S. aureus* (26 mm), *E. coli* (26 mm) and *S. typhi* (25 mm). The *in silico* analysis showed their encouraging binding orientations in the binding site of the alanine racemase enzyme.

**Conclusion:** Though of mild intensity, the synthesized derivatives were active against various types of microorganisms, including bacteria and fungi. Thus, it is obvious that the dimethoxyphenyl acetamides have antimicrobial potency and could be explored further.

**Keywords:** Antibacterial; antifungal; dimethoxyphenyl acetamide; *in silico*

# Evaluating Awareness and Perception of Breast Cancer: A Survey Across Demographic Groups

**BASRAT JAHAN DEEA*, SAJJAD HOSSEN SOURAV, NAZIFA TABASSUM, NAJNEEN AHMED**

*Department of Pharmacy, East West University, A, 2 Jahurul Islam Avenue Jahurul Islam City, Aftabnagar Dhaka -1212, Bangladesh*

**basrat.deea@ewubd.edu*

## ABSTRACT

**Background:** With millions of cases globally, breast cancer is the most prevalent form of cancer. Among the new cancer cases, 12% account for breast cancer, making it the most frequently diagnosed cancer in females. Despite advances in treatment and early detection, the disease continues to pose a significant challenge in public health due to the multifaced nature of the disease.

**Objective:** Numerous immutable and modifiable aspects subsidize the development of breast cancer, although awareness and early detection of breast cancer would be beneficial to battle the malady. This survey's primary objective was to assess the level of consciousness among different groups of people based on certain demographic factors.

**Materials and methods:** A questionnaire was developed based on an extensive literature survey and a snowball sampling method was applied using various social media platforms. Statistical analysis was accomplished using SPSS v26 software.

**Results:** The outcome of the survey revealed that overall awareness among the respondents is moderate, with 75% of the respondents considerably identifying the common risk factors of the disease. However, the knowledge about diagnosis and self-screening is limited. Approximately 35% know the diagnostic processes, while only 15% of participants are aware of the impact of early diagnosis. The findings also suggested that awareness among middle-aged (25-55) women was significantly ($p<0.05$) higher than other age groups. A total of 70% of individuals of urban habitats with moderate to high socioeconomic and 20% of city dwellers with low socioeconomic status are aware of the risk factors associated with breast cancer. Moreover, women with higher education levels were found to be significantly ($p<0.05$) aware of the risk factors associated with breast cancer. Additionally, 78% of respondents having higher education levels are significantly aware of the association of breast cancer with smoking, increased weight and age ($p<0.05$).

**Conclusion:** To conclude, the findings of our study suggested that although the overall awareness among the participants was adequate. However, considerable disparities were present based on certain demographic factors, suggesting the need for educational programs as well as community outreach to enhance awareness among people of all classes of society.

**Keywords:** Awareness; breast cancer; demographic factors; survey

# Evaluation of *In Vitro* and *Ex Vivo* Permeability of Nanocapsule-Loaded Hydrogels and a Marketed Product for Transdermal Hormone Replacement Therapy

**REATUL KARIM*, RIFA TAMANNA, FATIN ISLAM, MUHAMMAD F. ISLAM, HASAN M. REZA***

*Department of Pharmaceutical Sciences, School of Health & Life Sciences, North South University, Plot # 15, Block B, Bashundhara R/A, Dhaka-1229, Bangladesh*

**reatul.karim@northsouth.edu, hasan.reza@northsouth.edu*

## ABSTRACT

**Background:** Menopause brings significant changes in women's lives, which may cause various physiological, vasomotor, and psychological symptoms due to substantial reduction in estrogen and progesterone production and hamper their quality of life. Hormone replacement therapy (HRT) for menopausal symptoms mainly involves applying transdermal hydroalcoholic gels containing estradiol.

**Objective:** The objective of this study was to develop estradiol-entrapping lipid nanocapsules (LNCs) and to incorporate them into hydrogels (nanocapsule-loaded hydrogels) (LNCHs) to achieve enhanced transdermal delivery of estradiol, and compare them with a marketed product (MP).

**Materials and methods:** Several LNCs were developed using the phase-inversion technique. They were evaluated for their particle size by dynamic light scattering. The LNCHs were prepared by dispersing LNCs with carbomer, and evaluated for pH and spreadability. In vitro transmembrane permeability was evaluated using Strat-M® membranes, and the ex vivo transdermal permeability was assessed using an excised rat skin model and compared with a marketed alcoholic hydrogel.

**Results:** The particle size of the LNCs was between 59.4-108.5 nm. The pH of the LNCHs was 5.9-6.5, whereas it was 5.3 for the MP. The spreadability of the LNCHs was much higher (88.4-126.6 $cm^2/g$) than the MP (39.7 $cm^2/g$). In the in vitro transmembrane permeability study, the LNCHs' flux was much lower (1.0-1.9 $\mu g/cm^2.h$) than the MP (4.6 $\mu g/cm^2.h$). However, the calculated amount of drug permeation from each g per of LNCHs per hour was comparable with the MP (3.05-4.52 µg/g.h and 4.52 µg/g.h, respectively). Interestingly, in the ex vivo study, the flux and the calculated amount of drug permeation from each g of LNCHs per hour were much higher than the MP. This could be because in LNCH, the drug is possibly dissolved in the core oil of LNCs (due to the high partition coefficient of estradiol), and the oil perhaps acted as a skin permeation enhancer.

**Conclusion:** The developed LNCHs showed higher skin permeability than the MP in the ex vivo study. These can be promising formulations to improve the transdermal bioavailability of estradiol and may improve the lives of millions of women by reducing menopausal symptoms.

**Keywords:** Estrogen; hormone replacement therapy; menopause; nanocapsules; transdermal drug delivery

# High Prevalence of Multidrug Resistance in *Escherichia coli* Isolates from Poultry Farms and Retail Market in Bangladesh

**FARIHA TASNIM, SADIA NISHAT SALSABIL, KAZI SANJIDA ISLAM, SHABNAM NUSRAT, ESFAT M. SAIM BRISTHY, PREETI JAIN**

*Department of Pharmaceutical Sciences, School of Health and Life Sciences, North South University, Plot #15, Bashundhara R/A, Dhaka 1229, Bangladesh*

**preti.jain@northsouth.edu*

## ABSTRACT

**Background:** The indiscriminate use of antibiotics in the poultry industry leads to the development of antibiotic-resistant bacteria and the spread of antibiotic resistance genes. This represents a major global health threat, with developing countries such as Bangladesh being particularly vulnerable due to widespread antibiotic misuse.

**Objective:** The study was conducted to determine the antibiotic resistance profile of *Escherichia coli* isolates from broiler chicken feces and assess the prevalence of multi-drug resistance (MDR). The study also aimed to detect the presence of antibiotic resistance encoding genes by PCR-based approaches.

**Materials and methods:** A total of 105 *E. coli* isolates were obtained from the feces of broiler chickens. Kirby-Bauer disk diffusion method was used to analyze the antibiotic susceptibility pattern. A total of 14 antibiotics were used against each isolate, and multi-drug resistance (MDR) was assessed using the MAR (multiple antibiotic resistance) index. Genomic DNA was isolated from the selected isolates, and detection of the antibiotic resistance genes was carried out using PCR.

**Results:** The highest resistance rates were observed with penicillin (100%), ampicillin (99.05%), and vancomycin (97.14%), while meropenem exhibited the lowest resistance rate at 33.33%. In the present study, six of the isolates showed a multiple antibiotic resistance (MAR) index of 1. Approximately 99% and 96% of the *E. coli* isolates showed MAR index ≥ 0.3 and ≥ 0.4, respectively, whereas 95.24% of isolates showed MAR index ≥ 0.5. The lowest recorded MAR index was 0.35. The isolates with MAR index value of 1 were found to carry the antibiotic resistance genes blaNDM, and ampC.

**Conclusion:** A high prevalence of multidrug resistance was observed in this study, highlighting the poultry industry as a potential reservoir of antibiotic-resistant bacteria and ARGs. These bacteria could potentially spread and contaminate the environment through fecal matter. To address this issue, it is crucial to implement more prudent antibiotic use in the poultry industry.

**Keywords:** Antibiotic resistance; Bangladesh; broiler chicken; *E. coli*

# Exploring the Analgesic and Hypoglycemic Potential of *Syzygium aromaticum* Ethanol Extract: Insights from Phytochemical Analysis and Animal Models

NAFISAH MAHJABIN*, MD. IQBAL HOSSAIN NAYAN, SURIA KHAN TONNI, MAHFUZA LUBNA NODY, AHNAF FAIRUZ SANTONA

*Department of Pharmacy, Faculty of Health Science, Northern University Bangladesh, 111/2 Kawlar Jame Masjid Road, Dakshinkhan, Dhaka-1230, Bangladesh*

*nafisahmahjabin@gmail.com

## ABSTRACT

**Background:** *Syzygium aromaticum*, commonly known as clove has been used for generations in Bangladeshi cuisine, particularly to preserve food and lessen discomfort in the event of gum or dental issues. Furthermore, it has been utilized as a component of a supplementary diet worldwide to cure stomach problems, lower blood glucose levels, nausea, flatulence and so on. Although it has been used extensively earlier, there is still a dearth of scientific data supporting its effectiveness, which calls for more research.

**Objective:** The primary objective of the current research was to assess the analgesic and hypoglycemic properties of ethanol extract from *Syzygium aromaticum* (SAEE) and to explore the significance of its active components.

**Materials and methods:** The analgesic activity was evaluated using the acetic acid-induced writhing test and the formalin-induced pain method. Each group, including control, standard (diclofenac sodium 10 mg/kg and ibuprofen 100 mg/kg), and treatment (extract at doses of 200 mg/kg and 400 mg/kg), consisted of six Swiss albino mice. In the anti-diabetic assessment, the extract (500 mg/kg) was administered to diabetic-induced Wister rats (n=3 per group) and compared to the standard drug (metformin 500 mg/kg). Blood glucose levels were monitored at 0, 60, and 120 minutes after administration.

**Results:** The ethanolic extract of *Syzygium aromaticum* (SAEE) showed a significant 71% reduction ($p<0.05$) in the number of writhes in the acetic acid-induced writhing test in a dose-dependent manner compared to the control group, with results closely resembling the standard group (75% inhibition). In the formalin-induced pain method, SAEE exhibited 62% inhibition in the neurogenic phase ($p<0.05$) and 75% inhibition in the inflammatory phase ($p<0.01$), comparable to ibuprofen. In diabetes-induced rats, SAEE significantly reduced blood glucose levels, with a 45% reduction at 60 minutes ($p < 0.001$) and 62% at 120 minutes ($p<0.001$), closely resembling the effect of metformin (65% reduction at 120 minutes). Phytochemical screening of SAEE revealed the presence of flavonoids and phenolic compounds, which likely contribute to the observed pharmacological activities.

**Conclusion:** *Syzygium aromaticum* ethanol extract demonstrated significant analgesic and hypoglycemic properties comparable to standard drugs. Its traditional use is supported by the existence of bioactive compounds like flavonoids and phenolic constituents, indicating its potential for advancement in clinical uses.

**Keywords:** Analgesic activity; bioactive compounds; ethanol extract; hypoglycemic property; *Syzygium aromaticum*

# Detection of Antibiotic Resistant Enterotoxigenic *Escherichia coli* from Street Foods and Drinks of Dhaka City, Bangladesh

**TULI BASAK[1], ZANNATUL FIRDAUS[1], MD. SADDAM HOSSAIN[2], ABU HASHEM[2], SURAIA NUSRIN[1]***

*[1]Department of Genetic Engineering and Biotechnology, East West University,A/2, Jahurul Islam Avenue, Aftabnagar, Dhaka-1212, Bangladesh*

*[2]Microbial Biotechnology Division, National Institute of Biotechnology, Ganakbari, Ashulia, Savar, Dhaka-1349, Bangladesh*

*sunewu@ewubd.edu

## ABSTRACT

**Background:** Street food includes a wide variety of delicacies and beverages sold by sellers along the roadway. Enterotoxigenic *Escherichia coli* (ETEC), a large category of enteric bacteria, can colonize the small intestine and produce enterotoxins. The risk of food-borne infections is a major public health concern in both industrialized and developing countries. More than 250 food-borne illnesses have been recorded. Furthermore, ETEC is the most common cause of traveler's diarrhea (TD), accounting for 30 to 60% of all cases.

**Objective:** This study aimed to identify Enterotoxigenic *E. coli* and their antibiotic susceptibility pattern from several street foods sold by street vendors in several locations of Dhaka city.

**Materials and methods:** The presence of *E. coli* was confirmed by using conventional microbiological methods for isolation and identification with different agar media such as nutrient agar, MacConkey, and Xylose Lysine Deoxycholate, *Salmonella shigella* (SS) agar. Antibiotic susceptibility test was performed using the disc diffusion method with ampicillin (5), chloramphenicol (30), erythromycin (30), nalidixic acid (10), tetracycline (30), and trimethoprim (25), azithromycin (25) and ciprofloxacin (10), according to CSLI 2020. MALDI-TOF was conducted for species identification, where it was confirmed to be *E. coli* and PCR and sequencing of 16S rRNA was performed to confirm the species at the molecular level and advanced bioinformatics tools were used to compare the pathogenic patterns.

**Results:** Four isolates of ETEC, which are suspected to be responsible for traveler's diarrhea, were found in four samples out of the 19 samples, with quantities ranging from 1.8 10^4 to 3.1 10^4 CFU/ml. Antimicrobial susceptibility testing revealed the emergence of multi-drug resistant ETEC isolates, with the majority showing resistance to ampicillin (100%), erythromycin (100%), trimethoprim (26.5%), nalidixic acid (21%), chloramphenicol (16%), tetracycline (16%) and while remaining were susceptible to azithromycin (11%) and ciprofloxacin (5%) only.

**Conclusion:** An effective ETEC prevention or cure is extremely desirable and needs further study in the future. These findings highlight the urgency for the implementation of effective risk management policies to provide a scientific basis that authorities may need to adopt to safeguard public health and safety.

**Keywords:** Enterotoxigenic *E. coli* (ETEC); food contamination; food-borne diseases; multidrug-resistant; traveler's diarrhea

# Identification of Drug-Resistant *Enterobacter cloacae* Complex from Street Drinks in Dhaka City, Bangladesh: Implications for Public Health and Safety

**SADIA ISLAM SIMIN[1], TANVIR KHAN[1], MD. SADDAM HOSSAIN[2], MR. ABU HASHEM[2], SURAIA NUSRIN[1]***

*[1]Department of Genetic Engineering and Biotechnology, East West University, A/2, Jahurul Islam Avenue Jahurul Islam City, Aftabnagar, Dhaka-1212, Bangladesh*

*[2]Microbial Biotechnology Division, National Institute of Biotechnology, Ganakbari, Ashulia, Savar, Dhaka-1349, Bangladesh*

*sunewu@ewubd.edu

## ABSTRACT

**Background:** *Enterobacter cloacae* complex (ECC) strains are commonly found to cause nosocomial bloodstream infections and have emerged as an upsetting pathogen for healthcare institutions globally. Biochemical and molecular studies on *E. cloacae* complex have shown genomic heterogeneity, comprising six species: *Enterobacter cloacae, Enterobacter asburiae, Enterobacter hormaechei, Enterobacter kobei, Enterobacter ludwigii* and *Enterobacter nimipressuralis*. ECC are common nosocomial pathogens capable of producing a wide variety of infections, such as pneumonia, urinary tract infections, and septicemia.

**Objective:** This study aims to identify ECC from street drinks of Dhaka City and to determine their antimicrobial susceptibility patterns.

**Materials and methods:** Thirteen street drink samples were collected and cultured on EMB agar plates to isolate ECC. All the isolated ECC were identified using microbiological and biochemical tests. Furthermore, MALDI-TOF VITEK Mass Spectrometry was performed for species identification. Additionally, the Sanger sequencing of 16s rRNA gene was conducted, and the sequencing results were analyzed using BioEdit and MEGA X software. The antibiotic disc diffusion test was performed using 16 different antibiotics (amikacin, amoxiclav, ampicillin, erythromycin, novobiocin, sulfamethoxazole, tetracycline, azithromycin etc) according to the Kirby-Bauer method and CLSI 2022 guideline.

**Results:** Of the 13 samples, 5 were positive for ECC through culture, biochemical tests, and MALDI-TOF VITEK Mass Spectrometry analysis. Further molecular analysis using Sanger sequencing of the 16s rRNA gene confirmed the 5 isolates as Enterobacter cloacae. These 5 isolates are 100% resistant to several antibiotics such as ampicillin, amoxiclav, cefixime, erythromycin, novobiocin, and azithromycin. Among the 5 isolates or samples, 1 isolate showed resistance to three more antibiotics, namely streptomycin, sulfamethoxazole, and trimethoprim.

**Conclusion:** This finding is particularly concerning for azithromycin, as it is one of the most prescribed antibiotics in Bangladesh. Further investigation of street drinks for ECC contamination and understanding antibiotic susceptibility patterns will aid in the proper management and treatment of any infection brought on by *Enterobacter cloacae* species.

**Keywords:** Antibiotic resistance; *Enterobacter cloacae* complex; street foods

# A Survey on the Usage Patterns of Herbal Medicine among the Young Population and Their Vulnerability to Side Effects

**SUMIYA AKTER[1], SUMIYA AKTER[1], MD. SHAHI AMRAN[2]***

*[1]Department of Pharmacy, ASA University of Bangladesh, 23, 3 Bir Uttam ANM Nuruzzaman Road, Dhaka 1207*

*[2]Department of Pharmacy, State University of Bangladesh, South Purbachal, Kanchan, Dhaka-1461*

*mdshahiamran@gmail.com*

## ABSTRACT

**Background:** Herbal medicine has been in use for thousands of years, and despite advancements in modern technology, its appeal persists through its rehabilitative properties that contribute to human health.

**Objective:** The objective of the study was to assess the association between usage and reported side effects.

**Materials and Methods:** To gather data on the usage patterns and side effects of five specific herbal remedies, a qualitative survey was conducted on 130 individuals aged 18 to 29. This was achieved through a structured questionnaire, followed by statistical analysis using the Chi-square test.

**Results:** The findings indicate that 36.9% of respondents used herbal medicine in the past five years, while 49.2% had never tried it, and 26% consulted a physician before use. Among the herbal remedies, Adovas (cough syrup) was used by 58.5%, with 95.8% reporting no side effects. Sharbat Amla Syrup was used by 8.5%, with 15% experiencing adverse effects. Tuspel had a usage rate of 26.9%, and 7.1% reported side effects. Finally, Vitorist and Alkuli Syrup were used by 4.6% and 15.4%, respectively, with side effects reported at 2.6% and 9.1%. An analysis of the findings using the Chi-square test showed a statistically significant difference in the rates of side effects among the five herbal remedies used, $\chi^2$ (4, N = 130) = 12.45, p = 0.014).

**Conclusion:** The significant p-value (p = 0.014) indicates a statistically significant association between the type of herbal remedy used and the occurrence of side effects. These findings highlight the need for greater awareness and healthcare consultation regarding herbal remedies. More research is needed to explore the relationship between the remedies and side effects.

**Keywords:** Herbal medicine; side effects; survey; usage patterns; young population

# Exploring Antidepressive Effects of Conventional Antidiabetic Drugs and Their Combination in Fructose-Induced Diabetic Mice

**BASRAT JAHAN DEEA*, FARHANA RIZWAN, SUFIA ISLAM, MUTAKABRUN SHIMA**

*Department of Pharmacy, East West University, Dhaka 1217*

**basrat.jahan@ewubd.edu*

## ABSTRACT

**Background:** Extensive research in behavioral diabetes indicated that diabetes imposes not only physical constrain but also affects mental well-being, predominantly through the risk of depression. The complex interaction between diabetes and depression amplified the strains to manage this co-morbidity effectively

**Objective:** Our study endeavors to develop a diabetic depression model using 15% fructose solution in Swiss albino mice and to evaluate the antidepressive properties of certain conventional antidiabetic drugs and their combinations.

**Materials and methods:** A total of 35 Swiss albino mice were utilized to develop a diabetic depression model by employing 15% fructose solution for 8 weeks. The mice model was categorized into various groups: positive control, negative control and treatment groups. Followed by diabetes induction, the treatment group was subdivided into 5 groups, including treatment group 1 (metformin), treatment group 2 (empagliflozin), treatment group 3 (glimepiride), treatment group 4 (metformin + empagliflozin), treatment group 5 (metformin + glimepiride), and a 2-weeks of treatment protocol was initiated. Behavioral changes among the test mice were assessed by performing Force Swim Test (FST), Elevated plus Maze Test (EMT), Tail Suspension Test (TST), and Hole Board Test (HBT). One-way ANOVA was performed using SPSS v26 software for statistical analysis.

**Results:** The treatment groups demonstrated improved behavioral outcomes, with variations in effectiveness. Amongst them, treatment group 5 (metformin + glimepiride) depicted the greatest behavioral improvement, by significantly ($p < 0.05$) increasing head dipping in HBT (71.03%), mobility in FST (79.81%) and exploration in EMT (69.23%). Our findings also indicated that immobility time was significantly ($p < 0.05$) reduced in TST (75. 29 %) by treatment group 5.

**Conclusion:** Limited research has elucidated antidepressive features of the combination of metformin and glimepiride. However, our findings enlighten the need for further research works to pave the pathway of newer treatment approaches in diabetic depression.

**Keywords:** Antidiabetic drugs; central nervous system; diabetes mellitus; fructose; mice

# Supramolecular Complexation of Antibiotic that Improves Therapeutic Efficacy

**SHANJIDA SULTANA, TANJUM JAHAN MOJUMDER, RAFSANA BINTE ASHRAF, TALHA ZUBAIR, ABDULLAH-AL MASUM***

*Department of Pharmaceutical Sciences, School of Health and Life Sciences, North South University, Plot- 15, Block- B, Bashundhara R/A, Dhaka-1229, Bangladesh*

*abdullah.masum01@northsouth.edu

## ABSTRACT

**Background:** Supramolecular chemistry studies noncovalent interactions between molecules, especially host-guest complexes, where large hosts bind smaller guests. These complexes can self-assemble in various orientations and ratios. When drugs form such complexes, especially with metals, they may alter receptor affinity, cellular uptake, and biological effects, potentially enhancing therapeutic efficacy by modulating drug behavior at the molecular level.

**Objective:** In order to change receptor binding, cellular entrance, and other biological consequences, we assumed that if drug molecules (guest molecules) formed complexes with metal molecules (host molecules), they would do so in varied ratios (e.g., 1:1 to 1:10) and in different orientations. In order to increase efficacy, we sought to combine various drug classes from the same or other therapeutic groups by supramolecular complexation (antibiotics) with biological components like Zn and Fe.

**Materials and methods:** Antibiotic drug solutions were prepared using several solvents. Metals in various ratios (1:1 to 1:10) were progressively added to the drug solutions after being dissolved in distilled water. Analytical techniques like HPLC, TLC, and UV spectroscopy were used to investigate the complex formations between the drug molecules and metals. Later on, the effects of the metal-drug complex on the body were further investigated using microbiological culture tests.

**Results:** After adding the Fe and Zn solutions separately to the antibiotic drug solutions, the UV spectroscopic data revealed a steady shift in the graph's absorbance, indicating the complex formation of the antibiotics with metal. The biological effects of the antibiotic that forms a complex with Zn and Fe were then observed by a microbiological culture test utilizing both gram-positive and gram-negative bacteria. By displaying a broad zone of inhibition, metal-antibiotic complexes were discovered to have superior therapeutic efficacy in microbiological culture tests.

**Conclusion:** Our research revealed that metal-drug complexes are more effective than drug solutions alone. One intriguing finding from the study is that metal-drug complexation could be a practical technique for combining two or more drug molecules from the same or distinct therapeutic classes in a straightforward manner to increase drugs' efficacy and to provide a broad pharmacodynamic action within the body.

**Keywords:** Coordination chemistry; host-guest chemistry; metal complexation; supramolecular chemistry

# *In Vitro* Evaluation of Pharmacological Activities of Petroleum Ether, Dichloromethane, and Methanol Extracts of *Tamarindus indica* Leaf

**AFRIN ISLAM TAMA, MD JONAED MOLLAH, FOUZIA RAHMAN MUNIA, ARMAN AKHAND, RUPALI GHOSH***

*Department of Pharmacy, Faculty of Science and Engineering, East West University, A/2, Jahurul Islam Avenue, Aftabnagar, Dhaka-1212, Bangladesh*

*rg@ewubd.edu

## ABSTRACT

**Background:** *Tamarindus indica* L., commonly known as the tamarind tree, is widely utilized in traditional medicine across tropical regions due to its rich chemical, pharmaceutical, and nutritional properties. The fruit pulp is a valuable source of tartaric acid and amino acids, while various parts of the plant are employed in the treatment of conditions like constipation, wound healing, malarial fever, abdominal pain, diarrhea, and diabetes. Furthermore, bioactive compounds such as orientin, vitexin, glycosides, peroxidase, vitamin B3, and vitamin C have been extracted from the tree.

**Objective:** This study aimed to evaluate the antioxidant capacity, membrane-stabilizing activity as an anti-inflammatory mechanism, brine shrimp lethality bioassay, and antibacterial activity of extracts from *T. indica* leaves.

**Materials and methods:** The antioxidant potential was measured by the total antioxidant, flavonoid, and tannin content, using the ferric reducing power (FRAP) assay and hydrogen proxide ($H_2O_2$) radical scavenging activity with ascorbic acid as the standard. The membrane stabilizing activity was examined under two stress conditions: hypotonic solution and heat. The extracts were tested against bacteria using the disc diffusion method with standard antibiotic discs. A brine shrimp lethality bioassay was conducted to calculate the percentage mortality for various concentrations, with tamoxifen used as a positive control.

**Results:** The methanol extract displayed the highest total antioxidant (52.7 mg/g AAE) and total tannin content (142.7 mg/g GAE), while the petroleum ether extract exhibited the highest flavonoid content (558 mg/g CE). The dichloromethane extract showed the highest $H_2O_2$ radical scavenging activity of 83.11%. Additionally, the petroleum ether demonstrated the lowest $IC_{50}$ value of 161.92 µg/ml in the FRAP assay, and, by the heat-induced assay, showed a significant reduction of hemolysis (51.63%) compared with control ($p < 0.05$). A positive correlation ($p < 0.05$, $r=1$) was observed between FRAP & $H_2O_2$ radical scavenging assay and between total antioxidant and tannin content. Strong antibacterial activity against Salmonella Paratyphi with a 16 mm zone of inhibition at 600 µg/disc and the lowest $LC_{50}$ value of 0.264 µg/ml was demonstrated by dichloromethane extract.

**Conclusion:** Extracts of varied polarity showed promising therapeutic potential in in vitro studies and further research is needed in vivo.

**Keywords:** Antibacterial; antioxidant; hemolysis, $LC_{50}$; tamarind leaf

# Erythrocyte Membrane Stabilizing, Antioxidant, Anti-bacterial, and Brine Shrimp lethality Bioassay of Methanol Extract of *Tagetes erecta* Leaf

**FARJANA MUSTAFA RIA, SALAUDDIN LASKER UTHSO, JARIN KHAN, RUPALI GHOSH***

*Department of Pharmacy, Faculty of Science and Engineering, East West University, A/2, Jahurul Islam Avenue, Aftabnagar, Dhaka-1212, Bangladesh*

*rg@ewubd.edu

## ABSTRACT

**Background:** *Tagetes erecta* L., commonly known as marigold, is a flowering plant rich in secondary metabolites. Its flower petals are valued for the carotenoid "lutein" in the pharmaceutical industry. It originated in Mexico and was later introduced to Southeast Asia, including Bangladesh, where it has been used as a medicinal plant for various conditions such as conjunctivitis, muscle pain, stomachache, bronchitis, and infected wounds. The plant contains essential oils such as eugenol, tagetenone, limonene, and tagetone.

**Objective:** This study investigated the qualitative phytochemical analysis, erythrocyte membrane stabilizing, antioxidant potential, anti-bacterial activity, and brine shrimp lethality bioassay of methanolic extract from young *Tagetes erecta* leaf.

**Materials and methods:** Erythrocytes were subjected to hemolysis by hypotonic and heat-induced methods, and the percentage of hemolysis inhibition was measured. For the antioxidant measure, the total antioxidant compound and flavonoid content were calculated using the phosphomolybdate and aluminum tri-chloride methods, respectively. Ferric-reducing power (FRAP) assay and $H_2O_2$ radical scavenging assay were performed as a direct antioxidant mechanism. The disc diffusion method was employed to measure the zone of inhibition of the tested microorganisms, and the $LC_{50}$ value was determined for the brine shrimp lethality bioassay.

**Results:** Flavonoids, tannins, phenolic compounds, terpenoids, triterpenoids, quinones, coumarins, lignins, saponins, and alkaloids were found to be present in the preliminary qualitative analysis. The leaf extract showed 8.02% inhibition of hemolysis by the hypotonic-induced method and 35.17% inhibition of hemolysis by the heat-induced method when compared with the acetylsalicylic acid as a standard. 22.9 mg/g of total antioxidant compounds equivalent to ascorbic acid and 652.9 mg/g of flavonoid equivalent to catechin; $IC_{50}$ values were 199.73 µg/ml in the FRAP assay, and 88% $H_2O_2$ radical scavenging was the result of sufficient antioxidant activity. The largest inhibitory zone was claimed against Salmonella Paratyphi at 600 µg/disc concentration with a zone of inhibition of 16 mm, and the lethality bioassay $LC_{50}$ value was 1.024 µg/ml, which indicates the high cytotoxic potential of this plant extract.

**Conclusion:** As methanolic extract demonstrated great therapeutic potential, further research should be carried out with non-polar solvent extracts and isolating pure biomolecules.

**Keywords:** Disc diffusion, $IC_{50}$; flavonoids; membrane stabilizing; *Tagetes erecta*

# Prevalence and Assessment of Clinico-Hematological Parameters of Dengue Patients in Chattogram: A Single-center Retrospective Observational Study

**SHOURAV MOHAJAN[1,3], SAIFUR RAHMAN SAIF[1,3], MOSAMMAT FATIMA[1,3], PUJITA SHIL[1,3], MOHAMMAD OSMAN GONI[1,3], SHOHAG MAJUMDER[1,3,4], PAIR AHMED JIKO[2,3], MD. MONIRUL ISLAM[1,3]***

*[1]Department of Biochemistry and Biotechnology, Faculty of Life Sciences, University of Science and Technology Chittagong, Bangladesh*

*[2]Department of Clinical Biochemistry, Institute of Applied Health Sciences Hospital, Chattogram, Bangladesh*

*[3]Bangladesh Bioscience Research Group, Chattogram, Bangladesh*

*[4]Department of Emergency and Critical Care Medicine, Aichi Medical University, Nagakute, Japan*

*monirul.islam@ustc.ac.bd*

## ABSTRACT

**Background and Purpose:** Dengue fever, an Aedes mosquito-borne seasonal infectious disease caused by different serotypes of the dengue virus, is a serious public health concern, predominantly in tropical and subtropical areas. Nevertheless, in Bangladesh, very few data exist that highlight the clinic-hematological parameters of dengue patients. The goal of this study is to precisely investigate the hematological and clinical parameters of patients who have been diagnosed with dengue fever.

**Design and Setting:** A single-center retrospective study was conducted with dengue patients to assess the clinical and hematological parameters in a tertiary referral hospital in Chattogram, Bangladesh.

**Methods:** A Total 1122 confirmed dengue cases, ranging in age from 0 to 76 years, were assessed at Bangabandhu Memorial Hospital (BBMH) in Chittagong, Bangladesh, from January 2023 to December 2023. Out of 644, there were male, while 478 were female. A total of 260 patients with dengue were diagnosed using the dengue NS1 antigen ELISA test, while the remaining patients tested positive for dengue IgM and IgG using ICT. A retrospective observational study was conducted on clinical symptoms, lab results and disease prognosis.

**Results:** In our cohort of patients with dengue, the most frequent clinical symptoms were fever (100%), headache (82.5%), retro-orbital discomfort (75%), myalgia (67.5%), and rash (55%). Thirty percent (30%) of patients were found to have severe symptoms, such as dengue hemorrhagic fever (DHF). In this study, we observed primary hematological abnormalities, including leukopenia (30.92%), leukocytosis (6.66%), thrombocytopenia (24.24%), low hemoglobin levels; <11.1 g/dL (18.54%), elevated hematocrit; >45% (33.06%), and atypical lymphocytosis (43.67%) of patients.

**Conclusion:** This study found significant clinical and hematological changes associated with dengue viral infection that might be useful for physicians in promptly diagnosing and properly treating dengue fever.

**Keywords:** Dengue fever; dengue hemorrhagic fever; hematocrit; leukopenia; thrombocytopenia

# Effects of Long-term Consumption of Repeatedly Heated Mix Vegetable Oils in Swiss Albino Mice

**MD. MOFIJUR RAHMAN SHAHED[1,2,3], SHOHAG MAJUMDER[1,3,4], HAMIDA BANU SATHI1[3], ANIKA TABASSUM[1,3], RUKAIYA HOSSAIN PRANTE[1,3], IFFAT BINTE WAHAB[1,3], PAIR AHMED JIKO[2,3], MD. MONIRUL ISLAM[1.3]***

*[1]Department of Biochemistry and Biotechnology, Faculty of Life Sciences, University of Science and Technology Chittagong, Bangladesh*

*[2]Department of Clinical Biochemistry, Institute of Applied Health Sciences Hospital, Chattogram, Bangladesh*

*[3]Bangladesh Bioscience Research Group, Chattogram, Bangladesh*

*[4]Department of Emergency and Critical Care Medicine, Aichi Medical University, Nagakute, Japan*

*monirul.islam@ustc.ac.bd*

## ABSTRACT

**Background:** This study examines health risks from repeatedly heated sunflower, soybean, and palm oils, hypothesizing that such heating produces harmful compounds due to their differing fatty acid compositions.

**Objectives:** The present study was designed to properly investigate the impacts of different heating grades (unheated, single-time heated, three-times and repeatedly heated) of vegetable oils on the hemato-biochemical parameters and vital organs like heart, liver, kidney, intestine, and spleen in mice.

**Methods and Materials:** Swiss albino mice were divided into control and experimental groups, receiving variously heated vegetable oils every three days for one month (1 ml/kg). On day 31, blood and organ samples were collected to assess hematological, biochemical, and histo-morphological changes resulting from different oil treatments.

**Results:** We found significant hematological changes in mice consuming repeatedly heated vegetable oils, compared to the control group with decreased red blood cell counts ($P< 0.03$) and altered white blood cell profiles ($p< 0.05$). Moreover, heated oil changes total cholesterol, Triglycerides, LDL, Glucose, and Creatinine increased significantly ($P<0.02$), while HDL and Total Protein levels dropped markedly in the treatment groups. Lastly, severe histo-morphological alterations were also formed in the different organs like the heart, liver, kidney, intestine, and spleen (data not shown).

**Conclusion:** Repeatedly heated mixed vegetable oils cause harmful haemato-biochemical changes in mice, indicating health risks. The study urges public awareness, stricter dietary guidelines, and further research on long-term human impacts.

**Keywords**: Hemato-biochemical profile; histo-morphological alterations; repeated heating; swiss albino mice; vegetable oils

# Polymyxin B-Immobilized Membrane Can Adsorb Damage-associated Molecular Patterns *In Vitro*

**SAIF NUR CHOWDHURY[2,4], LEU NANDI[1,2], AFRINA HOQUE SUBAIKA[1,2], NAOSHI TAKEYAMA[3], MD. MONIRUL ISLAM[1,2]***

*[1]Department of Biochemistry and Biotechnology, Faculty of Life Sciences, University of Science and Technology Chittagong, Bangladesh*

*[2]Bangladesh Bioscience Research Group, Chattogram, Bangladesh*

*[3]Department of Emergency and Critical Care Medicine, Aichi Medical University, Nagakute, Japan*

*[4]Department of Medicine, Chattogram Medical College and Hospital, Chattogram, Bangladesh*

**monirul.islam@ustc.ac.bd*

## ABSTRACT

**Background:** Damage-associated molecular patterns (DAMPs) regulate inflammation and immunity but can be harmful in excess. Removing them may help patients. Polymyxin B (PMX) hemoperfusion is used in septic shock to eliminate endotoxins from circulation.

**Objectives:** This study aimed to evaluate the efficacy of PMX-immobilized membranes in adsorbing DAMPs in vitro.

**Methods:** DAMPs (commercially available DNA, RNA, nucleosomes and histone) activated neutrophils were added separately into each well (9.5 $cm^2$) with or without PMX-immobilized membrane (2 cm x 2 cm each with a surface area of 4 $cm^2$) and incubated for 5 min with shaking at room temperature. To increase the dose of PMX, the surface area of PMX-immobilized membrane was increased by repeated exposure of the membrane to the DMAPs. Following incubation, the levels of DAMPs were assayed.

**Results:** A significant reduction ($p < 0.001$) in DAMPs (DNA, RNA, nucleosomes, and histones) was observed with increasing surface area of the PMX-immobilized membrane (4 cm, 8 cm, & 12 cm) compared to the condition without the membrane (initial level, surface area 0 $cm^2$). The DNA level decreased from 9.68 µg/ml (initial level) to 7.98 µg/ml, 4.87 µg/ml, and 3.56 µg/ml as the surface area increased. A similar outcome was noted for RNA, which decreased from an initial level of 24.90 µg/ml to 20.10 µg/ml, 16.40 µg/ml, and 13.00 µg/ml. Nucleosome concentrations also decreased significantly, falling from its initial level of 24.90 µg/ml to 23.45 µg/ml, 10.00 µg/ml, and 6.92 µg/ml. Additionally, histone levels showed a significant reduction, decreasing from 0.163 AU to 0.091 AU, 0.078 AU, and 0.049 AU with the increase in the PMX-immobilized membrane surface area.

**Conclusions:** In vitro study shows PMX-immobilized membranes effectively absorb DAMPs, suggesting hemoperfusion with PMX cartridges may selectively remove DAMPs in sepsis, potentially reducing remote organ damage.

**Keywords:** DAMPs; hemoperfusion; PMX-immobilized membrane; septic shock

# Knowledge and Perception of Prostate Cancer among University Students in Bangladesh: A Survey to Shape the Future Cancer Healthcare Strategies

**SAMIT ISLAM RUDRA[1], MD. ABU BAKAR SIDDIQUE JAMI[1,2], FARHANA AKTER[1], NAJNEEN AHMED[1]***

*[1]Department of Pharmacy, East West University, A/2, Jahurul Islam Avenue, Aftabnagar, Dhaka- 1212, Bangladesh*

*[2]Department of Pharmacy, Bangladesh University, Adabar, Mohammadpur, Dhaka - 1207, Bangladesh*

**nna@ewubd.edu*

## ABSTRACT

**Background:** Prostate cancer (PCa) is the second most common cancer in men. It is essential to educate young people about PCa so that they can take measures to detect and prevent it.

**Objective:** This study aims to provide a comprehensive understanding of the knowledge and perceptions of PCa among male undergraduate university students of private universities in Bangladesh.

**Materials and methods:** This cross-sectional study employed a convenience sampling technique. Primary data was collected from 679 male university students aged 15-30, attending four leading private universities in Dhaka, Bangladesh. Data collection occurred between June 7, 2022, and December 22, 2022. Data collection methods included an online survey using Google Forms and face-to-face interviews. The sample represented students from different universities and diverse demographic backgrounds.

**Results:** These students are the future leaders and influencers of society, yet they have a limited understanding of PCa prevalence, risk factors, and symptoms. Participants' mean age was 22.77 years. Only 26% (175) of respondents were aware of the age-related risk factors for PCa and 94% (640) had never been screened for the disease. Despite the fact that the 'after 60' age group is most at risk, participants selected it the least (4%), highlighting a serious lack of knowledge of PCa. 41% (275) of respondents expressed willingness to consult a doctor about PCa. Moreover, 66% (445) of respondents have never discussed their sexual problems with others. 18% (122) said they felt too shy and 21% (144) said they felt uncomfortable with this topic. 32% (214) of respondents mistakenly believed PCa is a sexually transmitted disease. These findings underscore the urgent need for targeted educational programs to raise awareness.

**Conclusion:** The study reveals low prostate cancer awareness among Bangladeshi male university students, urging targeted education to correct misconceptions, promote early detection, and improve future public health and cancer care strategies.

**Keywords:** Bangladesh; cancer awareness; prostate cancer; students; survey

# Exploring the Potential of Reported Flavonoids of *Clitoria ternatea* or Butterfly Pea Flower against Diabetes Mellitus as Aldose Reductase Inhibitors Through Molecular Docking

MOLAY CHAKRABORTY, RASHMIA NARGIS REYDA, NAZIFA TABASSUM, BASRAT JAHAN DEEA, NAJNEEN AHMED*

*Department of Pharmacy, Faculty of Science & Engineering, East West University, A/2 Jahurul Islam City Gate, Dhaka 1212, Bangladesh*

*nna@ewubd.edu

## ABSTRACT

**Background:** Aldose reductase (AR) is crucial in diabetic complications via glucose metabolism. *Clitoria ternatea* (CT) flowers, used in Blue Tea, may prevent diabetes, with root extracts enhancing insulin release.

**Objective:** The objective was to investigate the inhibitory potential of some predetermined flavonoids from *C. ternatea* using *in silico* docking studies.

**Materials and methods:** For this study, phytochemicals reported to be present in the flower of *C. ternatea* were searched in the IMPPAT 2.0 database on 22nd April 2024. From the database, seven flavonoids, namely 3-O-rutinoside, kaempferol, apigenin, myricetin, delphinidin 3-glucoside, and epicatechin, were chosen for molecular docking. Four commercial aldose reductase inhibitors, namely epalrestat, tolmetin, sorbinil and alrestatin, were considered as standard drugs for the analysis. Protein crystal structures of human aldose reductase enzymes, which scored more than 95% in the ERRAT online tool for protein stability prediction (PDB ID 3S3G and 3RX2), were selected for docking. In the molecular docking studies using PyRx tool, binding affinity, bond distances and the bond types were also determined.

**Results:** The docking scores demonstrated that the binding affinities between the molecules of interest with 3S3G and 3RX2 proteins were ranged between (-7.5 to -9.6) kcal/mol and (-8.0 to -10.1) kcal/mol respectively. Subsequently, the binding affinities of the standard drugs with 3S3G scored between (-7.3 to -7.9) kcal/mol and (7.4 to -8.4) kcal/mol for 3RX2. Conventional Hydrogen bond was the prevalent binding interaction type in all the ligand-target complexes. Epicatechin and kaempferol showed pi-pi interaction bonds with 3RX2 with lesser distances making them more stable with the target proteins. All flavonoids with very good docking scores also showed hydrogen bonds with 3S3G protein at very short distances, making them potential inhibitors.

**Conclusion:** This study sets a background for further in-vitro and in-vivo investigation of the reported flavonoids as AR inhibitors in DM.

**Keywords:** Aldose reductase inhibitor; *Clitoria ternatea*; diabetes mellitus; flavonoids; molecular docking

# Prevalence of Work-Related Diseases and Injuries among Informal Workers in Tejgaon: A Situation Assessment and Policy Recommendations

**AFRIN NUR, MUNTASIR KAMRUL, HASNAT M ALAMGIR***

*Department of Pharmacy, Southeast University, Tejgaon, Dhaka-1208*
*h.alamgir@seu.edu.bd

## ABSTRACT

**Background:** In Dhaka, informal workers face unsafe working conditions while living in poor conditions. They have limited access to healthcare provisions and labor protections. Current programs, legal measures and policies leave large gaps in occupational safety and health among this working population that urgently need to be addressed.
**Objectives:** This study focuses on identifying the prevalence of work-related diseases and injuries among Tejgaon Industrial Area's working population to explore gaps in the current policy so that recommendations can be made to improve workplace health, safety and the rights of these vulnerable workers.
**Materials and Method**: The study used stratified sampling to gather occupationally diverse informal workers from Tejgaon slums (Kunipara, Sattola, Korail) and nearby footpaths. Trained pharmacy students conducted in-person interviews at homes or workplaces, collecting data on demographics, employment, living conditions, PPE use, injuries, diseases, mental health, and daily safety challenges.
**Results**: Among the 200 participants, 141 were male and 59 were female. 17.9% were rickshaw pullers, and 16.8% were garment workers. Another 12.2% worked in hotels or tea shops, 9% in automobile shops and 6.1% were sanitation workers, respectively. Others included drivers, day laborers, domestic workers, and street vendors. Among informal workers, 83% faced prolonged hours of sitting or standing, 70% suffered from heat stress, 66.5% experienced cuts, 62.5% faced muscle strain, 49.5% worked in unhealthy environments. In terms of diseases, 79.5% reported fatigue, 47% reported headache, 42.5% reported dysuria, 41.5% reported dizziness, and 41% suffered from allergy.
**Conclusion:** This study analyzed health and occupational hazards in Bangladesh's informal urban workforce; upcoming data collection includes observations, FGDs, and KIIs to inform policies and interventions for worker well-being.
**Keywords:** Informal workers; labor protections; occupational health and safety; occupational diseases; workplace interventions

# Isolation of Endophytic Bacteria from the Leaves of *Enhydra fluctuans*: Evaluation of Biological Activities of their Ethyl Acetate Crude Extract of Secondary Metabolites

ABDUL ALI BHUIYAN, ARAFATH RAHMAN AKASH, MD. SELIM UDDIN, SHARIFUL HAQUE*

*Department of Pharmacy, Pabna University of Science and Technology, Rajapur, Pabna-6600, Bangladesh*
*sharifulh044@pust.ac.bd

## ABSTRACT

**Background:** Endophytic microorganisms, known for producing bioactive secondary metabolites, are being explored for their potential pharmaceutical applications. *Enhydra fluctuans* Lour., a medicinal plant, is known for its antioxidant and antimicrobial activities. However, the bioactivity of its associated endophytic bacteria remains unexplored.

**Objective:** The study aimed to isolate endophytic bacteria from *Enhydra fluctuans* leaves, evaluate their biological activities through in-vitro assays and *in silico* analysis, and identify bioactive compounds.

**Materials and methods:** Fresh *Enhydra fluctuans* leaves were sterilized and used for bacterial isolation. Identified via morphology and 16S rRNA sequencing, bacterial metabolites were extracted with ethyl acetate. Antibacterial and antioxidant activities were tested. GC-MS identified bioactive compounds, followed by *in silico* analysis to predict their potential biological activities.

**Results:** From the leaves of *Enhydra fluctuans*, a single endophytic bacterium named Pseudomonas campi (NR_181172.1) was isolated and identified. The crude extract of the bacterial metabolites exhibited significant antibacterial activity against Staphylococcus aureus (zone of inhibition: 17 mm) at a concentration of 500 µg/disc, compared to the widely used standard kanamycin (30 µg/disc) and the antioxidant evaluation showed moderate DPPH scavenging activity ($IC_{50}$ = 61.66 µg/ml) compared to conventional ascorbic acid ($IC_{50}$ = 17.38 µg/ml). Nineteen bioactive chemical compounds had been determined by GC-MS analysis, with phenol, 3,5-bis(1,1-dimethylethyl)-, and 1,9-diazaspiro (4,4) nonane-2,8-dione being the principal constituents. *In silico* analysis revealed that the GC-MS-identified compound 9,10-anthracenedione, 2-[(tert.-butylamino) methylcarbamoyl] exhibited strong antibacterial and antioxidant potential, with the best binding affinity towards the proteins MurD ligase (-9.8 kcal/mol) and Myeloperoxidase (-9.6 kcal/mol), respectively.

**Conclusion:** An endophytic bacterium from *Enhydra fluctuans* shows strong antibacterial and antioxidant properties. Key compound 9,10-anthraquinone has pharmaceutical potential, highlighting endophytes as promising sources for new bioactive drugs.

**Keywords:** Antibacterial; antioxidant; endophytic bacteria; GC-MS; *in silico*

# A Computational Assessment of Triptolide, Sanguinarine, Paeoniflorin and Their Chemical Derivatives as Naturally-Derived Anti-Inflammatory Inhibitors of Tumor Necrosis Factor-Alpha

**ISHPIYA CHOWDHURY, ISRAT SULTANA, ITMAM NOWROJ, FAWZIA AFRIN, FATIHA TABASSUN, AKID ORNOB***

*Department of Biomedical Engineering, Military Institute of Science and Technology, Mirpur Cantonment, Dhaka-1216, Bangladesh*

**akid.ornob@bme.mist.ac.bd*

## ABSTRACT

**Background:** Tumor necrosis factor-alpha (TNF-alpha) contributes to rheumatoid arthritis (RA) development. Current RA drugs can cause harmful side effects, highlighting the need for safer alternatives. Natural compounds like triptolide, sanguinarine, and paeoniflorin show promise as TNF-alpha inhibitors, but a thorough investigation is needed to confirm their safety and effectiveness.
**Objective:** We evaluated derivatives of the natural compounds Triptolide, Sanguinarine and Paeoniflorin for their potential inhibitory activity against the TNF-alpha protein through various *in silico* techniques.
**Materials and Methods:** A library of 30 functional derivatives of natural compounds was compiled from the literature. The target protein (PDB: 2AZ5) was prepared using Swiss-PDBViewer, and ligand binding affinities were assessed via molecular docking in PyRx. ADMET analysis using SwissADME and Protox-II evaluated toxicity, selecting 8 compounds with LD50 ≥2000 mg/kg. Molecular Dynamics (MD) simulations for 50 ns were conducted to assess the stability of these compounds with the protein, analyzing RMSD, RMSF, SASA, hydrogen bonds, and radius of gyration.
**Results:** Out of the 30 ligands, 29 ligands showed stable binding affinities (less than -8 kcal/mol). In ADMET analysis, 8 ligands were deemed safe based on their $LD_{50}$ values ranging from 2000 to 4000 mg/kg. In MD simulation, 5 potential compounds were found showing stability in all the metrics from where paeoniflorin B and oxypaeoniflorin (paeoniflorin derivatives) were identified as the best drug candidates with average RMSD values of 0.20076 nm and 0.2027 nm, respectively.
**Conclusion:** The comparative effectiveness of triptolide, sanguinarine, paeoniflorin and their derivatives as possible anti-inflammatory medications targeting TNF-alpha is investigated in this study. The identified ligands are promising drug candidates and can be investigated for further in vitro and in vivo analysis.
**Keywords:** ADMET; drug; docking; dynamics; TNF-alpha

# Assessment of *in vitro* Antibacterial Efficacy of a Novel Herbal Toothpaste against *Streptococcus mutans* and *Lactobacillus species*

SALMA DELWAR, AINUN NAHAR, ABU BIN IHSAN*

*Department of Pharmacy, Faculty of Life Science, Eastern University, Ashulia Model Town, Savar, Dhaka-1345, Bangladesh*

*ihsan.pharmacy@easteruni.edu.bd

## ABSTRACT

**Background:** Herbal ingredients provide pharmacological benefits for dental and oral issues like infections, ulcers, and gum problems. Consumers prefer herbal-based toothpaste as they are considered safer, more effective, and less toxic due to the minimal use of chemicals compared to synthetic alternatives.

**Objective:** To develop a safe, cost-effective antimicrobial herbal toothpaste formulation and evaluate its physicochemical and antimicrobial properties.

**Materials and methods:** Herbal toothpaste was formulated using ethanol extracts from four herbs: *Piper betle, Acmella oleracea, Sphagneticola trilobata*, and *Caesalpinia pulcherrima.* Standard cultures of *Streptococcus mutans* and *Lactobacillus* species were used for the antibacterial test using the Kirby-Baur disc diffusion method. Quality control parameters (appearance, taste, texture, $p^H$, foaming ability, spreadability, moisture content, stability test, and antimicrobial activity) were evaluated and FTIR for identification of compounds was performed on developed herbal formulations.

**Results:** The quality parameters of the optimized formulation were within range. The optimized formulation showed a 12 mm and 15 mm zone of inhibition against Streptococcus mutants and Lactobacillus species, whereas other formulations showed lesser activity than the optimized formulation.

**Conclusion:** The formulated toothpaste showed significant inhibition against oral bacteria causing dental issues. Thereby, it opens a window for further study to enhance the toothpaste's ability and prove the efficacy and safety of the formulated herbal toothpaste.

**Keywords:** Antimicrobial activity; herbal product; oral infection; oral ulcer; toothpaste

# Cost Effective and Environment-Friendly Process of Isolation and Characterization of Cellulose from Banana Pseudo Fibers

**SAMIHA SAYEED[1], AL AMIN[2], AL-AMIN AHSAN SIAM[2], ABU ASAD CHOWDHURY[1]***

*[1]Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*[2]Department of Pharmacy, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*asaddg27@du.ac.bd

## ABSTRACT

**Background:** Banana pseudo stem has alpha-cellulose content of around 50% with 30% hemicellulose, 18% lignin and others. Pure cellulose can not only be used as a starting material for the synthesis of pharmaceutical excipients such as carboxymethylcellulose, ethyl cellulose, cellulose acetate, cellulose acetate phthalate, microcrystalline cellulose, etc. but also used for the synthesis of artificial fibers in textile.

**Objective:** This research aims to optimize cellulose extraction from fibers using minimal chemicals and energy, identifying key factors to maximize yield and efficiency for preparing high-quality dissolving cellulose.

**Materials and methods:** Cellulose was isolated from banana pseudo fibers with pre-treatment using hydrochloric acid (concentration of 0.1 N and 0.05 N) followed by sequential treatment with sodium hydroxide (0.5%, 1% and 5% of pulp's total weight) with a solvent to pulp ratio of 10:1 at boiling condition. The pulp was bleached following different sequences using chlorine dioxide (0.5% of pulp's total weight) and hydrogen peroxide (5% of pulp's total weight).

**Results: A s**ample with a cellulose content was obtained around 87%. Isolated cellulose was characterized by Fourier-transform infrared spectroscopy, alkali solubilization, intrinsic viscosity, fock reactivity and gamma number. All these confirm sufficient purification of the isolated cellulose.

**Conclusion:** The results prove the cost-effectiveness of the proposed method. Moreover, the use of low concentration of reagents compared to all the established methods further confirms the environment-friendly approach of the method.

**Keywords:** Banana pseudo fiber; cellulose; characterization; isolation

# Analysis of Phytochemistry and Biological Attributes of Peel of *Allium cepa*

**ISHTIAQ AHMED TAHIM, MD. JAHID HOSSAN, AKLIMA AKTER*, MD. KAWSAR HOSAIN, SHAH MD. GOLAM KIBRIA**

*Department of Pharmacy, Daffodil International University, Daffodil Smart City (DSC), Birulia, Dhaka-1216, Bangladesh*

*aklima.ju@gmail.com

## ABSTRACT

**Background:** The onion, formally known as *Allium cepa* L., is one of the plants that has been cultivated for a long time and is used as a vegetable and flavoring element all over the world. This plant exhibits numerous traditional health benefits.

**Objective:** To validate the traditional usage of *Allium cepa* and analyze its potential therapeutic advantages, the study will scientifically examine the phytochemical composition and assess the analgesic, antidiarrheal and anthelmintic activities of the peel of the plant.

**Materials and Methods:** Peels were collected, dried and extracted using methanol as solvent. Phytochemical screening of the peel extract was performed by using several reagents. Mice were treated with dose range between 250-500 mg/kg body weight for analgesic and anti-diarrheal activity. Moreover, anthelmintic activity was observed at 5-25 mg/ml doses against the standard 10 mg/ml dose. The acetic acid-induced writhing method was used to assess the analgesic activity of the extract. Anti-diarrheal activity was performed by using castor oil-induced diarrhea on Swiss albino mice. Antihelmintic test of the peel extract was also performed on earthworms against albendazole as the standard drug.

**Results:** In the phytochemical screening, compounds including alkaloids, flavonoids and saponins were present, which are found interlinked with few pharmacological activities. In the acetic acid-induced writhing test, the extract significantly reduced writhing in a dose-dependent manner (66% for 250 mg/kg and 72% for 500 mg/kg) compared to the standard drug diclofenac (69% for 10 mg/kg). In the castor oil-induced anti-diarrheal test, 250 mg/kg and 500 mg/kg dose were used, and the inhibition rate was found to be 31% and 54.55%, consecutively compared to 72% in loperamide (3 mg/kg b.w.). In the antihelminthic activity test, the paralyzing and death time for albendazole (10 mg/kg b.w.) was found to be 11 minutes and 44 minutes, whereas extract showed 18 minutes and 53 minutes for the paralyzing and death time for 25 mg/kg dose.

**Conclusion:** Overall, these results confirm the therapeutic potential of *Allium cepa* in managing pain, diarrhea, and parasitic infections, supporting its continued use in traditional medicine and encouraging further research into its bioactive compounds for drug development.

**Keywords:** *Allium cepa*; analgesic; antidiarrheal; anthelmintic

# Changes in UCP1 and Adhesion Molecule Expression by Non-Selective SGLT Inhibitor: A Way to Inhibit Adipogenesis and Related Inflammatory Condition

HALIMA KHATUN MUNNI, DIPESH DAS, KHAIRUN NAHAR JENI, MOHAMMAD SALIM HOSSAIN*

*Department of Pharmacy, Noakhali Science and Technology University, Noakhali-3814, Bangladesh*

**pharmasalim@nstu.edu.bd*

## ABSTRACT

**Background:** Obesity, characterized by adipocyte hypertrophy and hyperplasia or both, is a major public health concern worldwide. Excess energy accumulation in terms of triglyceride leads to the development of obesity. It is a major contributor to the pathogenesis of diabetes and cardiovascular complications, eventually causing metabolic syndrome. SGLT inhibitors are generally known as anti-diabetic medications with remarkable cardiovascular benefits, but little is known about their effects on adipogenesis and related inflammation.

**Objective:** As SGLT inhibition increases lipolysis, we aimed to ascertain the role of the SGLT pathway in adipogenesis and adipocyte inflammation in obesity employing a non-selective SGLT inhibitor, sotagliflozin.

**Methods and materials:** High-fat diet-induced obese mice were treated with three different diets: a regular diet, a high-fat diet, and sotagliflozin, combined with a high-fat diet. At the end of the study period, body weight, lipid profile, coronary index, liver and kidney function, adipose tissue size, inflammatory condition, and serum glucose level were monitored. Targeted gene expression was determined by qPCR using the ΔΔCT technique.

**Results:** When obese mice were treated with sotagliflozin, their body weight, adipocyte size, visceral fat mass, serum total cholesterols, serum and adipose tissue triglycerides, and blood glucose levels were significantly ($p< 0.05$) lower than those of the positive control group. The biochemical findings were supported by a significant ($p<0.05$) change in the gene expression of targeted genes linked to inflammation and adipogenesis, including PPARγ, IL-6, TNFα, UCP-1, PGES, P-Selectin, ICAM-1 and VCAM-I. These results indicate the positive role of sotagliflozin in obesity-induced inflammation.

**Conclusion:** The current investigation showed that inhibiting the SGLT pathway reduces adipogenesis and increases the chance of browning of white adipose tissue (evidenced by UCP-1 upregulation) to increase the lipolysis that eventually contributes to be useful in the management of obesity-induced complications.

**Keywords:** Inflammation; obesity; PPARγ; sotagliflozin; VCAM-1

# Enhancing Disintegrating Properties of Croscarmellose Sodium by Optimization of Reaction Parameters

**AL AMIN[1], MITHILA HAQUE[2], SAMIHA SAYEED[2], AL-AMIN AHSAN SIAM[1], ABU ASAD CHOWDURY[2]***

*[1]Department of Pharmacy, Faculty of Pharmacy, University of Dhaka, Dhaka 1000, Bangladesh*

*[2]Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*asaddg27@du.ac.bd

## ABSTRACT

**Background:** Effective drug formulations need fast tablet disintegration and dissolution. Sodium croscarmellose (CCS), a powerful super disintegrant derived from CMC, is widely used in Bangladesh. Despite its importance, no local production exists; pharmaceutical companies import CCS from Taiwan, India, and Ireland at high costs and in large quantities.

**Objective:** This research aims to synthesize CCS and optimize CMC crosslinking using glycolic acid to improve disintegration, focusing on key factors affecting swelling, water retention, and overall efficiency.

**Materials and methods:** In this study, CMC was crosslinked with glycolic acid under various conditions, including reaction time (2 to 4 hours), temperature (50˚C to 70˚C), solid-to-liquid ratio (1:10 to 1:20), IPA concentration (70% to 100%), and glycolic acid concentration (7 to 21% of CMC) and a total 33 CCS were prepared. The synthesized CCS was characterized using FTIR spectroscopy to compare with standard CCS. Swelling index, water retention, and tablet disintegration time were measured to assess performance.

**Results:** In this study, sample 1 (S: L of 1:15, 14% glycolic acid of CMC) and sample 8 (S: L of 1:20,16% glycolic acid of CMC) produced from the reaction with 3hr and 60˚C with 100% IPA showed maximum swelling index [sample 1 (8.4) and sample 8 (7.4)] and water retention properties [sample 1 (683.63%) and sample 8 (656.53%)]. The tablets formulated with this optimized croscarmellose showed a disintegration time of 93 seconds for sample 1 and 95 seconds for sample 8, demonstrating comparable performance to standard CCS.

**Conclusion:** Crosslinking of CMC in 100% IPA medium at a solid-to-liquid ratio of 1:15 - 1:20 with 14-16% glycolic acid for 3 hours at 60 - 70˚C temperature showed the maximum swelling and water retention properties

**Keywords:** CMC; disintegrating agent; disintegration time; sodium croscarmellose; swelling capacity

# Determination of Link of *IL-33* rs1929992 Polymorphism with Cervical Cancer Susceptibility in Bangladeshi Population: A Case-Control Study

MD ABDUL BAREK[1,2], MOHAMMAD SAFIQUL ISLAM[1,2]*

[1]*Department of Pharmacy, Noakhali Science and Technology University, Sonapur, Noakhali-3814, Bangladesh*
[2]*Laboratory of Pharmacogenomics and Molecular Biology, Department of Pharmacy, Noakhali Science and Technology University, Sonapur 3814, Noakhali, Bangladesh*
**research_safiq@yahoo.com*

## ABSTRACT

**Background:** Cervical cancer is the second leading and deadly cancer among Bangladeshi women, behind breast cancer. The majority of instances are caused by human papillomavirus infection (HPV) and other co-factors, including smoking. Recent investigations have identified numerous vulnerable genetic variants for the tendency of cervical cancer.
**Objective:** The current study aims to formulate and evaluate the relationship between IL-33 rs1929992 polymorphism and the susceptibility to the formation of cervical cancer among the people of Bangladesh.
**Materials and methods:** We carried out case-control research with 268 cases and 188 healthy volunteers to detect the association of rs1929992 polymorphism with cervical cancer in Bangladeshi women. We have applied the Polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) technique for genotyping.
**Results:** The frequencies of GG, AG, and AA genotype carriers were 29.85%, 53.36%, and 16.79% in cases, whereas these values were 50.53%, 38.83%, and 10.64% in controls, respectively. AG carriers showed 2.32 times more risk for the growth of cervical cancer in contrast with the GG genotype (OR= 2.32, 95%CI= 1.54-3.50, p= 0.0001), which is statistically significant (p>0.05). The individual carrying the AA genotype showed 2.67 times more risk for the growth of cervical cancer in contrast with the GG genotype (OR= 2.67, 95%CI= 1.45-4.89, p= 0.0015). In the dominant model (AG+AA vs. GG), carriers of at least one A allele (AG+AA carriers) exhibited a statistically significant association with a higher vulnerability of cervical cancer (OR= 2.40, 95%CI= 1.62-3.53, p= <0.0001). In contrast, in the recessive model (AA vs. GG+AG), no significant association was observed between AA carriers and an elevated chance of cervical cancer (OR= 1.29, 95% CI= 0.73-2.28, p = 0.3789). Furthermore, the presence of the A allele (A vs. G) demonstrated a substantial correlation with an enhanced possibility of cervical cancer (OR= 1.78, 95% CI= 1.35-2.36, p= <0.0001).
**Conclusion:** Our result indicates that the rs1929992 variation is linked to a higher incidence of cervical cancer in Bangladeshis.
**Keywords:** Cervical cancer; IL-33; PCR-RFLP; polymorphisms; rs1929992

# *In Vitro* and *In Vivo* Evaluation of Pharmacological Potential of *Brunfelsia pauciflora* Stem Extract

**RIFFATH UZ ZAMAN*, NAZNEEN AHMED SULTANA, AKLIMA AKHTER, A K M HABIBULLAH**

*Department of Pharmacy, Faculty of Health & Life Sciences, Daffodil International University, Dhaka-1207, Bangladesh*

*uz29-512@diu.edu.bd

## ABSTRACT

**Background:** *Brunfelsia pauciflora* is an ancient plant traditionally used in the treatment of fever & pain. However, there are no published reports about the pharmacological potentiality of *Brunfelsia pauciflora*.

**Objective:** The objective of this research is the phytochemical screening as well as determining the antibacterial, thrombolytic, analgesic, tumor necrosis factor levels and antidiarrheal activity of methanol extract of stem of *Brunfelsia pauciflora*.

**Materials and methods:** The antibacterial activity is done by in vitro process where several bacterial strains such as *Bacillus megaterium, Vibrio mimicus, Bacillus cereus and Vibrio parahemolyticus* were taken against kanamycin antibiotic. Thrombolytic activity was done with the help of streptokinase. The analgesic activity was identified when extracts were parenterally inserted in the mice and compared with diclofenac Na. On the other hand, antidiarrheal activity was measured with the help of a castor oil-induced diarrheal model in mice.

**Results:** Methanolic extract of *Brunfelsia pauciflora* shows 50% thrombolytic activity, whereas streptokinase and distilled water exhibits 77.41% & 13.33%, which indicates that the extract has medium thrombolytic activity. Acetic acid-induced writhing test shows that the conventional medication diclofenac sodium reduced 76.79% writhing in mice, whereas *Brunfelsia pauciflora* extract inhibited 60.71% and 62.5% for 250 mg and 500 mg of stem extract, which indicates that the extract has noticeable analgesic activity. In a castor oil-induced diarrheal model, the extract at dosages of 250 and 500 mg/kg resulted in a dose-dependent decrease in the amount of fecal matter passed by the mice. A significant inhibition of 48.28% of the typical diarrheal feces was seen at a higher dose of the methanol extracts (500 mg/kg), and a significant inhibition of 37.93% was seen at a lower dose (250 mg/kg). In the case of antibacterial activity, the dose of kanamycin was 30 µg/disc, and the extract was 500 µg/disc, showing moderate antibacterial activity.

**Conclusion:** The extracts have noteworthy pharmacological potential but further studies are needed about their mechanism of action and drug likeness.

**Keywords:** Analgesic; antidiarrheal; antimicrobial; *Brunfelsia pauciflora*; thrombolytic

# Investigation of Analgesic and CNS Depressant Activity of *Premna esculenta* Extract

**JANNATUL FERDOUS SHAILY, PRITESH RANJAN DASH***

*Department of Pharmacy, Independent University, Primeasia University, Dhaka-1213, Bangladesh*

*pritesh@primeasia.edu.bd

## ABSTRACT

**Background:** The current study used ethanolic extracts of *Premna esculenta* for phytochemical screening and pharmacological studies. *P. esculenta* ethanol extracts analgesic and central nervous system-depressant qualities were examined in this work using animal models.

**Methods and materials:** The ethanolic extract of the *P. esculenta* plant was given to mice at doses of 200 mg/kg and 400 mg/kg of body weight to examine any potential analgesic and central nervous system (CNS) depressive effects. An acetic acid-induced writhing test was used to assess the analgesic qualities for both central and peripheral pharmacological effects. Utilizing a hole cross and open field tests. It was assessed for its capacity to depress the central nervous system.

**Results:** In an acetic acid-induced writhing test, the extract decreased writhing by 200 mg/kg at the lower dose and by a maximum of 400 mg/kg at the higher dose, which is equivalent to the reference medication diclofenac sodium, which inhibited writhing by 66.06% at 25 mg/kg body weight. According to the results of CNS depressant action, the extract reduced mice's motor activity and exploratory behavior in dose-dependent ways in hole cross and open field tests. As time passed, fewer fields were crossed in the open field test, and fewer holes were crossed in the hole cross test. According to these findings, CNS depressive effects on mice.

**Conclusions:** The results of this investigation revealed *P. esculenta*'s analgesic and central nervous system effects.

**Keywords:** Analgesic; CNS; *Premna esculenta*

# Preparation and Evaluation of Biosynthetic Procedure of Iron Oxide and Magnesium Oxide Nanoparticles Using *Hylocereus undatus* Fruit Peel Extract and Their Anticancer Properties

**SADIA ADNIN OYSHI[1], RUMANA A. JAHAN[2], FAHIMA AKTAR[3], JAKIR AHMED CHOWDHURY[4], MD. SHAH AMRAN[3]***

*[1]Department of Pharmacy, East West University, A/2, Jahurul Islam Avenue Jahurul Islam City, Aftabnagar, Dhaka-1212, Bangladesh*

*[2]Center for Advanced Research in Sciences, University of Dhaka, Dhaka-1000, Bangladesh*

*[3]Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka, Dhaka 1000, Bangladesh*

*[4]Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka 1000, Bangladesh*

**amranms@du.ac.bd*

## ABSTRACT

**Background:** Nanoparticles with enhanced surface area are ideal for biomedical use due to improved strength and stability. We developed eco-friendly, cost-effective biosynthetic methods for iron and magnesium oxide nanoparticles using dragon fruit peel extract. Their anticancer effects were tested on HeLa and BHK-21 cells, showing promising biomedical potential.

**Objective:** Our main focus is to create nanoparticles by using environment-friendly and cost-effective way to use them as potential anticancer drug.

**Materials and methods:** We have collected *Hylocereus undatus* fruit peel (HUFP) extract with ethanol and water in 1:2 ratio, mixed it with ferric chloride hexahydrate ($FeCl_3.6H_2O$) in 1:1 and 1:3 ratio and magnesium nitrate hexahydrate ($Mg(NO_3)_2.H_2O$) separately in 1:5 ratio separately by magnetic stirrer and centrifuged them in 3000 rpm to collected. Later, we dried them at 70°C. They were characterized with different techniques such as ultraviolet-visible (UV-VIS) spectrophotometry, transmission electron microscopy (TEM) and energy dispersive X-ray spectroscopy (EDX), Fourier-transform infrared spectroscopy (FTIR) and X-ray diffractometer (XRD).

**Results:** The UV–Vis spectra gave a characteristic peak exactly at a range that matches iron oxide and magnesium oxide; XRD confirmed its crystalline structure; FTIR confirmed the involvement of phytochemicals in their capping and reduction; TEM images confirmed their size and EDX analyzed the elemental composition. In anticancer testd, it gave significant($p<0.05$) results which showed that only less than 5% HeLa cells survived in the case of both, and less than 5% and 60% BHK-21 cells survived with magnesium oxide and iron oxide, respectively. With only HUFP extract (standard), less than 95% survival in both cells.

**Conclusion:** This study presents a green, rapid synthesis of iron and magnesium oxide nanoparticles using DFP extract, showing significant anticancer activity and potential for safer, more effective drug development.

**Keywords:** BHK-21; cell iron oxide; HeLa cell; magnesium oxide; nanoparticles

# Isolation and Characterization of Cholinesterase Inhibitors from *Wedelia trilobata*

**JOYA RANI, MD. GOLAM SADIK***

*Department of Pharmacy, University of Rajshahi, Rajshahi-6205, Bangladesh.*
*gsadik2@ru.ac.bd*

## ABSTRACT

**Background:** Inhibitors of cholinesterases are considered the first-line pharmacotherapeutics in the treatment of Alzheimer's disease (AD). Only three cholinesterases are currently available to treat AD. Therefore, there is increasing interest in developing new cholinesterase inhibitors. *Wedelia trilobata* is a potential medicinal plant used traditionally in the treatment of nervous weakness, vertigo and other ailments. However, no cholinesterase inhibitory activity has been done on this plant.
**Objective:** The objective of this work is to evaluate the cholinesterase inhibitory and antioxidant activity of the extract of *W. trilobata* and to isolate the active compounds.
**Materials and methods:** The crude methanol extract of the plant was prepared and partitioned into n-hexane, chloroform, ethyl acetate and aqueous fraction. The cholinesterase inhibitory activity was determined by modified Ellman's method, and the antioxidant activity was determined using several in vitro assays. Chromatographic techniques were used for the isolation of compounds. The structure of the compounds was elucidated by analysis of their $^{1}$H-NMR and $^{13}$C-NMR spectral data.
**Results:** Among the fractions, chloroform fraction exhibited the highest inhibition against both the acetyl- and butyryl-choliesterase enzymes with $IC_{50}$ values of 50.00 and 130.00 µg/ml, respectively. The fractions also showed good antioxidant activity in terms of free radical scavenging, reducing power, total antioxidant activity and lipid peroxidation inhibition. Phytochemical analysis revealed the highest content of phenolics (00.84 ± 0.83 mg GAE/g) and flavonoids (00.98 ± 0.69 mg CE/g) in the chloroform fraction. Bioactivity-guided approach led to the isolation of kaur-16-en-19-oic acid and bis(2-ethylhexyl) phthalate as the cholinesterase inhibitors from the chloroform fraction. Although kaur-16-en-19-oic acid has previously been reported from this plant, this is the first report of the occurrence of bis(2-ethylhexyl) phthalate in this plant.
**Conclusion:** These results suggest that *W. trilobata* is an important source of cholinesterase inhibitors that may be used in the treatment of AD.
**Keywords:** Acetylcholinesterase; Alzheimer's disease; butyrylcholinesterase; neurodegenerative; *Wedelia trilobata*

# Isolation and Characterization of Triterpenes and Fatty Acids from *Dracaena spicata*: *In-Vivo* and *In-Vitro* Pharmacological Investigations

**RAJIB DAS[1], MD SAIFUL ISLAM[2], SADIA AFREEN CHOWDHURY[3,4], SITESH CHANDRA BACHAR[5], MONIRA AHSAN[4]***

*[1]Department of Clinical Pharmacy and Pharmacology, Faculty of Pharmacy, University of Dhaka, Dhaka 1000, Bangladesh*

*[2]Pharmaceutical Sciences Research Division, BCSIR Dhaka Laboratories, Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka-1205, Bangladesh*

*[3]Laborarory of Pharmacognosy and Phytochemistry, Department of Pharmacy, Stamford University Bangladesh, Dhaka-1217, Bangladesh*

*[4]Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Dhaka, Dhaka 1000, Bangladesh*

*[5]Department of Pharmacy, Faculty of Pharmacy, University of Dhaka, Dhaka 1000, Bangladesh*

**moniraahsan@du.ac.bd*

## ABSTRACT

**Background:** *Dracaena spicata*, belonging to the Asparagaceae family, is a succulent shrub known for its potential richness in bioactive compounds.

**Objective:** This study aimed to explore the phytochemical composition and biological properties of methanol extracts from the stem-leaves of *D. spicata*.

**Materials and Methods:** Dried and coarsely powdered plant material was extracted using methanol, followed by drying with a rotary evaporator. The crude extract was subjected to extensive separation via column chromatography and preparative thin-layer chromatography (TLC). The chemical structures of the isolated compounds were elucidated using spectroscopic techniques, including 1D and 2D nuclear magnetic resonance (NMR) spectroscopy. Phytochemical screening of the plant extract was performed using gas chromatography-mass spectrometry (GC-MS). The biological activities of the extracts were subsequently evaluated.

**Results:** Two lupane-type triterpenoids-betulin and betulinic acid-were identified for the first time in *D. spicata*, along with lauric acid. GC-MS analysis revealed diverse compounds, including amides, sterols, fatty acids, phenolic derivatives, lactones, and vitamins. The total phenolic and flavonoid contents were 138.21 mg GAE/g and 115.625 mg quercetin/g, respectively. The plant extract showed moderate antioxidant activity (IC50: 254.69 µg/mL) compared to the standard BHT (IC50: 6.72 µg/mL). In the brine shrimp lethality assay, it exhibited an LC50 of 36.683 µg/mL, though no significant cytotoxicity was noted in HeLa cells. The extract demonstrated strong thrombolytic activity with 83.02% clot lysis and antibacterial activity (8-13 mm inhibition zones) against *B. cereus, S. aureus, E. coli*, and *V. cholerae*. It also showed dose-dependent analgesic activity with 66.6% inhibition in the writhing assay, compared to 79.6% for diclofenac sodium, indicating potential pharmacological applications.

**Conclusion:** *D. spicata* is a promising source of bioactive compounds, particularly triterpenes and fatty acids. Further studies focusing on the biological activities of pure compounds are warranted for potential therapeutic applications.
**Keywords:** Analgesic; antioxidant; cytotoxicity; *Dracaena spicata*; thrombolysis

# *Rauvolfia serpentina* Treatment Prevents Oxidative Stress, Inflammation and Fibrosis in the Heart of Isoprenaline-administered Rats

**KAMRUN NAHAR ELA, ASIF UL HAQUE, MIRZA ALIMULLAH, PUSPA SORNAKAR, FERDOUS KHAN, NUSRAT SUBHAN, MD. ASHRAFUL ALAM***

*Department of Pharmaceutical Sciences, North South University, Dhaka 1229, Bangladesh*

*ashraful.alam@northsouth.edu

## ABSTRACT

**Background:** *Rauvolfia serpentina* plant, also known as sarpagandha, possesses several beneficial qualities and medicinal uses. However, the specific preventive effects of *Rauvolfia serpentina* root against isoprenaline (ISO)-induced myocardial damage have not been fully elucidated. This study seeks to explore the influence of *Rauvolfia serpentina* root extract (RSRE) on oxidative stress, fibrosis, and cardiac damage in isoprenaline-induced rats.

**Objective: P**hytochemical analysis and pharmacological evaluation of the RSRE were conducted to explore its cardioprotective effects in a rat model.

**Materials and methods:** In this research study, male Long Evans rats were placed in four distinct groups: Control, ISO, Control + RSRE (100 mg/kg), and ISO + RSRE (100 mg/kg). The rats received subcutaneous injections of ISO (50 mg/kg) twice a week in addition to *Rauvolfia serpentina* extract. At the end of the experiment, the rats were humanely euthanized, and samples of blood and organs were collected for biochemical and oxidative stress parameters such as malondialdehyde (MDA), nitric oxide (NO), advanced oxidation protein product (AOPP) and tissues antioxidant activity analysis. Histopathological examinations were also conducted to evaluate fibrosis and inflammatory cell infiltration in the heart.

**Results:** ISO therapy resulted in increased oxidative stress in the heart of rats. Administration of RSRE in ISO-induced rats prevented the MDA (16.36 $\pm$ 1.37 nmol/mL in plasma), NO (9.61 $\pm$ 1.26 nmol/mL), AOPP (227.94 $\pm$ 20.78 nmol/mL) formation compared to ISO group rats (MDA, 26.45 $\pm$ 1.09; NO 18.20 $\pm$ 1.77; AOPP, 365.24 $\pm$ 11.31 nmol/mL). RSRE root also restored the antioxidant enzymes such as superoxide dismutase (63.58 $\pm$ 7.58 U/min/mg protein) and catalase (35.83 $\pm$ 4.55 U/min/mg protein) activities in the heart of ISO administered rats (ISO group, SOD 38.90 $\pm$ 7.22 and catalase 21.67 $\pm$ 4.01 U/min/mg protein). Additionally, ISO-treated rats displayed increased levels of fibrosis and inflammatory cell infiltration in the heart, which were averted by RSRE treatment.

**Conclusion:** RSRE administration may protect the heart by reducing inflammation, oxidative stress, and fibrosis in ISO-induced rats. Further investigation is needed to understand the efficacy of RSRE in a clinical setup.

**Keywords:** Fibrosis; inflammation; isoprenaline; myocardial damage; *Rauvolfia serpentina*

# Investigation of Phytochemicals and Evaluation of Analgesic, Neuropharmacological, and Antioxidant Activity of the Methanolic Extract of *Clerodendrum indicum* Leaves

NURUL HUDA[1], SABRINA SULTANA RAISA[2], EMU DAS[1], AGNILA CHAKRABORTY[1]*

[1]*Department of Pharmacy, BGC Trust University Bangladesh, Chattogram*
[2]*Department of Pharmacy, University of Science & Technology Chittagong, Bangladesh*
**agnila@bgctub.ac.bd*

## ABSTRACT

**Background:** *Clerodendrum indicum*, locally named Bharangi or Turk's turban, is used as an excellent anti-inflammatory, and anti-nociceptive agent, and also aids in wound healing, allergy, and relieving symptoms of colds, coughs, and asthma. *Clerodendrum indicum* is enriched with secondary metabolites like phenolics, flavonoids, alkaloids, tannins, etc.

**Objective:** The study was conducted to evaluate the *in-vivo* analgesic, anxiolytic, central nervous system (CNS) depressant, and *in-vitro* antioxidant activity of the methanolic extract of *Clerodendrum indicum* leaves.

**Materials and methods:** Phytochemical screening of crude methanolic leaf extract of *Clerodendrum indicum* (MECI) was done using previously established methods. Evaluation of peripheral analgesic activity was done using the acetic acid-induced writhing method. Investigation of anxiolytic activity was carried out by hole-board and Elevated plus maze methods. CNS depressant activity was evaluated using open-field and hole-cross methods. All the in-vivo pharmacological activities were carried out on the Swiss albino mice model. In-vitro antioxidant antioxidant activity was evaluated by calculating the percentage (%) of scavenging effect and $IC_{50}$ value using DPPH free radical scavenging assay.

**Results:** In the acetic acid-induced writhing test, MECI at the doses of 200 mg/kg and 400 mg/kg showed highly significant ($P<0.001$) inhibition of writhing compared to the control and standard Diclofenac. The hole board test at dose 400 mg/kg showed moderate ($P<0.01$) anxiolytic activity and in the EPM method, both the doses 200 mg/kg and 400 mg/kg showed an increased number of entries in the open arm and total time spent in the open arm was moderate ($P<0.01$) compared to the control and standard Diazepam. MECI showed significant ($P<0.01$) CNS depressant activity in a dose-dependent manner by decreasing the locomotor activity of test animals and causing sedative effects at 90 and 120 minutes. In comparison, with the standard ascorbic acid, at higher concentrations (500, 250 µg/ml), MECI showed a significant antioxidant effect and the scavenging of DPPH free radicals decreased as the concentration decreased (15.63 µg/ml).

**Conclusion:** Overall, the study suggests that the methanolic extract of *Clerodendrum indicum leaves* has some significant phytoconstituents responsible for the potential pharmacological properties. Further study is required to identify and isolate the active compounds.

**Keywords:** Analgesic; antioxidant; anxiolytic; *Clerodendrum indicum;* CNS depressant

# Evaluation of Biological Activities of Ethanolic Extract of *Abroma augustum*

**MAISHA MUNTAKA MITHILA, PRITESH RANJAN DASH***

*Department of Pharmacy, Primeasia University, Banani, Dhaka, Bangladesh*

*pritesh@primeasia.edu.bd

## ABSTRACT

**Background:** A traditional remedy for conditions like anti-diabetic, anti-inflammatory, thrombolytic, antioxidant, and hypolipidemic illnesses is *Abroma augustum* (local name: Ulat kambal).

**Objective:** The objective of the current investigation was to evaluate the pharmacological effects of an ethanolic *Abroma augustum* bark extract.

**Materials and methods:** At doses of 200 mg/kg and 400 mg/kg of body weight on mice, the potential analgesic and central nervous system (CNS) depressant effects of the ethanolic extract of *Abroma augustum* bark were examined in the current study. Using an acetic acid-induced writhing test, the analgesic activities were examined for their central and peripheral pharmacological actions. With the help of hole cross and open field tests, its CNS depressant action was assessed.

**Results:** The results of an acetic acid-induced writhing test showed that the extract suppressed writhing by 54.22% at the lower dose and by a maximum of 74.99% at the higher dose, which is equivalent to the reference drug diclofenac sodium, whose writhing inhibition was 73.49% at 25 mg/kg body weight. According to the findings of the CNS depressant activity test, the extract reduced the mice's motor activity and exploratory behavior in hole cross and open field tests. As time passed, the open field test covered fewer fields, and the hole cross test covered fewer holes.

**Conclusion:** The investigation's findings demonstrated the analgesic and CNS effects of *Abroma augustum*.

**Keywords:** *Abroma augustum*; analgesic activity; CNS depressant; locomotor activity

# Isolation and Characterization of Endophytic Bacteria from Ginger, Turmeric and Radish and Investigation of Their Antibacterial and Antioxidant Activities

**SUDIPTA SAHA[1], MRINMOY SARKAR[1], MD. ZAHIRUL ISLAM[2], MD. AJIJUR RAHMAN[1]***

*[1]Department of Pharmacy, University of Rajshahi, Rajshahi-6205, Bangladesh*

*[2]Department of Pharmacy, East West University, Dhaka, Bangladesh*

**ajijurrahman.pharm@ru.ac.bd*

## ABSTRACT

**Background:** Endophytic bacteria, symbiotic microorganisms living within plant tissues, are emerging as valuable sources of novel bioactive secondary metabolites with potential antibacterial, antifungal, and anticancer properties.

**Objective:** This study focuses on isolating, identifying, and characterizing endophytic microorganisms from three widely used spices and vegetables-ginger (*Zingiber officinale*), turmeric (*Curcuma longa*), and white radish (*Raphanus sativus*)-to evaluate their antibacterial and antioxidant activities.

**Materials and methods:** The inner tissues from fresh surface-sterilized pieces of rhizomes of ginger, turmeric, and white radish were inoculated onto starch-casein-nitrate agar plates using the tissue segmentation method. The plates were incubated at 30°C for 7-14 days, allowing endophytes to grow, which were then isolated into pure cultures. Antibacterial activity was screened against six antibiotic-resistant bacteria, including four Gram-negative and two Gram-positive strains. Bioactive isolates were identified using phenotypic characteristics and 16S rDNA sequencing. The antibacterial efficacy of ethyl acetate extracts was assessed using the Kirby-Bauer disc diffusion method, while antioxidant activity was evaluated with the DPPH radical scavenging assay.

**Results:** A total of 24 endophytic bacterial strains were isolated-13 from turmeric, 5 from ginger, and 6 from white radish. Of these, 23.08% of turmeric, 40% of ginger, and 50% of white radish isolates displayed broad-spectrum antibacterial activity against multidrug-resistant pathogens. Strain RD-1(b) was identified as Burkholderia contaminans, and strains RD-2(c) and TM-4(b) as Enterobacter cloacae. The crude ethyl acetate extract of RD-1(b) exhibited significant antibacterial activity, the strongest against *Staphylococcus aureus*. The crude extract also demonstrated strong antioxidant activity.

**Conclusion:** Endophytes from turmeric, ginger, and white radish show potential as sources of bioactive compounds with antibacterial activity against multidrug-resistant pathogens. Further studies are necessary to isolate and characterize these compounds to evaluate their safety and efficacy.

**Keywords:** Antibacterial activity; antioxidant activity; endophytic bacteria; ginger; turmeric

# Computational Docking, Drug-likeness and ADMET Analysis of Bioactive Compounds Derived from *Polyalthia longifolia* Focusing on Antibacterial Activity

JOY JOHON ROY[1], KAZI MD. ASHRAFUL ISLAM[1], MST. MONISHA AKTER MIMI[1], MD. JAMAL HOSSAIN[1,2]*

[1]*Department of Pharmacy, School of Pharmaceutical Sciences, State University of Bangladesh, South Purbachal, Dhaka 1461, Bangladesh*

[2] *Bioscience PhD program, University of Utah, Salt Lake City, UT 84112, USA*

*jamal.hossain@utah.edu

## ABSTRACT

**Background:** *Polyalthia longifolia*, or the Ashoka tree, native to South Asia, is traditionally used to treat various ailments, including malaria, diabetes, and arthritis. It contains compounds like glycosides and flavonoids. Despite its medicinal potential, research on its antibacterial properties remains limited, necessitating further scientific investigation.

**Objective:** This study primarily aimed to explore the pharmacological potential of *Polyalthia longifolia*, specifically its antibacterial properties, by investigating the molecular interactions between the phytocompounds and bacterial targets.

**Materials and methods:** A total of 262 compounds isolated from *P. longifolia* were reviewed, and 73 compounds were selected for further evaluation based on their antibacterial potentialities. Molecular docking simulations were performed using PyRx, PyMol, and Discovery Studio (version 4.5) to examine interactions with bacterial targets: beta-lactamase (PDB: 1YLJ), dihydrofolate reductase (DHFR) (PDB: 4M6J), DNA gyrase (PDB: 1AJ6), and porin protein (PDB: 4GCQ). Absorption, distribution, metabolism, excretion, and toxicity (ADMET) properties were analyzed using pkCSM and Swiss ADME online tools.

**Results:** Out of 73 tested compounds, over 30 showed promising antibacterial activity with binding strengths between -7.0 and -10.0 kcal/mol. Rutin (C13), a lead compound from plants, displayed strong binding affinities across four bacterial targets. Other notable compounds included longimide A, quercetin glucopyranoside, apomorphine, harpagoside, hydroxyandrostan, and liriodenine. Most adhered to Lipinski's Rule of Five, indicating drug-like properties, and showed high intestinal absorption without inhibiting CYP2C19 or CYP3A4 enzymes. Additionally, these compounds demonstrated excellent safety profiles, with no signs of skin sensitization or hepatotoxicity, suggesting strong potential for further drug development.

**Conclusion:** According to current *in silico* evidence, constituents of *Polyalthia longifolia* have demonstrated potential in inhibiting various bacterial targets, including resistant proteins.

**Keywords:** Dihydrofolate reductase enzyme; DNA gyrase; molecular docking; pharmacokinetics analysis; *Polyalthia longifolia*

# Understanding The Awareness about The Importance of Pre-& Peri-conception of Folic Acid Intake and Vaccination in Pregnant Women in Bangladesh to Avoid Birth Defects

**SABRIN I KHAN[1], KANIJ NAHAR[2], ASHIQUR RAHMAN RAFI[1], REATUL KARIM[1], SHARLIN KHAN[3]*, BEJOLY BITHI[1], MD. MEHEDI HASAN[1], SABIQUN NAHER[1]**

*[1]Department of Pharmaceutical Sciences, School of Health & Life Sciences, North South University, Basundhara, Bangladesh*

*[2]Department of Pharmacy, School of Medicine, University of Asia Pacific, 74/A, Green Road, Dhaka-1215, Bangladesh*

*[3]Department of Clinical Pharmacy and Pharmacology, Faculty of Pharmacy, University of Dhaka, Bangladesh*

**sabrin.khan@northsouth.edu*

## ABSTRACT

**Background:** Folic acid, also known as folate, is one of the B vitamins (B9) that treats low blood levels. In the early stages of pregnancy, it contributes to the proper closure of the neural tube-a process that occurs within the first month of conception, which helps to form the brain and spine of babies in the womb. In addition, vaccination before and during pregnancy, especially MMR (Measles, Mumps, and Rubella) and COVID-19 vaccines, is essential for protecting both mothers and infants from preventable diseases.

**Objective:** The study aims to understand the awareness about folate status and vaccination among pregnant women in Bangladesh to help prevent both the recurrence and the first occurrence of congenital disabilities.

**Materials and methods:** A total of 400 patients aged 15-40 years were included in a study at BSMMU, Dhaka, from January to September 2024. Descriptive statistics assessed awareness of birth defect prevention among pregnant women based on demographic and clinical characteristics. A chi-square test will evaluate the overall impact of these attributes, followed by multinomial logistic regression analysis. Data will be analyzed using Microsoft Excel, SPSS 27, and Stata SE17.0. Ethical approval was granted by the Institutional Review Board of North South University (clearance #OR-NSU/IRB/0204), and hospital permission was also obtained for conducting the study.

**Results:** From the obtained result, only 35.6% of the mothers knew about the relation of folic acid to pregnancy. However, only 14.8% of mothers took folic acid supplements before conception, and only 35.7% of mothers during pregnancy. Among all of them, 56.8% of mothers did not know about the correct dose of folic acid. As a result, 46.7% of mothers took folic acid as a combination of multivitamins, but multivitamins do not contain the recommended dose. In addition, only 5.5% took the MMR (Measles, Mumps and Rubella), and 20% took COVID-19 vaccines before pregnancy.

**Conclusion:** Folic acid supplementation during pregnancy or food fortification is an evidence-based strategy that will be used to lower the risk of prevalence of birth defects by this study.

**Keywords:** Congenital disabilities; periconception and preconceptional intake; women of reproductive age; vaccination

# Evaluating Echocardiography Techniques in Small Animal Research to Assess the Beneficial Effect of Calcium Channel Blocker in Isoprenaline-Administered Rats

**MD JUNAEID RAHMAN, SADIA RAHMAN, ASIF UL HAQUE, MIRZA ALIMULLAH, MD. ASHRAFUL ALAM***

*Department of Pharmaceutical Sciences, North South University, Dhaka 1229, Bangladesh*

*ashraful.alam@northsouth.edu

## ABSTRACT

**Background:** Calcium channel blockers have already shown promise in reducing cardiac insult in myocardial infarction. Nifedipine is a first-generation dihydropyridine L-type calcium channel blocker. On the other hand, lercanidipine is a dihydropyridine calcium-channel blocker, that promotes systemic vasodilation by inhibiting the influx of calcium ions through L-type calcium channels in cell membranes.

**Objective:** This study used the echocardiography techniques along with other biochemical and histological staining techniques to compare the influence of these two calcium channel blockers-nifedipine and lercanidipine; on the cardiac oxidative stress in ISO-administered rats.

**Materials and methods:** Long Evans rats (n=6 per group) were divided into six groups, including Control, ISO, ISO + Nifedipine, and ISO + Lercanidipine. ISO rats received oral nifedipine (20 mg/kg/day) or lercanidipine (5 mg/kg/day) for 14 days. On day 14, echocardiography assessed ejection fraction, fractional shortening, and left ventricular posterior wall thickness. Afterwards, rats were humanely euthanized for blood and organ collection. Biochemical and oxidative stress markers, including malondialdehyde, nitric oxide, and advanced protein oxidation products, were analyzed. Histopathological examinations assessed fibrosis and inflammatory cell infiltration in heart and kidney tissues to evaluate treatment effects.

**Results:** ISO administration significantly raised cardiac markers (CK-MB), oxidative stress parameters and inflammation, while reducing antioxidant enzymes in rats. Treatment with nifedipine or lercanidipine significantly reduced ISO-induced changes in biochemical and oxidative stress markers. The echocardiography also revealed that ejection fraction, fractional shortening, and the left ventricular posterior wall thickness were improved by the treatment with nifedipine and lercanidipine. Additionally, ISO-treated rats displayed increased levels of fibrosis and inflammatory cell infiltration in the heart, which were averted by nifedipine or lercanidipine treatment.

**Conclusion:** The results of the study leave an impression that lercanidipine is better than nifedipine when eliminating ISO-related cardiac influence on rats. The possible reason is that lercanidipine has significantly greater vascular selectivity in comparison to widely used nifedipine.

**Keywords:** Fibrosis; inflammation; isoprenaline; lercanidipine; myocardial damage; nifedipine

# Anti-hyperglycemic and Anti-lipidemic Effects of Some Active Compounds Isolated from *Terminalia arjuna* on Streptozotocin-Induced Type 1 Diabetic Mice

**REJINA AFRIN[1,2]*, JANNATE HAQUE SOMA[1], TASFIA ZAMAN[1], ANAMIKA MAZUMDAR TANNY[1], MAHANAZ AFRIN[1], CHOWDHURY FAIZ HOSSAIN[1]***

*[1]Department of Pharmacy, East West University, A/2 Jaharul Islam Main Road, Aftabnagar, Dhaka-1212, Bangladesh*

*[2]Marshall University School of Pharmacy, 1 John Marshall Drive, Huntington, WV 25755-2950, USA*

*afrin@marshall.edu, faiz@ewubd.edu

## ABSTRACT

**Background:** Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia and often accompanied by dyslipidemia, which increases the risk of cardiovascular diseases-one of the leading causes of morbidity and mortality in diabetic patients. *Terminalia arjuna* has been used for centuries in Ayurveda to manage heart conditions and metabolic disorders.

**Objective:** Isolate and identify metabolites from *T. arjuna* and investigate their efficacy in a type 1 DM mice model.

**Materials and methods:** Four oleanane-type triterpenoids-arjunolic acid, arjunetin, arjunic acid, and arjungenin-were isolated from *T. arjuna* bark using chromatographic and spectroscopic techniques. Type-1 diabetes mellitus was induced in Swiss albino male mice using streptozotocin (150 mg/kg). Diabetes was confirmed at blood glucose levels  16 mmol/L. After three weeks, diabetic mice were treated orally with each compound (50 mg/kg/day) for 36 days. Normal and diabetic control groups received 0.5% carboxymethyl cellulose. Serum and organs were collected post-sacrifice for biochemical and histological analysis. The study followed institutional ethical guidelines [Approval No. EWUCRT-REC-1/2019].

**Results:** After five weeks of treatment, blood glucose levels in the DM group were significantly elevated ($p<0.05$ vs. Normal). Arjunic acid and arjunolic acid reduced glucose levels by 71% and 48.3%, respectively, while arjunetin and arjungenin showed reductions of 12.66% and 6.17%. The body weight was significantly reduced ($p<0.05$ vs. Normal), and the organ index was increased in DM mice, slightly altered by treatment. Elevated serum total cholesterol and low-density lipoprotein levels were significantly reduced by arjunic acid (33.7%-36%), arjungenin (33.9%-58.5%), and arjunolic acid (49.5%-52.3%) but slightly reduced by arjunetin (20.8%-27.4%). The markers for liver damage, such as alanine transaminase, aspartate aminotransferase and alkaline phosphatase, were significantly elevated among the mice of the DM group ($p<0.01$, 0.0001 vs. Normal), whereas significant reduction (24.5%-68.7%) was found in all treatment groups. The histopathological changes were improved in the H&E-stained organs of all treated mice.

**Conclusion:** Four compounds have anti-diabetic, lipid-lowering, and hepatoprotective properties, with arjunic acid being the most prominent.

**Keywords:** Anti-hyperglycemic; arjunetin; arjungenin; arjunic acid; arjunolic acid

# Pharmacological Activities of the MeOH-Extract and the Secondary Metabolites of *Cayratia trifolia*

ADAM SAFIULLAH[1], JAHERA BINTE JASHIM[1], MD. MOHIUDDIN KABIR[2], REJINA AFRIN[1,3]*, CHOWDHURY FAIZ HOSSAIN[1]*

[1]*Department of Pharmacy, East West University, A/2 Jaharul Islam Main Road, Aftabnagar, Dhaka-1212, Bangladesh*

[2]*Department of Genetic Engineering and Biotechnology, East West University, A/2 Jaharul Islam Main Road, Aftabnagar, Dhaka-1212, Bangladesh*

[3]*Marshall University School of Pharmacy, 1 John Marshall Drive, Huntington, WV 25755-2950, USA*

*afrin@marshall.edu, *faiz@ewubd.edu

## ABSTRACT

**Background:** *Cayratia trifolia*, a medicinal plant, could be a potential source of new drugs for analgesics, anti-inflammatory, and infection against extremely drug-resistant bacteria.

**Objective:** Isolate and purify metabolites of *C. trifolia*, elucidate their structures, and evaluate their pharmacological activities.

**Materials and methods:** *C. trifolia* leaves (1.0 kg), identified by the Bangladesh National Herbarium (DACB-94840), were macerated with methanol to obtain a 40.0 g MeOH extract. TLC-guided silica-gel chromatography yielded four compounds: CT_01 (247 mg), CT_02 (725 mg), CT_03 (81 mg), and CT_04 (255 mg). NMR spectra were recorded at 400 MHz. Analgesic and anti-inflammatory activities were evaluated in Swiss albino mice using acetic acid-induced writhing and carrageenan-induced paw edema tests. Antimicrobial susceptibility was tested against 14 XDR clinical isolates following CLSI guidelines, including strains of *E. coli*, *V. cholerae*, and *Klebsiella* spp.

**Results:** The structures of the purified metabolites were elucidated with $^{1}$H- and $^{13}$C-NMR spectral analysis and confirmed by comparing the data with published data in the literature. CT_**01** and CT-**04** were identified as stigma-5-en-3-O-β-glucoside and campesterol, respectively. Significant inhibition of pain sensation was observed in MeOH-extract ($p<0.01$, $p<0.0001$) and CT_**03** ($p<0.05$, $p<0.001$) treated mice in a dose-dependent manner and in CT_**01** ($p<0.05$) and CT_**04** ($p<0.001$) treated mice at a lower dose when compared to the mice of negative control. The volume of paw edema was also reduced at a significant level by 70-80% in CT_**01** and CT_**03** treated mice after one hour ($p<0.0001$) and two hours ($p<0.01$), and by 37.5-58.75% and 16.67-44.44% in CT_**04** treated mice after one hour ($p<0.05$, $p<0.001$) and two hours of carrageenan induction. The extract and purified compounds were tested to evaluate their antibacterial activities. The results showed some degree of significant inhibition among the tested strains.

**Conclusion:** *C. trifolia* leaves are promising in managing pain, inflammation and treating XDR bacterial infections, warranting further research into it.

**Keywords:** Analgesic; anti-inflammatory; *Cayratia trifolia*; campesterol; stigma-5-en-3-O-β-glucoside; XDR

# Investigation of Pharmacological Potentials of *Pholgacanthus wallichii*

**NAZIFA MARIOM, ZEBUNNESA AHMED, NUSRATUN NAHAR, YESMIN BEGUM***

*Department of Pharmacy, Southeast University, Dhaka -1208, Bangladesh*

*yeasmin.begum@seu.edu.bd

## ABSTRACT

**Background**: *Phlogacanthus wallichii*, a plant of the Acanthaceae family, has long been used in Ayurvedic medicine for its therapeutic purposes. The natural properties of plants that improve health outcomes and develop new therapeutic options are of great importance in medical science.

**Objective**: The study's objective was to assess the methanolic bark extract of *Phlogacanthus wallichii* (MESW) for its analgesic, sedative, CNS and anti-diarrheal properties in several animal models.

**Materials and Methods:** In vivo sedative effects of MESW were evaluated using the open-field method. Analgesic properties were assessed through the acetic acid-induced writhing and hot plate methods. Castor oil-induced diarrheal models were used to evaluate antidiarrheal properties. Test dosages were 100 and 200 mg/kg for CNS activities, whereas 200 and 300 mg/kg doses were used for analgesic and anti-diarrheal properties. Human blood was used to measure thrombolytic potential utilizing streptokinase as standard.

**Results**: Phytochemical screening identified the presence of flavonoids, steroids, tannins, phenols, and carbohydrate MESW significantly ($p<0.05$) inhibited writhing in mice at doses of 200mg/kg (27.53%) and 300 mg/kg (28.26%) body weight, with a 40.57% inhibition rate compared to indomethacin. In CNS tests, open field method, MESW demonstrated significant ($p<0.001$) and dose-dependent sedative effects in mice models, with 23.70%, 52.80% and 61% movement inhibition at doses 100 and 200 mg/kg body weight at 120 minutes, compared to the standard clonazepam (85.10% movement inhibition). MESW inhibited diarrhea significantly ($p<0.05$) by decreasing defection by 88.57% and 71.42%, respectively, at 200 mg and 300 mg/kg doses. In thrombolytic assay, the standard (streptokinase) showed 90.22% clot lysis and the extract showed 81% clot lysis.

**Conclusion**: The ongoing research accomplished by the *Phlogacanthus wallichii* will improve our understanding of Bangladeshi species and necessitate future identification isolation. An explanation of responsive compounds will be required for this Bangladeshi species.

**Keywords**: Analgesic; anti-diarrheal; *Phlogacanthus wallichii*; sedative

# TMEPAI as a Novel Biomarker for Treatment in Triple Negative Breast Cancer

MD. ANWARUL HAQUE[1,2]*

[1]*Department of Pharmacy, University of Rajshahi, Bangladesh*
[2]*Department of Experimental Pathology, University of Tsukuba, Ibaraki, Japan*
*anwarulhaque@ru.ac.bd*

## ABSTRACT

**Background**: Triple-negative breast cancer lacks key receptors and targeted therapies, making treatment difficult. TMEPAI, a potential biomarker in other cancers, may help guide TNBC treatment but needs further study.
**Objective**: This study aims to evaluate TMEPAI expression as a biomarker for predicting treatment response and clinical outcomes in TNBC patients.
**Methods**: The CRISPR/Cas9 gene editing system was employed to knockout (KO) TMEPAI in TNBC cells. To assess the role of TMEPAI in oncogenesis, various functional assays, including colony formation, cell migration, scratch wound healing, tumor sphere formation, and xenograft tumor formation, were conducted. Gene and protein expression levels were measured using PCR, qPCR, and Western blotting techniques. Furthermore, TCGA data of invasive breast cancer patients were analyzed to investigate the association between TMEPAI and PI3K/AKT signaling pathway.
**Results**: TMEPAI expression is negatively associated with patient survival. In TMEPAI KO cells, there was a significant reduction in colony formation, cell migration, and tumor sphere formation. Analysis of the TCGA clinical dataset revealed a positive correlation between TMEPAI expression and PI3K/AKT signaling activity, particularly in the phosphorylation of AKT at S473, which was further confirmed by Western blotting. This relationship was corroborated by in vivo experiments. To determine which motifs of TMEPAI are responsible for PI3K/AKT signaling, TMEPAI re-expression experiments were performed in TMEPAI KO cells using a lentiviral expression system. The results demonstrated that mutation in the PPxY (PY) motifs of TMEPAI abolished its ability to enhance AKT phosphorylation, unlike wild-type TMEPAI and a Smad-interacting motif (SIM) mutant. These findings suggest that TMEPAI regulates AKT phosphorylation through its PY motifs.
**Conclusion**: TMEPAI holds promise as a prognostic biomarker and potential therapeutic target in TNBC. Its expression levels could help stratify patients for personalized treatment approaches, potentially leading to improved clinical outcomes. Further validation in prospective studies and exploration of TMEPAI-targeted therapies are warranted to confirm its utility in clinical practice.
**Keywords:** Biomarker; prognosis; TMEPAI; TNBC; treatment

# Biopharmaceutical Characterization of Coenzyme Q10-Loaded Lipid-Based Nanosuspension for Enhanced Transport to The Brain

**NAJIBAH NASRIN*, SHIMUL HALDER*, FARIA NASRIN, SYED SHABBIR HAIDER**

*Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

**shimulpht@du.ac.bd*

## ABSTRACT

**Background**: Coenzyme Q10 (CoQ10), a highly lipophilic component synthesized in the inner mitochondrial membrane, is essential for ATP synthesis. Its efficacy as a promising therapeutic agent for neurological diseases is narrowed down due to poor solubility in water, poor oral bioavailability, and transport barriers across biological membranes.

**Objective:** The present investigation involved the preparation, characterization, and optimization of CoQ10-loaded nanosuspension (NS); CoQ10-NS to enhance the dissolution behavior, solubility, intra-cellular permeation, and bioavailability as a means of exploring novel formulations to improve the biopharmaceutical profile.

**Materials and Methods:** CoQ10-NS was developed using emulsification-solvent evaporation, optimizing factors like surfactant type, concentration, agitation speed, and solvent ratio. The final formulation was assessed for particle size, zeta potential, PDI, entrapment efficiency, morphology, pH, mucus permeation, and drug dissolution. Compatibility was studied via FTIR. A pharmacokinetic study in rats (100 mg/kg, oral) was performed to evaluate improved oral bioavailability and brain transport of CoQ10.

**Results:** The optimized formulation demonstrated desirable nanosizing of particles (80.1 ± 4.4 nm), (PDI, 0.214), zeta potential (-31.4 mV), percent entrapment efficiency (67.70 ± 4.98) %, pH (4.79 ± 0.03) and permeability of (9.57  0.35)  g/mL through artificial mucus, without aggregation, employing a stabilizer ratio of 2:5 and solvent: anti-solvent ratio of 1:2. The infrared spectroscopy analysis indicated minimal band transitions between CoQ10 and polymers, indicating the absence of significant drug-carrier interactions. In the dissolution test, CoQ10-NS exhibited marked improvement in the dissolution behavior of CoQ10, as evidenced by the 63.4% dissolved amount of CoQ10 in 120 min water ($p<0.05$). After oral administration of CoQ10 samples in rats, enhanced CoQ10 exposure was observed with increased systemic exposure by 11.8-fold in CoQ10-NS compared with crystalline CoQ10.

**Conclusion:** From these findings, the NS approach might be an attractive dosage option for CoQ10, as well as other lipophilic phytonutrients, offering enhanced nutraceutical properties of CoQ10.

**Keywords:** Bioavailability; CoQ10; nanosuspension; permeability; solubility

# Strategic Application of Coenzyme Q10-Loaded Solid Lipid Nanoparticles for Improved Biopharmaceutical Property of Coenzyme Q10

**FARIA NASRIN[1], SHIMUL HALDER[2]*, MANIK CHANDRA SHILL[3], MD. SELIM REZA[2]***

*[1]School of Pharmacy, Brac University, KHA 224, Progati Sarani, Merul Badda, Dhaka 1212, Bangladesh*

*[2]Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*[3]Department of Pharmaceutical Sciences, North South University, Dhaka-1229, Bangladesh*

*shimulpht@du.ac.bd, selimreza@du.ac.bd*

## ABSTRACT

**Background**: Coenzyme Q10 (CoQ10), a lipid-soluble antioxidant of the inner mitochondrial membrane, plays a crucial role in ATP generation. The potential to be used as a beneficial agent in neurodegenerative diseases is hindered by the poor oral bioavailability of this BCS class IV drug.

**Objective:** This study aimed to develop an effective oral drug delivery system of CoQ10 for neurodegenerative disease by evaluating the potential of solid lipid nanoparticles (SLN) to enhance the biopharmaceutical properties of CoQ10.

**Materials and Methods:** CoQ10-SLN was formulated using a solvent injection method using stearic acid, TPGS, and soya lecithin as lipids, surfactants, and cosurfactants, respectively. Particle size (DLS), polydispersity index (PDI), entrapment efficiency (%EE), drug loading, dissolution, crystallinity (DSC and XRPD), FT-IR, surface morphology (SEM), and artificial mucus test were employed for characterization of the CoQ10-SLNs. For %EE and mucus test, one-way ANOVA with pairwise comparisons using Fisher's least significant difference method was used for statistical comparisons with statistical significance of $p < 0.05$. Dissolution data were analyzed using model-dependent and independent methods.

**Results:** The optimized formula (F2) showed a particle size of 91.6 nm, PDI of 1, entrapment efficiency (EE%) of 85%, and drug loading (DL%) of 2.17%. Statistical analysis revealed a significant EE% difference in F1. In vitro studies indicated burst drug release from all formulations, enhancing dissolution over crystalline CoQ10. The dissimilarity factor confirmed non-identical release profiles. Most formulations followed the Korsmeyer-Peppas model, except F2, which fit the Weibull model. Mucus permeation testing showed a 42-fold increase in CoQ10 permeability for F2 versus crystalline CoQ10. Statistical analysis confirmed a significant difference in mucus permeation between F2 and the reference, highlighting F2's enhanced bioavailability.

**Conclusion:** CoQ10-SLN enhances CoQ10's solubility and permeability in vitro, suggesting improved oral bioavailability. However, in vivo pharmacokinetic studies with biocompatible formulations are needed to validate these results.

Keywords: Bioavailability; CoQ10; permeability; solid lipid nanoparticle; solvent injection

# Development of Pioglitazone Loaded Polymeric Nanoparticle and *In Vivo* Assessment on Rat Model for Effective Treatment of Non-alcoholic Steatohepatitis (NASH)

TANVEER HOSSAIN RATUL, SHIMUL HALDER*, JAKIR AHMED CHOWDHURY, MD. SELIM REZA*

*Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*shimulpht@du.ac.bd, selimreza@du.ac.bd

## ABSTRACT

**Background**: Non-alcoholic steatohepatitis (NASH), a severe NAFLD form, involves liver damage and insulin resistance. Pioglitazone, a PPAR activator, aids fat storage in white adipose tissue but suffers from poor oral bioavailability, limiting its therapeutic use in NASH.

**Objective:** This research aims to develop PGZ-loaded lipid nanoparticles (LNPs) to enhance the drug's biopharmaceutical and physicochemical properties and assess their impact on NASH.

**Materials and Methods:** PGZ-LNP was formulated using the solvent evaporation method with Soluplus® and Aerosil®. The LNP was characterized using particle size, PDI, entrapment efficiency, drug loading, dissolution, DSC, XRD, FT-IR and SEM. In a rat model, the optimized LNP formulation was used for pharmacokinetic study and its effectiveness on NASH. The protective behavior against NASH was measured by plasma alanine aminotransferase (ALT) and aspartate aminotransferase (AST), hepatotoxic biomarkers, in the model rats induced by a high-fat diet (HFD).

**Results:** PGZ-loaded lipid nanoparticles (PGZ-LNP) were developed using Soluplus® to enhance pioglitazone (PGZ) solubility and therapeutic efficacy. Various drug-polymer ratios were tested, with 10% PGZ chosen for optimal solubility and particle size (56.7 nm). The optimized formula showed a PDI of 0.113, 85% encapsulation efficiency, and 8.5% drug loading. In vitro studies revealed improved dissolution over crystalline PGZ. Drug release followed Korsmeyer-Peppas and Weibull models. Compatibility tests (DSC, FTIR) confirmed minimal PGZ-polymer interaction. SEM analysis showed smoother, spherical nanoparticles. In a rat model of HFD-induced hepatic injury, PGZ-LNP treatment significantly reduced liver damage, lowering ALT and AST levels by 91.7% and 86.8% ($p<0.001$), respectively.

**Conclusion:** The study suggests that the proposed LNP formulation of Pioglitazone has higher solubility and bioavailability and is also efficacious against NASH.

**Keywords:** Bioavailability; lipid nanoparticle; NASH; pioglitazone; solubility

# Lipid-Based Nanocarriers Loaded with Bioactive Plant Extract for Improved Biopharmaceutical and Enhanced Hepatorenal Protection

SHIMUL HALDER[1]*, FATEMA TUZ-ZOHORA[1], TANIA AHMED CHOWDHURY[2], MD. ABDUL MUHIT[3], MADHABI LATA SHUMA[4], MANIK CHANDRA SHILL[2]

[1]*Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

[2]*Department of Pharmaceutical Sciences, North South University, Dhaka-1229, Bangladesh*

[3]*Department of Clinical Pharmacy and Pharmacology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

[4]*Department of Pharmacy, Independent University Bangladesh, Dhaka-1229, Bangladesh*

*shimulpht@du.ac.bd

## ABSTRACT

**Background**: Bioactive phytochemicals offer antioxidant, anti-inflammatory, and antibacterial benefits, but face clinical limitations. Nanotechnology enhances their effectiveness by improving stability, solubility, and delivery through nanostructured systems.

**Objective:** The present work aimed to enhance the hepatorenal protective efficacy of *Carum copticum* seed extract (CCE) by formulating a self-emulsifying drug delivery system (SEDDS).

**Materials and Methods:** In this study, SEDDS-CCE was prepared and characterized physicochemically in micelle forming potency, dispersibility, gastric stability, and miscibility of polymers with CCE. The hepatorenal protective effects were assessed in a rat model of acute hepatorenal injury induced by cisplatin (7.5 mg/kg, i.p.) by evaluating plasma biomarkers and histological observations.

**Results:** SEDDS-CCE forms fine micelles averaging 231 nm in water, significantly enhancing the dispersion of CCE-4.8 times higher than CCE alone. Oral administration of SEDDS-CCE (75 mg/kg) markedly reduced liver enzyme levels: ALT by 54.1%, AST by 44.6%, and ALP by 65.5% (all $p<0.001$), compared to the disease group. A higher dose (150 mg/kg) further decreased ALT by 60%, AST by 52%, and ALP by 68.1% ($p<0.001$). Additionally, SEDDS-CCE (75 mg/kg) lowered elevated plasma creatinine and BUN by 63% and 49%, respectively, while the 150 mg/kg dose reduced them by 55% and 66% ($p<0.001$). Histological analysis showed reduced tissue damage and inflammation in liver and kidney cells, suggesting protective effects against oxidative stress-related conditions. These findings highlight the potential of SEDDS-CCE to enhance bioavailability and provide therapeutic benefits in liver and kidney health.

**Conclusion:** The findings suggest that the strategic application of the SEDDS-based approach may effectively enhance the nutraceutical properties of CCE.

**Keywords:** *Carum copticum*; cisplatin; hepatoprotective; nephroprotective; self-emulsifying drug delivery system

# Phytochemical Analysis and Evaluation of Anti-Cancer Activity of Methanolic Leaf Extract of *Lepidargathis incurva*

**KAMRUN NAHAR, AFSARA KANOM, SHORMILA AKTER, FATEMA TUZ ZOHORA FARIA, KAMRUN NAHAR***

*Department of Pharmacy, Primeasia University, Banani, Dhaka-1215, Bangladesh*

*kamrun.nahar@primeasia.edu.bd

## ABSTRACT

**Background:** *Lepidargathis incurva* is a lesser-known plant of the family Acanthraceace. It is widely distributed in tropical and subtropical Asia, such as Bangladesh, India, Myanmar, and Nepal.
**Objective:** This research was conducted to examine the traditional use of the plant as limited number of publications are available in this regard. Traditionally, it is used topically for the treatment of skin cancer, shingles, and hemostasis to regain energy after childbirth. For this research, we focused on breast cancer.
**Materials and methods:** Leaves of a plant collected from Birulia, Savar, in February were shade-dried, pulverized, and extracted with methanol via maceration. GC-MS analysis identified 59 compounds. *In silico* studies assessed binding affinity to H-ras protein of breast cancer using cyclophosphamide as a standard. For in vivo and in vitro studies, EAC cell-bearing mice from Jahangirnagar University were treated with crude and fractionated extracts (n-hexane, chloroform, ethyl acetate, methanol). In vitro assays used concentrations from 50 to 1600 µg/ml. In vivo, mice were grouped into controls, standard, and two extract doses. Brine shrimp lethality and acute oral toxicity tests evaluated safety.
**Results:** The result of *in silico* study shows that 22,23-dibromostigmasterol acetate, ergosta-5,22-dien-3-ol, (3.beta., 22€)- shows the highest affinity among other compounds, which are -7.4 and -7.5 respectively where affinity of cyclophosphamide was -4.2. For the result of in vitro cell line activity, interestingly, at the dose 400 mcg/ml tumor cells started to rupture, but at 200 mcg/ml, the highest number of cells were killed rather than the lowest dosages for both crude and N-hexane fraction. From the brine shrimp lethality bio-assay, it can be interpreted that the plant extract is comparatively safe with a $LD_{50}$ value of 109.5 mcg/ml and LD90 value of 209.5 mcg/ml compared to vincristine sulfate with a LD50 value of 0.02 mcg/ml. The acute oral toxicity shows no significant toxicity at the dosages of 300 mg/kg and 2000 mg/kg, except for mild diarrhea and hyperactivity in certain mice.
**Conclusion:** The data suggests a promising breast cancer drug with fewer side effects can be developed from the plant extract; further research is needed to isolate potent polar phytochemicals like dibromostigmasterol acetate.
**Keywords:** Breast cancer; cytotoxicity; EAC cell; *in silico*; in vitro; in-vivo

# Development of Cost-Effective Gelatin-Based Microneedle Patch for Local Drug Delivery and Wound Healing Applications

**ARIFUR RAHMAN NIBIR, JAMILA AKTHER, NISHAT TASNIM, RIFA TASFIA FAIZA, SHAZID MD. SHARKER***

*Department of Pharmaceutical Sciences, School of Health and Life Sciences, North South University, Dhaka-1229, Bangladesh*

*shazid.sharker@northsouth.edu

## ABSTRACT

**Background:** Microneedles patches (MNP) offer a promising approach for local drug delivery, bypassing the first-pass effect and enabling painless, self-administered treatments. However, current MNP systems face limitations due to high costs, insufficient mechanical strength for skin penetration, and a lack of necessary biodegradability and bio-adhesion properties.

**Objective:** This study aims to develop a cost-effective microneedle patch (MNP) fabrication technology suitable for various biomedical applications.

**Materials and methods:** A novel method for fabricating gelatin-based microneedles using a hot-melt press deposition technique on patch moulds was developed. The MNP, loaded with levofloxacin and lidocaine, were designed to deliver localized therapeutic effects while maintaining patient compliance through complete biodegradation after application. The system was evaluated in vivo using a diabetic wound-healing mouse model and a pinch test for local pain relief.

**Results:** The chemical composition of the therapeutic agents was confirmed using FT-IR and EDX analyses, while microneedle size and surface characteristics were examined through FE-SEM imaging, revealing needle sizes ranging from 200 to 600 µm for loaded and unloaded patches. Tensile strength tests demonstrated adequate mechanical stability of the microneedles. In vitro antimicrobial activity showed significant zones of inhibition (3 mm) compared to standard antibiotic discs. Post-penetration effects and wound recovery were assessed through histological analysis, demonstrating effective therapeutic outcomes after five days of treatment.

**Conclusion:** The developed microneedle patch system offers a versatile, cost-effective solution for biomedical applications, including vaccine delivery, insulin administration, and therapeutic gene delivery.

**Keywords:** Cost-effective fabrication; gelatin-based microneedles; local drug delivery; microneedle patch (MNP); wound healing

# TLC and GC-MS Profiling and Cytotoxic Potential of Methanol Extract of *Hedychium coronarium* Rhizome*: In Vitro and In Silico Approaches*

**FARJANA YEASMIN, GOLAM RABBI, KISHORE MAZUMDER***

*Department of Pharmacy, Faculty of Biological Science and Technology, Jashore University of Science and Technology, Jashore-7408, Bangladesh*

**kmazumder@just.edu.bd*

## ABSTRACT

**Background:** *Hedychium coronarium* J. koenig (Zingiberaceae) is familiar with its medicinal and aromatic properties because of its terpenic components. Traditionally, this plant has been used for anti-inflammatory and anti-rheumatic purposes. In vitro assay of these plant extracts poses cytotoxic potential.

**Objective:** There is an absence of selective studies on compounds specifically responsible for cytotoxic potential. This research focuses on compound characterization that has cytotoxic potential using in vitro cell line cytotoxicity assay.

**Materials and methods:** The phytochemical screening of the extract was determined by qualitative reagent tests, and it was found that it contains several chemical groups, including carbohydrates, flavonoids, phenolic groups, acidic groups, and saponins. The rhizome extract was separated by Kupchan method and further sub-fractioned by column chromatography. After thin-layer chromatography of the sub-fraction, it was identified a number of different compounds with different Rf values. The plant extract also contains a significant amount of antioxidant activity that is determined by reducing power antioxidant activity.

**Results:** It resulted in $IC_{50}$ 1190.82 microgram/ml that was compared with standard ascorbic acid. GC-MS analysis and molecular docking of the extract resulted in this study indicating that it has antioxidant, cytotoxic, and anti-diabetic potential. The molecular docking results in good results for coronarin E and copalic acid against epidermal growth factor receptors. *Hedychium coronarium* rhizome extract was effective in a cell line cytotoxicity study showing effectiveness against cancer cells.

**Conclusion:** The above results indicate that the rhizome extract of *Hedychium coronarium* contains significant cytotoxic potential and will be used to treat human disease and other complications.

**Keywords:** Anti-oxidant; column chromatography; cytotoxicity; GC-MS; Rf value

# Detection of Association of *ESR1* Gene Polymorpism (rs2234693) with Cervical Cancer Risk in Bangladeshi Population: Case-Control Study

**LUTFUNNESA[1,2], MOHAMMAD SAFIQUL ISLAM[1,2,3]***

*[1]Department of Pharmacy, Faculty of Science, Noakhali Science and Technology University, Noakhali 3814, Bangladesh*

*[2]Laboratory of Pharmacogenomics and Molecular Biology, Department of Pharmacy, Noakhali Science and Technology University, Noakhali 3814, Bangladesh*

*[3]Bangladesh Pharmacogenomics Research Network (BdPGRN), Noakhali 3814, Bangladesh*

**research_safiq@nstu.edu.bd*

## ABSTRACT

**Background:** Cervical cancer is the second leading cancer among Bangladeshi women. Mutations in the ESR1 gene may disrupt oestrogen receptor signaling, affecting cell functions and contributing to cancer development.

**Objective:** The study aimed to investigate the association between the ESR1 rs2234693 polymorphism and cervical cancer susceptibility in the Bangladeshi population.

**Methods:** To find the relationship between the rs2234693 polymorphism and cervical cancer in Bangladeshi women, we conducted case-control research with 166 CC cases and 110 healthy controls. We have utilized the RFLP approach for genotyping. To support the consistency of the selected samples, the statistical analysis was performed using MedCalc software (version 19.0.7) to compute odds ratios, odd ratios (OR), and chi-square tests ($\chi^2$). These tests were used to estimate the Hardy-Weinberg Equilibrium (HWE) assumption.

**Results:** The variant rs2234693 did not deviate from the Hardy-Weinberg Equilibrium in cases ($\chi^2$= 1.88, p= 0.169) or controls ($\chi^2$= 3.48, p= 0.062). However, the TC genotype exhibited a statistically insignificant 1.50-fold increased risk of developing cervical cancer (OR= 1.50, 95%CI= 0.87-2.57, p= 0.141) compared to the TT genotype. Similarly, the CC genotype was associated with a 0.69 times lower risk (OR= 0.69, 95%CI= 0.34-1.39, p= 0.296) compared to the TT genotype, which was also statistically insignificant. Individuals with at least one variant allele or the dominant genotype (TC+CC vs. TT) were 1.21 times more likely to develop cervical cancer than those with the CC genotype (OR= 1.21, 95%CI= 0.73-2.0, p= 0.450). The recessive model (CC vs. TT+TC) suggested an insignificant 0.55 times lower risk (OR= 0.55, 95%CI= 0.29-1.04, p= 0.064) for those with the CC genotype. Importantly, the over-dominant model (TC vs TT+CC) revealed that the TC genotype was significantly 1.69 times higher risk of developing cervical cancer (OR=1.69, 95%CI= 1.04-2.76, p= 0.035) compared to the combined TT+ CC genotypes. However, carriers of the variant allele (C) did not demonstrate any statistically significant findings (OR= 0.92, 95%CI= 0.65-1.30, p= 0.630).

**Conclusion:** While most genotype comparisons did not show significant associations, the over-dominant model's significant finding suggests a potential risk factor for cervical cancer in Bangladeshi women with the TC genotype of the ESR1 rs2234693 polymorphism.

**Keywords:** Cervical cancer; ESR1; PCR-RFLP; rs2234693

# A Study on Diabetes Mellitus Patients in Urban & Rural Area of Chattogram, Bangladesh

**SHAWON KANTI DAS[1,2], PRITESH RANJAN DASH[2]***

*[1]Department of Pharmacy, University of Science and Technology Chittagong (USTC), Chittagong, Bangladesh*
*[2]Department of Pharmacy, Primeasia University, Banani, Dhaka, Bangladesh*
**pritesh@primeasia.edu.bd*

## ABSTRACT

**Background:** This study surveyed 200 diabetes patients in Chattogram over seven weeks to assess diabetes status and complications using structured questionnaires in Bangla and English at a medical college hospital.
**Objective:** Identify and address key factors behind poor diabetes knowledge, self-management issues, and inadequate treatment to raise awareness among healthcare professionals and government leaders for improved care and policy action.
**Methods:** A random sample of 200 (109 women and 91 men) adults aged 21 years and older from both urban and rural areas. The questionnaire included socio-demographic data such as sex, medical conditions, marital status, economic conditions, educational level, and type and family history of diabetes.
**Result:** To analyze diabetic patient survey results from Chittagong's rural and urban areas. Of these patients, 40% had type-I and 60% had type-2 diabetes. The other characteristics of the subjects were as follows: family history of diabetes presents 58% vs absent 42%; economic conditions: high 15%, medium 27%, poor 58%; medical conditions: kidney diseases 54%, hypertension 42%, eye problem 30%, foot problem 22%, joint pain 33%, itching 10%, chest pain 25%, allergy 15% and arthritis 17%). We also observed that 44% of the patients had complicated diseases before being diagnosed with diabetes, while 56% after being diagnosed with diabetes.
**Conclusion:** We assume that the outcomes of this study will work as a baseline for future studies in a similar context.
**Keywords:** Chattogram; diabetes mellitus; survey

# Identification of Properties of *Vitex peduncularis* Methanolic Extract Against Neurodegenerative Disease

**LAMIA ALAM, SHARMIN AKTER, HUMAYRA TASNIM, SHIHAB UDDIN AHMAD***

*Department of Pharmacy, School of Medicine, University of Asia Pacific, 74/A, Green Road, Dhaka-1215, Bangladesh*

*shihab@uap-bd.edu

## ABSTRACT

**Background:** Normal functioning of the brain can be disrupted due to different neurodegenerative diseases, which can lead to mortality. The drugs are available only to provide symptomatic relief, but there is no such drug that can cure the root cause of the disease. A plant common in hill-tract areas is suspected to have medicinal compounds that can treat various neuro diseases.
**Objective:** This study seeks to identify how the methanolic extract of *Vitex peduncularis* can treat neurodegenerative diseases.
**Materials and methods:** Thirty Swiss-Albino mice were taken to conduct the study. They were kept in five different cages, and D-galactose was used to induce neuro diseases among them. Memantine hydrochloride was given as standard medicine, and two different strength of plant extract were prepared. Three behavioral tests were carried out to check a total of five parameters to determine the brain function and phytochemical, in-vitro chemical and biochemical analysis were conducted.
**Results:** VP-treated mice showed a considerable recovery in tissue histological score, as well as in behavioral and biochemical markers. A substantial reduction in the brain tissue staining histological score ($p < 0.05$) indicates that treatment with VP, either prior to or during D-galactose administration, provides a protective effect on dopaminergic neurons. Increases in glutathione levels ($p < 0.05$) and acetylcholinesterase levels ($p < 0.01$) further ensure the recovered brain functioning. The treated groups demonstrated a similar lipid peroxidation inhibition ($p < 0.000$), and a direct correlation exists between phenolic concentration and antioxidant capability.
**Conclusion:** Neurodegenerative diseases, regardless of the type, can be effectively treated with compounds extracted from *Vitex peduncularis* due to having anti-oxidant properties.
**Keywords:** D-galactose; neurodegenerative diseases; *Vitex peduncularis*

# Unveiling The Potential Roles of *Aeginetia indica* in Alzheimer's Disease Management Using A Multifaced Approach: *In Vitro, In Vivo*, Molecular Docking And Molecular Dynamics Simulation Studies

MARJANUR RAHMAN BHUIYAN, NUSAIBA JAHAN, A F M SHAHID-UD-DAULA*

*Department of Pharmacy, Noakhali Science and Technology University, Noakhali-3814, Bangladesh*
*shahid@nstu.edu.bd

## ABSTRACT

**Background:** Alzheimer's disease (AD), the predominant form of dementia, is marked by cholinergic dysfunction and increased acetylcholinesterase activity, exacerbated by chronic neuroinflammation and oxidative stress.

**Objective**: This study investigates the potential of *Aeginetia indica* whole plant methanolic extract (AIME) and its phytochemicals as natural acetylcholinesterase inhibitors for AD management.

**Materials and Methods**: An in vitro approach was used to assess the acetylcholinesterase inhibitory and antioxidant activities of the AIME. An additional in vivo study evaluated its anti-inflammatory properties. To identify potential active compounds, phytochemical analysis using LCMS/MS and GCMS was conducted. *In silico* docking studies, the binding affinities and interactions of these phytochemicals with the acetylcholinesterase active site were investigated. Finally, 100ns molecular dynamics (MD) simulations explored the molecular mechanism of the extract's anti-acetylcholinesterase activity by analyzing the stability of acteoside and acacetin complexes with apo-acetylcholinesterase.

**Results:** AIME exhibited moderate, dose-dependent antioxidant activity in all the antioxidant assays (DPPH, reducing power and ferric-reducing antioxidant power assays). AIME at all doses showed significant inhibition ($p < 0.001$) of paw edema compared to the negative control group. Notably, AIME displayed superior ache inhibitory activity ($IC_{50}$ = 1.63 mg/ml) compared to rivastigmine ($IC_{50}$ = 2.34 mg/ml). LCMS/MS analysis identified 16 phenolic compounds, and GCMS analysis revealed 23 phytoconstituents in AIME. Molecular docking studies revealed acteoside, acacetin, and luteolin as promising leads, exhibiting favorable binding affinities and hydrogen bond interactions with the acetylcholinesterase active site. Molecular dynamics simulations of the top two leads (acteoside and acacetin) with acetylcholinesterase demonstrated minimal fluctuations, suggesting significant complex stability and rigidity.

**Conclusions:** This study highlights the potential of *A. Indica* and its phenolic constituents as natural alternatives for AD management, offering a multi-pronged mechanistic pathway through acetylcholinesterase inhibition, anti-inflammatory, and antioxidant properties.

**Keywords:** *Aeginetia indica*; Alzheimer's disease; GCMS analysis; LCMS/MS analysis; polyphenols

# Food Safety Practices among Street Food Vendors and Their Knowledge Regarding Health Hazards of the Consumers at Selected Areas in Rajshahi City

**NAZIA TABASSUM, MD GOLAM ABBAS***

*Department of Occupational and Environmental Health (OEH), National Institute of Preventive and Social Medicine (NIPSOM), Mohakhali, Dhaka 1212, Bangladesh*

*abbasgolam@yahoo.com

## ABSTRACT

**Background:** Street food is a rapidly growing industry in Dhaka, Bangladesh, especially among urban consumers who seek quick, affordable meals. However, food safety practices among vendors often fall short, raising public health concerns due to associated risks of food-borne illnesses.

**Objective**: To assess the level of safety practices of street food vendors and to find out their knowledge regarding the health hazards of consumers in selected areas in Rajshahi city.

**Materials and methods**: This was a cross-sectional study to assess the level of food safety practices among the street food vendors and their knowledge regarding health hazards of the consumers in selected areas in Rajshahi city.

**Results**: The mean age of the respondents was 30.85 years. Almost 94% of the respondents were male. Among all the respondents, 37.2% completed secondary education. In addition, 73.7% of respondents were working for more than 20 years. Almost 78.9% of respondents had a monthly income between 10001 to 30000 BDT. Almost respondents 65.4% were married. Almost 50.7% half of respondents had the habit of taking paan, biri/cigarette and gul. Besides, 96% of respondents had average safety practices, while 72.0% of respondents had satisfactory knowledge about health hazards. The association between educational qualification, income, personal habits and knowledge regarding health hazards is significant. The association between knowledge regarding health hazards and food safety practices of the consumers is found to be significant.

**Conclusion**: Most Dhaka street food vendors have average safety practices and knowledge of health hazards, which are influenced by education, income, and habits. Stronger collaboration and policy enforcement are vital for improved food safety.

**Keywords**: Food safety practices; health hazards; street food vendors

# Evaluating Glycemic Control and Medication Adherence Following the Transition from Weekly-Once Injectable to Daily Oral Semaglutide in Type 2 Diabetes Mellitus

**MOHAMMAD MAHFUZ ENAM ELAHI[1], PETER SINGH[2], NAJIBAH NASRIN[3], MD ROHAN NADVI[4], MARUF HASAN[4]***

*[1]Department of Pharmacy, School of Medicine, University of Asia Pacific, 74/A Green Road, Dhaka-1215, Bangladesh*

*[2]School of Pharmacy, BRAC University, Dhaka, Bangladesh*

*[3]Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka, Bangladesh*

*[4]Department of Pharmacy, Jahangirnagar University, Savar, Bangladesh*

*paul.sajib4048@gmail.com

## ABSTRACT

**Background**: Semaglutide, a GLP-1 receptor agonist for type 2 diabetes, was initially injectable due to low tablet bioavailability. Oral formulations are now in Bangladesh, but comparative studies are lacking.

**Objective**: This observational cohort study focuses on investigating the changes in glycemic control, medication adherence, and dosage form preference at the transition to oral semaglutide from injectable formulation.

**Materials and method**: This study involved 25 adults with type 2 diabetes who switched from 0.5 mg injectable semaglutide to oral semaglutide (3 mg, then 7 mg). Data on HbA1c, demographics, adherence, and satisfaction were collected via self-reported questionnaires from February 8 to July 12, 2024. Exclusion criteria included age under 18, pregnancy, or psychological issues. Ethical consent was obtained. SPSS v27 was used, with significance set at $p<0.05$, 95% CI.

**Result**: Among 25 participants, 56% were male and 44% were female, having a mean age of 53 years. 40% of the participants had at least 2 comorbidities, whereby 20% of them had been living with diabetes for over 10 years. The mean HbA1c level while on injectable semaglutide once a week was 7.9%. However, after three months of starting oral semaglutide, the mean HbA1c level increased to 8.3%. After switching to oral semaglutide, a statistically significant increase in HbA1c level ($p<0.01$) was seen. However, oral semaglutide is associated (correlation coefficient 0.3) with a higher medication adherence rate compared to injectable semaglutide, making patients' satisfaction and preference for daily oral semaglutide higher by 21%.

**Conclusion**: The weekly-once injectable semaglutide provides better glycemic control. However, patients prefer daily oral semaglutide, considering its convenience.

**Keywords**: Diabetes mellitus; glycemic control; HbA1c; medication adherence; semaglutide

# Biological Investigation of in-vitro Antimicrobial, Anticancer, and in-vivo Antidiabetic and Neuropharmacological Activities of *Apium prostratum*

KHADIZA AKTER BONNA[1], SUDIP SAHA[2], FATEMATUZ JOHORA[1], MOULI AZAM[1], HASIB KHAN SHOMUDRO[1,3]*

[1]*Department of Pharmacy, Stamford University Bangladesh, 51 Siddheswari Rd, Dhaka 1217, Bangladesh*

[2]*Department of Pharmaceutical Sciences, North South University, Dhaka 1229, Bangladesh*

[3]*Department of Integrative Genomics, Black Hills State University, 1200 University St, Spearfish, SD 57799, USA*

*hasibkhan.shomudro@yellowjackets.bhsu.edu

## ABSTRACT

**Background:** The most common subspecies of *Apium prostratum* is a perennial plant found approximately all over the world, including Bangladesh. It is a member of the Umbelliferae family. It has traditionally been used to relieve pain and cure wounds and toothaches.

**Objective:** This research aims to evaluate the methanolic extract of *Apium prostratum* (MEAP) plant's antimicrobial, anticancer, antidiabetic and neuropharmacological activities.

**Materials and methods:** Phytochemical screening of this plant revealed the presence of alkaloids, flavonoids, phenolics and tannins. This phytochemical possesses several pharmacological activities. Antimicrobial activity was investigated using the Disk Diffusion method, using 5 different bacteria and fungi. Anticancer activity was evaluated using cytotoxic activity on IMR-32 cells. Antidiabetic activity was evaluated using blood glucose test on rats using the dose of 200 and 400 mg/kg of MEAP, while neuropharmacological activity was performed using elevated plus maze test (EPMT) and thiopental sodium induced sleeping test (TSIST) on mice using the dose of 200 and 400 mg/kg of MEAP.

**Results:** In the antimicrobial activity test, the zone of inhibition was 9-29 mm, while in the anticancer activity test, the percent of inhibition in the concentration of 1000 was 49.16%. After statistical analysis, an antidiabetic test revealed significant improvement in the sugar level of blood, which was $4.19 \pm 0.05$ and $3.01 \pm 0.02$, while the standard drug glibenclamide showed a value of $4.96 \pm 0.11$. In neuropharmacological activity, EPMT showed entries in closed arms for 11 sec, and entries in open arms were 266 sec in the dose of 400 mg/kg of MEAP. TSIST have shown a duration of sleeping time of $128.80 \pm 2.58$ minutes for the dose of 400 mg/kg, which was a potent result compared to its standard drug diazepam.

**Conclusion:** In the end of the study, it is clear that the bioactive metabolites of *Apium prostratum* can be used for developing new drugs as it shows significant results in pharmacological investigation.

**Keywords:** Antidiabetic; anticancer; antimicrobial; *Apium prostratum*; neuropharmacological

# The Impact of Residual Pesticides, Fipronil and Abamectin on Zebrafish Embryogenesis

AL MAMUN*, ASIQ IQBAL, MD SHAHADAT HOSSAIN, MD. ANWARUL HAQUE, ALAM KHAN

*Department of Pharmacy, University of Rajshahi, Rajshahi-6205, Bangladesh*

*almamun@ru.ac.bd

## ABSTRACT

**Background:** Pesticides are widely used for crop protection, but their potential adverse effects on the environment and human health are a growing concern. Fipronil is a phenylpyrazole that disrupts GABA receptors to protect crops from insect pests, whereas abamectin is a macrocyclic lactone that acts on glutamate-gated chloride channels in insects.

**Objective:** This study aims to determine the effects of two widely used pesticides (fipronil and abamectin) on the zebrafish embryonic development process.

**Materials and methods:** After exposing the zebrafish to pesticides, toxicity was evaluated through morphological characterization. The effects on bone and cartilage were assessed using Alizarin Red and Alcian Blue staining techniques, respectively. Data analysis was performed using SPSS statistical software (version 15.0). Comparisons between the data of various groups were made using Student's t-test.

**Results:** Fipronil (at 2.5ppm, 5ppm, 10ppm) exposure significantly reduced bone density, altered craniofacial skeleton size and shape, and decreased acetylcholinesterase activity, which is essential for cartilage development. Abamectin (at ppm, 2ppm, 3ppm) exposure caused increased lipid peroxidation, oxidative stress, impaired eye development and also reduced eye size. When compared to normal embryos, the size and morphology of the fipronil and abamectin-exposed embryos decreased and raised oxidative stress. Both abamectin and fipronil exhibit some cytotoxicity during the earlier stages of zebrafish embryo development (at 18hpf).

**Conclusion:** These data suggest that exposure to these pesticides significantly disrupted the embryonic stage of development and caused oxidative stress, cytotoxicity, and aberrant growth or development.

**Keywords:** Abamectin; embryo; fipronil; zebrafish

# *In silico* Study of Several Flavonoids as Potential Poly-ADP Ribose Polymerase and Vascular Endothelial Growth Factor Receptor Inhibitor

**MD. SAWKHIN AHMMED[1], SADIYA AFRIN MIM[1], SOWKAT JAHAN SHIPA[1], MD. SABBIR HOSSAIN[2], NAJNEEN AHMED[1]***

*[1]Department of Pharmacy, Faculty of Science & Engineering, East West University, A/2 Jahurul Islam City Gate, Dhaka 1212, Bangladesh*

*[2]Department of Clinical Pharmacy and Pharmacology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*nna@ewubd.com

## ABSTRACT

**Background:** Cancer is a multifaceted illness that involves several tempo-spatial alterations in cell physiology, culminating in the development of malignant tumors. Inhibition of poly-ADP ribose polymerase (PARP) enzyme and vascular endothelial growth factor receptor 1 (VEGFR1) offers a promising strategy in reducing the progression of cancer cells. Naturally occurring polyphenol compounds like flavonoids, are a diverse range of substances that have been found to have a substantial impact on the prevention and treatment of cancer. The activity of PARP and VEGFR1 may be altered by these natural flavonoids, opening new paths for therapeutic development.

**Objective:** This study aimed to explore the PARP and VEGFR1 inhibitory potential of a number of flavonoids using molecular docking approaches.

**Materials and methods:** For this study, a dataset of flavonoids with anticancer potential reported in different published articles indexed in Google Scholar was listed. The selected flavonoids, along with the standard PARP and VEGFR 1 inhibitor BAY 6035, were selected for docking. The protein crystallographic structures of PARP (PDB ID 5DSY) and VEGFR1 (PDB ID 5EX3) were selected as the target proteins following stability analysis by ERRAT. Molecular docking was carried out using PyRx, and binding interactions were analyzed using Discovery Studio. In the molecular docking studies, binding affinity, bond distances and bond types were also explored.

**Results:** Molecular docking analyses revealed that theaflavin showed the best result (-10.6 Kcal/mol with 5DSY and -9.9 Kcal/mol with 5EX3) in rigid docking and showed better results than standard drug (-7.0 Kcal/mol with 5EX39) of the market. Among the remaining flavonoids rutin, luteolin, quercetin, genistein, eriodictyol, tricin, peonidin, fisetin with docking scores of -10.3, -9.1, -9.1, -8.9, -8.8, -8.8, -8.5, -8.4, -8.2 Kcal/mol respectively in rigid docking with 5DSY and rutin, quercetin, fisetin, genistein, eriodictyol, luteolin, naringenin, tricin, peonidin with docking scores -9.6, -9.3, -9.3, -9.0, -9.0, -9.0, -8.7, -8.6, -8.4 Kcal/mol respectively in rigid docking with 5EX3.

**Conclusion:** This study warranted further in vitro and in vivo investigation of the reported flavonoids as potential PARP and VEGFR1 inhibitors involving specific cancer cell lines.

**Keywords:** Cancer; flavonoids; molecular docking; PARP; VEGFR1

# Hepatoprotective Effects of Methanolic Extracts of *Rhizoclonium riparium* (RR) on Non-Alcoholic Fatty Liver Disease (NAFLD) Induced by High Fat Diet (HFD) in Mice Model

**HUMAYRA TASNIM, TASLIMA JAMAL URMI, SHARMIN AKTER, LAMIA ALAM, SHIHAB UDDIN AHMAD***

*Department of Pharmacy, School of Medicine, University of Asia Pacific, 74/A, Green Road, Dhaka-1215, Bangladesh*

*shihab@uap-bd.edu

## ABSTRACT

**Background:** NAFLD is strongly correlated with obesity, insulin resistance, inflammation, and oxidative stress. RR is a green filamentous algae rich in flavonoids and phenolic compounds that are responsible for its potent antioxidant and anti-inflammatory properties, which could play an important role in hepatoprotection.

**Objective:** The current study aims to investigate the hepatoprotective effects of RR extracts against NAFLD.

**Materials and methods:** Thirty Swiss Albino mice were allocated equally into five groups: sham control (SC), negative control (NC), metformin hydrochloride received as standard treatment (STD), and the other two groups treated with low dose (RRL) and high dose (RRH) of RR methanolic extract. The following parameters were investigated in the experimental groups: body weight, BMI, FBS, OGTT, liver and visceral fat weight, biochemical analysis (AST, ALT, TG, LDL, HDL, glucose level), histopathological study (H&E) and immunoassay study (SOD, GSH, CAT, MDA).

**Results:** The NC group developed features similar to NAFLD. RR extract intake decreased hepatic fat accumulation by a significant reduction in body weight ($p < 0.001$), reduced inflammation ($p < 0.01$), increased SOD activity ($p < 0.0001$), decreased MDA levels ($p < 0.05$), reduced hepatomegaly and glucose levels ($p < 0.0001$) of the RRH group.

**Conclusion:** Methanolic extract of RR could be further developed as a novel natural hepatoprotective agent against NAFLD.

**Keywords:** Algae; hepatoprotection; mice

# Determination of Genetic Association of BMPR1B rs1434536 Polymorphism and Breast Cancer Risk in Bangladeshi Women: A Case-Control Study

**FATIMA TUJ JOHURA[1,2], MD ABDUL BAREK[1,2,3], MOHAMMAD SAFIQUL ISLAM[1,2,3]***

*[1]Department of Pharmacy, Faculty of Science, Noakhali Science and Technology University, Noakhali 3814, Bangladesh*

*[2]Laboratory of Pharmacogenomics and Molecular Biology, Department of Pharmacy, Noakhali Science and Technology University, Noakhali 3814, Bangladesh*

*[3]Bangladesh Pharmacogenomics Research Network (BdPGRN), Noakhali 3814, Bangladesh*

*research_safiq@nstu.edu.bd

## ABSTRACT

**Background:** Breast cancer (BC) is one of the most frequently detected malignancies in women and is rising, especially in low- and middle-income nations like Bangladesh. Breast cancer is perhaps the most prevalent kind of cancer in Bangladeshi females. BMPR1B, a multifunctional signaling molecule, has a worse prognosis when abnormally expressed. Genetic polymorphism in the BMPR1B gene might potentially be linked to breast cancer development. Our current research aimed to examine the genetic correlation between Bangladeshi women's potential for breast cancer and the BMPR1B rs1434536 polymorphism.

**Objective:** This research aims to determine the prevalence of BMPR1B rs1434536 polymorphism in Bangladeshi women and assess its association with breast cancer risk.

**Materials and methods:** This study utilized a case-control design and included 174 female individuals who had been diagnosed with breast cancer, as well as 126 healthy females who performed as controls. We utilized the polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) technology for our investigation.

**Results:** Demographic characteristics, including age (OR = 2.35, 95% CI = 0.90-6.09, p = 0.0784) and other factors of breast cancer patients showed no significant correlation with BMPR1B rs1434536 polymorphism. Both case and control genotyping data support Hardy-Weinberg equilibrium (HWE) (p>0.05). BC risk was not significant for CT carriers (OR = 0.829, 95% CI = 0.38-1.81, p = 0.639). Breast cancer risk was lower for TT genotype carriers, with an OR of 0.783 (95% CI: 0.35-1.76, p = 0.554). In the dominant model (CT + TT versus CC), CT + TT carriers had no statistically significant increased risk of breast cancer (OR = 0.811, 95% CI = 0.38-1.73, p = 0.586). Our research also found no statistically significant link between the recessive model (TT vs. CC+CT) and the T allele (T vs. C) and breast cancer risk.

**Conclusion:** This research reveals that the BMPR1B rs1434536 polymorphism does not have a meaningful connection to breast cancer risk among Bangladeshi women. Individuals with the TT genotype or those carrying the CT variant are not found to be at heightened risk.

**Keywords:** BMPR1B rs1434536; breast cancer; PCR- RFLP; polymorphism

# Formulation Development and Characterization of Valsartan Loaded Liposomal Gel for Topical Application to Excision Wound Animal Model

**SHIRA AZIZ, SHIHAB UDDIN AHMAD, MD. ASADUZZAMAN***

*Department of Pharmacy, School of Medicine, University of Asia Pacific, 74/A, Green Road, Dhaka-1215, Bangladesh*

**asad_985@uap-bd.edu*

## ABSTRACT

**Background:** Renin-angiotensin system (RAS) dysregulation in the skin has been linked to unusual wound healing in the elderly. Angiotensin receptor blockers (ARB) can promote the healing process and collagen deposition by transforming growth factor (TGF) β signaling pathway. Throughout research found that valsartan is promising in chronic wound healing compared with other ARB and ACE inhibitors.

**Objective:** The current investigation is focused on the formulation of valsartan-loaded liposome gel for wound healing with longer stability and sustained release. Valsartan, a BCS class II drug, was chosen to formulate as a liposomal gel to achieve enhanced skin permeability.

**Materials and methods:** Two different concentrations of liposomal gel (2% & 10%) were investigated to deliver anti-hypertensive drug valsartan topically to evaluate wound healing activity in animal model. Thin film hydration by mechanical agitation was selected to develop stable valsartan-loaded liposomes characterized by SEM, FTIR, particle size, Zeta potential, XRD, surface morphology, and entrapment efficiency. In vitro drug release was conducted in both simulated gastric fluid (SGF) and phosphate buffer and ex vivo drug permeation was performed for two different doses of valsartan by Franz diffusion cell using cellulose acetate membrane. An in vivo wound healing activity was studied in Swiss albino mice model.

**Results:** The prepared liposomes showed promising characteristics in their vesicle size, shape, surface morphology, drug entrapment efficiency, in-vitro drug release pattern in the dissolution media and ex-vivo drug permeability. Treatment with valsartan-loaded liposomal gel for 15 days revealed enhanced healing characteristics supported by histopathological examination of hematoxylin and eosin (H&E). Cumulative percent drug release of valsartan liposomes was found 80.11% & 93.24% after 7 hours in pH 1.2 & 6.8, respectively. The 2% valsartan liposomal gels showed 76.32% ex-vivo drug permeability after 7 hours. Compared with normal control (NC), the growth of epithelial cells of the treatment group was strongly significant ($p<0.001$) at day 9.

**Conclusion:** These results concluded that incorporating valsartan into a liposomal gel system improved the wound healing efficacy of the drug, thus proving to be more patient-compliant by reducing the cost of therapy for such health conditions.

**Keywords:** BCS class-II drug; liposomal gel; valsartan; wound healing

# Anti-oxidative and Anti-inflammatory Effects of L-arginine Against Cardiac Damage Induced by Fludrocortisone Acetate in Rats

**ASTRID MUKTA BISWAS, TUSHAR EMRAN, HASAN MAHMUD REZA***

*Department of Pharmaceutical Sciences, School of Health & Life Sciences, North South University, Bashundhara R/A, Dhaka-1229, Bangladesh*

*hasan.reza@northsouth.edu

## ABSTRACT

**Background:** Cardiovascular diseases (CVDs) remain the leading cause of death worldwide, driven largely by an aging population. Oxidative stress and inflammation are key contributors to CVDs, resulting in substantial cardiac damage. Fludrocortisone acetate (FCA), a synthetic mineralocorticoid, is known to induce hypertension and oxidative stress, worsening cardiovascular damage in experimental models. Addressing oxidative stress with therapeutic interventions holds promise for mitigating CVD-related damage. L-arginine, a precursor to nitric oxide (NO), possesses vasodilatory, anti-oxidative, and anti-inflammatory properties, making it a potential agent for cardiac protection.

**Objective:** To investigate the effects of L-arginine on cardiac damage and oxidative stress caused by FCA-Salt in a single-kidney rat model.

**Materials and methods:** Four groups of single-kidney Wister rats were tested: Control, Control+L-arginine, FCA-Salt, and FCA-Salt+L-arginine. L-arginine (30 mg/kg) was administered by mouth daily for 28 days. Oxidative stress parameters and antioxidant enzyme levels were assessed using biochemical assays on heart and kidney homogenates and plasma samples. Plasma levels of ALP, ALT, AST, uric acid, and creatinine were measured spectrophotometrically, while plasma cytokines (IL-1β, IL-17A, TNF-α, and TGF-β1) were measured via ELISA. Tissue morphology and fibrosis were examined using hematoxylin & eosin and Sirius red staining, respectively. The statistical analysis was performed by one-way ANOVA with Newman-Keuls post hoc test.

**Results:** L-arginine significantly improved oxidative stress by altering the levels of malondialdehyde (MDA), nitric oxide (NO), and advanced oxidative protein products (AOPP), as well as, antioxidant enzyme activities, including catalase (CAT), superoxide dismutase (SOD), and reduced glutathione (GSH). Plasma levels of ALP, AST, ALT, uric acid, creatinine and inflammatory cytokines IL-1β, IL-17A, and TNF-α were also significantly reduced ($p < 0.05$) by L-arginine. Histopathology showed healing of FCA-induced cardiac tissue damage and decreased fibrosis by L-arginine as compared to FCA-rats.

**Conclusion:** L-arginine prevents FCA-induced cardiac damage and holds potential as a therapeutic agent against oxidative stress, warranting further exploration in clinical settings.

**Keywords:** Antioxidant enzyme; cardiovascular diseases; fludrocortisone acetate; L-arginine; oxidative stress

# Evaluation of The Association Between *DNMT1* rs16999593 Variant and Breast Cancer Susceptibility in Bangladeshi Women: A Case-control Study, *In-silico* Study and Meta-analysis

ARAFAT MIAH[1,2], MD ABDUL BAREK[1,2,3], JAMIUDDIN AHMED[1], MOHAMMAD SAFIQUL ISLAM[1,2,3]*

[1]*Department of Pharmacy, Faculty of Science, Noakhali Science and Technology University, Noakhali 3814, Bangladesh*

[2]*Laboratory of Pharmacogenomics and Molecular Biology, Department of Pharmacy, Noakhali Science and Technology University, Noakhali 3814, Bangladesh*

[3]*Bangladesh Pharmacogenomics Research Network (BdPGRN), Noakhali 3814, Bangladesh*

*research_safiq@nstu.edu.bd

## ABSTRACT

**Background:** Globally, breast cancer is the most widespread carcinoma in terms of prevalence as well as death among women. Aberrant DNA methylation patterns of some genes can contribute to pathogenesis and progression of breast carcinoma.

**Objective:** Our study aims to perform case-control research with meta-analysis in Bangladeshi women to clarify the relation of rs16999593 polymorphisms in DNMT1 gene with breast carcinoma susceptibility.

**Materials and methods:** 100 female breast cancer patients and 116 healthy controls participated in our study. The samples in this investigation were genotyped by employing the PCR-RFLP technique. The statistical analysis includes MedCalc software (version 19.0.7) to calculate odds ratio odd ratio (OR) and Chi-square ($\chi^2$) test was conducted to estimate the Hardy-Weinberg Equilibrium (HWE) assumption for the purpose of justifying the chosen samples' consistency. A meta-analysis was performed utilizing seven eligible studies through RevMan 5.4 software and the MetaGenyo web browser. The GEPIA and UALCAN databases were applied for in-silico mRNA analysis.

**Results:** In this study, association of DNMT1 rs16999593 variant with breast malignancy in the six genetic models is reported but all models are non-significant, involving additive model 1 (OR = 0.57), additive model 2 (OR = 1.14), dominant model (OR = 0.57), recessive model (OR = 1.16), over dominant model (OR = 0.57) and the allelic model (OR = 0.58). Based on demographic and clinicopathological parameters, the DNMT1 rs16999593 variant was not significantly associated with breast cancer susceptibility. Our meta-analysis found that for DNMT1 rs1816999593 codominant 1 (OR = 1.50), codominant 2 (OR = 1.10), codominant 3 (OR = 0.70), dominant (OR = 1.45), recessive (OR = 0.92), over dominant (OR = 1.50), and allelic (OR = 1.27) models are non-significantly associated with breast carcinoma risk in the overall population. In addition, BC tissues showed higher levels of DNMT1 gene expression than healthy tissues in in-silico studies.

**Conclusion:** There is no significant linkage of DNMT1 rs16999593 with the development of breast carcinoma among Bangladeshi women.

**Keywords:** Breast cancer; DNMT1; PCR-RFLP; polymorphisms; rs16999593

# Mechanistic Insights into Antidiabetic Activity of *Ficus hispida* against α-Glucosidase & Caspase-3: In-vitro, In-vivo, Network Pharmacology, Molecular Docking and Molecular Dynamics Simulation Studies

NUSAIBA JAHAN, MARJANUR RAHMAN BHUIYAN, A F M SHAHID-UD-DAULA*

*Department of Pharmacy, Noakhali Science and Technology University, Noakhali-3814, Bangladesh*
*shahid@nstu.edu.bd

## ABSTRACT

**Background:** Diabetes mellitus (DM) is the most critical global health issue, wherein α-glucosidase causes the hydrolytic cleavage of carbohydrates to glucose and caspase-3 causes pancreatic β-cell apoptosis, resulting in augmentation of blood glucose level and depletion of insulin level respectively.
**Objective:** To scrutinize the antidiabetic activity of methanolic extract of *Ficus hispida* fruits (FhME), with a specific emphasis on its potentiality to inhibit α-glucosidase by enzyme assay and caspase-3 after network pharmacology analysis.
**Methods:** An in-vitro α-glucosidase inhibition test and in-vivo study assessed FhME's effects on blood glucose in normal, diabetic, and treated mice. Phytochemicals in FhME were analyzed using HPLC-DAD and a literature review. Alloxan-induced diabetic models were evaluated over time using two-way ANOVA. Network pharmacology identified key genes linking phytochemicals and diabetes, revealing drug-disease mechanisms. Further investigations included molecular docking, molecular dynamics simulations (MDS), and ADMET analysis to explore FhME's potential in diabetes management, providing insights into its pharmacological action and therapeutic strategy.
**Results:** In vitro tests showed FhME inhibits α-glucosidase with an IC50 of 850 µg/mL. In diabetic mice, FhME at 200 and 400 mg/kg significantly reduced blood glucose levels by 64.67% and 58.10%, outperforming glibenclamide (55.54%). Phytochemical analysis revealed 26 constituents; nine compounds exhibited strong -glucosidase binding affinity (-7.1 to -6.7 kcal/mol). Caspase-3 emerged as a key protein target, with four compounds showing high affinity (-4.706 to -3.745 kcal/mol). Molecular docking and simulation confirmed that gallic acid and alpinumisoflavone formed the most stable complexes with caspase-3, highlighting FhME's potential as an antidiabetic agent through dual mechanisms.
**Conclusion:** This research accentuates the potent antidiabetic activity of *Ficus hispida* fruit and manifests it as a valuable alternative to synthetic hypoglycemic agents.
**Keywords:** Antidiabetic activity; diabetes mellitus; *Ficus hispida;* HPLC-DAD; network pharmacology

# Investigating Current Scenario, Sterilization Efficacy, and Waste Disposal Condition of Dental Clinics in Dhaka City, Bangladesh

MD MAHDI HASAN[1], ROKONUZZAMAN[1], RADWAN MD NURULLAH[1], MOHIBUR RAHMAN MUSTAFIZ[1], MD SHAFAYAT HOSSAIN[1,2]*

[1]*Department of Pharmacy, Manarat International University, Bangladesh*

[2]*Department of Pharmacy, School of Biosciences, University of Birmingham, Edgbaston, Birmingham B15 2TT, United Kingdom*

*shafayat@manarat.ac.bd

## ABSTRACT

**Background:** The rapid growth of dental services in Dhaka raises concerns over sterilization practices and waste management, posing health risks and highlighting the urgent need for comprehensive investigation and reliable data.

**Objective:** This study aimed to evaluate the current sterilization techniques and waste management systems employed in dental clinics across Dhaka City. The goal was to identify deficiencies in existing practices and to propose improvements to enhance public health and safety.

**Materials and methods:** A descriptive cross-sectional study was conducted, involving 1,036 dental clinics in Dhaka City. Data collection included structured observational checklists and interviews with clinic staff, focusing on sterilization practices, equipment maintenance, and waste disposal procedures. Compliance with internationally recognized sterilization standards (such as the use of autoclaves, dry heat, and ultraviolet light) was assessed. Additionally, the study examined their routine waste management practices, particularly for hazardous dental waste.

**Results:** The current study found that only 44.1% of clinics utilized adequate sterilization methods like autoclaves, while 55.9% relied on less effective methods such as chemical sterilization and boiling water. Approximately 34.1% of clinics routinely checked the effectiveness of their sterilization procedures, and 44% had scheduled maintenance for their equipment. Regarding waste disposal, 70.36% of clinics managed waste internally without professional assistance, which increases the risks of cross-infection and environmental contamination.

**Conclusion:** These findings reveal significant shortcomings in sterilization and waste management practices in dental clinics in Dhaka City. There is an urgent need for regulatory reforms and the adoption of best practices to safeguard patient health and protect the environment.

**Keywords:** Hygiene; patient safety; registration; sterilization; waste management

# Drug and Alcohol Use and Associated Sociodemographic, Psychosocial and Health Factors among Bus Drivers in Bangladesh

ROKONUZZAMAN[1#], MD MAHDI HASAN[1#], MD SHAFIKUL ISLAM[1], GARETH J HOLLANDS[2], MD SHAFAYAT HOSSAIN[1,3*]

[1]*Department of Pharmacy, Manarat International University, Dhaka, Bangladesh*
[2]*EPPI Centre, UCL Social Research Institute, University College London, United Kingdom*
[3]*School of Biosciences, University of Birmingham, Edgbaston, Birmingham B15 2TT, United Kingdom*
*m.s.hossain@bham.ac.uk

## ABSTRACT

**Background:** Globally, drug and alcohol use among transport workers presents a challenge to public health. For example, studies in Pakistan found that 10% of commercial drivers consumed alcohol while driving, and approximately 30% consumed marijuana. However, there has been no comprehensive study of drug and alcohol use in such populations in Bangladesh.
**Objective:** This research aims to further understanding of the characteristics and determinants of drug and alcohol use amongst a hard-to-access population of transport workers to inform the development of future interventions.
**Materials and methods:** Cross-sectional descriptive survey investigating drug and alcohol use and potentially related factors among male bus drivers (n= 503; ranging in age from 13-74 years, mean=32) in Dhaka City and surrounding areas, Bangladesh, via questionnaires completed during in-person interviews. Participants were recruited through direct approaches at workplaces, free medical check-ups, and blood testing/collection campaigns. We collected data on recent substance use, reasons for use, and its negative effects, as well as information concerning socio-demographic characteristics and health status.
**Results:** Other than near-ubiquitous tobacco use (used by 93% of drivers), the most commonly used drug was marijuana (75%). A wide range of other substances were also used, including alcohol products, vang, yaba, injection drugs, and glue. Many participants reported using multiple drugs simultaneously and spending significant proportions of their income on use. Greater levels of drug use appeared to be related to lower levels of education and being aged 26-30. Psychosocial, personal and social factors such as experience of difficult family circumstances, low mood, and being subject to negative employer and other peer influences were cited as important determinants of drug use.
**Conclusion:** This study reveals widespread drug use among Bangladeshi bus drivers, linked to various factors, urging better monitoring and comprehensive interventions to improve health, productivity, and reduce societal harm.
**Keywords:** Accidents; alcohol use; Bangladesh; bus drivers, drug use; health risks

# The Association of TGFβ1 rs1800470 Polymorphism with Breast Cancer Patients among Bangladesh

**PRIYANKA SEN[1], MUHAMMAD ASADUZZAMAN[1,2]*, MD. SIDDIQUL ISLAM[3], ABU SYED MD. MOSADDEK[4], WAHEED AKHTAR[5]**

*[1]Department of Clinical Pharmacy and Pharmacology, Faculty of Pharmacy, University of Dhaka-1000, Bangladesh*

*[2]School of Pharmacy, BRAC University, kha 224, Bir Uttam Rafiqul Islam Ave, Dhaka 1212, Bangladesh*

*[3]Department of Pharmacy, South-East University, 251/A Tejgaon I/A, Dhaka 1208, Bangladesh*

*[4]Department of Pharmacology, Uttara Adhunik Medical College, Dhaka 1230, Bangladesh*

*[5]Department of Radiotherapy, Sir Salimullah Medical College, Dhaka 1100, Bangladesh*

*asaduzzaman@du.ac.bd

## ABSTRACT

**Background:** Breast cancer is one of the most prevalent cancer types across the globe. In a developing country like Bangladesh, the rate of breast cancer has increased recently. Genetic polymorphism has a prominent role in breast cancer prognosis, one of the death-causing diseases among women. TGFβ1 has versatile ways to be implicated in breast cancer progression and worse prognosis.

**Objective:** This study determines the correlation of breast cancer and TGFβ1 rs1800470 polymorphism (T29C) among Bangladeshi breast cancer patients.

**Materials and methods:** For this study, blood samples were collected from a total of 400 people (200 cases and 200 healthy volunteers). Blood samples from the patients with breast cancer were obtained from the National Institute of Cancer & Research Centre located at Mohakhali, Dhaka. After matching age and gender, healthy controls, who were garment workers and domestic workers, were selected. PCR-RFLP method was applied to determine genetic polymorphism. Statistical analysis was performed to determine the correlation.

**Results:** We have found a significant association between CC genotype and breast cancer patients (OR=1.91, 95% CI=1.40-3.20, p=0.014). No significant association was found between TC genotype and the studied polymorphism, the odds ratio (OR) being 1.44 (95% CI=0.91-2.28, p=0.12). However, CC and TC genotypes together have shown statistical significance (OR=1.62, CI=1.09 - 2.40, p=0.017). Prevalence of the C allele has augmented the risk of breast cancer with an odds ratio (OR) of 1.57 (CI=1.17-2.10, p=0.003). Moreover, the CC genotype serves as a protective factor for TNBC, the OR being 0.4917 with a 95%CI of 0.228 -1.059 and p value 0.0349.

**Conclusion:** Overall, our study demonstrates that TGFβ1 rs1800470 polymorphism in Bangladeshi population increases the chance of breast cancer significantly irrespective of age and can be of a prognostic value in triple-negative breast cancer.

**Keywords:** Breast cancer; genetic polymorphism; PCR-RFLP; TGFβ1; triple-negative breast cancer

# Association of VDR Gene (rs7731236 and rs2228570) Polymorphism in COVID-19 Induced Cardiac Disorders

**UMME ROKAYA KEYA, FERDIN EHSAN, TAMANNA ISLAM, ABU SYED MD. MOSADDEK, MD. SIDDIQUL ISLAM***

*Department of Pharmacy, School of Science and Engineering, Southeast University, 251/A Tejgaon I/A, Dhaka-1208, Bangladesh*

*chairpharmacy@seu.edu.bd

## ABSTRACT

**Background:** COVID-19 is considered to have an association with cardiovascular disorders. The polymorphic VDR (rs731236, rs2228570) gene may be triggered to influence COVID-19-induced cardiac diseases.

**Objective:** This research focused on investigating the correlation between VDR gene polymorphism and cardiovascular complications.

**Materials and Methods:** One hundred Covid-19 patients' blood was collected from Uttara Adhunik Medical College Hospital, Bangladesh. The specimens' DNA was isolated and amplified by PCR. The polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) was used to investigate genetic polymorphisms. Odds ratios (ORs) and 95% Confidence Intervals (CIs) were applied to monitor the relationship between COVID-19 and cardiac disorders.

**Results:** Our investigation found that the VDR gene did not interfere with complications like NSTEMI, IHD, AKI, anemia, ALVF, bradycardia and CKD. However, HTN, DM, AMI and angina had stronger relationships with VDR gene polymorphism. The investigation assesses the patients with "TC" and "TC+CC" genotypes of VDR [Taq-I rs731236] have [OR=2.4, 95%CI=1.0068 to 5.7724, p=0.0482; OR=2.4158, 95% CI=1.0791 to 5.4085, p=0.0319] increased hypertension when compared to those with "TT" genotype. Among the patients carrying "TC", "CC", "TC+CC" genotype, VDR [Taq-I rs731236] polymorphism was evaluated to be associated with covid stimulated diabetics mellitus [OR=3.22, 95% CI=1.3254 to 7.8335, p = 0.0098 OR=4.0278, 95% CI=1.0975 to 14.7817, p = 0.00357; OR=3.4118, 95% CI=1.4970 to 7.7756 p = 0.0035] and angina [OR=3.8750, 95% CI=1.5778 to 9.5166, p=0.0031; OR=4.8438, 95% CI= 1.3107 to 17.9003, p=0.0180; OR=4.1029, 95% CI=1.7807 to 9.4536, p=0.0009]. We also observed that the patients with "TC" and "CC" genotypes of VDR [Taq-I rs731236] gene had [OR=3.1513, 95% CI=1.3014 to 7.6306, p = 0.0110; OR=4.4118, 95% CI=1.1984 to 16.2416, p = 0.0256] produced acute myocardial infection as compared to "TT" genotype. Therefore, the data did not find any influential effect of VDR gene polymorphism [FokI rs2228570] on the cardiovascular disease triggered by COVID-19.

**Conclusion:** This study found a significant link between VDR gene Taq-I polymorphism and COVID-19-related cardiovascular disease, while FokI showed no association, highlighting the potential of pharmacogenomic biomarker testing.

**Keywords:** Cardiac disorder; FokI; polymorphism; TaqI; VDR

# Antioxidant, Antibacterial and Cytotoxic Activities of the Methanolic Extract of *Syzygium myrtifolium* Leaves

**NAFISA TASNIM, SADIA TAMANNA, EJAJ SUMIT, SAMIA ZAMAN MEEM, MARJANA KHALIL, NIGAR SULTANA TITHI***

*Department of Pharmacy, East West University, A/2, Jahurul Islam Avenue, Jahurul Islam City, Aftabnagar, Dhaka-1212, Bangladesh*

*ngst@ewubd.edu

## ABSTRACT

**Background:** *Syzygium myrtifolium*, a shrub from the Myrtaceae family, is widely cultivated in Asia as an ornamental plant and is traditionally used to fight various ailments.
**Objective**: This study seeks to identify the key phytochemicals of the methanolic leaf extract of *S. myrtifolium*, and to evaluate its antioxidant, antibacterial, and cytotoxic activities.
**Materials and methods:** Preliminary phytochemical screening was performed using standardized methodologies specific to each chemical class. Total phenolic content was quantified via the Folin-Ciocalteu assay, while flavonoid content was measured using the aluminium trichloride colorimetric method. Antioxidant activity was appraised by implementing a ferric-reducing power assay. The antibacterial efficiency of the leaf extract was determined using a disk diffusion test, and the cytotoxic potential was examined through a brine shrimp lethality bioassay.
**Results:** The existence of flavonoids, tannins, saponins, steroids, and triterpenoids in the leaf extract was revealed from the phytochemical profiling. For each gram of dried extract, the total phenolic content was quantified as 703.13 mg of gallic acid equivalents and the total flavonoid content as 141 mg of catechin equivalents. The result of the reducing power assay indicated that the extract exhibits moderate antioxidant properties relative to the standard (ascorbic acid). The leaf extract demonstrated significant antibacterial efficacy against all tested bacteria, with the zones of inhibition varying between 14 mm and 26 mm. Moreover, the extract yielded an $LC_{50}$ value of 42.95 g/ml in the brine shrimp lethality bioassay, emphasizing its prominent cytotoxic potential.
**Conclusion:** The findings of this study establish that the methanolic extract of *Syzygium myrtifolium* is a promising source of phytochemicals, exhibiting noteworthy antioxidant, antibacterial, and cytotoxic properties.
**Keywords:** Antibacterial activity; antioxidant activity; cytotoxicity; phytochemical screening; *Syzygium myrtifolium*

# Development and Optimization of Glimepiride Solid Dispersion by Central Composite Design

**SHARMIN AKHTER[1,2]*, SUKALYAN KUMAR KUNDU[2], TAZIM HASAN FAHIM[1], FARUQ MOHAMMAD TASHRIQ[1], MD. SHAJADUR RAHMAN RAFI[1]**

*[1]Department of Pharmacy, BGC Trust University Bangladesh, BGC Biddyanagar, Chandanaish, Chittagong-4381*

*[2]Department of Pharmacy, Faculty of Biological Sciences, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh*

*sharmin@bgctub.ac.bd*

## ABSTRACT

**Background:** Glimepiride, a BCS Class II anti-diabetic drug, has poor water solubility and high permeability, leading to delayed therapeutic action.

**Objectives:** The current exploration intends to design and optimize an immediate-release solid dispersion of glimepiride using response surface methodology by applying the Central Composite Design to enhance drug release.

**Materials and methods:** A Central Composite Design (runs 1-24) using DOE software (v13) was employed to optimize glimepiride solid dispersions, evaluating three variables: polymer amount, time, and type (Eudragit, Poloxamer). Dispersions were prepared via solvent evaporation at varying drug-polymer ratios. Optimized formulations underwent in-vitro release studies and physicochemical characterization using FTIR, SEM, PXRD, and DTA/TG. Drug release kinetics were assessed through zero-order, first-order, Higuchi, and Hixson-Crowell models to determine Mean Dissolution Time (MDT), aiding in understanding the release mechanism and improving glimepiride bioavailability.

**Results:** The Eudragit-based solid dispersion (SD) formulation released 82.29% of glimepiride within 60 minutes. Response surface plots and statistical tests confirmed the reduced cubic model's adequacy. FTIR confirmed drug stability without significant drug-polymer interactions. SEM and PXRD analyses revealed the conversion of crystalline glimepiride to an amorphous state. DTA/TG curves indicated the formation of a drug-polymer inclusion complex, enhancing solubility and dissolution rate. Overall, polymer incorporation improved glimepiride's physicochemical properties and release profile in SD formulations.

**Conclusion:** The study shows that solid dispersion improves glimepiride dissolution and solubility, suggesting it could improve the bioavailability of poorly water-soluble drugs.

**Keywords:** Central composite design; DoE; eudragit; glimepiride; solid dispersion

# Estimation of Antibacterial Activity, Total Flavonoid Content and Reducing Power of Different Solvent Extracts of *Dillenia indica* Leaves

**ARPITA SAHA, SANZIDA PARVIN MOOMO, AFSANA HOSSAIN PRIYA, SANJIDA SATTAR KEYA, NAVIRA ASFA NOELY, NIGAR SULTANA TITHI***

*Department of Pharmacy, East West University, A/2, Jahurul Islam Avenue, Jahurul Islam City, Aftabnagar, Dhaka-1212, Bangladesh*

*ngst@ewubd.edu

## ABSTRACT

**Background:** *Dillenia indica*, or Chalta, is a common tree in Bangladesh that possesses a noteworthy legacy in traditional medicine.

**Objective:** The objectives of this study were to detect the presence of different phytochemicals as well as to evaluate the antibacterial activity and the antioxidant properties of *Dillenia indica* leaf extracts in methanol, ethyl acetate, cyclohexane and dichloromethane.

**Materials and methods:** Phytochemicals were screened using specific standard methods. The Kirby-Bauer disk diffusion method was employed to investigate antibacterial activity. For the assessment of antioxidant potential, the reducing power assay was conducted, and the total flavonoid contents of the extracts were determined.

**Results:** The presence of alkaloids and flavonoids was observed in all extracts, while terpenoids were detected in methanol, ethyl acetate, and cyclohexane extracts. Mild to moderate antibacterial activities were demonstrated by the extracts, with the zones of inhibition varying from 7 to 10 mm. The highest total flavonoid content was found in the methanolic extract (463.33 mg/g of QE), followed by ethyl acetate, dichloromethane and cyclohexane extracts. A similar order was observed in the results of their reducing power, which reflected the correlation between antioxidant potential and flavonoid content.

**Conclusion:** It can be concluded that *D. indica* leaf extracts exhibit high antioxidant potential with mild to moderate antibacterial activity. Further investigations should be conducted to find out the full pharmacological profile of this plant.

**Keywords:** Antibacterial; *Dillenia indica*; flavonoid content; phytochemicals; reducing power

# Methanolic Extracts *of Vitex peduncularis* Mitigate Acute Kidney Disease in Experimental Mice Model

**TASLIMA JAMAL URMI[1], HUMAYRA TASNIM[1], LAMIA ALAM[1], SHARMIN AKTER[1,2], SHIHAB UDDIN AHMAD[1]***

*[1]Department of Pharmacy, School of Medicine, University of Asia Pacific, 74/A, Green Road, Dhaka-1215, Bangladesh*

*[2]School of Bioengineering, Dalian University of Technology, No.2 Linggong Road, Dalian City, Liaoning Province, China*

*shihab@uap-bd.edu

## ABSTRACT

**Background:** The prevalence of kidney disease is a significant concern. Some commonly used drugs can have severe negative impacts on the kidneys. Safe treatment options are important. Research on the plant Vitex shows it may have nephroprotective effects.

**Objective:** This study evaluates the potential nephroprotective effects of *Vitex peduncularis* (VP) extracts.

**Methods:** Forty Swiss Albino mice were divided into five groups: sham control (SC), negative control (NC), and groups treated with different doses of VP extract - low (VPL), medium (VPA), and high (VPH). Nephrotoxicity was induced by ten days of intraperitoneal gentamicin injections, and all treatments were given via oral gavage over three weeks. The following parameters were investigated: biochemical analysis (BUN, urea, uric acid, serum, and urine creatinine), immunoassay (SOD, GSH, CAT, and MDA), and histopathological study (H&E).

**Results:** There were no noticeable variations in body or kidney weights between the groups. The renal somatic index of the NC group significantly differed from all other groups ($p < 0.001$). Blood creatinine, BUN, and urea levels in the VPH group were similar to the SC group ($p < 0.05$, $p < 0.05$, $p < 0.01$, respectively). Uric acid levels significantly differed between the VPH and both the NC and VPL groups ($p < 0.01$), but no significant difference in urine creatinine levels was observed between the five groups. VPH group demonstrated significant improvements in SOD ($p < 0.01$), MDA ($p < 0.01$), GSH ($p < 0.01$) and CAT ($p < 0.0001$) compared to the NC group. Additionally, a dose-dependent improvement was observed in CAT ($p < 0.05$) and GSH ($p < 0.01$) levels when comparing the VPH and VPL groups. Kidney tissue damage parameters in the high-dose group, specifically tissue degeneration, presence of hyaline casts, and inflammatory cell infiltration, indicated significant improvements with a p-value of less than 0.0001 compared to the NC group.

**Conclusion:** The findings from in vivo studies of VP extract indicate its potential as a viable candidate for mitigating kidney damage. Further In-vitro studies are recommended to uncover the underlying mechanism of action of the isolated compounds.

**Keywords:** Acute kidney disease; gentamicin; oxidative stress

# Evaluation of the link between IL-27 (rs153109) Polymorphism & Colorectal Cancer Susceptibility in Bangladeshi Population: A Case-Control Study

**TASNUVA MUSNAT TUSY[1,2], MD ABDUL BAREK[1,2], MOHAMMAD SAFIQUL ISLAM[1,2]***

*[1]Department of Pharmacy, Noakhali Science and Technology University, Sonapur, Noakhali-3814, Bangladesh*

*[2]Laboratory of Pharmacogenomics and Molecular Biology, Department of Pharmacy, Noakhali Science and Technology University, Sonapur 3814, Noakhali, Bangladesh*

*research_safiq@yahoo.com

## ABSTRACT

**Background:** Colorectal cancer is a malignancy arising from cells of the colon or rectum, which are vital parts of the large intestinal tract. Colorectal cancer ranks third among female cancers and fourth among male cancers worldwide. It has been observed that CRC is linked to IL-27 gene polymorphisms in several groups.

**Objective:** This research work aims to evaluate the prevalence of IL-27 gene polymorphism in the Bangladeshi population and assess its association with colorectal cancer risk.

**Materials and methods:** 194 CRC cases and 192 controls were considered in this study. We used polymerase chain reaction-restriction fragment length polymorphism method for genotyping. Agarose gel electrophoresis was utilized to identify digested fragments and PCR products.

**Results:** The findings suggest that 39.18%, 47.42%, 13.4% of CRC cases had TT, TC and CC genotypes, respectively. In addition, 59.89%, 36.46%, 3.65% of controls had TT, TC and CC genotypes, respectively. TC and CC genotypes showed 1.99 and 5.62-fold higher cancer risk compared to TT genotypes. The observed genetic models are Additive model -1, Additive model -2, Dominant model, Recessive model, Over Dominant model and Allele model (OR = 1.99, 5.62, 2.32, 4.09, 1.57, and 2.39 with corresponding 95% CI = 1.30-3.04, 2.32-13.60, 1.54-3.49, 1.73-9.67, 1.05-2.36, and 1.72-3.32, respectively). A higher risk of CRC was found in all genetic models, and the outcomes are significant as $p<0.05$.

**Conclusion:** The finding of the study indicates a highly substantial correlation of IL-27 gene polymorphism with colorectal cancer susceptibility.

**Keywords:** Colorectal cancer; interleukin 27; rs153109; PCR- RFLP; polymorphism

# Detection and Quantification of Hydroquinone and Heavy Metals in Lipsticks Available in Bangladeshi Market

**SUMYIA CHOWDHURY[1], FAHMIDA CHOWDHURY[1], FARHANA AKTER[1], MD RAIHAN SARKER[2], FARHANA RIZWAN[1]***

*[1]Department of Pharmacy, East West University, Dhaka-1212, Bangladesh*

*[2]Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*frezwan@ewubd.edu*

## ABSTRACT

**Background:** Lipstick, a popular item in fashion and beauty, raises concerns due to the presence of hydroquinone and heavy metals, such as iron oxides, chromium oxide greens, and titanium dioxide. Overexposure to these substances is associated with developmental issues, neurotoxicity, and reproductive harm.

**Objective:** The objective is to evaluate the quality and safety of lipsticks by assessing the presence of heavy metals and detecting hydroquinone using HPLC methods to ensure compliance with regulatory standards.

**Materials and Method:** The research focuses on 22 different branded and non-branded lipsticks collected from local, branded, and super shops in Bangladesh, utilizing atomic absorption spectroscopy (AAS) for analysis of iron (Fe), the ICP-OES method to assay arsenic (As), lead (Pb), cadmium (Cd), chromium (Cr), and high-performance liquid chromatography (HPLC) for comprehensive analysis of hydroquinone. In addition to the method design, validation and calibration, the study also includes arsenic, lead, cadmium, chromium, and iron sample preparations, as well as the selection of the HPLC procedure to quantify hydroquinone.

**Results:** Although hydroquinone was found to be absent in lipstick within the detection limit, high levels of trace metals have been reported in various branded lipsticks. All brands have arsenic and cadmium levels below the detection quantitation. However, chromium levels vary significantly with the high concentration in some brands like LP-10 (121332.0 µg/kg), LP-9 (15382.0 µg/kg), LP-7 (9964.0 µg/kg) in addition to the local brand LP-16 (150524.0 µg/kg). Besides, the amount of lead was below the detection quantitation for most of the brands apart from LP-3 (4730.0 µg/kg) and LP-9 (3218.0 µg/kg). Iron also displayed a wide variation in their concentration, in which the amount of iron contained by LP-10 (10056.0 mg/kg) and LP-2 (26378.0 mg/kg) were on the alarmingly higher side.

**Conclusion:** The study found that many local lipsticks contained chromium levels that exceeded the acceptable range. In contrast, most branded lipsticks are generally safe, although there are a few exceptions. Additionally, some lipstick brands contain higher levels of lead and iron than recommended, which may pose health risks. Consumers need to be aware when choosing their lip products. Opting for reputable brands can help ensure the safety and well-being of consumers.

**Keywords:** Chromium level; heavy metals; hydroquinone; lead level; lipstick

# Detection and Quantification of Hydroquinone and Heavy Metals in Skin Fairness Creams Available in Bangladeshi Market

**JANNATUL FERDOUS MOUMITA[1], JANNATUL FERDOUS TANJINA[1], FARHANA AKTER[1], MD RAIHAN SARKER[2], FARHANA RIZWAN[1]***

*[1]Department of Pharmacy, East West University, Dhaka-1212, Bangladesh*

*[2]Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*frezwan@ewubd.edu*

## ABSTRACT

**Background:** Skin fairness creams are designed to lighten the skin, reduce melanin production, and create a radiant glow. However, their use is associated with several risks, including dermatitis, melasma, and hyperpigmentation. Additionally, some fairness creams contain excessive levels of heavy metals, which can lead to toxicity, neurotoxicity, carcinogenic effects, and other harmful outcomes.

**Objective:** The objective is to evaluate the quality and safety of skin fairness cream by assessing heavy metal content and detecting hydroquinone using HPLC methods, ensuring compliance with regulatory standards.

**Materials and Method:** The study focuses on 16 different skin fairness cream samples collected from local, branded, and super shops in Bangladesh, utilizing AAS (Atomic absorption spectroscopy) for analysis of iron (Fe), the ICP-OES method to assay arsenic (As), lead (Pb), cadmium (Cd), chromium (Cr), and high-performance liquid chromatography (HPLC) for comprehensive analysis of hydroquinone. In addition to the method design, validation and calibration, the study also includes arsenic, lead, cadmium, chromium, and iron sample preparations, as well as the selection of HPLC procedure to quantify hydroquinone.

**Results:** The hydroquinone value of 4 samples exceeds the standard limit (2% w/w), and among them, SFC-2 contains the highest amount (8.48% w/w). The arsenic (As) and cadmium (Cd) levels were in the normal range in both branded and non-branded fairness creams. The quantity of lead (Pb) is within the USFDA-approved limit (5000 µg/kg) in all the samples except SFC-14 (62058.0 µg/kg). The concentration of iron is within the 0.3 mg/kg range in 11 samples, and SFC-13 contains the uppermost concentration (405.0 mg/kg) of iron (Fe). However, all the fairness creams exceeded the limitation range (1000 µg/kg) of chromium (Cr) concentration, and the maximum concentration was found in SFC-15 (3544.0 µg/kg).

**Conclusion:** Analysis reveals dangerously high chromium levels in all tested skin fairness creams, with some also containing hazardous lead and hydroquinone, urging consumer awareness of serious health risks in such products.

**Keywords:** Chromium level; heavy metals; hydroquinone; lead level; skin fairness cream

# Ligand-Based Identification of Naturally Occurring 1E3G Receptor Inhibitors for Treating Prostate Cancer

**ABU SAYED, MOHAMMED IFTEAKHAR UDDIN, MOHAMMED RAIHAN UDDIN, SANJIDA BANU, JOYA DATTA RIPA***

*Department of Pharmacy, University of Science and Technology Chittagong; D-Block, Foy's Lake, Zakir Hossain Road, Chattagram-4202, Bangladesh*

*joya.datta27@ustc.ac.bd

## ABSTRACT

**Background:** An estimated 1 in 8 men may acquire prostate cancer at some point in their lives, making it one of the most common malignancies to affect men globally. The androgen receptor (AR), linked to controlling genes essential for cell survival and proliferation, is a major therapeutic target in prostate cancer. The 1E3G is vital to the development of the disease.

**Objective:** This study aims to investigate potential 1E3G receptor inhibitors for prostate cancer treatment computationally. Using molecular docking, DFT analysis, and ADMET profiling, compounds such as cianidanol and gallocatechin are assessed for their binding characteristics and pharmacological interactions to identify promising therapeutic candidates for further development.

**Materials and methods:** Using a computational ligand-based approach, the inhibitory properties of 1E3G were explored. Cianidanol and gallocatechin from Camellia sinensis and Phyllanthus amarus were analyzed using DFT (6-31g(d,p)), Gaussian 16, ADMET, and PyRx. Binding interactions and molecular properties were studied via Chimera, molecular orbital analysis, and network pharmacology. Pharmacokinetics and toxicity were predicted using admetSAR and ProTox-3.0. A 100-nanosecond molecular dynamics simulation using Desmond confirmed the stability of the selected compounds as potential 1E3G inhibitors.

**Results:** Based on computational research, drug binding site evaluation, docking score, optimization, and molecular dynamic simulation results, cianidanol (binding affinity -8.1) and gallocatechin (binding affinity -8.4) are the most selective 1E3G inhibitors.

**Conclusion:** These compounds need to be studied further to develop a useful 1E3G inhibitor for the treatment of prostate cancer.

**Keywords:** Androgen receptor; computational study; prostate cancer; small molecule inhibitors

# Association of Polymorphisms in Vitamin D Receptor Genes with Childhood Autism Spectrum Disorders

**FERDIN EHSAN[1], ZANNATUL TUNJUM ISLAM[1], UMME ROKAYA KEYA[1], KAZI ASHARAFUL ISLAM[2], MD. SIDDIQUL ISLAM[1]***

*[1]Department of Pharmacy, Southeast University, Tejgaon I/A, Dhaka 1208, Bangladesh and Institute of Paediatric Neurodisorder*

*[2]Autism, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka 1000, Bangladesh*

*chairpharmacy@seu.edu.bd

## ABSTRACT

**Background:** There are currently no shared biological indicators amongst affected persons in the spectrum of diseases known as autism spectrum disorder (ASD), which is a collection of diverse, behaviorally defined conditions. Single nucleotide polymorphisms (SNPs) found in many genes may be involved in the etiology of ASD.

**Objective:** The main objective of this study is to evaluate the influence of VDR gene polymorphism in Childhood Autism spectrum disorders

**Methods:** The study involved 100 children with ASD recruited from the Institute for Paediatric Neurodisorder and Autism in BSMMU, with 100 healthy persons serving as the control group. Genomic DNA was isolated from a blood sample. It is done by PCR, which makes use of primers specific to a certain region. After PCR, the appropriate enzymes were used to perform Polymerase Chain Reaction Restriction Fragment Length Polymorphism (PCR-RFLP) to determine genotypes. Odds ratios (ORs) and their associated 95% confidence intervals (95% CIs) were calculated to evaluate the association.

**Results:** We observed a correlation between a higher incidence of ASD and the C allele located at location Taq-I (rs731236) of the VDR gene (OR=2.2094, 95% Cl=1.4156 to 3.4483 and P value =0.0005) in compared to T allele. Patients carrying TC showed 2.5 times higher incidence of autism compared to patients carrying TT (P value =0.0036, 95% Cl=1.3479 to 4.6046). Patients with any T allele (CT+CC) got 2.6 times higher (P=0.0008, 95%Cl=1.5077 to 4.7371 propensity of getting ASD than patients with CC (P value =0.0008, 95% Cl=1.5077 to 4.7371). We found a correlation between an increased risk of ASD and the presence of the T allele at the Fok-I (rs731236) site of the VDR gene (OR=1.56, 95% CI=1.0281 to 2.3536, P=0.036) when compared to the C allele. Patients carrying at least one T allele (CT+TT) had a 1.86 times greater likelihood of developing ASD than those with the CC genotype (OR=1.8571, 95% CI=1.0525 to 3.27710, P=0.033).

**Conclusion:** These genes are linked to an increased risk of childhood ASD and could be a promising target for diagnosing the disorder. However, these findings need further confirmation through larger studies that encompass diverse ethnic groups and geographical areas.

**Key Words:** ASD; PCR-RFLP; polymorphism; SNPs; VDR

# Comparative Analysis of Binding Affinity and Toxicity Profiles of Reported Aromatase Inhibitors against Breast Cancer via Computational Approaches

**RIFAT HASSAN RABBY[1], NISHAT NASRIN[1], NIGAR SULTANA TITHI[1], NAJNEEN AHMED[1], FARJANA KHATUN[1,2]***

*[1]Department of Pharmacy, East West University, A/2 Jahurul Islam Avenue, Aftabnagar, Dhaka-1212, Bangladesh*

*[2]Bio-Bio-1 Bioinformatics Research Organization, Sanskreeti Bikas Kendra Bhaban, 1/E/1 Porabagh, Dhaka, Bangladesh*

**fkh@ewubd.edu*

## ABSTRACT

**Background:** Breast cancer, the most common cancer in women, caused 670,000 deaths in 2022. Hormonal and genetic factors drive its progression. Over 70% of cases are hormone receptor-positive and HER2-negative, making hormone-targeting treatments a promising therapeutic approach.

**Objective:** This study focuses on finding safe and effective aromatase inhibitors based on their binding affinity and toxicity properties via the in-silico model approaches.

**Materials and methods:** Preclinically promising nine aromatase inhibitors, selected from derivatives of coumarin, deketene curcumin, benzothiazolyl-piperazine (ziprasidone) and benzimidazole-triazolothiadiazine, were analyzed and compared with established aromatase inhibitors (letrozole and anastrozole). An aromatase enzyme (PDB: 3S7S) was used as a target protein for docking study. Different software such as ChemDraw Professional 16.0, PyMoL, AutoDockTools-1.5.7, AutoDock Vina, and Biovia Discovery Studio 2021 Client were used for molecular docking analysis. The ProTox 3.0 tool was used to determine the toxic properties of these inhibitors.

**Results:** Molecular docking showed nine inhibitors had binding affinities ranging from -8.6 to -11.5 Kcal/mol against 3S7S. Letrozole and anastrozole had lower affinities of -8.6 and -9.2 Kcal/mol, respectively. The benzimidazole-triazolothiadiazine (-11.5 Kcal/mol) and coumarin (-10.3 Kcal/mol) derivatives showed superior binding. The benzimidazole-triazolothiadiazine formed stable interactions via hydrogen bonds, pi-sulfur, and alkyl bonds, while coumarin's higher affinity was due to multiple hydrogen bonds. Toxicity analysis revealed that the benzimidazole-triazolothiadiazine derivative was largely non-toxic, with low neural and respiratory risks (0.6). The coumarin derivative was safe for liver, neural, and respiratory systems but showed moderate nephrotoxicity (0.64) and cardiotoxicity (0.59).

**Conclusion:** These inhibitors require further investigations to confirm them as safe and effective aromatase inhibitors.

**Keywords:** Aromatase inhibitor; breast cancer; molecular docking; PDB: 3S7S; toxicity

# Post-Market Comparative Quality Assessment of Eight Cefixime Trihydrate Tablet Brands by RP-HPLC Available in Bangladesh

**ARIFUL ISLAM, SUMAIYA AKTAR, ANTARA NASHRAH, SHAHRIAR ALAM SHANTO, MD. HASANUZZAMAN SHOHAG***

*Department of Pharmaceutical Sciences, North South University, Dhaka-1229, Bangladesh*
*hasanuzzaman.shohag@northsouth.edu

## ABSTRACT

**Background:** Cefixime antibiotic is commonly used against diseases caused by both Gram-positive and Gram-negative bacteria. Cefixime is commercially available as cefixime trihydrate in Bangladesh. To combat antibiotic resistance and ensure public health, it is crucial to evaluate the standards of the marketed antibiotic products regularly.

**Objective:** This study aimed to determine different quality attributes (e.g., % drug content, % drug release, etc.) of eight commonly prescribed cefixime trihydrate 200mg tablet brands in Bangladesh and compare these with the innovator brand.

**Materials and methods:** The Shimadzu LC-20A series instrument equipped with a UV-visible spectrophotometer has been used to quantify the drug content in the marketed cefixime tablets. The percentage of drug release after 45 min has been assessed utilizing a tablet dissolution analyzer USP type-2. Chromatographic separation was performed on a reversed-phase C18 column at 30°C for 8 min using methanol and 0.01M $KH_2PO_4$ buffer (pH adjusted to 4.5) at 282 nm. Finally, the antimicrobial efficacy of the eight local brands and the innovator brand has been assessed using Kirby-Bauer's disc-diffusion method.

**Results:** Our analysis indicated that 87.5% (7 out of 8) of cefixime tablet brands met the potency standards specified by the BP and USP (90%-110% of the declared amount). In contrast, one brand did not comply with the guidelines. The dissolution test revealed that 87.5% (7 out of 8) of the brands comply with the USP dissolution test criteria (not less than 80%). Only one brand failed to release 80% of the labeled drug content within 45 minutes. All nine brands (including the innovator) showed susceptibility to the tested microbial strains (*E. coli* and *Vibrio cholerae*) in antimicrobial efficacy assessment.

**Conclusion:** Our study demonstrated that 87.5% of the total cefixime trihydrate brands (7 out of 8 local brands) complied with regulatory parameters and, therefore, can be used interchangeably.

**Keywords:** Bangladesh; cefixime trihydrate; post-market analysis; RP-HPLC

# Isolation, Identification and Bioactivity of Endophytic Fungi Isolated from The Medicinal Plant *Murraya paniculata* (Family-Rutaceae)

**NAZIFA TABASSUM[1], MD. HOSSAIN SOHRAB[2], RABITA ZINNURINE[2], SUFIA ISLAM[1], NAZIA HOQUE[1]***

*[1]Department of Pharmacy, East West University, Dhaka-1212, Bangladesh*

*[2]Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka-1205, Bangladesh*

*nzh@ewubd.edu

## ABSTRACT

**Background:** The symbiotic relationship between plants and their endophytic fungi has been well-known for decades. Not only do they provide the plants with secondary metabolites, but these fungi also produce chemicals that are found to be excellent medicinal agents.

**Objective:** This study explores the antioxidant, antimicrobial, and cytotoxic potential of endophytic fungi from *Murraya paniculata*, which is underexplored compared to bacteria.

**Materials and methods:** Identification of fungal isolates was done by macroscopic and microscopic methods. DPPH free radical scavenging assay, total phenolic content and total flavonoid content were measured to identify the antioxidant potential of the isolates. Evaluation of antimicrobial activity was done using the disc diffusion method against twelve different bacterial species. Brine shrimp lethality bioassay was incorporated to measure the cytotoxicity potential expressed as $LC_{50}$ of the fungal extracts.

**Results:** A total of nine (MPBE-1, MPBE-3, MPBE-5, MPBE-6, MPLE-1, MPLE-2, MPLE-3, MPLE-4, MPLE-5) fungal species were isolated and identified. The total phenolic content of the fungal isolates ranged between 221.4 $\pm$ 5.3 mg/g to 1004.9 $\pm$ 6.0 mg/g where the highest phenolic content was obtained from MPLE-1. The total flavonoid contents of the isolates were between 35.7 $\pm$ 1.9 mg/g to 271.3 $\pm$ 1.5 mg/g where the highest flavonoid content was obtained from MPBE-6. In DPPH scavenging assay, the $IC_{50}$ values ranged between 199.6 $\pm$ 12.3 µg/ml to 1326.4 $\pm$ 8.9 µg/ml where MPLE-2 showed the highest scavenging activity. Fungal extract of MPLE-4 exhibited considerable antimicrobial activity against *Salmonella paratyphii, Escherichia coli, Bacillus megaterium*, *Pseudomonas aeruginosa*. In brine shrimp lethality bioassay, all nine fungal extracts exerted promising effects, where the highest cytotoxicity was observed for MPLE-4 ($LC_{50}$: 5.35 µg/ml).

**Conclusion**: Further research on these specific endophytes is needed to identify novel bioactive compounds, potentially contributing to drug discovery efforts in this underexplored area.

**Keywords:** Cytotoxicity; DPPH assay; flavonoid content; fungal extract; phenolic content

# Drug Discovery from *Ecbolium viride* Leaves: A Combined Phyto-Pharmacological, Toxicological and Computational Approaches

MD. SHOHEL HOSSEN[1], MD. JAMAL HOSSAIN[1,2*]

[1] *Department of Pharmacy, School of Pharmaceutical Sciences, State University of Bangladesh, South Purbachal, Dhaka 1461, Bangladesh*

[2]*Bioscience PhD program, University of Utah, Salt Lake City, UT 84112, USA*

*jamal.hossain@utah.edu

## ABSTRACT

**Background:** Plant-based remedies have long contributed to drug development. Today, many medicines originate from plant compounds. Bioactivity-guided fractionation is key in identifying active ingredients in medicinal plants, helping researchers isolate components responsible for their therapeutic effects.

**Objective:** The study is to explore *Ecbolium viride* leaf extract's phytochemical, pharmacological, and toxicological properties using in vitro, in vivo, and *in silico* methods for bioassay-guided drug discovery.

**Materials and methods:** GC-MS and NMR identified phytoconstituents of *E. viride* leaf extract, while bioassays assessed antioxidant, thrombolytic, antibacterial, and membrane-stabilizing activities. In vivo tests evaluated analgesic, anti-inflammatory, hypoglycemic, and antidiarrheal effects. Acute and sub-acute toxicity studies determined single and repeated dose safety profiles in Swiss Albino mice, supporting the compound's pharmacological and toxicological potential.

**Results:** The DPPH assay revealed promising antioxidant properties ($IC_{50}$: 3.35-19.04 µg/mL). Clot lysis was nearly 60%, comparable to streptokinase (75.75%). The crude extract and all the fractions demonstrated moderate antibacterial activity. Three doses (200, 400, and 600 mg/kg bw) of the crude extracts exhibited significant activities against pain, inflammation, hyperglycemia, and diarrhea ($p < 0.05$). The acute toxicity assessed the median lethal dose (LD50) of the crude extract is over 5000 mg/kg bw, and sub-acute toxicity supported repeated dose safety. In addition, the molecular docking and *in silico* ADMET analysis validated the experimental results obtained from the in vitro and in vivo tests.

**Conclusion:** The study found *E. viride* leaf extracts pharmacologically active and safe in animal models, supporting further phytochemical isolation and bioassay-guided drug discovery using computational validation of its compounds.

**Keywords:** Analgesic; anti-inflammatory; GC-MS/MS analysis; molecular docking; phytochemical isolation

# Evaluation of Awareness and Knowledge of Adolescent Girls Towards Reproductive Health: A Prospective Cross-sectional Study

**JANNATUL FERDOUS KEYA[1], NIGAR SULTANA TITHI[1], FARIHA TASNIM[1], NOOSRAT IMROSE[1], MUHAMMAD ASADUZZAMAN[2,3], NISHAT NASRIN[1]***

*[1]Department of Pharmacy, East West University, A/2 Jahurul Islam Avenue, Aftabnagar, Dhaka-1212, Bangladesh*

*[2]Department of Clinical Pharmacy and Pharmacology, University of Dhaka, Dhaka 1000, Bangladesh*

*[3]School of Pharmacy, BRAC University, kha 224, Bir Uttam Rafiqul Islam Ave, Dhaka 1212, Bangladesh*

*nishat@ewubd.edu

## ABSTRACT

**Background:** Reproductive health encompasses an overall condition of physical, mental and social well-being and is driven by various factors and influences that are associated with the reproductive system, its functions, and processes. Preserving the reproductive health of the youth, with a specific emphasis on female reproductive health, poses a significant challenge. This challenge is particularly pronounced in developing and underdeveloped countries, where a lack of education and awareness of fundamental health issues exacerbate the condition.

**Objective:** The present study was designed to evaluate the level of awareness and knowledge regarding reproductive health among adolescent females of selected areas of Dhaka city.

**Methods:** This cross-sectional study was conducted on 259 female population (aged between 16 and 23 years) purposively selected from different areas of Dhaka city from July to September 2016. They responded to a structured questionnaire, where having heard of the disease in the question was defined as 'awareness', while having some opinions and understandings of some reproductive health issue was defined as 'knowledge'.

**Results:** Our findings suggest that awareness about the legal age of female marriage was 71.43% (n=185). Approximately 62% of participants (n=161) knew about HIV, while 57.92% (n=150) knew condom use. Furthermore, only 39% of the population (n=101) could identify their fertility period. A significant percentage of the population (78%) were unaware of inadequate pregnancy gaps, and only 15% of females (n=39) understood 'conception timing'. Among the participants, 65.25% (n=169) exhibited knowledge of oral contraceptive pills. Notably, 54% (n=140) recognized that infertility was linked to contraceptive pills.

**Conclusion:** Overall, the outcome of the study revealed unsatisfactory reproductive health knowledge among the female population of Dhaka city. Therefore, periodic assessments are essential to pinpoint factors for targeted improvements in reproductive health awareness and knowledge.

**Keywords:** Adolescent; awareness; contraceptives; knowledge; reproductive health

# The Effects of Cinnamon (*Cinnamomum zeylanicum*) on Diabetic Wound Healing Process in Excision Wound Model

**SHIHAB UDDIN AHMAD[1]*, SHARMIN AKTER[1,2], LAMIA ALAM[1], MOHIUDDIN AHMED BHUIYAN[1], AJOY KUMAR[3]**

*[1]Department of Pharmacy, School of Medicine, University of Asia Pacific, 74/A, Green Road, Dhaka-1215, Bangladesh*

*[2]Department of Bioengineering, Dalian University of Technology, No.2, Linggong Road, Ganjingzi District, Dalian City, Liaoning Province, China*

*[3]Department of Chemistry, College of Arts and Sciences, International University of Business Agriculture and Technology, Dhaka 1230, Bangladesh*

*shihab@uap-bd.edu*

## ABSTRACT

**Background:** The prevalence of diabetes is rapidly increasing worldwide, leading to a growing number of diabetic patients with chronic wounds. Diabetic wounds are challenging to treat due to their severity and lack of proper cure. This study aimed to investigate the wound healing and anti-microbial effects of cinnamon in diabetic rats induced by alloxan.

**Objective:** The aim is to investigate the wound-healing effect of cinnamon in diabetic rat models.

**Materials and methods:** A total of sixty male Wistar rats were used in the study, with each group containing 12 rats. The rats were randomly assigned to each of the five groups: non-diabetic (ND), Diabetic control (DC), vehicle-control (VC), standard treatment using 5% povidone-iodine (ST), and treated with optimized cinnamon extract (CE). Six rats from each group were used for wound contraction measurement, and the other six for histology and biochemical analysis. We performed histology of the skin tissue to analyze the wound and conducted biochemical analysis, including glucose test, cholesterol, triglyceride, alanine aminotransferase, and aspartate transaminase, to ensure the diabetic condition.

**Results:** The results showed that the CE extract had high activity and recovered faster ($p < 0.05$) than the other groups (ND, DC, VC and ST). The histology of the liver and pancreas ensured the diabetic condition, and the biochemical analysis revealed the potential of cinnamon in controlling diabetes.

**Conclusion:** The findings demonstrate the potential of cinnamon as a natural alternative for treating diabetic wounds and suggest that it may offer a new therapeutic strategy for the management of diabetic complications.

**Keywords:** Cinnamon; diabetes; wound healing

# The Effects of *Cinnamomum zeylanicum* Extracts on Non-Alcoholic Fatty Liver Disease in High Fat Diet-Fed Mice Model

**SHIHAB UDDIN AHMAD[1]*, RAZIA PARVIN[1], FARHANA TONNY[1], SHARMIN AKTER[1,2], LAMIA ALAM[1]**

[1]*Department of Pharmacy, School of Medicine, University of Asia Pacific, 74/A, Green Road, Dhaka-1215, Bangladesh*

[2]*Department of Bioengineering, Dalian University of Technology, No.2, Linggong Road, Ganjingzi District, Dalian City, Liaoning Province, China*

*shihab@uap-bd.edu

## ABSTRACT

**Background:** The most prevalent metabolic problem that results in excessive lipid accumulation in the liver is known as non-alcoholic fatty liver disease (NAFLD), and it is the main cause of end-stage liver disease. *Cinnamomum zeylanicum* (CZ) is a spice and flavoring ingredient that has a broad range of biological attributes, including antioxidant, anti-inflammatory, antibacterial, anti-diabetic, and anti-bacterial activities. CZ may have potential role in the treatment of NAFLD owing to its ethnopharmacological properties.

**Objective:** The major purpose of the study is to investigate the impact of CZ extracts on nonalcoholic fatty liver disease in a high-fat diet-induced mice model.

**Materials and methods:** For this study, fifty Swiss albino male mice used which were randomly divided into five groups with normal control (NC), disease control (DC), standard treatment (ST), and treated with CZ extracts with low dose, (CZ100) and high dose, (CZ500). High-fat diet (HFD) was fed every day to four groups; NC, DC, ST, CZ100 and CZ500, to develop fatty liver conditions for 6 weeks. Treatments were started on the 7th week. SC and NC were treated with normal distilled water, ST was as a standard treatment using metformin 100 mg/kg/day, and CZ extracts were incorporated in the treatment at 100 mg/kg/day (CZ100) and 500 mg/kg/day (CZ500) by mixing with HFD for another 6 weeks. After six weeks of treatment, mice were euthanized and collected blood and liver tissues. The efficacy parameters of the NAFLD activity of CZ extracts were evaluated using body weight measurement, fasting blood glucose test, OGTT, histopathological study (H&E) and biochemical analysis.

**Results:** According to the findings, administering CZ extracts for six weeks substantially reduced body weight, liver weight, blood sugar level, and serum indicators like AST, ALT, ALP, TG, TC, and LDL; and the liver inflammatory factor such as CRP. Meanwhile, histological findings showed that CZ extract reduced liver damage and fat buildup.

**Conclusion:** CZ extract has a functional relevance in treating non-alcoholic fatty liver diseases in a HFD-induced mouse model due to its ethnopharmacological properties.

**Keywords:** *Cinnamomum zeylanicum*; hepatitis; high-fat diet; NAFLD

# Investigation of Potential Derivatives of Diisooctyl Phthalate: Drug Designing and Development Through *in-silico* Study

**UTHPALL KUMAR ROY[1]*, MARIA AFROZ[2], SABBIR HOSSAIN SHIFAT[1], ABU BIN IHSAN[1]**

*[1]Department of Pharmacy, Faculty of Life Science, Eastern University, Savar, Dhaka-1345, Bangladesh*
*[2]Department of Pharmacy, World University of Bangladesh, Uttara-17, Dhaka-1230, Bangadesh*
*uthpall.pharmacy@easternuni.edu.bd

## ABSTRACT

**Background:** Diisooctyl phthalate is a bioactive component derived from the family of Clusiaceae. It has recently been demonstrated to have significant potential effects against phobic disorders, which involve the management of extreme fear and anxiety responses.
**Objective:** The main objective of this study is to design and develop some selective derivatives of diisooctyl phthalate, which will have more potential effects than its original.
**Materials and methods:** In the present study, different derivatives of diisooctyl phthalate were developed. The serotonin transporter (SERT) protein [PDB ID: 6DZZ] was chosen for molecular docking, which was associated with phobic disorder. Different computer-based software like Gaussian, Gauss-View (Version 0.6), and Gabedit, Swiss-PDB, PyRx (Version 0.8) and Discover Studio (2021) were employed for computational study. Some online websites like Drug bank, Pub Chem, RCSB:PDB, WebMo server, Online smile convertor, PASS Prediction, ADMET Online and Drug-likeness were used for pharmacokinetic study.
**Results:** The molecular docking results showed that the di-n-butyl phthalate (DBP), a derivative of diisooctyl phthalate, demonstrated the highest binding affinity of -7.9 kcal/mol, surpassing its original and other derivatives. This indicates that the DBP can be considered as a more effective treatment option for phobic disorders.
**Conclusion:** Based on molecular docking, ADMET study and drug-likeness analysis, this study provides valuable insight into the biochemical activities of diisooctyl phthalate derivatives, suggesting their potential effects for the development of effective therapeutic agents for treating phobic disorders.
**Keywords:** Bioactive component; *in-silico* study; molecular docking; pharmacokinetic; phobic disorder

# Isolation and Bioactivity Evaluation of the Secondary Metabolites obtained from Endophytic Fungi from *Cestrum nocturnum* Leaf

**TAMNNA SHULTANA, GAZI MD. MONJUR MURSHID***

*Pharmacy Discipline, Khulna University, Khulna-9208, Bangladesh*
*monjur@pharm.ku.ac.bd

## ABSTRACT

**Background**: Endophytic fungi, living inside the tissues of plants without harming the host, produce secondary metabolites to defend their host. Almost all the plants of this universe contain fungal endophytes having potential bioactive secondary metabolite(s).

**Objective**: The objective of the present study was to isolate and identify potential secondary bioactive metabolites obtained from the endophytic fungal strains of the leaf of *Cestrum nocturum* (local name: Jasmine; family: Solanaceae).

**Materials and Methods:** The plant parts were collected, and endophytes were inoculated on water agar media using standard procedure. A fungal strain, coded CNL, was isolated and fermented on potato dextrose broth (PDB). Extraction was performed using ethyl acetate (EtOAc), and finally, fungal extract was obtained using a rotary evaporator. A phylogenetic study revealed that one CNL isolate was *Aspergillus* sp. The crude extract was subjected to evaluate its putative biological activities. Antibacterial activity was determined by the disc diffusion method and antioxidant activity by DPPH scavenging activity test. The alpha-glycosidase inhibitory assay was performed to determine antidiabetic activity of the fungal extract. GC-MS of the fungal leaf extract was also performed.

**Results**: In disc-diffusion antimicrobial assay, crude extract CNL exhibited zones of inhibition against *Staphylococcus aureus* (26 mm), *Escherichia coli* (29 mm), *Bacillus subtilis* (19 mm), and *Pseudomonas aeruginosa* (21 mm) at a concentration of 250 µg/mL. The values were found to be comparable to the standard Ciprofloxacin (30 µg/disc). On evaluating the antioxidant capacity of the crude extract by DPPH scavenging activity test, CNL showed $IC_{50}$ value of 10.19 µg/mL, which was comparable to the standard ascorbic acid. The alpha-glycosidase inhibitory assay was performed to determine the antidiabetic activity of the fungal extract, and the obtained $IC_{50}$ value of the extract CNL was 0.59 mg/mL. The value was comparable to the $IC_{50}$ value of the standard drug acarbose (0.413 µg/mL). The major compounds that identified from CNL leaf were 2,4-di-tert-butylphenol, 4-methoxy-6-methyl-6,7-dihydro-4h-furo[3,2-c]pyran and 2,6,10,14-tetramethyl-7-(3-methoxylpent-4-enylidene) pentadecane.

**Conclusion:** Antibacterial, antioxidant and antidiabetic properties of the isolated fungal strain of the leaf of *Cestrum nocturum* were explored in our study. Still, the study was a preliminary one, and the researchers suggest further extensive studies in future.

**Keywords:** Antibacterial study; antidiabetic study; antioxidant study; endophytic fungi

# Exploration of Anti-inflammatory, Antihyperglycemic and Hepatoprotective Effects of BARI-1 Malta (*Citrus sinensis*) Peels with *In Silico* Analysis

**PRITAM KUNDU*, K. M. NAZMUL HASAN REFAT, MD. AKHLAKUR RAHMAN, UTPAL KUMAR KARMAKAR**

*Pharmacy Discipline, Life Science School, Khulna University, Khulna-9208, Bangladesh.*
**pritam.kupharm@gmail.com*

## ABSTRACT

**Background:** Citrus *sinensis*, native to Asia, holds traditional medicinal value. Although not previously grown in Bangladesh, BARI scientists developed a green variety (BARI-1 malta), now widely cultivated. This study investigates the biological properties of its peels.
**Objective:** Our goal was to assess this extract's potential for antioxidants. Next, we set out to evaluate the hepatoprotective, anti-inflammatory, antipyretic, analgesic, and antihyperglycemic properties. After that, *in silico* study was carried out.
**Materials and methods:** Antioxidant activity was evaluated using DPPH assays and secondary metabolite quantification. Analgesic, anti-inflammatory, and antipyretic effects were tested in mice using acetic acid, formalin, and yeast-induced models, respectively. Antihyperglycemic activity was assessed via OGTT and alloxan-induced diabetes in mice. Hepatoprotective effects were examined through paracetamol-induced hepatotoxicity in mice. Molecular docking was performed using PyRx and Discovery Biovia Studio, while ADMET analysis was conducted using pkCSM and SwissADME to evaluate pharmacokinetic and toxicity profiles.
**Results:** The estimated total content of phenol, flavonoid, and tannin contents were 47 mg GAE/g, 440 mg QE/g and 169 mg GAE/g, respectively, where $IC_{50}$ was 185 µg/ml in DPPH free radical scavenging assay. This extract lessened reduced writhing reflex inhibition up to 42.33%. It also showed a significant reduction in paw edema size and elevated rectal temperature over the observation time. This extract was capable of decreasing the elevated blood glucose level over time in both antihyperglycemic tests. The high SGPT, ALT, and bilirubin results in the hepatoprotective test were lowered to 73 U/L, 112 U/L, and 1.06 mg/dl, respectively. In hepatoprotective test, the elevated SGPT, ALT and bilirubin values were reduced to 73 U/L, 112 U/L and 1.06 mg/dl, respectively. Finally, from *in silico* analysis, we have selected 5 compounds that might be fruitful in eliciting biological responses in respective conditions cases.
**Conclusion:** From our analysis, it can be suggested that *C. sinensis* peels are capable of eliciting the above-mentioned biological effects. These results might be helpful in discovering new lead molecules from this plant in the future.
**Keywords:** Antihyperglycemic; anti-inflammatory; *Citrus sinensis*; hepatoprotective

# Phytochemical Screening, Cytotoxic and Antidiarrheal Activities of the Different Extracts of *Crataeva nurvala*

TASLIMA BEGUM[1,2]*, MAHMUDA NASRIN[2], MD SHOHAN HASAN[2], MD. FAHIM ISLAM[2], MONIRA AHSAN[1]

[1]*Department of Pharmaceutical Chemistry, University of Dhaka, Dhaka-1000, Bangladesh*

[2]*Department of Pharmacy, Primeasia University, Banani, Dhaka-1215, Bangladesh.*

*taslima.begum@primeasia.edu.bd

## ABSTRACT

**Background:** *Crataeva nurvala* Buch-Ham is a significant medicinal plant belonging to the Capparidaceae family and extensively used in traditional medicines of South Asian countries to treat inflammation, rheumatic fever, gastric irritation, memory loss, weak immune system and constipation.

**Objective:** To evaluate the cytotoxic and anti-diarrheal activities of crude extract and different fractions of *Crataeva nurvala* leaves.

**Materials and methods:** The *Crataeva nurvala* leaf was macerated using absolute methanol and then fractionated using solvents (n-hexane, dichloromethane, ethyl acetate) of different polarity indexes. Cytotoxic and antidiarrheal activities were evaluated by brine shrimp lethality assay and magnesium sulfate-induced diarrhea method, respectively.

**Results:** A preliminary phytochemical study revealed the presence of alkaloids, flavonoids, carbohydrates, glycosides, and tannins in the leaf extracts. Among the extracts screened, the methanolic and n-hexane extracts exhibited significant cytotoxic activity to brine shrimp with the $LC_{50}$ values of 693.75 µg/ml and 382.79 µg/ml compared to the standard vincristine sulfate with the $LC_{50}$ value of 7.84 µg/ml. Mice treated with 200 mg/kg and 400 mg/kg methanol crude extract showed a significant decrease in the frequency of wet stools and watery content of diarrhea, intestinal motility, intestinal fluid accumulation, and delaying the onset of diarrhea when compared with control. However, the effect increased dose-dependently, and the 400 mg/kg crude extract produced a comparable effect with the standard drug in the mice model.

**Conclusion:** The results of this study showed that crude extract and different fractions of *Crataeva nurvala* leaf demonstrated significant cytotoxic and anti-diarrheal activity, which supports its traditional use as a diarrhea treatment. Further work on isolation, characterization, and tests on cell lines may lead to the identification of active compounds.

**Keywords:** Antidiarrheal activity; *Crataeva nurvala*; cytotoxic activity; phytochemical screening

# Cinnamic Acid Positively Influences Hyperlipidemia through Its Antioxidant, Hepatoprotective and Gene-Expression Modulatory Activities

**NIVANA MOSTAFI KAMAL, BIBI HUMAYARA SHAHEEN CHOWDHURY, SUMYA AFRIN KHAN, SYED ABDUL KUDDUS, FERDOUS KHAN***

*Department of Pharmaceutical Sciences, North South University, Bashundhara, Dhaka-1229, Bangladesh*
*khan.ferdous@northsouth.edu

## ABSTRACT

**Background:** Cinnamic acid is a weakly acidic compound with antioxidant properties. It also plays an important role in the formation of other phenolic compounds.
**Objective:** This study explored the effects of cinnamic acid (CA) on high-fat diet (HFD)-induced hyperlipidemia in Wistar rats.
**Methods:** Male Wistar rats were arranged into four different groups based on feeding patterns: control, HFD, control + CA, and HFD + CA. CA was orally administered every day at a dose of 2 mg/100 g body weight for 8 weeks. The rats were then sacrificed, and several oxidative stress-related parameters, lipid profiles, and liver enzyme levels were investigated in the serum. Using hepatic tissue, the expression of several proteins such as SREBP-2, LXR , PPARγ, HMGCR, Apo-B100, LDLR, ABCG5, and Apo-A1 were also explored.
**Results:** CA supplementation in HFD-fed rats markedly ($p < 0.01$) prevented oxidative stress by compensating the activity of antioxidant enzymes, which was reflected in reduced MDA, NO, and APOP levels and increased GSH levels. Cinnamic acid intake also alleviated HFD-induced increases in ALT, AST, and ALP levels ($p < 0.01$), thereby reducing liver stress. It also prevented the HFD-induced upregulation of SREBP-2, LXR , PPARγ, HMGCR, and Apo-B100 significantly ($p < 0.01$). However, HFD-mediated suppressed expression of LDLR, ABCG5, and Apo-A1 expression was significantly ($p < 0.01$) augmented by CA feeding. The antioxidant, hepatoprotective, and gene expression modulatory effects of CA contributed to the prevention of HFD-induced hyperlipidemia and hyperglycemia. All of these ameliorating effects resulted in a significant reduction ($p < 0.01$) of harmful lipid levels, liver weight, adipose tissue weight, and overall body weight.
**Conclusion:** Thus, CA positively influences HFD-induced hyperlipidemia in Wistar rats through its antioxidant, hepatoprotective, and gene expression modulatory activities.
**Keywords:** Antioxidant; cinnamic acid; hyperlipidemia; oxidative stress; sterol regulatory element-binding protein

# Investigation of Antihyperglycemic Activity of Vildagliptin and *Trigonella foenumgraecum*-Loaded Liposome Formulations

**SEFAT HASAN SUMAIYA[1], SWARNALI ISLAM[1], SHIHAB UDDIN AHMAD[1], MD. ELIAS AL-MAMUN[2], SUMIYA SHARMIN MOU[1], IRIN DEWAN[1]***

*[1]Department of Pharmacy, School of Medicine, University of Asia Pacific, 74/A, Green Road, Dhaka-1215, Bangladesh*

*[2]Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*irin_d@uap-bd.edu

## ABSTRACT

**Background:** The conventional solid dosage forms of vildagliptin exhibit a shorter biological half-life that requires frequent dosing. Moreover, having less permeability is also an immense concern.

**Objective:** This study aims to overcome this shortcoming by formulating vildagliptin-loaded liposomes with *Trigonella foenumgraecum* (local name - fenugreek) for a more potent and efficient antidiabetic activity as well as to get a sustained release of the drug. This preparation also may increase its bioavailability because of its better solubility and permeability.

**Materials and methods:** The full factorial design was employed to prepare all formulations using the ether injection method (EIM) to investigate the impact of three independent variables X1 (amount of lecithin), X2 (amount of cholesterol), and X3 (amount of chitosan/PLGA) on two dependent variables Y1 (percent drug entrapment efficiency) and Y2 (cumulative percent drug release). The statistical analysis was performed using SPSS. The prepared liposomes were characterized by percent drug entrapment efficiency, cumulative percent drug release, freeze-drying, FTIR, SEM, zeta potential, and particle size. In vitro and ex vivo permeability tests were carried out using the USP paddle method in acidic buffer (pH 1.2) media for 8 hours and absorbance was taken at 210 nm.

**Results:** Among various mathematical models for assessing in vitro release kinetics, zero-order models provided the best fit, with the highest correlation value ($R^2$) for the formulated liposomes. The drug entrapment efficiency ranged from 87.99% to 92.52%, with formulations loaded with chitosan (CHF-1) and PLGA (PLFE-4) exhibiting the minimum and maximum values, respectively. SEM analysis of liposome vesicles revealed a size range of 3.3 µm to 4.5 µm, with smooth round-shaped surfaces. Additionally, other surface characteristics were confirmed by zeta potential analysis. FTIR study indicated no interaction between the medication and polymers. Immediate reduction in blood glucose levels was observed after administering the formulation loaded with PLGA (PLFE-4) to diabetic rats, which steadily persisted for 8 hours.

**Conclusion:** From the above discussion, we can infer that the formulation of vildagliptin loaded with fenugreek liposome showed promising results. All the experiments with the formulated liposomes demonstrated a significant reduction in blood glucose levels, thereby treating the type II diabetes mellitus.

**Keywords:** Chitosan; liposome; PLGA; *Trigonella foenumgraecum*; vildagliptin

# Assessment of the Post-Phase Dengue Symptom's Persistence among Bangladeshi Population: A Cross-sectional Study

**FARIA TASNEEM[1], SK. SALVIN MORSHED[2], MD. RAIHAN CHOWDHORY[2], NAZIFA TABASSUM[3], MD. SABBIR HOSSAIN[1]***

*[1]Department of Clinical Pharmacy and Pharmacology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*[2]Department of Pharmacy, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh*

*[3]Department of Pharmacy, East West University, Dhaka-1212, Bangladesh*

*mdsabbir@du.ac.bd*

## ABSTRACT

**Background:** Dengue is the most significant arboviral illness in terms of mortality and organ damage. The number of reported dengue infection cases annually exceeds 100 million. Bangladesh is one of those countries that experiences a large number of dengue-infected individuals every year. Dengue does not only cause complications during the infection period; many of the symptoms are seen to appear in the post-infection period.

**Objective:** The study was conducted to evaluate the dengue-infected Bangladeshi population's susceptibility to dengue symptoms in the post-infection period.

**Materials and methods:** The research was structured as a questionnaire-based cross-sectional investigation. It was conducted in Dhaka, Bangladesh, from February 2024 to June 2024. Dengue symptoms in the acute phase (while being dengue positive) and post-phase or recovery phase (while being dengue negative) were addressed in the work. All the collected data were subjected to statistical analysis with the help of SPSS software (version 25.0).

**Results:** A total of 20 dengue symptoms were addressed in the work to evaluate their persistence in the post-infection phase. Data from 251 participants were subjected to statistical analysis. Among the symptoms, fever was the only symptom that did not appear after the recovery. Fatigue was the most prevalent dengue symptom (48.6%, N = 122) when both the acute and recovery phases were considered. After the recovery, alopecia was experienced by the highest number of study participants (17.9%, N = 45). Except for vomiting, all the post-phase symptoms were more prevalent among female participants, and post-phase fatigue and blurred vision were closely linked to the female gender, with P values of 0.055 and 0.074, respectively. Recovery phase dengue symptoms were more prevalent among individuals with comorbidities and who were hospitalized. The association between skin rash and the presence of comorbidities was highly significant (P = 0.004). Post-phase joint pain was highly associated with hospitalization (P = 0.056).

**Conclusion:** Female participants and individuals with comorbidities were relatively vulnerable to post-phase dengue symptoms. Considering the continuous persistence of the symptoms, appropriate and adequate approaches should be executed to lessen the burden of dengue symptoms, even after the recovery.

**Keywords:** Bangladesh; dengue; post-phase; symptoms

# Enhancement of Antibacterial and Antibiofilm Potential by *Baccaurea ramiflora* Fruit Extract and FMSP-Nanoparticles against Drug-Resistant Bacteria Combination of *In Vitro* and *In- Silico* Study

**TRIPTI RANI PAUL[1,2], SAAD AHMED SAMI[1], ASHIK MOSADDIK[2,3], MIR IMAM IBNE WAHED[2]***

*[1]Department of Pharmacy, School of Science & Technology, Varendra University, Rajshahi-6204, Bangladesh*
*[2]Department of Pharmacy, Faculty of Science, University of Rajshahi, Rajshahi-6204, Bangladesh*
*[3]Department of Pharmacy, East West University, Dhaka-1212, Bangladesh*
*drmirimam@gmail.com

## ABSTRACT

**Background:** The increasing prevalence of antimicrobial resistance (AMR) and biofilm-associated infections poses significant challenges to public health.
**Objectives:** This study evaluated BRP and BRS ethanol extracts with FMSP-nps for antibacterial and antibiofilm activity against MRSA and MDR-PA.
**Materials and methods:** FMSP-nps was prepared using a hetero-coagulation process where structure, morphology and size were analyzed by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). MIC, MBC and morphology of bacteria were analyzed by the microbroth dilution method. The crystal violet assay method was used to investigate biofilm formation inhibition ability. Ligand poses of 18 selected phytoconstituents of BRP and BRS were predicted in a molecular docking study targeting two enzymes: *Staphylococcus aureus* Gyrase B and *Staphylococcus aureus* Sortase A for antibacterial and antibiofilm activity.
**Results:** The study found that FMSP nanoparticles (NPs) were spherical with diameters ranging from 100-300 nm. Among the samples tested, FMSP-BRP showed the highest antibacterial activity, with MIC values of 0.25 mg/ml against Pseudomonas aeruginosa and 2 mg/ml against *Staphylococcus aureus*, and corresponding MBC values of 0.5 mg/ml and 4 mg/ml. Scanning electron microscopy revealed significant bacterial cell damage caused by FMSP-BRP. Biofilm inhibition rates for FMSP-BRP were 65.1% and 59.2% for P. aeruginosa and MRSA, respectively-higher than FMSP-BRS and FMSP-NPs. FMSP-BRP also disrupted biofilm integrity and reduced extracellular polymeric substances (EPS). Molecular docking studies identified proanthocyanidin as the most effective compound, showing strong binding to *S. aureus* Gyrase B and Sortase A-key enzymes in bacterial survival and biofilm formation. These results highlight the potential of FMSP-BRP nanocomposites as promising agents for developing new antibacterial and antibiofilm therapies against drug-resistant pathogens.
**Conclusion:** These findings correlate with the documented traditional use of *B. Ramiflora* in treating infectious diseases and highlight the potential of nanotechnology with natural extracts in addressing the global threat of AMR.
**Keywords:** Antibacterial; antibiofilm; *Baccaurea ramiflora*; molecular docking; nanoparticles