Removal of Crystal Violet Dye from Wastewater using Activated Charcoal

(Project code : BSCH 358)

A

Report submitted in partial fulfillment of the requirement for the degree of

Bachelor of Science in Chemistry(Honours)

Submitted to: Dr. Neeraj Kumari

Assistant professor

SBAS-Chemistry

Submitted by: Anjali Chauhan

Roll no. : 1903100001

B.Sc. (H) Chemistry

SCHOOL OF BASIC AND APPLIED SCIENCES

K.R. MANGALAM UNIVERSITY

SOHNA ROAD, GURGAON

July , 2022

DECLARATION

I, **Anjali Chauhan,** a bonafide student of B.Sc (H) Chemistry of K. R. Mangalam University, Gurgaon would like to declare that the dissertation entitled "**Removal of Crystal Violet Dye from Wastewater using Activated Charcoal**" submitted by me in partial fulfillment of the requirement for the award of the degree of Bachelor of Science in Chemistry (Honours) is my original work.

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ACKNOWLEDGEMENT

A work is never successfully completed without the assistance and guidance from appropriate persons. So, now it is a time to express my sincere gratitude towards all persons who have helped me to complete my work.

First and foremost, I would like to express my deep sense of gratitude and sincere thanks to my supervisor **Dr. Neeraj Kumari** for her guidance, endeavour throughout the course which helped me in timely completion of this work under whose guidance this task has become reality. I am extremely grateful to her for taking pains in checking my dissertation and giving me valuable suggestions, help and encouragement, without her help it would have been indispensable to accomplish my work.

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am also highly grateful to the Laboratory Assistant Mr. Sunil Kumar for their help in ompleting my work in time.

n no way, I am thankful to my classmates and all my friends.

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Nitrogen based Heterocycles as an Anti-cancer agent

(Project Code: BSCH358)

A

Report submitted to partially fulfilment of the
Requirement for the degree of
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I, Chhavi Kaushik, a bona-fide student of B.Sc. Chemistry of K. R. Mangalam University, Sohna, Gurugram would like to declare that the dissertation entitled "**Nitrogen based Heterocyclic Compound as an Anti-cancer agent**" submitted by me in partial fulfilment of the requirement for the award of the degree of Bachelor of Science in Chemistry is our original work.

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ACKNOWLEDGEMENT

A work is never successful completed without the assistance and guidance from appropriate person. So, it is time to express our sincere gratitude toward all persons who have helped us to complete our work.

First and foremost, we would like to express our deep sense of gratitude and sincere thanks to our supervisor **Dr. Chandra Mohan** for his guidance, endeavour throughout the course which helped us in timely completion of this work.

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INDEX

Removal of Crystal Violet Dye from Water bodies using Activated charcoal as an Adsorbent

(Project Code: BSCH358)

A
Report submitted in partial fulfillment of the
Requirement for the degree of
Bachelor of Science in Chemistry (Honors)

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This is to certify that the dissertation entitled **"Removal of Crystal Violet Dye from Water bodies using Activated charcoal as an Adsorbent"** is a bonafide record of the work done byNishu Yadav, under my supervision and submitted to K. R. Mangalam University in partial fulfillment for the award of the degree of Bachelor of Science in Chemistry (Honours).

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ACKNOWLEDGEMENT

A work is never successfully completed without the assistance and guidance from appropriate persons. So, now it is a time to express my sincere gratitude towards all persons who have helped me to complete my work.

First and foremost, I would like to express my deep sense of gratitude and sincere thanks to my supervisor **Dr. Neeraj Kumari** for her guidance, endeavour throughout the course which helped me in timely completion of this work under whose guidance this task has become reality. I am extremely grateful to her for taking pains in checking my dissertation and giving me valuable suggestions, help and encouragement, without her help it would have been indispensable to accomplish my work.

I am highly obliged to **Prof. (Dr.) Meena Bhandari**, Dean SBAS, for giving me this opportunity and the teaching and Lab staff of the Department for providing necessary facilities.

I am also highly grateful to the Laboratory Assistant **Mr.Sunil Kumar** for their help in completing my work in time.

In no way, I am thankful to my classmates and all my friends.

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CONTENTS

EXTRACTION OF PHYTOCHEMICALS FOR ANTIOXIDANT AND ANTI-INFLAMMATORY USAGE: A REVIEW

(Project CodeBSCH358A)

A PROJECT REPORT

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This is to certify that the dissertation entitled "**Extraction of Phytochemicals for Antioxidant and Anti-inflammatory Usage: A Review**" is a bonafide record of the work done by Ms. Priya Garg (Roll No.1903100002) and under my supervision and submitted to K. R. Mangalam University in partial fulfillment for the award of the degree of Bachelor of Science in Chemistry.

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A work is never successfully completed without the assistance and guidance from appropriate persons. So, now it is a time to express my sincere gratitude towards all persons who have helped me to complete my work.

First and foremost, I would like to express my deep sense of gratitude and sincere thanks to our supervisor Dean SBAS, Dr. Meena Bhandari for her guidance, Endeavour throughout the course which helped me in timely completion of this Work under whose guidance this task has become reality. I am extremely grateful to her for taking pains in checking our dissertation and giving me valuable Suggestions help and encouragement, without her it would have been Indispensable to accomplish our work.

We are highly obliged to **Dr Meena Bhandari,** Dean SBAS, for giving me this opportunity and the teaching and Lab staff of the Department for providing necessary facilities.

We are also highly grateful to the **Laboratory Assistant Mr. Sunil Kumar** for their Help in completing my work in time.

In no way, I am thankful to our classmates and all my friends.

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Utilisation of fly ash in Wastewater treatment

(Project Code: BSCH 358A)

A

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I, Shreya verma , a bonafide student of B.Sc (H) Chemistry of K. R. Mangalam University, Gurgaon would like to declare that the dissertation entitled **"Utilisation of fly ash in Wastewater treatment"** submitted by me in partial fulfillment of the requirement for the award of the degree of Bachelor of Science in Chemistry (Honours)is my original work.

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First and foremost, I would like to express my deep sense of gratitude and sincere thanks to my supervisorDr. Seema Raj for her guidance, endeavour throughout the course which helped me in timely completion of this work under whose guidance this task has become reality. I am extremely grateful to her for taking pains in checking my dissertation and giving me valuable suggestions, help and encouragement, without her help it would have been indispensable to accomplish my work.

I am highly obliged to Prof. (Dr.) **Meena Bhandari**, Dean SBAS,for giving me this opportunity and the teaching and Lab staff of the Department for providing necessary facilities.

In no way, I am thankful to my classmatesand all my friends.

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A REVIEW ON EFFECT OF NATURAL AND SYNTHETIC DYE ON DIFFRENT TYPES OF FABRICS

(Project Code: BSCH 358)

A Report submitted in partial fulfilment of the requirement for the degree of Bachelor of Science in Chemistry (Honours)

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DECLARATION

I, **Anshul** , a bona fide student of B.Sc (H) Chemistry of K. R. Mangalam University, Gurugram would like to declare that the dissertation entitled "**A REVIEW ON EFFECT OF NATURAL AND SYNTHETIC DYE ON DIFFRENT TYPES OF FABRICS**" submitted by me in partial fulfilment of the requirement for the award of the degree of Bachelor bona fide of Science in Chemistry (Honours)is my original work.

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Date: June 5th,2018

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ACKNOWLEDGEMENT

A work is never successfully completed without the assistance and guidance from appropriate persons. So, now it is a time to express my sincere gratitude towards all persons who have helped me to complete my work.

First and foremost, I would like to express my deep sense of gratitude and sincere thanks to my supervisor Dr. Sangeeta kanakraj for her guidance, endeavour throughout the course which helped me in timely completion of this work under whose guidance this task has become reality. I am extremely grateful to her for taking pains in checking my dissertation and giving me valuable suggestions, help and encouragement, without her help it would have been indispensable to accomplish my work.

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In no way, I am thankful to my classmates and all my friends.

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CONTENTS

A REVIEW ON EFFECT OF NATURAL AND SYNTHETIC DYE ON DIFFERENT TYPES OF FABRICS

INTRODUCTION

A dye is a coloured substance that has an affinity to the substrate to which it is being applied. The dye is generally applied in an aqueous solution, and may require a mordant to improve the fastness of the dye on the fibre.(Booth, Gerald (2000). *Dyes, General Survey*. Wiley-VCH.)Both dyes and pigments are colored, because they absorb only some wavelengths of visible light. Dyes are usually soluble in water whereas pigments are insoluble. Some dyes can be rendered insoluble with the addition of salt to produce a lake pigment. Dyes are coloured compounds used for imparting colour to the textiles, silk, wool, food stuffs, etc. A dye is an organic compound which can absorb some band of the light falling on it. The rest of the light is reflected. The reflected light will eventually have colour complementary to that of the absorbed.[1] A dye may absorb all visible light except one band that may be reflected. The dye will then have colour of the reflected band.

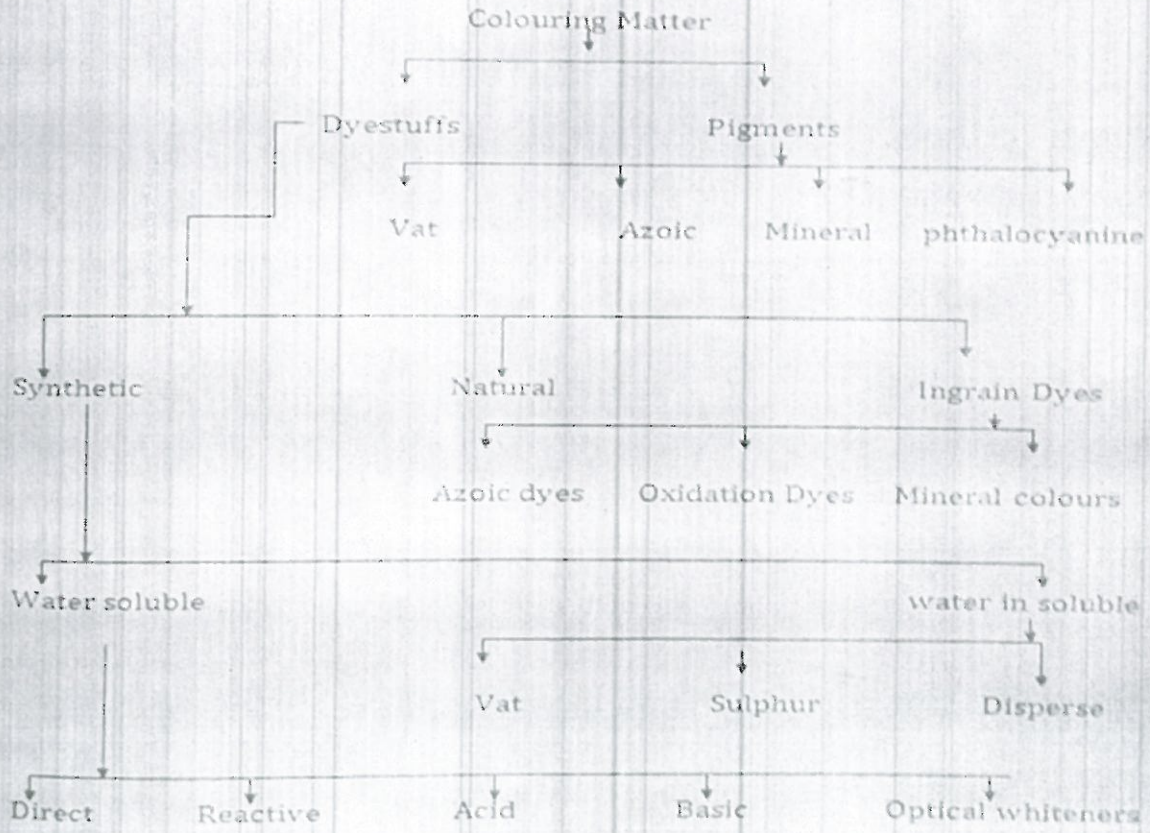

Fig.

Classification of Dyes Based on Application

1. ACID DYES
2. BASIC DYES
3. DIRECT DYES
4. MORDANT DYES
5. VAT DYES
6 REACTIVE DYES
7 DISPERSE DYES

Chemistry of natural and synthetic dye:

Natural Dye:Nature is full of beautiful colours that attract human attention. Natural dyes have been used since ancient times for dyeing of body, food, walls of caves, textiles, leather and objects of daily use. A large number of plant, animal, insect or mineral sources have been identified for extraction of dyes and pigments. The art of dyeing is as old as human civilisation. Dyed textiles found during archaeological excavations at different places all over the world provide evidence to the practice of dyeing in ancient civilisations. Earliest written record of the use of dyestuffs in China comes from year 2,600 BC. The use of cochineal as a textile and paint dyestuff in Mexico and Peru dates back almost 3,000 years. Alizarin, purpurin and indigo were identified in the Late Bronze Age on textiles found in Chinese Yanghai. Prehistoric discoveries of textiles in Europe document the use of alizarin and purpurin from the 4th century BC. In 55 BC Romans found painted people "picti" in Gaul dyeing themselves with woad (same chemical content of colour as indigo). Start of 16th century was the time when France, Holland and Germany began the cultivation of dye plants as an industry. Natural dyes were used for colouring of textiles till the 19th century when synthetic dyes pushed them out. It is only since few decades ago that textile industries have turned to synthetic dyes, but they were so successful that natural dyes currently account only for about one percent of the total amount of dyes used worldwide. And this is so even thought that the use of natural dyes has a strong tradition in many countries (e.g. India, Turkey, Mexico, Morocco or countries of West Africa).

The majority of natural dyes are derived from plant sources; roots, berries, bark, leaves, and wood, fungi, and lichens. Textile dyeing dates back to the Neolithic period. Throughout history, people have dyed their textiles using common, locally available materials. Scarce dyestuffs that produced brilliant and permanent colors such as the natural invertebrate dyes Tyrian purple and crimson kermes were highly prized luxury items in the ancient and medieval world. Plant-based dyes such as woad, indigo, saffron, and madder were raised commercially and were important trade goods in the economies of Asia and Europe. Across Asia and Africa, patterned fabrics were produced using resist dyeing techniques to control the absorption of color in piece-dyed cloth. Dyes from the New World such as cochineal and logwood were brought to Europe by the Spanish treasure fleets, and the dyestuffs of Europe were carried by colonists to America.

Dyed flax fibers have been found in the Republic of Georgia in a prehistoric cave dated to 36,000 BP.Archaeological evidence shows that, particularly in India and Phoenicia, dyeing has been widely carried out for over 5,000 years. The dyes were obtained from animal, vegetable or mineral origin, with none to very little processing. By far the greatest source of dyes has been from the plant kingdom, notably roots, berries, bark, leaves and wood, but only a few have ever been used on a commercial scale.

The discovery of man-made synthetic dyes late in the 19th century ended the large-scale market for natural dyes.

Synthetic dye: Synthetic dyes are man-made. These dyes are made from petroleum, sometimes in combination with mineral-derived components.

The first human-made organicaniline dye, mauveine, was discovered serendipitously by William Henry Perkin in 1856, the result of a failed attempt at the total synthesis of quinine. Other aniline dyes followed, such as fuchsine, safranine, and induline. Many thousands of synthetic dyes have since been prepared.Have you ever wondered what gives the cloths your the jazzy colours, what gives the printer you use with your desktop the multicoloured printing. The answer to all this lies in the synthetic dyes. No doubt Synthetic dyes today has evolved into a multi billion dollar industry. Almost all the colours that you see today are Synthetic dyes. They are widely used for dyeing and printing in a broad range of industries. There are over 10,000 dyes, and the annual production globally, exceeds over 7 × 105 metric tones. They have become indispensable to the dyeing units specifically to textile units. It is a fact that fashion would not have so much vibrancy in terms of colours and generated so much

hype and enthusiasm, were it not for the synthetic dyes. The synthetic dyes, can be named according to the chemical structure of their particular chromophoric group. For example, diphenylmethane derivatives, triphenylmethane compounds oxazine compounds, xanthene compounds, Azo dyes to name a few. Out of these Azo Dyes are one of the most popular varieties of synthetic dyes. Today it is being used up to 90% in the dyeing units, as they are versatile and simple to synthesize. Most of the synthetic dyes with a few exception are aromatic organic compounds which can be divided into groups like non-ionic (oil soluble), cationic, and anionic. A typical example of Cationic dye is Methyl violet, while Azo dyes are anionic dyes.Synthetic dyes can be primarily made from aniline or chrome. Aniline dyes are obtained from chemical processes and is defined as a class of synthetic, organic dyes. Today the term dye is almost synonymous with any reference of synthetic organic dye or pigment. Aniline dyes are classified based on their degree of brightness or according to light fastness. They are also called coal tar dyes, because the synthetic aniline dyes were made up of coal tar initially, but they faded easily when exposed to sun light. While Chromic dyes were color fast and non-corrosive.The synthetic dye industry arose directly from studies of coal tar. By 1850 coal tar was an industrial nuisance because only a fraction was utilized as wood preservative, road binder, and a source of the solvent naphtha. Fortunately, it attracted the attention of chemists as a source of new organic compounds, isolable by distillation. A leading researcher in this area, German chemist August Wilhelm von Hofmann, had been attracted to England in 1845 to direct the Royal College of Chemistry. In the following 20 years, he trained most of the chemists in the English dye industry, one of whom was Perkin, the discoverer of mauve. The success of mauve led to demands by English textile manufacturers for other new dyes. By trial and error, reactions of coal tar compounds were found to yield useful dyes. However, Hofmann became disenchanted with this purely empirical approach, insisting that it was more important to understand the chemistry than to proceed blindly. In 1865 he returned to Germany, and by 1875 most of his students had been lured to German industrial positions. By 1900 more than 50 compounds had been isolated from coal tar, many of which were used in the developing German chemical industry. By 1914 the synthetic dye industry was firmly established in Germany, where 90 percent of the world's dyes were produced.

Advances in the understanding of chemical structure, combined with strong industrial-academic interactions and favourable governmental practices, gave a setting well-suited for systematic development based on solid scientific foundations. Only a few Swiss firms and one in England survived the strong competition generated by the vigorous activity in the German dye industry.

Synthesise of Microspheres with different cross-linking agents for controlled drug release

(Project Code: BSCH 358)

A

Report submitted in partial fulfillment of the requirement for the degree of

Bachelor of Science in Chemistry (Honours)

Submitted to:
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I,**Divya**, a bonafide student of B.Sc. (H) Chemistry of K. R. Mangalam University, Gurgaon would like to declare that the dissertation entitled **"Synthesise of Microspheres with different cross-linking agents for controlled drug release"**submitted by me in partial fulfillment of the requirement for the award of the degree of Bachelor of Science in Chemistry (Honours)is my original work.

Place: Sohna

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A work is never successfully completed without the assistance and guidance from appropriate persons. So, now it is a time to express my sincere gratitude towards all persons who have helped me to complete my work.

First and foremost, I would like to express my deep sense of gratitude and sincere thanks to my supervisor **Dr. Romila Manchandafor** her guidance, endeavour throughout the course which helped me in timely completion of this work under whose guidance this task has become reality. I am extremely grateful to her for taking pains in checking my dissertation and giving me valuable suggestions, help and encouragement, without her help it would have been indispensable to accomplish my work. I would also like to show gratitude to **Assistant Professor Mr. Sabir Alam** for sharing his pearls of wisdom with me during the course of this research.

I am highly obliged to **Prof. (Dr.) Meena Bhandari**, Dean SBAS, for giving me this opportunity and the teaching and Lab staff of the Department for providing necessary facilities.

I am also highly grateful to the **Laboratory Assistant Mr.Sunil Kumar** for their help in completing my work in time.

In no way, I am thankful to my classmates and all my friends.

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Introduction

Malignancy is a gathering of infections including strange cell development with the possibility to attack or spread to different parts of the body. These stand out from begnin tumours, which don't spread to different parts of the body. Tumor starts from DNA transformations that influence cell cycle procedures and cell development, causing uncontrolled cell multiplication, disabilities in apoptosis, intrusiveness, and metastasis. Conventional modes of treating tumour can be dealt with by surgery, chemotherapy, radiation treatment, hormonal treatment, directed treatment and manufactured lethality. The decision of treatment relies on the area and grade of the tumour and the phase of the malady, and also the general condition of the patient (performance status). Various test tumour medications are likewise being worked on. Under current assessments, two out of five individuals will have tumor sooner or later in their lifetime.

The main objective of oncology is to completely eradicate the tumor without harm to normal surrounding tissues. This can be proficient by surgery, yet the inclination of tumors to attack contiguous tissue or to spread to removed locales by minuscule metastasis regularly confines its viability; and chemotherapy and radiotherapy can negatively affect ordinary cells. Therefore, there is always a need to explore this area of research with nonnegligible antagonistic impacts having the key functional objectives which might be acknowledged. The main corrective expectation is to make handy objectives of treatment therapy that can likewise incorporate smothering the malignancy to a subclinical state and keeping up that state for quite a long time of good personal satisfaction, and palliative care without remedial goal (for cutting edge arrange metastatic diseases).

Since "growth" alludes to a class of diseases, it is improbable that there will ever be a solitary "cure for tumour" any more than there will be a solitary treatment for all irresistible diseases. Angiogenesis inhibitors were once thought to have potential as a "silver bullet" treatment appropriate to numerous kinds of malignancy, yet this has not been the situation in practice.

Recently, microsphere/nanotechnology innovation is the most common modality in malignancies. It encourages the oncologist to figure the system with most extreme helpful esteem and least or insignificant range reactions. A noteworthy disservice of anticancer medications is their absence of selectivity for tumor tissue alone, which causes serious reactions with dangerous side effects and results in low cure rates. Hence, it is exceptionally hard to target anomalous cells by the customary technique for the medication conveyance framework. In recent time micro/nanotechnology has been explored tremendously as carrier system which can be utilized for site-particular activity, without causing noteworthy side reactions on ordinary cells. This audit article depicts different microspheres/nanospheres that have been arranged or figured to abuse microsphere innovation for focused medication treatment in different diseases. We took a gander at the convenience of microspheres as an apparatus for cancer treatment.

The revelation and plan of novel polymers is essential keeping in mind the end goal to extend the conventional medication and meet the unique needs of medication formulators. In comparison to synthetic polymers, there are a few regular gums which are generally accessible in the tropics

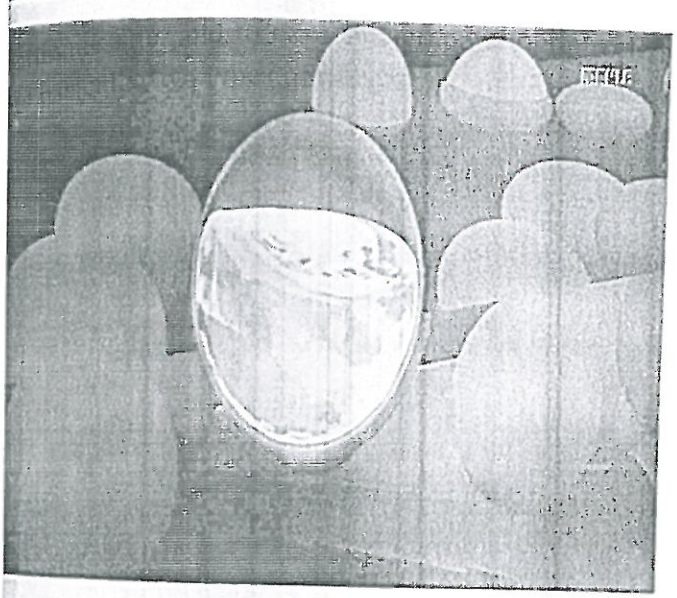
that are underutilized which could discover application in the pharmaceutical prerequisites of being non-harmful, steady, biodegradable, moderately modest and having an adaptable administrative issue. Likewise, their rich surface chemistry lends these gums in various modification which brings about extensive variety of application.

Microspheres are the spherical particles of size range 1-1000 µm. These are free flowing particle consisting proteins or synthetic polymer. They can increase the bioavailability of drug at a particular site, and to exploit therapeutic controlled release of a drug and drug targeting. There are basically two types of microspheres:

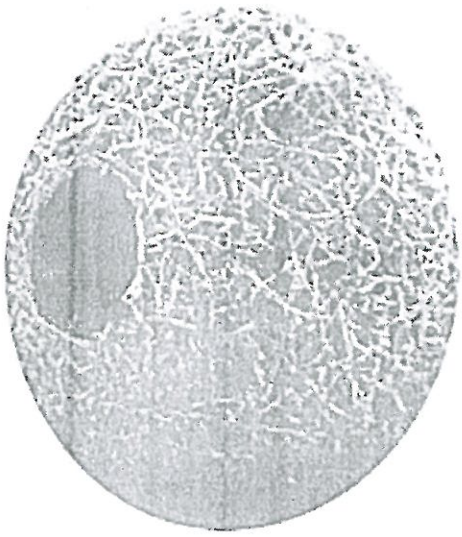
1. Microcapsules
2. Micromatrices

Microcapsules are those which contain the substance entrapped in a hollow capsules and micro matrices are those in which the entrapped substance is uniformly dispersed throughout the matrix of microsphere. These microspheres Incorporating the drug can control the release of drug potentially. They are made up of polymeric, waxy, or other protective materials, that is, biodegradable synthetic polymers and modified natural products.(1)

Microcapsules



Micromatrices



Different types of microspheres

Bioadhesive Microspheres

Adhesion can be defined as sticking of drug to the membrane by using the sticking property of the water-soluble polymers. Adhesion of drug delivery device to the mucosal membrane such as buccal, ocular, rectal, nasal etc. can be termed as bio adhesion. These kinds of

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microspheres exhibit a prolonged residence time at the site of application and causes intimate contact with the absorption site and produces better therapeutic action(2).Carrier technology offers an intelligent approach for drug delivery by coupling the drug to a carrier particle such as microspheres, nanospheres, liposomes, nanoparticles, etc., which modulates the release and absorption of the drug. Microspheres constitute an important part of these particulate drug delivery systems by virtue of their small size and efficient carrier capacity. (Patel J. Bioadhesion is a topic of current interest in the design of controlled or targeted drug delivery system)

2. Magnetic Microspheres

Magnetic drug transport technique is based on the fact that the drug can be either encapsulated into a magnetic microsphere or conjugated on the surface of the microsphere. The accumulation of the carrier at the target site allow them to deliver the drug locally(3). This type of delivery system is especially essential which limits the drug to only disease site. In this larger amount of freely circulating drug can be replaced by smaller amount of magnetically targeted drug. Magnetic carriers receive magnetic responses to a magnetic field from incorporated materials that are used for magnetic microspheres are chitosan, dextran etc.(4)The different type are Therapeutic magnetic microspheres are used to deliver chemotherapeutic agent to liver tumour. Drugs like proteins and peptides can also be targeted through this system.Diagnostic microspheres, utilized for imaging liver metastases and utilized to distinguish bowel loops from other abdominal structures by forming Nano size particles supramagnetic iron oxides.(5)

3. Floating Microspheres

In this type of microspheres, the bulk density is less than the gastric fluid so remains buoyant in stomach without influencing gastric discharging rate. The drug is discharged gradually at required rate, the system is observed to be floating on gastric content and increments gastric residency and build changes in plasma concentration. In addition, it diminishes the chances of dose dumping. It produces prolonged helpful impact and decrease the dosing frequency. Drug ketoprofen which is a one of the propionic acid class of nonsteroidal anti-inflammatory drugs (NSAID) with analgesic and antipyretic effects is given in the form of floating microspheres.(6)(7)

4. Radioactive Microspheres

Radio embolization therapy microspheres sized 10-30 nm are of larger than the diameter of the capillaries and gets tapped in first capillary bed when they come across. They are injected in the arteries that leads them to tumour of interest. It differs from drug delivery system, as radio activity is not released from microspheres but acts from within a radioisotope typical distance and the different kinds of radioactive microspheres are α emitters, β emitters, γ emitters.(8) These radiolabelled microspheres are very stable and have a proven efficacy in the field of primary as well as metastatic cancers. Radioactive microspheres can be selectively targeted to various tumors without undue radiation to the nontumorous tissues. The radioactive microspheres are injected to halt tumor growth via the blood supply, thereby enabling surgical removal once the tumor size decreases. This review provides an outlook to

Nitrogen based Heterocycles as an Anti-cancer agent

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A

Report submitted to partially fulfilment of the
Requirement for the degree of
Bachelor of Science in Chemistry

Submitted to:
Dr. Chandra Mohan
Assistant Professor

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JULY, 2022

DECLARATION

I, **Aarti Gangadhar Shinde**, a bona-fide student of B.Sc. Chemistry of K. R. Mangalam University, Sohna, Gurugram would like to declare that the dissertation entitled "**Nitrogen based Heterocyclic Compound as an Anti-cancer agent**" submitted by me in partial fulfilment of the requirement for the award of the degree of Bachelor of Science in Chemistry is our original work.

Place: Sohna

Date: July 11th, 2022

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CERTIFICATE

This is to certify that the dissertation entitled **"Nitrogen based Heterocyclic Compound as an Anti-cancer agent"** is a bonafide record of the work done by**Ms. Aarti Gangadhar Shinde(Roll no. 1903100008)** under my supervision and submitted to K. R. Mangalam University is partial fulfilment for the award of the degree of Bachelor of Science in Chemistry.

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INDEX