Evaluation of Locomotor activity of Dichloromethane Extract of *Dracaena spicata* by Open Field Method

A Dissertation submitted to the Department of Pharmacy, East West University, Bangladesh, in partial fulfillment of the requirements for the Degree of Bachelor of Pharmacy.

Submitted by

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Declaration by the Candidate

I, Md. Junayet Hossain, hereby declare that the dissertation entitled **"Evaluation of Locomotor activity of Dichloromethane Extract of *Dracaena spicata* by Open Field Method"** submitted by me to the Department of Pharmacy, East West University, in the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy, under the supervision and guidance of Nazia Hoque, Senior Lecturer, Department of Pharmacy, East West University. The thesis paper has not formed the basis for the award of any other degree/diploma/fellowship or other similar title to any candidate of any university.

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Certificate by the Supervisor

This is to certify that the thesis entitled **"Evaluation of Locomotor activity of Dichloromethane Extract of *Dracaena spicata* by Open Field Method"** submitted to the Department of Pharmacy, East West University for the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy, was carried out by Md. Junayet Hossain, ID: 2012-3-70-009, under the supervision and guidance of me. The thesis has not formed the basis for the award of any other degree/diploma/fellowship or other similar title to any candidate of any university.

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This is to certify that the thesis entitled **"Evaluation of Locomotor activity of Dichloromethane Extract of *Dracaena spicata* by Open Field Method"** submitted to the Department of Pharmacy, East West University for the partial fulfillment of the requirement for the award of the degree Bachelor of Pharmacy, was carried out by Md. Junayet Hossain, ID: 2012-3-70-009.

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Dedication

This research paper is dedicated to my beloved Parents and my family members

Abstract

Dracaena spicata has been used as a medicinal plant for the general promotion of health and longevity by Asian tribal. It is used as a traditional medicine for the treatment of various diseases like cough, syphilis, conjunctivitis, constipation by the Chakma, Marma and Tanchunga. The antimicrobial activity and cytotoxic activity of methanolic extract of *Dracaena spicata* is well established. The aim of the present study was to evaluate the locomotor activity of dichloromethane (DCM) extract of *Dracaena spicata*. The locomotor activity was evaluated by open field method where mice were treated with positive control test with Diazepam, negative control test with 1% Carboxy methyl cellulose (CMC), and the 200 mg/kg and 400 mg/kg body weight of DCM extract of *Dracaena spicata* with 5 parameters (central locomotion, peripheral locomotion, grooming, leaning and defecation count). The result showed the 200 mg/kg and 400 mg/kg of DCM extract of *D. spicata* causes sedative effect, reduction in spontaneous motor activity, exploratory behaviour and motor coordination. DCM extract of *D. spicata* at 200 mg/kg the peripheral locomotion was reduced from 124.00± 4.26 at 0 minute to 13.25± 2.92 at 120minutes and for 400 mg/kg doses the peripheral locomotion was started from 110.00± 9.02 at 0 minute and ended in 17.50± 9.91 and the grooming count was increased from 3.50± 1.84 at 0 minute to 12.25± 1.84 at 120 minutes and for 400 mg/kg doses grooming count increased from 4.25± 1.10 at 0 minute to 5.50±2.62. The central locomotion count, peripheral locomotion count, leaning count, grooming count, and defecation count data supports the reduction of motor activity in mice. Study found that *D. spicata* have moderate to strong reduction in locomotor activity. In conclusion, further investigations are needed to identify the active constituents and the exact mechanism(s) of action responsible for the reported locomotor activity of *Dracaena spicata*.

Keyword: *Dracaena spicata*, CNS test, Locomotion, Sedation, Central, Peripheral, Leaning.

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List of Abbreviation

BC- Before Christ

CMC- Carboxy methyl cellulose

CNS- Central Nervous System

DCCC- Droplet countercurrent chromatography

DCM- Dichloromethane

DPPH- 1, 1-Diphenyl-2-picrylhydrazyl

EEAA- Ethanol extract of Achyranthes aspera Linn.

EtAc- Ethyl Acetate

FRAP- Ferric reducing/antioxidant power

MMP- Mitochondrial membrane potential

OSCC- Oral Squamous Cell Carcinoma

PNS- Peripheral nervous system

WHO- World Health Organization

WP- Wettable powder

Chapter One
INTRODUCTION

1.1 Overview

Plants have been used by human beings since immemorial times to cure diseases and to promote relief from ailments. There were times when they were most important sources of medicines for people. Neuropharmacology is the scientific study of the effects of drugs on the central nervous system. Its primary focus is actions of medications for psychiatric and neurologic disorders as well as those of drugs of abuse. The goal of Neuropharmacology is to apply information about drugs and their mechanisms of action, develop safer and more effective treatments and eventually curative and preventive measures for a host of nervous system abnormalities.

There are a number of drugs being used in the traditional medicine for treatment of various CNS disorders and presently many of these drugs are being explored scientifically to ascertain their CNS activities. Significant number of studies has been performed to find alternative treatment for diseases of the nervous forum by identifying structures with activity at the central nervous system.

Ancient use of plants was a lead for scientists in their search for new substances endowed with therapeutic properties. It is estimated that nearly 25% of the modern drugs directly or indirectly originated from plants. Several are examples concerning the CNS: Caffeine, ephedrine, cannabinoids, opioids and reserpine are a few of them. However, for the majority of CNS active plants, the active principles are not yet known (Jain *et al.*, 2014).

Current investigation approaches to explore traditional medicine and medicinal plants as a potential CNS stimulator and modulator for treating various neuronal disorders like Epilepsy, Tardive Dyskinesia, Schizophrenia, Anxiety and Depression etc (Prashant *et al.*, 2014).

1.2 Nervous system

The nervous system essentially exhibits a bilateral symmetry with those structural features and pathways located on one side of the midline also found on the other side. It is subdivided anatomically into the central nervous system and the peripheral nervous system and functionally into the somatic nervous system and the autonomic (visceral) nervous system.

The central nervous system (CNS) comprises the brain and spinal cord. The brain is encapsulated within the skull and the spinal cord is at the center of the vertebral column. The peripheral nervous system (PNS) consists of the nerves emerging from the brain (called cranial nerves) and from the spinal cord (called spinal nerves).

The peripheral nerves convey neural messages from the sense organs and sensory receptors in the organism inward to the CNS and from the CNS outward to the muscles and glands of the body. The somatic nervous system consists of those neural structures of the CNS and PNS responsible for conveying and processing conscious and unconscious sensory (afferent) information, vision, pain, touch, unconscious muscle sense from the head, body wall, and extremities to the CNS and motor (efferent) control of the voluntary (striated) muscles.

The autonomic nervous system is composed of the neural structures responsible for conveying and processing sensory input from the visceral organs (e.g., digestive system and cardiovascular system) and motor control of the involuntary (smooth) and cardiac musculature, and of glands of the viscera. Many authors, however, consider the autonomic nervous system to be exclusively concerned with visceral motor activities (Charles *et al.*, 2005).

1.3 CNS

The "Central Nervous System", comprised of brain, brainstem, and spinal cord. The central nervous system (CNS) represents the largest part of the nervous system, including the brain and the spinal cord. Together, with the peripheral nervous system (PNS), it has a fundamental role in the control of behavior. The CNS is conceived as a system devoted to information processing, where an appropriate motor output is computed as a response to a sensory input. Many threads of research suggest that motor activity exists well before the maturation of the sensory systems, and senses only influence behavior without dictating it. This has brought the conception of the CNS as an autonomous system.

The brain can be subdivided into several distinct regions:

The cerebral hemispheres form the largest part of the brain, occupying the anterior and middle cranial fossae in the skull and extending backwards over the tentorium cerebelli.

They are made up of the cerebral cortex, the basal ganglia, tracts of synaptic connections, and the ventricles containing CSF.

The Diencephalon (not shown above) includes the thalamus, hyopthalamus, epithalamus and subthalamus, and forms the central core of the brain. It is surrounded by the cerebral hemispheres.

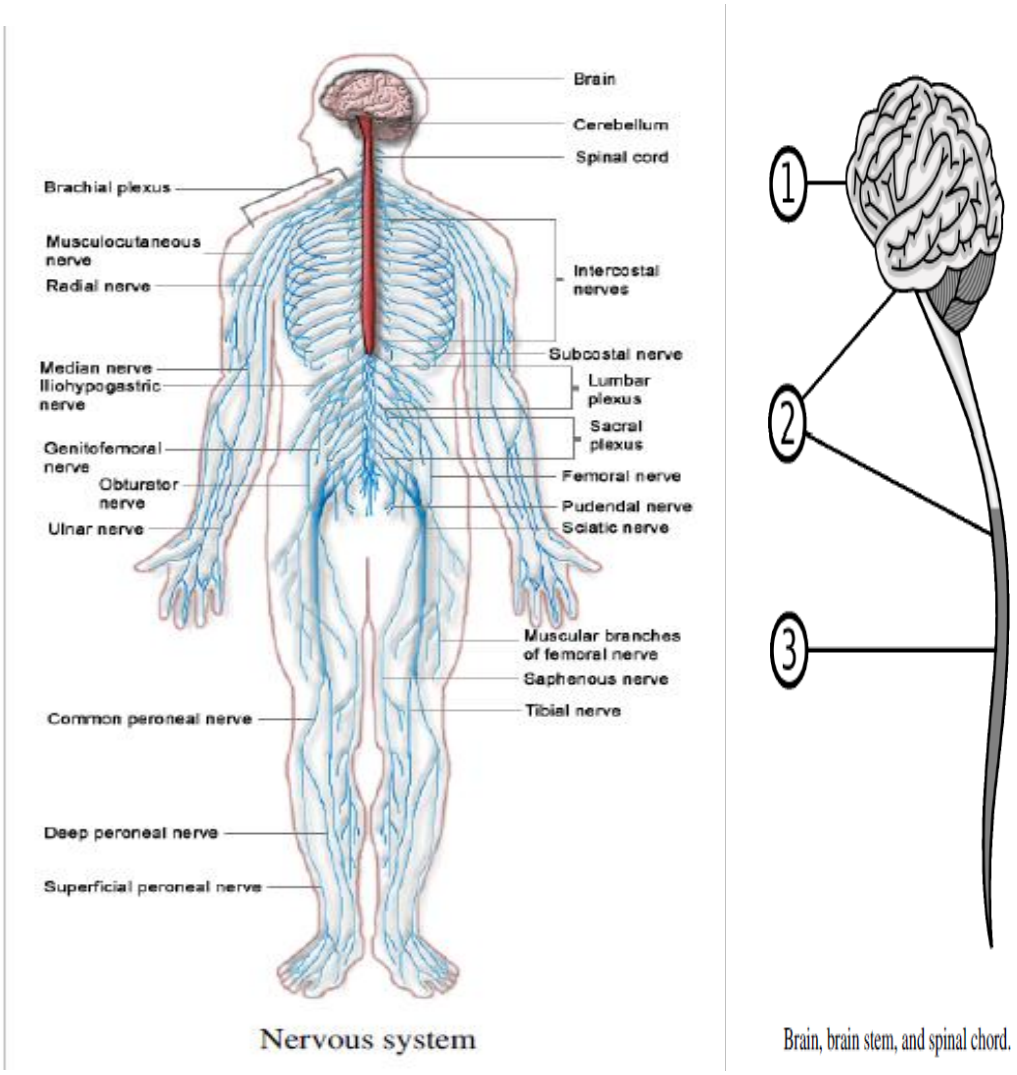

Figure 1.1: Nervous System

The Midbrain (not shown) is located at the junction of the middle and posterior cranial fossae.

The Pons sits in the anterior part of the posterior cranial fossa- the fibres within the structure connect one cerebral hemisphere with its opposite cerebellar hemisphere.

The Medulla Oblongata is continuous with the spinal cord, and is responsible for automatic control of the respiratory and cardiovascular systems.

The Cerebellum overlies the pons and medulla, extending beneath the tentorium cerebelli and occupying most of the posterior cranial fossa. It is mainly concerned with motor functions that regulate muscle tone, coordination, and posture (Le.ac.uk, 2016).

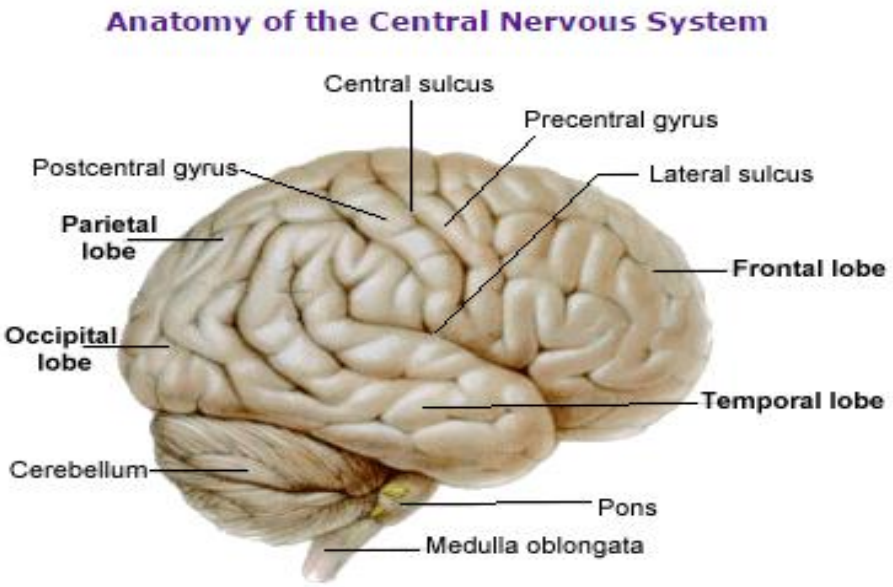

Figure 1.2: Central Nervous System

1.4 Disorders of CNS

1.4.1 Neurodegenerative Diseases

Neurodegenerative diseases of the CNS include Alzheimer's disease, Parkinson's disease, Huntington's disease, and amyotrophic lateral sclerosis. These devastating illnesses are characterized by the progressive loss of selected neurons in discrete brain areas, resulting in characteristic disorders of movement, cognition, or both. For example, Alzheimer's disease is characterized by the loss of cholinergic neurons in the nucleus basalis of

Maynert, whereas Parkinson's disease is associated with a loss of dopaminergic neurons in the substantia nigra. The most prevalent of these disorders is Alzheimer's disease, estimated to have affected some 4 million people in 2000. The number of cases is expected to increase as the proportion of elderly in the population increases.

1.4.2 Parkinson's disease

Parkinsonism is a progressive neurological disorder of muscle movement, characterized by tremors, muscular rigidity, bradykinesia (slowness in initiating and carrying out voluntary movements), and postural and gait abnormalities. Most cases involve people over the age of 65, among whom the incidence is about 1 in 100 individuals.

1.4.3 Schizophrenia

Schizophrenia is a particular type of psychosis that is, a mental disorder caused by some inherent dysfunction of the brain. It is characterized by delusions, hallucinations (often in the form of voices), and thinking or speech disturbances. This mental disorder is a common affliction, occurring among about one percent of the population. The illness often initially affects people during late adolescence or early adulthood and is a chronic and disabling disorder. Schizophrenia has a strong genetic component and probably reflects some fundamental biochemical abnormality, possibly a dysfunction of the mesolimbic or mesocortical dopaminergic neurons.

1.4.4 Epilepsy

Epilepsy affects approximately 3 percent of individuals by the time they are 80 years old. About 10 percent of the population will have at least one seizure in their lifetime. Globally epilepsy is the third most common neurologic disorder after cerebrovascular and Alzheimer's disease. Epilepsy is not a single entity but, instead, an assortment of different seizure types and syndromes originating from several mechanisms that have in common the sudden, excessive, and synchronous discharge of cerebral neurons. This abnormal electrical activity may result in a variety of events, including loss of consciousness, abnormal movements, atypical or odd behavior, or distorted perceptions that are of limited duration but recur if untreated. The site of origin of the abnormal neuronal firing

determines the symptoms that are produced. For example, if the motor cortex is involved, the patient may experience abnormal movements or a generalized convulsion. Seizures originating in the parietal or occipital lobe may include visual, auditory, or olfactory hallucinations (Finkel *et al.*, 2009).

1.4.4.1 Idiopathic epilepsy

When no specific anatomic cause for the seizure, such as trauma or neoplasm, is evident, a patient may be diagnosed with idiopathic or cryptogenic (primary) epilepsy. These seizures may result from an inherited abnormality in the central nervous system (CNS). Patients are treated chronically with antiseizure drugs or vagal nerve stimulation. Most cases of epilepsy are idiopathic.

1.4.4.2 Symptomatic epilepsy

A number of causes, such as illicit drug use, tumors, head injury, hypoglycemia, meningeal infection, or rapid withdrawal of alcohol from an alcoholic, can precipitate seizures. When two or more seizures occur, then the patient may be diagnosed with symptomatic (secondary) epilepsy. Chronic treatment with antiseizure medications, vagal nerve stimulation and surgery are all appropriate treatments and may be used alone or in combination. In some cases when the cause of a single seizure can be determined and corrected, therapy may not necessary. For example, a seizure that is caused by transient hypotension or is due to a drug reaction does not require chronic prophylactic therapy. In other situations, antiseizure drugs may be given until the primary cause of the seizures can be corrected.

1.4.5 Depression

Depression is a serious disorder that afflicts approximately 14 million adults in the United States each year. The lifetime prevalence rate of depression in the United States has been estimated to include 16 percent of adults (21 percent of women, 13 percent of men), or more than 32 million people. The symptoms of depression are intense feelings of sadness, hopelessness, and despair, as well as the inability to experience pleasure in

usual activities, changes in sleep patterns and appetite, loss of energy, and suicidal thoughts.

1.4.6 Mania

Mania is characterized by the opposite behavior that is, enthusiasm, rapid thought and speech patterns, extreme self-confidence, and impaired judgment (Finkel *et al.*, 2009).

1.4.7 Bipolar Disorder

Bipolar disorder, also known as manic-depressive illness, is a brain disorder that causes unusual shifts in mood, energy, activity levels, and the ability to carry out day-to-day tasks.

There are four basic types of bipolar disorder; all of them involve clear changes in mood, energy, and activity levels. These moods range from periods of extremely "up," elated, and energized behavior (known as manic episodes) to very sad, "down," or hopeless periods (known as depressive episodes). Less severe manic periods are known as hypomanic episodes.

1.4.7.1 Bipolar I Disorder

Bipolar I Disorder is defined by manic episodes that last at least 7 days, or by manic symptoms that are so severe that the person needs immediate hospital care. Usually, depressive episodes occur as well, typically lasting at least 2 weeks. Episodes of depression with mixed features (having depression and manic symptoms at the same time) are also possible.

1.4.7.2 Bipolar II Disorder

Bipolar II Disorder is defined by a pattern of depressive episodes and hypomanic episodes, but not the full-blown manic episodes described above.

1.4.7.3 Cyclothymic Disorder

Cyclothymic Disorder (also called cyclothymia) is defined by numerous periods of hypomanic symptoms as well numerous periods of depressive symptoms lasting for at

least 2 years (1 year in children and adolescents). However, the symptoms do not meet the diagnostic requirements for a hypomanic episode and a depressive episode.

1.4.7.4 Other Specified and Unspecified Bipolar and Related Disorders

They are defined by bipolar disorder symptoms that do not match the three categories listed above (Nimh.nih.gov, 2014).

1.5 Medicinal plants

Medicinal plants, since times immemorial, have been used in virtually all cultures as a source of medicine. The widespread use of herbal remedies and healthcare preparations, as those described in ancient texts such as the Vedas and the Bible, and obtained from commonly used traditional herbs and medicinal plants, has been traced to the occurrence of natural products with medicinal properties. The use of traditional medicine and medicinal plants in most developing countries, as a normative basis for the maintenance of good health, has been widely observed. Furthermore, increasing reliance on the use of medicinal plants in the industrialized societies has been traced to the extraction and development of several drugs and chemotherapeutics from these plants as well as from traditionally used rural herbal remedies. Moreover, in these societies, herbal remedies have become more popular in the treatment of minor ailments, and also on account of the increasing costs of personal health maintenance. Indeed, the market and public demand has been so great that there is a great risk that many medicinal plants today, face either extinction or loss of genetic diversity. For the most part, the discovery of the drugs stems from knowledge that their extracts are used to treat one or more diseases in humans. The world health organization estimates that 80% of the people in developing countries of the world rely on traditional medicine for their primary health care needs, and about 85% of traditional medicine involves the use of plant extracts.

Plants have formed the basis for the treatment of diseases in traditional medicine systems for thousands of years, and continue to play a major role in the primary health care of about 80% of the world's inhabitants according to World Health Organization statistic. Approximately 119 pure chemical substances extracted from higher plants are used in medicine throughout the world.

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For the most part, the discovery of the drugs stems from knowledge that their extracts are used to treat one or more diseases in humans. The more interesting of the extracts are then subjected to pharmacological and chemical tests to determine the nature of the active components. The world health organization estimates that 80% of the people in developing countries of the world rely on traditional medicine for their primary health care needs, and about 85% of traditional medicine involves the use of plant extracts. This means that about 3.5 to 4 billion people in the world rely on plants as sources of drugs.

1.5.1 Medicinal plants from Ancient Times

Archaeological evidence indicates that the use of medicinal plants dates at least to the Paleolithic, approximately 60,000 years ago. Written evidence of herbal remedies dates back over 5,000 years, to the Sumerians, who created lists of plants (John, 2002). A number of ancient cultures wrote on plants and their medical uses. In ancient Egypt, herbs are mentioned in Egyptian medical papyri, depicted in tomb illustrations, or on rare occasions found in medical jars containing trace amounts of herbs. The earliest known Greek herbals were those of Diocles of Carystus, written during the 3rd century B.C, and one by Krateuas from the 1st century B.C. Only a few fragments of these works have survived intact, but from what remains scholars have noted that there is a large amount of overlap with the Egyptian herbals (Robson and Beak, 2009). Seeds likely used for herbalism have been found in the archaeological sites of Bronze Age China dating from the Shang Dynasty. Over a hundred of the 224 drugs mentioned in the Huangdi Neijing, an early Chinese medical text, are herbs (Hong and Francis, 2004). Herbs were also common in the medicine of ancient India, where the principal treatment for diseases was diet. De Materia Medica by Pedanius Dioscorides, a Roman physician, is a particularly important example of such writings. The documentation of herbs and their uses was a central part of both Western and Eastern medical scholarship through to the 1600s, and

these works played an important role in the development of the science of botany (Ackerknecht, 1982).

Human beings have used plants for the treatment of diverse ailments for thousands of years. According to the World Health Organization, most populations still rely on traditional medicines for their psychological and physical health requirements, since they cannot afford the products of Western pharmaceutical industries, together with their side effects and lack of healthcare facilities. Rural areas of many developing countries still rely on traditional medicine for their primary health care needs and have found a place in day-to-day life. These medicines are relatively safer and cheaper than synthetic or modern medicine. People living in rural areas from their personal experience know that these traditional remedies are valuable source of natural products to maintain human health, but they may not understand the science behind these medicines, but knew that some medicinal plants are highly effective only when used at therapeutic doses.

Herbal medicines are in great demand in both developed and developing countries as a source of primary health care owing to their attributes having wide biological and medicinal activities, high safety margins and lesser costs. Herbal molecules are safe and would overcome the resistance produced by the pathogens as they exist in a combined form or in a pooled form of more than one molecule in the protoplasm of the plant cell (Ernst, 2007). Even with the advent of modern or allopathic medicine have noted that a number of important modern drugs have been derived from plants used by indigenous people (Balick and Cox, 1996).

Traditional use of medicine is recognized as a way to learn about potential future medicines. Researchers have identified number of compounds used in mainstream medicine which were derived from "ethnomedical" plant sources. Plants are used medicinally in different countries and are a source of many potent and powerful drugs (Fabricant and Farnsworth, 2001).

1.5.2 Classification of medicinal plants

Of the 2,50,000 higher plant species on earth, more than 80,000 species are reported to have at least some medicinal value and around 5000 species have specific therapeutic

value. They are classified according to the part used, habit, habitat, therapeutic value etc. besides the usual botanical classification (Joy et al. 1998).

Table 1.1: Classification of medicinal plants (Joy et al. 1998)

Based on part used	1. Whole plant: Diffusa, *Phyllanthus neruri* 2. Root: Dasamula 3. Stem:*Tinospora cordifolia, Acorus calamus* 4. Bark: *Saraca asoca* 5. Leaf: *Indigofera tinctoria, Lawsonia inermis, Aloe vera* 6. Flower:*Biophytum sensityvum, Mimusops elenji* 7. Fruit: *Solanum* species 8. Seed: *Datura stramonium*
Based on habitat	1. Tropical: *Andrographis paniculata* 2. Sub-tropical: Mentha arvensis 3. Temperate: Atropa belladonna
Based on therapeutic value	1. Antimalarial: *Cinchona officinalis, Artemisia annua* 2. Anticancer: *Catharanthus roseus, Taxus baccata* 3. Antiulcer: *Azadirachta indica, Glycyrrhiza glabra* 4. Antidiabetic: *Catharanthus roseus, Momordica charantia* 5. Anticholesterol: *Allium sativum* 6. Antiinflammatory: *Curcuma domestica, Desmodium gangeticum* 7. Antiviral: *Acacia catechu* 8. Antibacterial: *Plumbago indica* 9. Antifungal: *Allium sativum* 10. Antiprotozoal: *Ailanthus sp., Cephaelis ipecacuanha* 11. Antidiarrhoeal: *Psidium gujava, Curcuma domestica* 12. Hypotensive: *Coleus forskohlii, Alium sativum* 13. Tranquilizing: *Rauvolfia serpentina* 14. Anaesthetic: *Erythroxylum coca* 15. Spasmolytic: *Atropa belladona, Hyoscyamus niger* 16. Diuretic: *Phyllanthus niruri, Centella asiatica* 17. Astringent: *Piper betle, Abrus precatorius*

	18. Anthelmentic: *Quisqualis indica, Punica granatum* 19. Cardiotonic: *Digitalis sp., Thevetia sp.* 20. Antiallergic: *Nandina domestica, Scutellaria baicalensis* 21. Hepatoprotective: *Silybum marianum, Andrographis paniculata*
Based on habit	1.Grasses: *Cynodondactylon* 2.Sedges: *Cyperusrotundus* 3.Herbs: *Vernoniacineria* 4.Shrubs: *Solanum* species 5.Climbers: *Asparagus racemosus* 6.Tress: *Azadirachtaindica*

1.5.3 Importance of medicinal plant

The high costs of western pharmaceuticals put modern health care services out of reach of most of the world's population, which relies on traditional medicine and medicinal plants to meet their primary health care needs. Even where modern medical care is available and affordable, many people prefer more traditional practices. This is particularly true for first nations and immigrant populations, who have tended to retain ethnic medical practices. In the last decade, there has been considerable interest in resurrecting medicinal plants in western medicine, and integrating their use into modern medical systems. The reasons for this interest are varied, and include:

- **Low cost:** herbals are relatively inexpensive and the cost of pharmaceuticals to governments and individuals is rising
- **Drug resistance:** the need for alternative treatments for drug-resistant pathogens Limitations of medicine: the existence of ailments without an effective pharmaceutical treatment
- **Medicinal value:** laboratory and clinical corroboration of safety and efficacy for a growing number of medicinal plants
- **Cultural exchange:** expanding contact and growing respect for foreign cultures, including alternative systems of medicine

- **Commercial value:** growing appreciation of trade and other commercial economic opportunities represented by medicinal plants

However, the pace of re-adopting the use of traditional medicinal plants is by no means uniform in western medicine.

In parts of Europe, especially in Germany, herbal medicine (or phytomedicine) is much more popular than is the case in North America. Some 67,000 different herbal products are available in Germany. The already well-established medicinal plant trade of Europe is increasing at an annual rate of about 10%. In Canada, and the US, the regulatory climate has been much less receptive to herbal medicines. This is because lack of proper scientific evaluation, limited regulation, absence of quality control, limited education of many herbal practitioners, and the presence of "snake-oil salesmen" have all combined to give herbal medicine a bad reputation. However, in response to public demand for "alternative" or "complementary" medicine, this situation is changing. At least 20% of Canadians have used some form of alternative therapy, such as herbalism, naturopathy, acupuncture, and homeopathy.

Herbs are the fastest-growing part of the pharmacy industry of North America, with an annual growth variously estimated as 15 to 20%, and thousands of herbal products are now available to Canadians. Herbal remedies have been estimated to have a current value of between two and ten billion dollars in North America, depending on how comprehensively the category of medicinal herbs is interpreted predicted that with appropriate research and regulation, "herbal medicine will regain its rightful status as an important and integral aspect of classical medicine"(Balick and Cox, 1996).

1.5.4 Traditional Medicine

Traditional medicines have existed in Bangladesh as an important basis of health care since olden times. Because of their potentialities and close association with the culture and tradition of the people, traditional systems of medicine have assumed a unique position in the health care of the people living in even the remotest areas of the country. Although the use of traditional medicine is so deeply rooted in the cultural heritage of Bangladesh the concept, practice, type and method of application of traditional medicine

vary widely among the different ethnic groups. Traditional medical practice among the tribal people is guided by their culture and life style and is mainly based on the use of plant and animal parts. Among the largest ethnic group, the bangles on the main land, there are two distinct forms of Traditional medicine practice:

i) One is the old and original form based on old knowledge, experience and belief of the older generations. This includes:

- Folk medicine, which uses mainly plant and animal parts and their products as medicines for treating different diseases and also includes treatments like bloodletting, bonesetting, hot and cold baths, therapeutic fasting and cauterization.
- Religious medicine, which includes use of verses from religious books written on papers and given as amulets, religious verses recited and blown on the face or on water to drink or on food to eat, sacrifices and offerings in the name of God and Gods, etc. and
- Spiritual medicine, which utilizes methods like communicating with the supernatural beings, spirits or ancestors through human media, torturous treatment of the patient along with incantations to drive away the imaginary evil spirits and other similar methods.

ii) The other is the improved and modified form based on the following two main traditional systems:

- Unani-Tibb or Graeco-Arab system, which has been developed by the Arab and Muslim scholars from the ancient Greek system, and
- Ayurvedic system, which is the old Indian system, based on the Vedas the oldest scriptures of the Hindu saints of the Aryan age.

Both the Unani and Ayurvedic systems of traditional medicine have firm roots in Bangladesh and are widely practiced all over the country. Apparently the recipients of these systems of medicine appear to be the rural people, but practically a good proportion of the urban population still continues to use these traditional medicines, although organized modern health care facilities are available to them (Ghani, 1998).

As only a certain percentage of plants are used in traditional medicines, it is roughly estimated that of the discovered 17,000 species, nearly 3,000 species are used in

medicinal field (Samy *et al.*, 2008). Some medicinal uses of common plants in Bangladesh are reported in following table:

Table 1.2: Name and Medicinal use of some common plants in Bangladesh (Samy *et al.*, 2008)

Common name	**Botanical name**	**Parts Used**	**Uses**
Pudina	*Menthe arvensis*	Whole plant	Indigestion, Stomach disorder, Stimulant
Kalmegh/ Bhui neem	*Andrographis paniculata*	Whole plant	Fever, Weakness, Release of gas.
Kalmishak	*Smilax zeylanica*	Roots, steams	Blood dysentery, Rheumatisms, and Abscess.
Dhutara	*Datura metel*	Roots, leaves, seeds	Anesthesia, pain, asthma, epilepsy, Rheumatic fever, Hypertension.
Tulsi	*Ocimum sanclum*	Leaves, flower, seeds	Cough, Cold, Bronchitis, and Expectorant.
Henna/Mehdi	*Lawsennia iermis*	Leaves, flower	Burning, Steam, Antiinflammatory.
Gritkumari	*Aloe verra*	Leaves	Laxative, Wound healing, Skinburns & care, Ulcer.
Anantamul/ sariva	*Hemidesmus indicus*	Root, leaves	Appetizer, Carminative, Aphrodisiac, Astringent.
Sharisa	*Brassica napus*	Leaves, seeds.	Fever, Common cold, Stomachache, Itching, Headache.
Vringraj	*Eclipta alba*	Whole plant	Anti-inflammatory, Digestive, Hair tonic.
Neem	*Azardirchata indica*	Leaves	Sedative, Analgesic, Epilepsy, Hypertensive.

Table 1.3: Plants used by the Kavirajes and tribal medicinal practitioners of Bangladesh (Yusuf *et al.*, 2006)

Common name	Botanical name	Parts Used	Uses
Rakabbory	*Callicarpa japanica*	Leaf	Dyspepsia, heart burn
Jama-thoi	*Callicarpama crophylla*	Whole plant	Tonic, Dermatitis, Cancer, Antidote.
Brahmonhati	*Clerodendrum indicum*	Whole plant	Rheumatoid arthritis, Jaundice, Skin diseases.
Vana-jhai	*Clerodendrum inerme*	Leaf, flower	Night blindness, Pneumonia, colic, Rheumatoid arthritis.
Chapa-genda	*Clerodendrum trichotomum*	Leaf, stem, flower	Heart diseases, Rheumatoid arthritis, Skin diseases.
Viti	*Clerodendrum viscosum*	Whole plant, leaf	Giddiness, Typhus, Colic in cattle, Diabetes, Fever, Cold, Aphrodisiac,
Kata mehandi	*Duranta repens*	Whole plant, fruit, bark	Insect repellent, Itches, Infertility, Fever, Pneumonia.
Chaturaangi	*Lantana camara*	Root, flower	Cough, Mental diseases, Fever.
Khuria	*Lippia alba*	Leaf	Cuts and wounds.
Bhumi-okra	*Lippianodi flora*	Leaf, stem, bark	Constipation, Eczema, Stroke, Gonorrhea.
Shefali	*Nyctanthe sarbor*	Whole plant,	Influenza, Hypertension,
Goniari	*Premnainte grifolia*	Leaf, bark, root	Fever, Energy stimulant.
Supang	*Stachytarpheta indica*	Leaf, stem	Leukorrhea.

1.5.5 Significances of Medicinal Plants to mankind

Medicinal plants have many characteristics when used as a treatment, as follow:

Synergic medicine- The ingredients of plants all interact simultaneously, so their uses can complement or damage others or neutralize their possible negative effects.

Support of official medicine- In the treatment of complex cases like cancer diseases the components of the plants proved to be very effective.

Preventive medicine- It has been proven that the component of the plants also characterize by their ability to prevent the appearance of some diseases. This will help to reduce the use of the chemical remedies which will be used when the disease is already present i.e., reduce the side effect of synthetic treatment.

1.5.6 Global scenario of Medicinal Plants

According to the World Health Organization (WHO), more than 80% of the world's population relies on traditional medicine for their primary healthcare needs. The use of herbal medicines in Asia represents a long history of human interactions with the environment. Herbal medicine is a common element in Ayurvedic, homeopathic, naturopathic, traditional and oriental, Native American & Indian medicine. Plant products also play an important role in the health care systems of the remaining 20% of the population, mainly residing in developed countries. The present global herbal market is worth about US$ 62 billion per annum. The annual growth of herbal market is about 15 percent and the global herbal market by 2050 is expected to be about US$ 5 trillion (Payyappallimana, 2009).

Thus, the modern social context and economic view of health services, the needs of the pharmaceutical market and the recognition that research on medicinal plants used in folk medicine represents a suitable approach for the development of new drugs have led to an increase in the number of publications in this field, and private and governmental institutions are now financially supporting research programmes worldwide (Rates, 2001).

1.5.7 Medicinal Plants in Bangladesh

In Bangladesh, about 500 plant species have been identified as medicinal plants because of their therapeutic properties, Approximately 400 herbal factories have been established in this country for producing Ayurvedic and Unani medicines. It has been estimated that Bangladesh has a market of about 100-core taka worth herbal products annually. The total size of the medicinal plant market at wholesale prices was estimated at some US$ 14

million per annum which corresponds to 17000 tons of products .It has been estimated that 12,500 tonnes of dried medicinal plant products are sold in Bangladesh that have a worth of Tk 255 million to rural economy. At the factory level, 5000 tonnes of medicinal plants are imported annually that cost around 480 million taka (Alam *et al*., 1996). Although modern medicinal science has been developed to a great extent, many rural people of Bangladesh still depend on plant products and herbal remedies for treating their ailments (Bregum, 2004).

1.5.8 Plants parts used

Several plants parts have been studied and their activities have been reported, which are summarized below-

1.5.8.1 Root

The fleshy or woody parts of many species are used medicinally. Roots may be fibrous (*Urtica dioica* or *u. Radix* of the urticaceae family, stinging nettle), solid (*Glycyrrhiza glabra* of the leguminosae family, liquorice) or fleshy (*Harpagophytum procrumbens* of the pedaliaceae family, devils claw).

1.5.8.2 Rhizome

The rhizome is a woody or fleshy elongated stem that usually grows horizontally below the ground, forming leaves above the ground and roots into the ground. Medicinally important rhizomes include kava kava (*Piper methysticum* of the piperaceae Family) and the ginger (*Zingiber officinalis* of the zingiberaceae family).

1.5.8.3 Bulb

A bulb is the fleshy structure made up of numerous layers of bulb scales which are leaf bases. Bulbs which are popular for medicinal uses include the onion and garlic (*Allium cepa* and *A. Sativum* respectively, both of the liliaceae family).

1.5.8.4 Tuber

A tuber is a swollen, fleshy structure below the ground, usually of stem origin but often partly stem. Example: African potato (*Hypoxis sp*. Of the hypoxidaceae family)

1.5.8.5 Bark

The bark is the outer most protective layer of a tree trunk and is formed by layers of living cells just above the wood itself. There are usually high concentrations of the active

ingredients in the bark and several examples of the bark exists e.g. the quinine bark (*Cinchona sp*., rubiaceae) and cinnamon and camphor (*Cinnamomum Camphora* and *C. camphora* both of the lauraceae family).

1.5.8.6 Wood

The wood is the thick stem or the wood itself. Important examples of useful woods include sandalwood (*Santalum album* of the santalaceae family).

1.5.8.7 Leaf

The leaves can sometimes be used alone or mixed with the petiole. Example of plants where only the leaves are used is the Gingko (*Gingko biloba* of the ginkoaceae family).

1.5.8.8 Aerial parts

All parts of the plant found above the ground are referred to as the aerial parts. Very often the plants, which have useful aerial parts, are harvested when flowering. One such example is the st. Johns wort (*Hypericum perforatum* of the hypericaceae family).

1.5.8.9 Flowers

Flowers are very commonly used and popular in traditional medicine. Several flowers commonly used in medicine include the clove (*Syzygium aromaticum*, myrtaceae), camomille flower (*Chamaemelum Nobil*e, asteraceae), Roselle (*Hibiscus Sabdiriffa*, Meliaceae), and the marigold (*Calendula officinalis*, asteraceae).

1.5.8.10 Seeds

Seeds are contained in the fruit and in some instances are used by themselves. Examples exist for the use of the seeds e.g. castor oil (*Ricinus communis*, Euphorbiaceae), and the seeds of the fennel (*Foeniculum vulgare*, Apiaceae) (Prashant *et al*., 2014).

1.5.8.11 Gum

Gums are solids consisting of mixtures of polysaccharides. They are water soluble and are partially digested by humans. Gums sometimes flow from a damaged stem as a defense mechanism or sometimes as a protective system against the invasion of bacterial and fungal rots. Well known examples of gums are gum Arabic (*Acacia senegal*, leguminosae), Benjoin (*Terminalia Bentzoe*, Combretaceae) and aloe gel (*Aloe vera* gum of the liliaceae family mixed with water).

1.5.8.12 Resins

Resins are excreted from specialized cells or ducts in plants.

They consist of a mixture of essential oils and polymerized terpenes, usually insoluble in water. Well known examples of resins since biblical times include frankincense (*Boswellia sacra)* and myrrh (*Commiphora myrrha*) both of the Burseraceae family.

1.5.8.13 Fatty oils

These are non-volatile, insoluble oils pressed either from the seeds or from the fruits of plants. Oils are often referred to as Acylglycerides because they are derived from glycerol molecules. Olive oil is a useful example in as much as these oils over their own therapeutic potential are also used in carriers as liquid formulations and ointments (Prashant *et al.*, 2014).

1.5.9 Bioactive Compounds in Medicinal Plants

All plants produce chemical compounds as part of their normal metabolic activities.

These phytochemicals are divided into-

- Primary metabolites such as sugars and fats, which are found in all plants; and
- Secondary metabolites are compounds which are found in a smaller range of plants, serving a more specific function. For example, some secondary metabolites are toxins used to deter predation and others are pheromones used to attract insects for pollination (Bernhoft, 2010).

It is these secondary metabolites and pigments that can have therapeutic actions in humans and which can be refined to produce drugs—examples are inulin from the roots of dahlias, quinine from the cinchona, morphine and codeine from the poppy, and digoxin from the foxglove. Plants synthesize a bewildering variety of phytochemicals but most are derivatives of a few biochemical motifs:

- Alkaloids are a class of chemical compounds containing a nitrogen ring. Alkaloids are produced by a large variety of organisms, including bacteria, fungi, plants, and animals, and are part of the group of natural products (also called secondary metabolites).They often have pharmacological effects and are used as medications, as recreational drugs, or in entheogenic rituals. Examples are the local anesthetic and stimulant cocaine; the psychedelic psilocin; the stimulant caffeine; nicotine; the analgesic morphine; the antibacterial berberine; the

anticancer compound vincristine; the antihypertension agent reserpine; the cholinomimeric galatamine; the spasmolysis agent atropine; the vasodilator vincamine; the anti-arhythmia compound quinidine; the anti-asthma therapeutic ephedrine; and the antimalarial drug quinine.

- Polyphenols (also known as phenolics) are compounds contain phenol rings. Theanthocyanins that give grapes their purple color, the isoflavones, the phytoestrogens from soy and the tannins that give tea its astringency are phenolics.
- Glycosides are molecules in which a sugar is bound to a non-carbohydrate moiety, usually a small organic molecule. Glycosides play numerous important roles in living organisms. Many plants store chemicals in the form of inactive glycosides. These can be activated by enzyme hydrolysis, which causes the sugar part to be broken off, making the chemical available for use. Many such plant glycosides are used as medications. In animals and humans, poisons are often bound to sugar molecules as part of their elimination from the body. An example is the cyanoglycosides in cherry pits that release toxins only when bitten by an herbivore.
- Terpenes are a large and diverse class of organic compounds, produced by a variety of plants, particularly conifers, which are often strong smelling and thus may have had a protective function. They are the major components of resin, and of turpentine produced from resin. (The name "terpene" is derived from the word "turpentine"). Terpenes are major biosynthetic building blocks within nearly every living creature. Steroids, for example, are derivatives of the triterpene squalene.Terpenes and terpenoids are the primary constituents of the essential oils of many types of plants and flowers. Essential oils are used widely as natural flavor additives for food, as fragrances in perfumery, and in traditional and alternative medicines such as aromatherapy. Synthetic variations and derivatives of natural terpenes and terpenoids also greatly expand the variety of aromas used in perfumery and flavors used in food additives. Vitamin A is an example of a terpene. The fragrance of rose and lavender is due to monoterpenes. The

carotenoids produce the reds, yellows and oranges of pumpkin, corn and tomatoes (Bernhoft, 2010).

Table 1.4: Drugs derived from Natural products with their Therapeutic use (Mishra and Tiwari, 2011)

Trade name	Lead compound	Therapeutic use
Dronabinol (Sativex™)	Dronabinol	Pain
Fumagillin (Flisint™)	Fumagillin	Antiparasitic
Tigecycline (Tygacil™)	Tetracycline	Antibacterial
Zotarolimus (Endeavor™)	Sirolimus	Cardiovascular
Anidulafungin (Eraxis™)	Echinocandin	Anti-fungal
Exenatide (Byetta™)	Exenatide-4	Diabetes
Lisdexamfetamine (Vyvanse™)	Amphetamine	ADHD
Temsirolimus (Torisel™)	Sirolimus	Oncology
Methylnaltrexone (Relistor™)	Naltrexone	Pain
Telavancin (Vibativ™)	Vancomycin	Antibacterial
Romidepsin (Istodax™)	Romidepsin	Oncology
Monobactam aztreonam (Cayston™)	Monobactam aztreonam	Antibacterial

1.5.10 Approaches of drug development

The major portion of the present day knowledge of the medicinal properties of plants is the sum total of some observations and experiences. According to some generous estimates, almost 80 percent of the present day medicines are directly or indirectly obtained from plants.

Steps of drug development from plant sources given below:

1.5.10.1 Selection of plant species

- Preliminary screening of traditionally used plants
- Review literature and scientific result

- Authentication of data for their validity and comprehensiveness

1.5.10.2 Evaluation of toxicity

- Gather data concerning toxicity and if demonstrate no toxicity then proceed to next step
- If toxicity data is not exit, select an appropriate test for toxicity analysis
- Develop and prepare bioassay protocol for safety and toxicity

1.5.10.3 Preparation of plant sample and element analysis

- Collection of plant sample
- Extraction
- Analysis for elemental contents

1.5.10.4Biological Testing

- Selection of appropriate biological test
- Development protocol for biological test
- Analyze biological activity in- vivo
- Determine type and level of biological activity

1.5.10.5 Isolating active compounds

- Isolating and characterization of compounds responsible for
- Observed biological activity
- Evaluation of active compounds singularly and in combination with others to explore existence of activity and/or synergy of biological effect

1.5.10.6 In-vivo analysis

- Use animal model for bioactivity analysis of active compounds
- Analyze again safety and toxicity but in in-vivo
- Conduct human studies

1.5.10.7 Commercialization

- Develop appropriate dose delivery system
- Analyze cost-effectiveness
- Sustainable industrial production (Ghani, 1998).

1.6 Plants having potential action on CNS

During the history of mankind, drugs acting the central nervous system (CNS) have focused essentially on those that bring relief to psychiatric disorders. Recently, a lot of focus has been made on those likely to bring relief to those acting on Parkinsonism and epilepsy and more potent analgesics etc. Drugs of plant origin are important in all these areas although not usually for self-medication. Reserpine has been a classical example where this antipsychotic drug has revolutionized the treatment of schizophrenia and has enabled patients to avoid hospitalization before the introduction of drugs such as *Chlorpromazine* and *Olanzapine* and *Risperidone*. *Reserpine* in the meantime has shown some side effects in depleting the neurotransmitter levels in the brain thus causing severe depression and has recently been involved in the development of breast cancer. For milder psychiatric conditions, Phytotherapy can still provide support when one takes into account the statistics whereby depression and anxiety still affects one in six persons and that 40% or the people having mental problems will also develop symptoms of anxiety and depression. The latter is more prevalent in women than in men with associated problems like sleep disturbances etc. It is in this context again that phytotherapy is called upon to re-establish a regular pattern of sleep. Migraines, Dementia, Alzheimer disease are many of the problems associated with the CNS, which are being addressed by plant extracts (Prashant *et al.*, 2014).

1.6.1 Plant as Hypnotics and sedatives

It has been reported that the difference between a sedative and a hypnotic agent depends on the dose. Plant products used in this way are not as potent as synthetic drugs but they do not have as many disadvantages as their synthetic counter parts, which are often recommended for short-term use. *Valeriana officinalis* (Valerianaceae) (*Radix valerianae*).This plant has a long history in traditional medicine as a digestive aid, and as adjuvant in Spasmolytic states of smooth muscle and gastrointestinal pains of nervous origin. It has also been used to treat Epilepsy, gum sores, headaches, nausea etc. This herbaceous plant is being cultivated in many European countries, in the US and also in Japan. The parts used pharmaceutically are the root, rhizome and stolons. Valerian has a

characteristic smell, usually described as unpleasant and is attributed to the presence of Valepotriate constituents and other volatile oils (Prashant *et al.*, 2014).

Table 1.5: List of plants used having CNS activity (Jain *et al.*, 2014)

Name	Family	Property
Adiantum capillus veneris linn.	Adiantaceae	Anticonvulsant activity
Anacyclus pyrethrum	Asteraceae	Neuropharmacological activity and antidepressant activity
Argemone mexicana	Papaveraceae	CNS depressant activity
Argyreia speciosa (Sweet)	Convolvulaceae	Hypnotic activity
Avicennia officinalis	Avicenniaceae	Induced sleeping time in mice
Balanites roxburghii planch	Zygophyllaceae	Depressant effect
Barleria lupulina	Acanthaceae	Reduction in general behavioural pattern
Bixa Orellana L.	Bixaceae	Antiepileptic
Bryophyllum pinnatum (Lam.)	Crassulaceae	Sedative effect
Caesalpinia pulcherrima (L.)	Fabaceae	Induced sleeping time in mice
Calotropis gigantea R.Br.	Asclepiadaceae	Used in sprain, anxiety, epilepsy and in mental disorders
Camellia sinensis	Theaceae	Anxiolytic activity
Cissus quadrangularis Linn	Vitaceae	Reduction in spontaneous motor activity, exploratory behaviour and motor coordination and prolonged pentobarbitone induced sleeping time
Clitoria ternatea Linn	Fabaceae	Anxiolytic, antidepressant, anticonvulsant and anti-stress activity
Couroupita guianensis Aubl.	Lecythidaceae	Spontaneous motor activity
Eclipta alba (Linn.)	Asteraceae	Sedative, muscle-relaxant, anxiolytic, no-tropic and anti-stress activities.
Fumaria indica Linn.	Fumariaceae	Sedative and tonic

Hedychium coronarium Koen	Zingiberaceae	Excitant, febrifuge and tonic.
Jatropha gossypifolia Linn.	Euphorbiaceae	Anxiolytic activity at lower dose
Leptadenia reticulate	Asclepiadaceae	Decrease in locomotor activity
Lucas longifolia Benth.	Lamiaceae	Sedative effect
Lippia nodiflora	Verbanaceae	Sedative effect, anticonvulsant effect and anxiolytic effect in mice
Mikania scandens (L.)	Asteraceae	Central anti-nociceptive, locomotor and depressant, muscle relaxant and sedative potentiating effects
Mimusops elengi	Sapotaceae	Depressant activity
Nigella sativa L.	Ranunculaceae	CNS-depressant action
Passiflora incarnata Linn	Passifloraceae	Anxiolytic effect
Peperomia pellucida (L.)	Piperaceae	Depressant effects
Pistia stratiotes L.	Araceae	Decreased the locomotor activity in mice
Portulaca oleracea L.	Portulacaceae	Reduction in the locomotor activity in mice
Portulaca quadrifida Linn.	Portulacaceae	Anticonvulsant activity
Ruta chalepensis	Rutaceae	sedative-hypnotic potentiation, anxiolytic, anticonvulsant and anti-nociceptive effects
Solanum nigrum L	Solanaceae	Alteration in the general behaviour pattern, reduced exploratory behaviour pattern, suppressed the aggressive behaviour, affected locomotor activity and reduced spontaneous motility
Strychnos nux-vomica Linn.	Loganiaceae	Convulsions and maximal potentiation of hypnosis
Thuja occidentalis (L.)	Capressaceae	Anxiolytic, anticonvulsant and motor

		coordination activity.
Trapa bispinosa	Trapaceae	Anxiolytic activity
Trigonella foenum-graecum Linn.	Fabaceae	Suppression of motor activity, exploratory behaviour
Viscum album L.	Loranthaceae	Dopaminergic activity
Wedelia calendulacea Less	Asteracea	Neuropharmacological activity that may be sedative in nature
Xylocarpus moluccensis Lamk. M. Roem.	Meliaceae	CNS depressant activity

1.7 Plant review

Figure 1.3: *Dracaena spicata* Plant

Dracaena (*Dracaena spp*.) is grown for its dramatic foliage and carefree nature. This large group of plants includes many species that can grow up to 6 feet tall with long, strap-like leaves, often with red and yellow variegation.

Dracaena is an undemanding plant that tolerates low light and low humidity and it will forgive the occasional missed watering. As the plant grows, the lower leaves drop off and the trunk scars over, creating an interesting pattern of markings. *D.fragrans*, which is the familiar corn plant and *D. marginata*, commonly known as the rainbow plant, are two of the more familiar *Dracaena species.*

Table 1.6: Plant review of *Dracaena Spicata* (Ebbd.info, 2016)

Scientific name	*Dracaena Spicata Roxb.*
Family	Asparagaceae - Century-plant family
Group	Monocot
Growth habit	Shrub
Duration	Annual
Bangla/Vernacular Name:	Dracaena
Tribal Name	Kadorateng gaas(chakama,Tanchangya)
Planting month for zone 10 and 11	year round
Origin	native to Mayanmar, Bangladesh
Availability	generally available in many areas within its hardiness range
Synonym:	*Dracaena wallichii Kunth* *Draco spicata(Roxb.)Kuntze* *Pleomelespicata (Roxb.)N.E.Br.*
Parts utilized	Rhizomes, flowers, seeds, leaves, roots,fruits

1.7.1 Taxonomy

Kingdom: Plantae

Clade: Angiosperms

Clade: Monocots

Order: Asparagales

Family: Asparagaceae

Subfamily: Nolinoideae

Genus: *Dracaena*

Species: *D. spicata*

1.7.2 Distribution

D. spicata is widely distributed in forests of Chittagong, Chittagong Hill Tracts, Cox's Bazar, Andaman Islands and some parts of Myanmar (Ebbd.info, 2016).

1.7.3 Description of the plant

Caulescent, Leaves lanceolate, drooping, Spikes terminal, bracts many flowered, Corolcylindric, at last becoming twisted, Stigma three-lobed.

A native of Chittagong, and from thence introduced into this Garden by Dr. Buchanan, where it blossoms in April.

Root fibrous, stem erect, toward the top succulent, perennial, marked with the cicatrices of the fallen leaves, as in the other *Dracaena*. Leaves crowded about the extremity of the plant, sheathing, lanceolate, drooping, entire, pointed; smooth on both sides; from six to twelve inches long, and two or three broad. Spikes terminal, bent a little to one side; numerous pointed, recurvedbractes surround the base, and a few shorter, oppressed ones from thence to the flower-bearing position.

Flowers numerous, sessile, collected in small fascicles, each fascicle having a small, cordate, pointed bracte immediately under it.Calyx none corol onepetalled, cylindric divided half way down into three exterior, and three interior slender, linear, equal, straight segments; color pale greenish yellow, as they advance in age the tube becomes twisted. Filaments inserted on the base of the segments of the corol, and of their length. Stigma three lobed, Berry with from one to three, distinct, round, and smooth lobes;

while immature, a deep olive green, when ripe, deep reddish orange; each lobe containing a single large, round, smooth, white, horny seed (E-monocot.org, 2016).

1.7.4 Culture

Light requirement: plant grows in part shade/part sun

Soil tolerances: clay; sand; acidic; slightly alkaline; loam

Drought tolerance: high

Soil salt tolerances: poor

Plant spacing: 36 to 60 inches

Light: Bright light. Avoid direct sunlight in summer.

Water: Keep soil lightly moist spring through fall, slightly drier in winter. Do not let soil get waterlogged.

Humidity: Average room humidity

Temperature: Normal room temperatures. 60-75°F/16-24°C

Soil: Good-quality, all-purpose potting mix.

Fertilizer: Feed every 2 weeks in spring and summer with a 10-10-10 liquid fertilizer diluted by half.

Propagation: Cut off the cane at any height and root them like stem cuttings.

1.7.5 Use

- Pills prepared with warm water twice daily for the treatment of meals by the Chakma
- A root extract of Dracaena spicata and Pandanus foetidus is taken togather and administered to healthy children during outbreaks of meals by Tanchangya
- Antimicrobial activity, Atiulcerant activity, Antit hrombolytic, Antipyretic activity
- Cooked as vegetable
- Also used as a traditional medicine for the treatment of various diseases cough, syphilis, conjunctivitis, constipation, pills prepared from the leaves are taken with warm water twice daily for the treatment of measles by the Chakma.

1.7.6 Other species

There are around 110 species of *Dracaena*, including:

Dracaena afromontana – Afromontane dragon tree

Dracaena americana – Central America dragon tree

Dracaena aletriformis (Haw.) Bos)

Dracaena arborea – tree dracaena

Dracaena aubryana Brongn. ex E.Morren (syn.*D. thalioides*)

Dracaena bicolor Hook.

Dracaena braunii Engl. – ribbon dracaena, marketed as "lucky bamboo"

Dracaena camerooniana Baker

Dracaena cincta

Dracaena cinnabari Balf.f. – Socotra dragon tree

*Dracaena concinna*Kunth

Dracaena draco (L.) L. – Canary Islands dragon tree

Dracaena elliptica

Dracaena fragrans (L.) Ker Gawl. (syn. *D. deremensis*) – striped dracaena, compact dracaena, corn plant, cornstalk dracaena

*Dracaena goldieana*W.Bull

Dracaena hookeriana

Dracaena kaweesakii Wilkin &Suksathan

Dracaena mannii

Dracaena marginata Lam. – red-edged dracaena or Madagascar dragon tree: see *Dracaena reflexa* var. *angustifolia*

Dracaena marmorata

Dracaena ombet – Gabal Elba dragon tree

Dracaena phrynioides

Dracaena reflexa Lam. – Pleomele dracaena or "Song of India"

*Dracaena surculosa*Lindl. – Spotted or gold dust *dracaena*, formerly *D. godseffiana* (E-monocot.org, 2016).

Chapter Two

LITERATURE REVIEW

2.1 Literature Review on *Dracaena spicata*

2.1.1 Evaluation of antimicrobial activities of some Bangladeshi medicinal plans

The crude methanol extracts of aerial parts of *Abrus precatorius L*., leaf of *Magnolia pterocarpa Roxb., Dracaena spicata Roxb*. and *Ravenala madagascariensis Sonn*. as well as their hexane, carbon tetrachloride, chloroform and aqueous soluble partitionates were subjected to screenings for disc diffusion assay. Among the test samples of *A. precatorius*, the highest zone of inhibition (15.0mm) was exhibited by the carbon tetrachloride soluble fraction against *Pseudomonas aeruginosa*. The *M. pterocarpa* extractives exhibited significant zone of inhibition ranging from 7.0 to 23.0mm against the test organisms. The highest zone of inhibition (23.0mm) was demonstrated by the carbon tetrachloride soluble fraction against *Pseudomonas aeruginosa*. This fraction also exhibited 20.0mm zone of inhibition against the gram positive bacteria *Staphylococcus aureus* and gram negative bacteria *Vibrio parahemolyticus*. Among the test samples of *D. spicata*, the highest (18.0mm) zone of inhibition was demonstrated by the aqueous soluble fraction against *Pseudomonas aeruginosa*. The test samples of *R. madagascariensis* exhibited weak antimicrobial activity with zone of inhibition ranging from 2.0 to 9.0mm (Sharmin *et al*., 2014).

2.1.2 Evaluation of thrombolytic and membrane stabilizing activities of four medicinal plants of Bangladesh

The crude methanol extracts of aerial parts of *Abrus precatorius L*., leaf of *Magnolia pterocarpa Roxb.* and *Dracaena spicata Roxb.* and leaf and bark of *Ravenala madagascariensis Sonn.* as well as their hexane, carbon tetrachloride, chloroform and aqueous soluble partitionates were subjected to screenings for thrombolytic and membrane stabilizing activities. Among the extractives of *A. precatorius*, the crude methanol extract exhibited the highest thrombolytic activity (34.92±0.54 %) while the carbon tetrachloride soluble fraction of *M. pterocarpa* exhibited 22.59±0.88 % clot lysis. *D. spicata* extractives showed mild thrombolytic activity. The methanolic crude extract of *R. madagascariensis* leaf and the aqueous soluble fraction of *R. madagascariensis*

bark extract showed 45.32±0.82 % and 32.67±0.74% clot lysis, respectively. In hypotonic solution and heat induced conditions, the crude methanol extract of *A. precatorius* and the hexane soluble fraction of crude methanol extract of *M. pterocarpa* inhibited 63.46±0.84 % & 36.54±0.21 % and 66.12±0.66 % & 40.54±0.02 % haemolysis of RBCs, respectively as compared to 71.90 % and 42.12 % inhibition by acetyl salicylic acid (0.10 mg/ml), respectively. The crude methanol extract of *D. spicata* demonstrated 64.44±0.68 % and 36.52±0.19 % inhibition of hypotonic solution and heat induced hemolysis, respectively. The chloroform soluble fraction of *R. madagascariensis* leaf extract demonstrated 28.72±0.61 % & 39.97±0.39 % and the hexane soluble fraction of *R. madagascariensis* bark extract revealed 53.78±0.17 % & 41.83±0.61 % inhibition of hypotonic solution and heat induced hemolysis of RBCs, respectively (Chowdhury *et al*., 2013).

2.1.3 Antimicrobial activity test

Antimicrobial screening: Antimicrobial activity of the extractives was determined against gram positive and gram negative bacteria and fungi by the disc diffusion method Measured amount of the test samples were dissolved in definite volume of solvent (chloroform or methanol) and applied to sterile discs and carefully dried to evaporate the residual solvent. In this investigation, ciprofloxacin (30μg/disc) disc was used as the reference.

Result: The test samples of *D. Spicata* exhibited zone of inhibition ranging from 7.0 to 18.0mm against the test organisms. The highest (18.0mm) zone of inhibition was demonstrated by the aqueous soluble fraction against *Pseudomonas aeruginosa*. Against gram positive bacteria *Staphylococcus aureus*, the carbon tetrachloride and aqueous soluble extractives revealed 15.0mm zone of inhibition.

2.1.4 Thrombolytic activity

The thrombolytic activity was evaluated by the method developed by by using streptokinase as positive control.

Result: The crude methanol extracts of aerial parts of leaf of *D. spicata* as well as its hexane, carbon tetrachloride, chloroform and aqueous soluble partitionates were subjected to screenings for thrombolytic and membrane stabilizing potentials. In order to identify the drugs with the ability to promote lysis of blood clot from natural resources, the extractives *D. spicata* were assessed for thrombolytic activity. Addition of 100 µl streptokinase, a positive control (30,000 I.U.) to the clots of human blood and subsequent incubation for 90 minutes at 37°C showed 66.77 % lysis of clot. On the other hand, distilled water, treated as negative control, revealed a negligible lysis of clot (3.79 %). *D. spicata* extractives showed mild thrombolytic activity and the highest thrombolytic activity was demonstrated by the carbon tetrachloride soluble fraction (21.05±0.23 %).

2.1.5 Membrane stabilizing activity

The membrane stabilizing activity of the extractives was assessed by evaluating their ability to inhibit hypotonic solution and heat induced haemolysis of human erythrocytes following the method developed by Omale *et al.,* 2008

Result: The membrane stabilizing activity of D. spicata extractives was also determined. The hexane soluble fraction of crude methanol extract of D. Spicata demonstrated 64.44±0.68 % & 36.52 % inhibition of hypotonic solution and heat induced hemolysis, respectively. *D. spicata* exhibited significant membrane stabilizing activity 2.4.Antipyretic activity: Root extract of the plant possesses antipyretic activity mild.

2.1.6 Antiulcerant activity

The tribal people make juice from the leaf of the plant and it is used for ulcer and stomachaches (EncyclopediaBritannica, 2013).

2.2 Literature Review on other *Dracaena* species

2.2.1 Biological activity of saponins from two *Dracaena* species

Many species of the west African "soap tree" *Dracaena* are used in traditional medicine for the treatment of a variety of diseases. In continuation of our search for anti-infective

agents from plants implicated in traditional medicine, we evaluated the biological activities of saponins from extracts of *Dracaena mannii* and *Dracaena arborea* by using a battery of test systems such as radiorespirometry, Cytosensor bioautography, and agar dilution methods and molluscicidal tests. Bioassay-directed fractionation of the methanol extracts of seed pulp using a combination of chromatographic techniques, gel filtration, droplet counter current chromatography (DCCC), and low-pressure liquid chromatography (Lobar), led to the isolation and characterization of spiroconazole A, a pennogenin triglycoside [3 beta-O-[(alpha-L-rhamnopyranosyl(1-->2), alpha-L-rhamnopyranosyl(1-->3)-beta-D-glucopyranosyl]-17 alpha-hydroxyl-spirost-5-ene] As the active constituent, spiroconazole A exhibited pronounced antileishmanial, antimalarial, and molluscicidal activities. It also reports on the fungistatic, fungicidal and bacteriostatic activity of spiroconazole A against 17 species of fungi and 4 of bacteria (Okunji *et al*., 2016).

2.2.2 Anticoagulant and Antioxidant Activities of *Dracaena arborea* Leaves

The crude methanol extract of *Dracaena arborea* leaves induced significant ($p<0.01$) increase in the clotting times of 21 ± 0.54 sec and 25 ± 1.1 sec at 5% and 10% concentrations of the extract respectively compared to the baseline clotting time of 7 ± 0.63 sec for the blood sample. The extract also exhibited potent in vivo and in vitro anticoagulant activities. Increased doses (100 and 200 mg/kg) of the extract, heparin (0.75 and 1.5 mg/kg) and aspirin (1.0 and 2.0 mg/kg) were found to have significantly ($p < 0.01$) prolonged the mean bleeding times with respect to the baseline in rabbits. However, in thrombin-induced clotting assay, the extract demonstrated a reduced potency compared to heparin. DPPH (1, 1-Diphenyl-2-picrylhydrazyl) and FRAP (Ferric reducing/antioxidant power) spetrophotometric assays revealed that the crude leaf extract possesses appreciable high antioxidant potentials. *Dracaena arborea* leaves could be a source of novel anticoagulant and antioxidant compounds for the management of various hematological disorders (Chinaka *et al.*, 2013).

2.2.3 Anthracnose of lucky bamboo *Dracaena sanderiana* caused by the fungus Colletotrichum dracaenophilum in Egypt

Dracaena sanderiana, of the family Liliaceae, is among the ornamental plants most frequently imported into Egypt. Typical anthracnose symptoms were observed on the stems of imported *D. sanderiana* samples. The pathogen was isolated, demonstrated to be pathogenic based on Koch's rule and identified as *Colletotrichum dracaenophilum*. The optimum temperature for its growth ranges from 25 to 30 °C, maintained for 8 days. Kemazed 50% wettable powder (WP) was the most effective fungicide against the pathogen, as no fungal growth was observed over 100 ppm. The biocontrol agents *Trichoderma harzianum* and *Trichoderma viride* followed by *Bacillus subtilis* and *Bacillus pumilus* caused the highest reduction in fungal growth. This report describes the first time that this pathogen was observed on *D. sanderiana* in Egypt (Ibrahim , 2016).

2.2.4 Phytochemical Screening, Proximate Analysis and Antioxidant Activity of *Dracaena reflexa Lam.* Leaves

In the present study, the antioxidant activity of successive leaf extracts of *Dracaena reflexa* was investigated using the scavenging activity on 1,1-diphenyl-2-picrylhydrazyl and reducing power by ferric reducing antioxidant power assay. Methanol extract was found potent in both the assays. IC50 values of 1,1-diphenyl-2-picrylhydrazyl assay for methanol extract was 0.97 mg/ml and ferric reducing antioxidant power value for the same is 1.19. Phytochemical screening, proximate analysis and total phenolic content were also determined. Qualitative screening for phytochemical showed the presence of alkaloids, flavonoids, terpenoids, glycosides and saponins. Highest phenolic content was shown by methanol extract (49.69 mg gallic acid equivalent/g dry weight). Proximate analysis showed moisture content (3.31%), ash content (8.02%), crude fibre (1.31%), crude fat (0.97%), total protein (3.70%), total carbohydrate (86.01) and nutritive value (367.56 kcal/100 g), which would make it a potential nutraceutical. This study suggested that *Dracaena reflexa*, a potential natural free radical scavenger, which could find use as an antioxidative (Shukla *et al.,* 2016)

2.2.5 Cell Cycle Arrest and Apoptosis Induction via Modulation of Mitochondrial Integrity by Bcl-2 Family Members and Caspase Dependence in *Dracaena cinnabari*-Treated H400 Human Oral Squamous Cell Carcinoma

Dracaena cinnabari Balf.f. is a red resin endemic to Socotra Island, Yemen. Although there have been several reports on its therapeutic properties, information on its cytotoxicity and anticancer effects is very limited. This study utilized a bioassay-guided fractionation approach to determine the cytotoxic and apoptosis-inducing effects of *D. cinnabari* on human oral squamous cell carcinoma (OSCC). The cytotoxic effects of *D. cinnabari* crude extract were observed in a panel of OSCC cell lines and were most pronounced in H400. Only fractions DCc and DCd were active on H400 cells; subfractions DCc15 and DCd16 exhibited the greatest cytotoxicity against H400 cells and D. cinnabari inhibited cells proliferation in a time-dependent manner. This was achieved primarily via apoptosis where externalization of phospholipid phosphatidylserine was observed using DAPI/Annexin V fluorescence double staining mechanism studied through mitochondrial membrane potential assay cytochrome c enzyme-linked immunosorbent and caspases activities revealed depolarization of mitochondrial membrane potential (MMP) and significant activation of caspases 9 and 3/7, concomitant with S phase arrest. Apoptotic proteins array suggested that MMP was regulated by Bcl-2 proteins family as results demonstrated an upregulation of Bax, Bad, and Bid as well as downregulation of Bcl-2. Hence, *D. cinnabari* has the potential to be developed as an anticancer agent (Alabsi *et al.*, 2016).

Chapter Three

METHODOLOGY

3.1 Preparation of Plant Extract for Experiments

3.1.1 Materials

3.1.1.1 Reagent

1. Methanol
2. *n*-hexane
3. Dichloromethane
4. Ethyl acetate

3.1.1.2 Equipments

1. Beaker
2. Funnel
3. Glass rod
4. Grinding machine
5. Filter paper
6. Cotton
7. Separating funnel
8. Measuring cylinder
9. Cotton cloth

3.1.2 Collection & Preparation of Plant Material

Dracaena spicata plant was collected from Chittagong Hill tracts. The plant was taxonomically identified by experts in Bangladesh National Herbarium, Mirpur, Dhaka, where a voucher specimen (Accession No. 40633) has been deposited for future reference.

The leaves of the plant were sun dried for several days. The plant materials were then oven dried for 24 hours at considerably low temperature for better grinding. The dried leaves was then ground in coarse powder using high capacity grinding machine in the Phytochemical Research Laboratory, Department of Pharmacy, East West University.

3.1.3 Washing and Drying of *Dracaena spicata*

At first the leaves were thoroughly washed with tap water to remove dust, soil, bird's droppings etc. within them. The leaves were dried under sunlight for one week. But, due

to rainy season sun drying was avoided. Instead, the leaves were dried in hot air oven at 500C for 2 hours.

3.1.4 Grinding and Storage of Dried Samples

The dried parts were ground to coarse powder with the help of home blender machine. This process breaks the plant parts into smaller pieces thus exposing internal tissues and cells to solvents and facilitating their easy penetration into the cells to extract the constituents. Then the powdered sample was kept in clean closed glass containers till extraction. During grinding of sample, the grinder was thoroughly cleaned to avoid contamination with any remnant of previously ground material or other extraneous matters deposited on the grinder. The total weight of the dried powdered leaf was 550g and was measured using electronic balance.

3.1.5 Extraction of the Dried Powdered Sample

The fine powder of *Dracaena spicata* whole plant was dissolved in 1000 ml methanol and it was thoroughly shaken to dissolve the powder into the solvent. Then it was kept in a closely covered glass jar for 7 days and shaken several times during the process for more interaction between the powdered particles and the solvent. This process is termed as maceration. The cover of the jar was closed properly to resist the entrance of air in the jar.

3.1.6 Filtration of the Extract

After the extraction process the plant extracts was filtered with sterilized cotton filter and filter paper. The filtrate was collected in a beaker. The filtration process was repeated three times by using cotton and filter paper. Then the filtrate was taken into a volumetric flask and covered with aluminum foil paper was prepared for rotary evaporation.

3.1.7 Solvent Evaporation

The filtrate was kept in rotary evaporator for complete evaporation of the solvent. The solution was also kept in the hot plate and stirred frequently for solvent evaporation. After running this procedure, a gummy extraction was obtained which was preserved in refrigerator.

3.1.8 Solvent –solvent partitioning of methanolic extracts

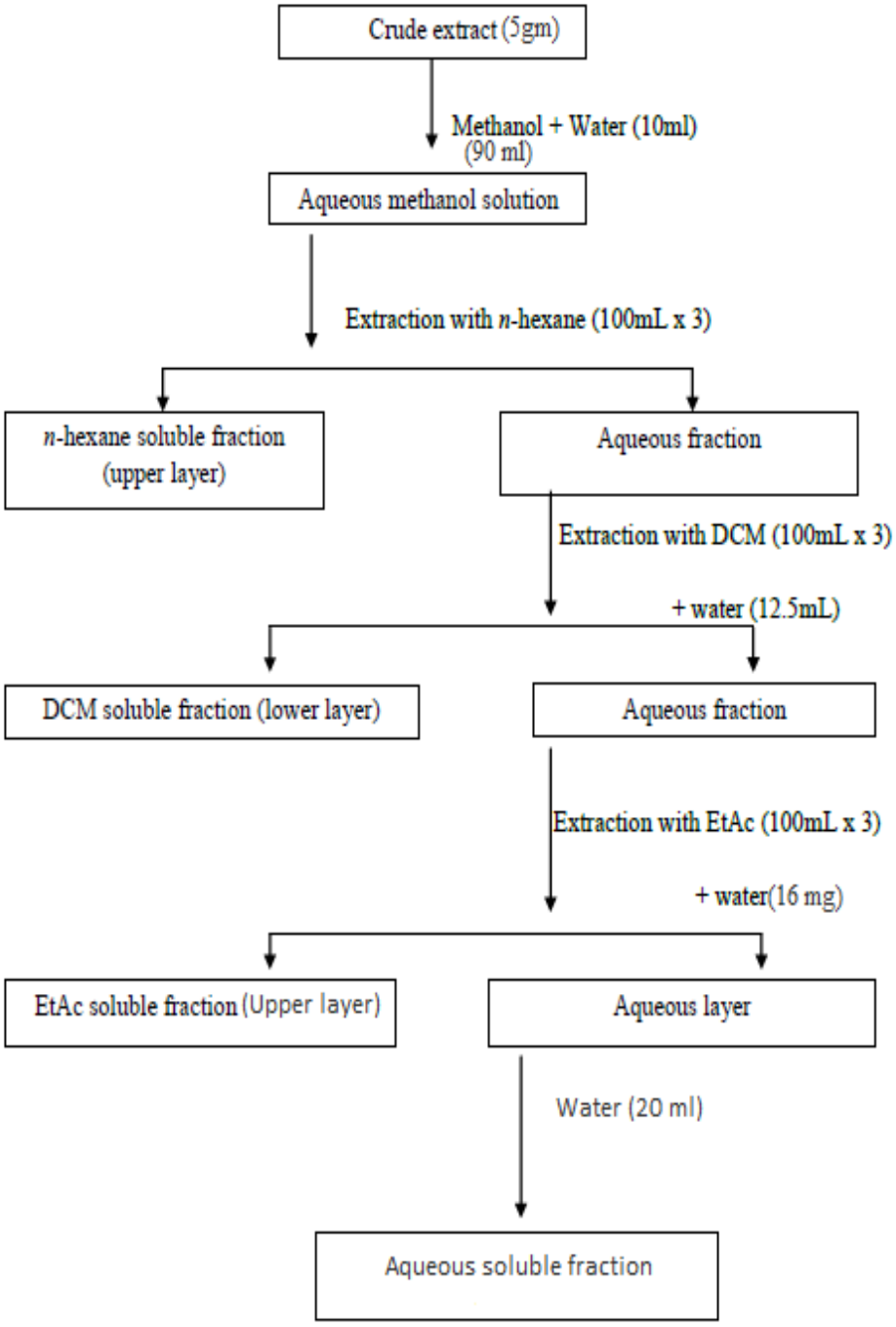


Figure 3.1: Schematic representation of the Partitioning of crude extract of *D. spicata* by Kapchan method.

3.1.8.1 Partition with Petroleum ether

Slurry of concentrated methanolic extract of *Dracaena spicata* was made with water. The slurry was taken in a separating funnel and few ml of Petroleum ether (100 ml) was added. The funnel was shaken vigorously and allowed to stand for a few minutes. The n-hexane fraction (upper fraction) was collected .The process was repeated three times. The n-hexane fraction of root parts of the plants was found to be concentrated.

3.1.8.2 Partition with Dichloromethane

Slurry of concentrated methanolic extract of *D. spicata* was made with water. The slurry was taken in a separating funnel and few ml of dichloromethane (100 ml) was added. The funnel was shaken vigorously and allowed to stand for a few minutes. The dichloromethane fraction (lower fraction) was collected .The process was repeated three times. The dichloromethane fraction of root parts of the plants was found to be concentrated.

3.1.8.3 Partition with Ethyl acetate

Slurry of concentrated methanolic extract of *D. spicata* was made with water. The slurry was taken in a separating funnel and few ml of Ethyl acetate (100 ml) was added. The funnel was shaken vigorously and allowed to stand for a few minutes. The Ethyl acetate (lower fraction) was collected .The process was repeated three times. The Ethyl acetate fraction of root parts of the plants was found to be concentrated.

3.2 Principle of a Rotary Evaporator

A rotary evaporator is a device used in chemical laboratories for the efficient and gentle removal of solvents from samples by evaporation. Rotary evaporators are also used in molecular cooking for the preparation of distillates and extracts.

Figure 3.2: Rotary evaporator devaice

A simple rotary evaporator system was invented by Lyman C. Craig. It was first commercialized by the Swiss company Büchi in 1957. Other common evaporator brands are Heidolph, LabTech, Stuart, Hydrion Scientific, SENCO, IKA and EYELA. In research the most common form is the 1L bench-top unit, whereas large scale (e.g., 20L-50L) versions are used in pilot plants in commercial chemical operations.

3.3 Test for CNS activity

3.3.1 Experimental design

Twenty four experimental animals were randomly selected and divided into six groups denoted as experimental group *D. spicata* Dichloromethane part (200mg/kg, 400mg/kg) positive control (Diazepapam 1 mg/kg) group & negative control (CMC 10 ml/kg) group. Each group of mouse was weighed properly & dose of the test sample & control materials was adjusted accordingly.

3.3.2 Drugs and chemicals

1. Carboxy methyl cellulose (CMC)

2. Water for injection

3. Diazepam

4. Crude extract of *D. spicata* (Dichloromethane part)

3.3.3 Method of identification of animals

Each group consists of five animals. It was difficult to observe the biological response of six mice at a time receiving same treatment. It is quite necessary to identify individual animal of groups during treatment. The animals were individualized in the following way i.e. marked as:

M1=mice 1, M2=mice 2, M3=mice3, M4=mice & M5=mice 5.

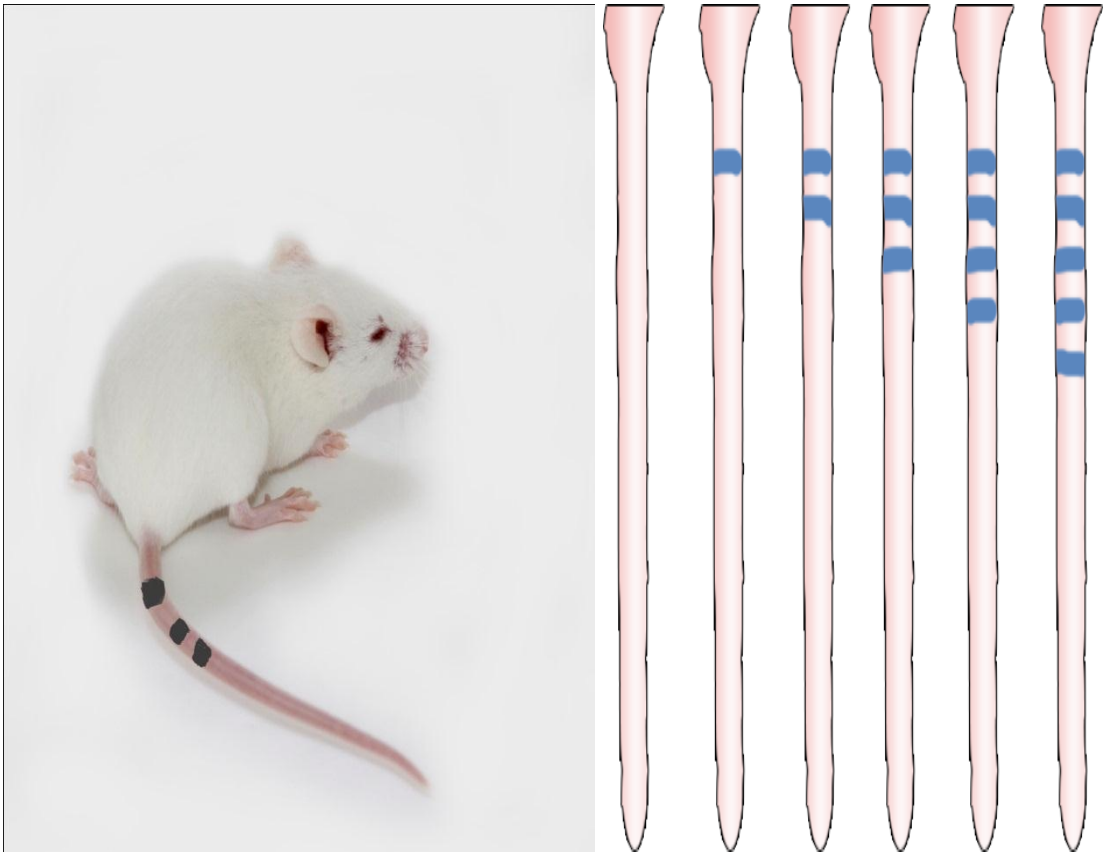


Figure 3.3: Identification of test animals for analgesic property screening

3.3.4. Animal

For the experiment male Swiss albino mice of 3 - 4 weeks of age, weighing between 20 - 25 gm, were collected from the laboratoro of Jahangirnagar University. Animals were kept in standard environmental conditions and had free access to feed and water.

Figure 3.4: Swiss Albino Mouse

3.3.5. Preparation of test material

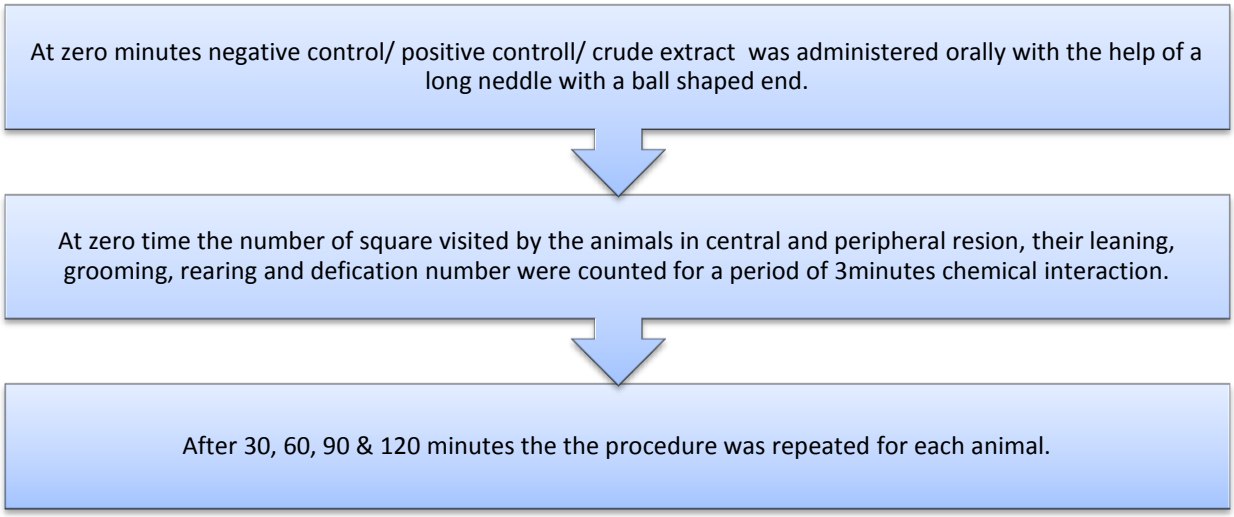
In order to administer the crude extract of Dichloromethane at dose 200 & 400 mg/kg body weight of mice. The extract was collect by calculating of mice weight & was triturated in unidirectional way by the addition of 3 ml of distilled water. For proper mixing, small amount of suspending agent CMC was slowly added. The final volume of the suspension was made 1.5 ml. The final volume of the suspension was made 1.5 ml. To stabilize the suspension it was stirred well. For the preparation of positive control group (5 mg/kg) Diazepam is taken & a suspension of 1.5 ml is made.

3.3.6 Open field test

This experiment was carried out as described by Gupta (Gupta et al., 1971). The animals were divided into control and test groups containing 5 mice each. The test group received *D. spicata* extract at the doses of 200 and 400 mg/kg body weight orally whereas the negative control group received vehicle (CMC in water) & positive control group received Diazepam (1mg/kg).The floor of an open field of half square meter was divided

into a series of squares each alternatively colored black and white. The apparatus had a wall of 40 cm height. The number of squares visited by the animals was counted for 3 min at 0, 30, 60, 90 & 120 min after oral administration of the test drugs. Then measure the behaviors' Line crossing, Center square, entries, Center square duration, Rearing, Stretch attend postures, Grooming, Freezing, Urination, and Defecation.

Figure 3.5: Intraperitoneal Injection of Diazepam in mouse



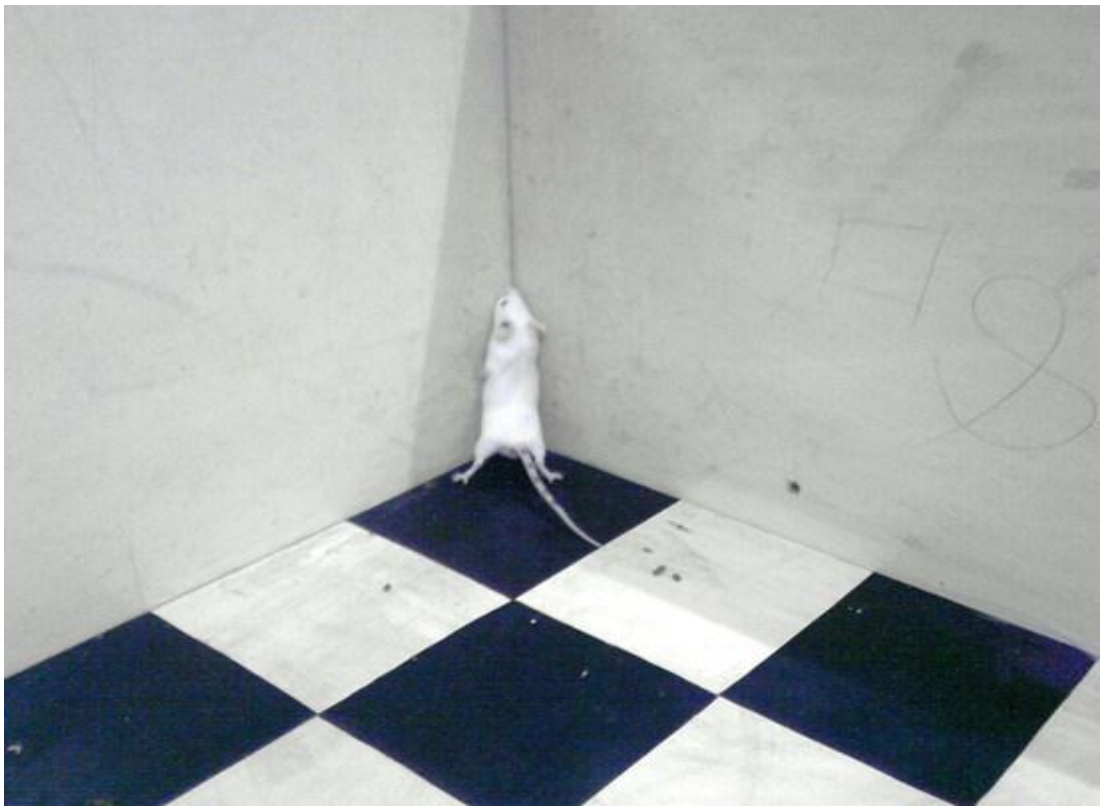


Figure 3.6: A leaning by a mouse during Open Field test

Some parameters of open field tests are described below-

- **Central locomotion count:** Frequency with which rodent entered center square (9 units) with all four paws and the rodent crossed a grid line with all four paws.
- **Center Square Duration:** Duration of time the mice spent in the central square.
- **Peripheral locomotion count:** Frequency with which rodent leaves center square and enters the peripheral square with all four paws and the rodent crossed a grid line with all four paws.
- **Leaning:** Frequency with which the rodent stood on their hind legs with the support of wall in the field.
- **Rearing:** Frequency with which the rodent stood on their hind legs with the support of wall in the field. This behavior shows increased exploratory behavior.
- **Defecation:** number of fecal body produced.

- **Urination:** number of puddles or streaks of urine.
- **Stretch Attend Postures:** Frequency with which the animal demonstrated forward elongation of the head and shoulders followed by retraction to the original position.
- **Grooming:** Duration of time the animal spent licking or scratching itself while stationary.
- **Freezing:** Duration with which the mouse was completely stationary.

Chapter Four

RESULTS

4.1 CNS activity test of *Dracaena spicata* by Central Locomotion count

Table 4.1: Central locomotion count

Treatment	Dose	0 min	30 min	60 min	90 min	120 min
Positive control (Diazepam)	1 mg/ kg	7.00± 3.36	2.50± 0.28	2.25± 0.25	2.75± 0.75	6.00± 2.12
Negative control (1% CMC)	10 ml/ kg	2.00± 0.00	2.50± 0.50	4.75± 1.70	4.75± 0.62	5.50± 1.84
DCM extract of *D. spicata*	200 mg/kg	2.00± 0.00	2.50± 0.28	5.00± 1.08	5.00± 0.70	4.75± 0.75
DCM extract of *D. spicata*	400 mg/kg	5.50± 1.32	3.25± 0.94	3.00± 0.40	4.50± 0.64	4.25± 0.85

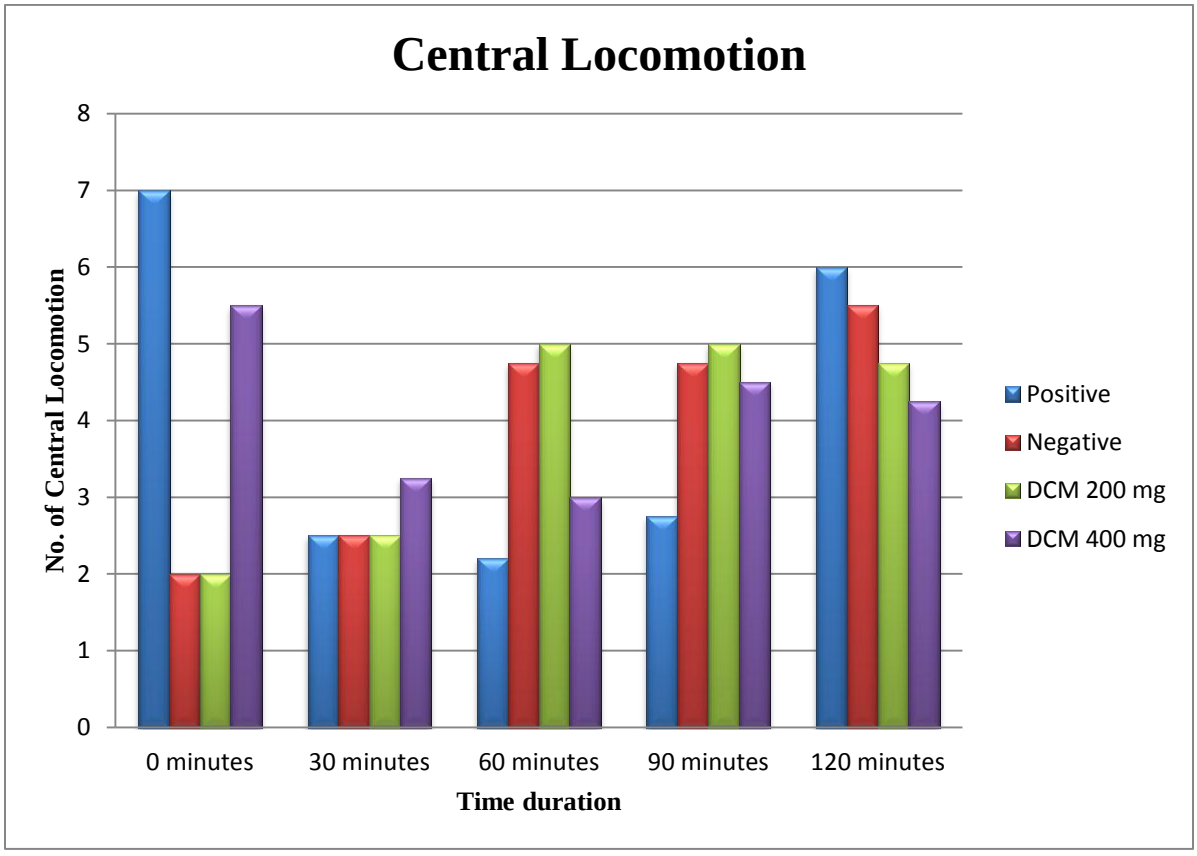


Figure 4.1: Central locomotion count

From this chart we found that central locomotion count for DCM extract of *D. spicata* (200 & 400 mg) increased as the time proceeded.

4.2 CNS activity test of *Dracaena spicata* by Peripheral Locomotion count

Table 4.2: Peripheral locomotion count

Treatment	Dose	0 min	30 min	60 min	90 min	120 min
Positive control (Diazepam)	1 mg/ kg	158.25± 17.54	72.00± 2.12	41.75± 11.68	15.00± 6.94	45.00± 21.62
Negative control (1% CMC)	10 ml/ kg	112.50± 2.59	83.75± 7.04	51.00± 12.68	9.50± 5.85	20.75± 15.09
DCM extract of *D. spicata*	200 mg/kg	124.00± 4.26	80.00± 18.76	13.00± 4.02	32.00± 18.51	13.25± 2.92
DCM extract of *D. spicata*	400 mg/kg	110.00± 9.02	85.25± 8.67	17.00± 4.14	21.75± 5.57	17.50± 9.91

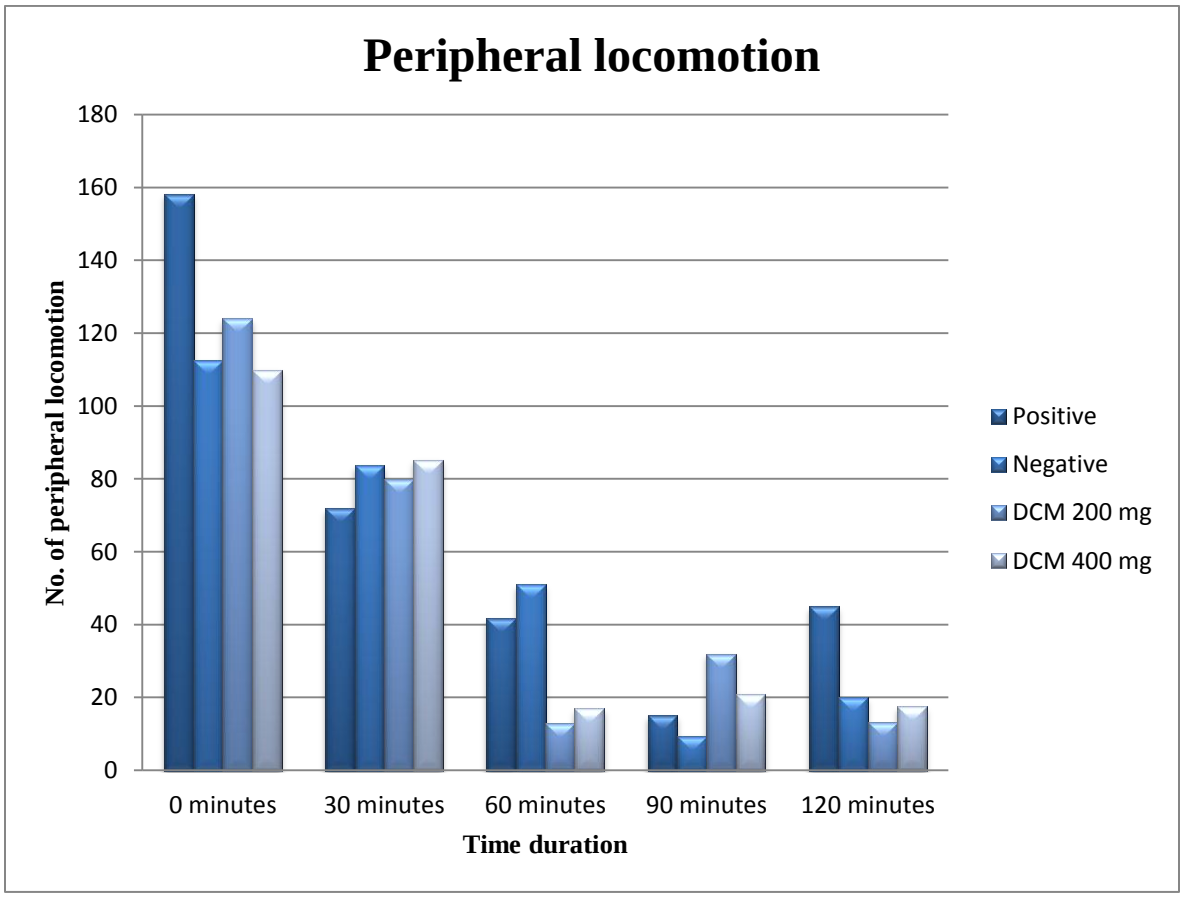


Figure 4.2: Peripheral locomotion count

From this chart we found that Peripheral locomotion count for DCM extract of *D. spicata* (200 & 400 mg) decreased as the time proceeded.

4.3 CNS activity test of *Dracaena spicata* by Leaning count

Table 4.3: Leaning count

Treatment	Dose	0 min	30 min	60 min	90 min	120 min
Positive control (Diazepam)	1 mg/ kg	10.00± 2.04	3.25± 0.62	1.75± 0.85	0.00± 0.00	0.00± 0.00
Negative control (1% CMC)	10 ml/ kg	12.50± 3.09	16.25± 3.40	13.50± 1.25	6.25± 2.17	2.75± 2.42
DCM extract of *D. spicata*	200 mg/kg	4.75± 0.85	9.25± 2.98	3.75± 1.43	2.50± 0.64	2.50± 0.50
DCM extract of *D. spicata*	400 mg/kg	10.50± 0.50	11.00± 2.48	3.75±1.43	3.00± 0.81	0.75± 0.75

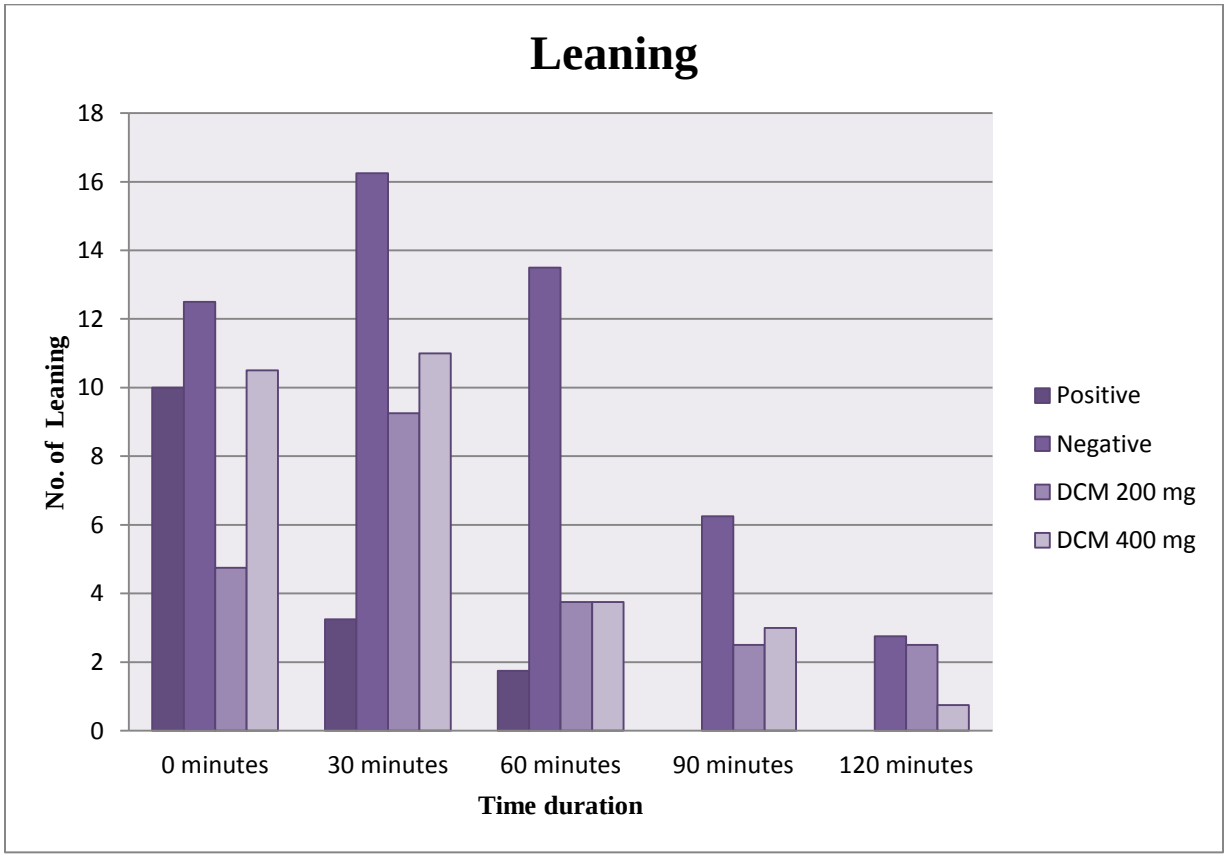


Figure 4.3: Leaning count

From this chart we found that leaning count for DCM extract of *D. spicata* (200 & 400 mg) decreased as the time proceeded.

4.4 CNS activity test of *Dracaena spicata* by Grooming count

Table 4.4: Grooming count

Treatment	Dose	**0 min**	**30 min**	**60 min**	**90 min**	**120 min**
Positive control (Diazepam)	1mg/ kg	1.75± 0.75	3.25± 0.85	0.50± 0.28	2.75± 0.75	0.00± 0.00
Negative control (1% CMC)	10ml/ kg	2.00± 1.08	5.75± 1.49	3.25± 1.10	5.00± 1.58	3.25± 0.47
DCM extract of *D. spicata*	200mg/kg	3.50± 1.84	4.25± 1.10	5.25± 1.60	5.50± 0.28	12.25± 1.84
DCM extract of *D. spicata*	400mg/kg	4.25± 1.10	2.50± 0.50	4.00± 2.16	9.00± 6.35	5.50± 2.62

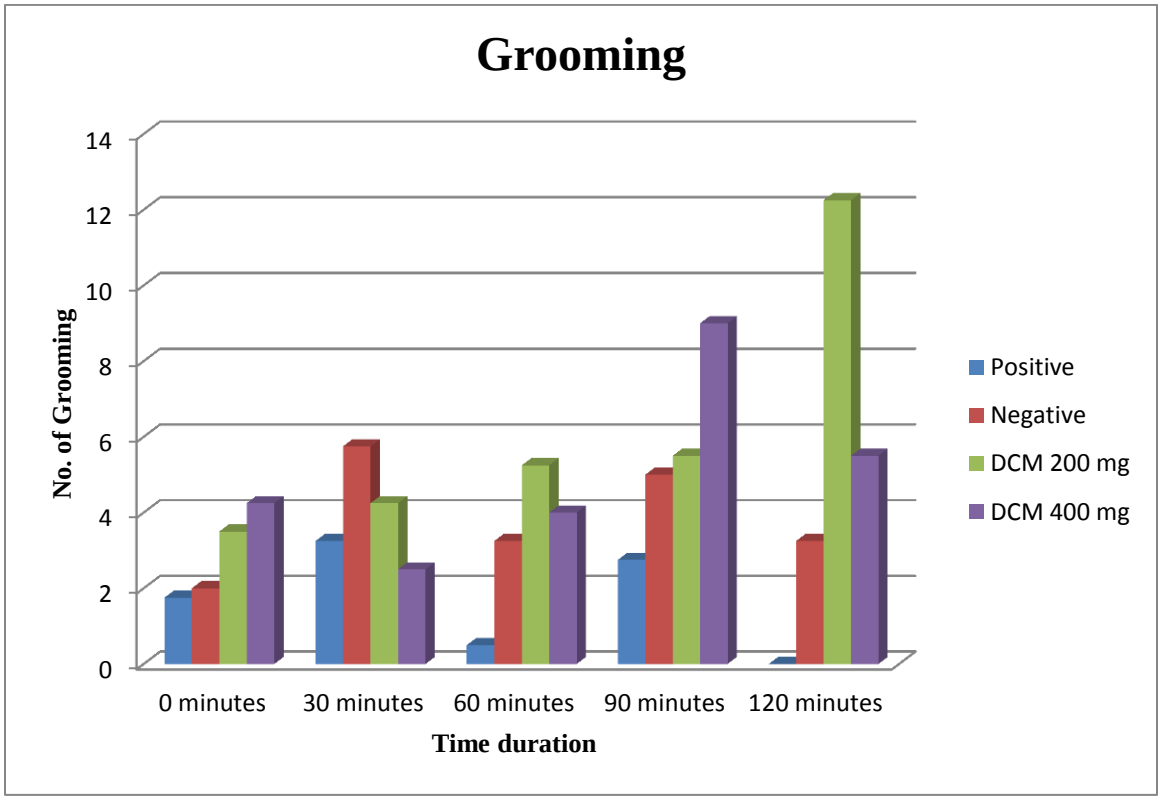


Figure 4.4: Grooming count

From this chart we found that grooming count for DCM extract of *D. spicata* (200 & 400 mg) increase as the time proceeded.

4.5 CNS activity test of *Dracaena spicata* by Defecation count

Table 4.5: Defecation count

Treatment	Dose	0 min	30 min	60 min	90 min	120 min
Positive control (Diazepam)	1 mg/ kg	1.50± 0.64	1.00± 0.57	0.0± 0.00	0.50 ± 0.28	0.50± 0.28
Negative control (1% CMC)	10 ml/kg	1.75± 0.47	1.50± 0.64	0.75± 0.25	1.00 ± 0.70	0.75± 0.25
DCM extract of *D. spicata*	200mg/kg	1.25± 0.75	1.25± 0.47	0.50± 0.28	0.25 ± 0.25	1.00± 0.40
DCM extract of *D. spicata*	400mg/kg	1.25± 0.25	0.50± 0.28	0.50± 0.28	0.75 ± 0.25	0.25± 0.25

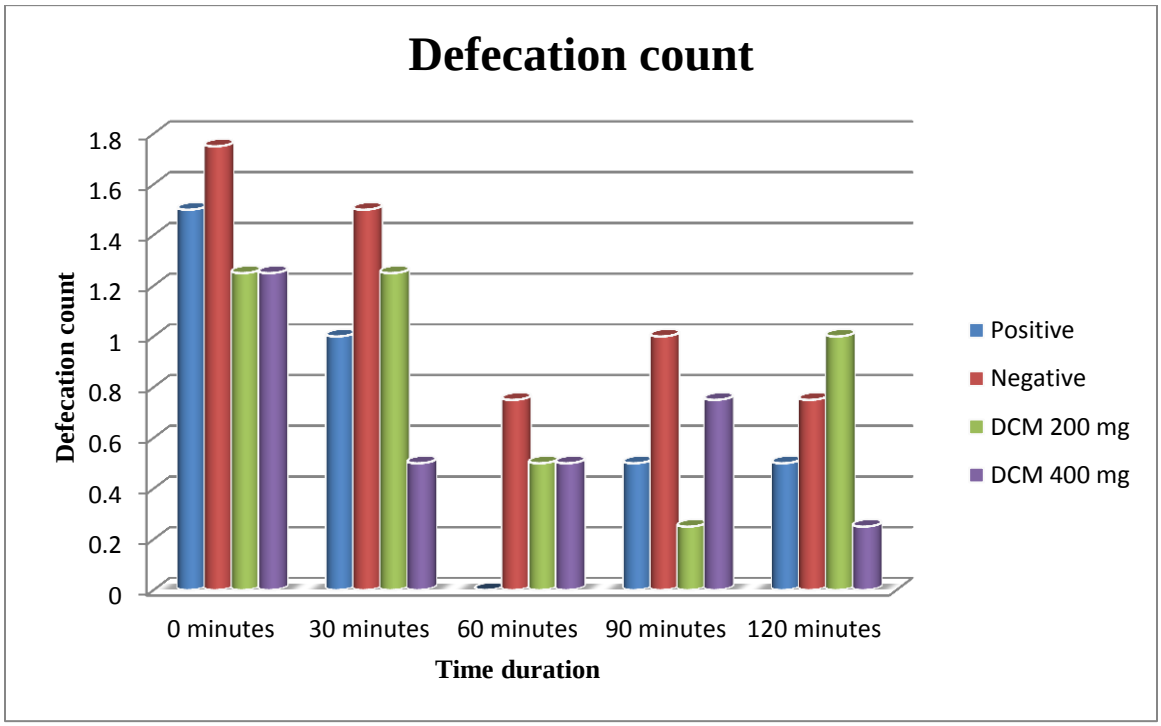


Figure 4.5: Defecation count

From this chart we found that defecation count for DCM extract of *D. spicata* (200 & 400 mg) decrease as the time proceeded.

Chapter Five

DISCUSSION AND CONCLUSION

Discussion

The plant *Dracaena spicata* has been used for the general promotion of health and longevity by Asian tribal (specially Chakma, Marma and Tanchunga). The most important step in evaluating drug action on CNS is to observe its effect on locomotor activity of the animal. The locomotion activity was tested by DCM extract of *Dracaena spicata*. The locomotor activity was evaluated by open field method where mice were treated with positive control test with Diazepam, negative control test with 1% Carboxy methyl cellulose (CMC), and the 200 mg and 400 mg of DCM extract of *Dracaena spicata.* The result showed the 200 mg and 400 mg of DCM extract of *Dracaena spicata* causes sedative effect, reduction in spontaneous motor activity, exploratory behaviour and motor coordination. The central locomotion count, peripheral locomotion count, leaning count, grooming count, and defecation count data supports the reduction of motor activity in mice.

According to a previous study, CNS depressant activity of Ethanol extract of *Achyranthes aspera Linn.* (EEAA) was evaluated by open field test, which has clearly demonstrated the CNS depressant activity evidenced by decreased fall off time. Another important step in evaluating CNS drug action is to observe its effect on locomotor activity of the animal. The activity is a measure of the level of excitability of the CNS, and decreased activity results from CNS depression. The extract significantly decreased the locomotor activity as observed in the results of the actophotometer test (Uma *et al.*, 2011).

From the table 4.1 we found that, central locomotion count for DCM extract of *D. spicata* (200 & 400 mg/kg) increased as the time proceeded it was due to the sedative effect and reduction in spontaneous locomotion. For, DCM extract of *D. spicata* 200 mg/kg the central locomotion was started from 2.00± 0.00 at 0 minute and ended in 4.75± 0.75 at 120 minutes.

From the table 4.2 we found that, peripheral locomotion count for DCM extract of *D. spicata* (200 & 400 mg/kg) decreased as the time proceeded it is due to the reduction in spontaneous locomotion. For, DCM extract of *D. spicata* 200 mg/kg the peripheral locomotion was started from 124.00± 4.26 at 0 minute and ended in 13.25± 2.92 at 120

minutes and for 400 mg/kg doses the peripheral locomotion was started from 110.00± 9.02 at 0 minute and ended in 17.50± 9.91.

From our study, table 4.3 described that, leaning count for DCM extract of *D. spicata* (200 & 400 mg/kg) decreased as the time proceeded it was due to the sedative effect and reduction in spontaneous locomotion. For, DCM extract of *D. spicata* 200 mg/kg the leaning count was started from 4.75± 0.85 at 0 minute and ended in 2.50± 0.50 at 120 minutes and for 400 mg/kg doses leaning count reduces from 10.50± 0.05 at 0 minute to 0.75±0.75.

Table 4.4 described that, grooming count for DCM extract of *D. spicata* (200 & 400 mg/kg) increased as the time proceeded it was due to the sedative effect and reduction in spontaneous locomotion. For, DCM extract of *D. spicata* 200 mg/kg the grooming count was increased from 3.50± 1.84 at 0 minute to 12.25± 1.84 at 120 minutes and for 400 mg/kg doses grooming count increased from 4.25± 1.10 at 0 minute to 5.50±2.62.

From our study, table 4.5 described that, defecation count for DCM extract of *D. spicata* (200 & 400 mg/kg) decreased as the time proceeded it was due to the sedative effect. For, DCM extract of *D. spicata* 200 mg/kg the leaning count was started from 1.25± 0.75 at 0 minute and ended in 1.00± 040 at 120 minutes and for 400 mg/kg doses leaning count reduces from 1.25± 0.25 at 0 minute to 0.25±0.25.

Conclusion

From the result of my study, it can be concluded that, using in vivo experiments established that dichloromethane extract of *Dracaena spicata* inhibits the locomotion in mice. It can be used as a depressant medication. For the plant physiologist, work on medicinal plants opens up a wide range of research possibilities, and plant physiological studies would indeed have a major role to play in this burgeoning field. With only a few exceptions, many widely used medicinal plants have not received the extensive plant physiological characterization received by food crops or model plant systems. . In our experiment it shows very positive result for CNS locomotor activity with open field method. The locomotor activity of the plant extracts were tested against five perameters by using positive and negative control at different concentrations of the extracts of *Dracaena spicata* to understand the most effective activity. Still there are plenty of scopes to establish a variety of properties which are significantly beneficial to mankind.

Chapter Six

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