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DOCUMENTS

PROJECT/ FIELD WORK/ DISSERTATION

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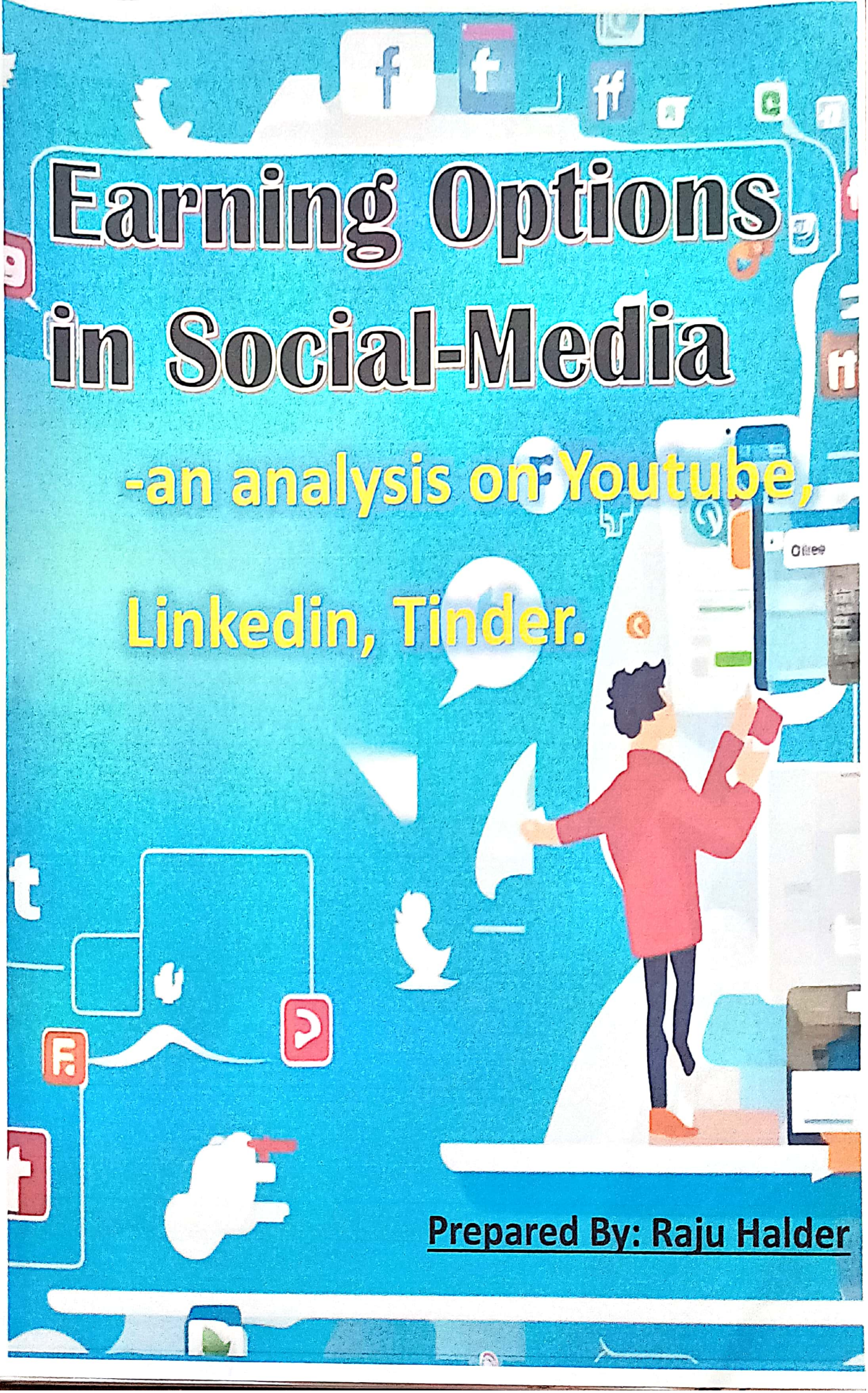
Department of Accountancy

Project

Earning Options in Social-Media

-an analysis on Youtube, Linkedin, Tinder.



Prepared By: Raju Halder

(Submitted for the Degree of B.Com Honours in Accounts & Finance under the University of Kalyani)

Title of the Project

Earning options in social media

-(an analysis on youtube, linkedin, tinder.)

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Any Project work cannot be completed without the support of a team or a group of persons. Although all the attention is received by the person whose name has been mentioned on it, there are a lot of persons who help in the preparation of such project and remain unmentioned. Such project can never be completed without them. So I would like to take the opportunity to thank all my supporters in the project report for their immense help and support.

I would like to thank all my friends who provided me essential data, graphs etcfor the project. Without their help the job could have never been successful. I would also like to thank my parents and relatives for their help in this project report.

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Supervisor's Certificate

This is to certify that "Mr. Raju Halder" a student of B.Com Honours in Accounting & Finance in Business of "Jangipur College" under the University of Kalyani has worked under my supervision and guidance for his project work and prepared a project Report with the title "Earning options in social media -(an analysis on youtube, linkedin, tinder.)" Which he has submitted, is his genuine and original work to the best of my knowledge.

Place: JANGIPUR

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Date: 13.07.2023

Annexure- IB

Student's Declaration

I hereby declare that the project work with the title **"Earning options in social media -(an analysis on youtube, linkedin, tinder.)"** submitted by me for the partial fulfillment of the degree of B.Com Honours in Accounting & Finance in Business under the University of Kalyani is my original work and has not been submitted earlier to any other University for the fulfillment of the requirement for any course of study.

I also declare that no chapter of this manuscript in whole or in part has been incorporated in this report from any others or by me. However, extracts of any literature which has been used for this report has been dully acknowledge providing details of such literature in the references.

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CHAPTER 1: INTRODUCTION

1.1 Introduction:

Social media is an online platform where users connect, share content, and interact with others globally. It enables people to share ideas, photos, videos, and thoughts instantly. Popular platforms include Facebook, Twitter, Instagram, and LinkedIn. Social media has transformed communication, networking, and information dissemination in today's digitally connected world.

1.2 Rationale :

with increase of uses of internet, day by day usage of social media is increasing in a tremendous way. People became dependent on social media for communication, entertainment, education, information, etc. It creates a virtual world with different types of jobs options. So this project is an attempt to indentify some of them.

1.3 Survey of literature :

- Guy Kawasaki, Peg Fitzpatrick,"The art of social media- power tips for power users", Penguin Books Limited, edition 1: this books provides an overview of and a general guide to the different social media platforms and how to use them most effectively.
- Kelli S. Burns, "Social Media: A Reference Handbook" Gale eBooks, edition 1,: This book explores in detail the evolution of social media and the multitude of issues related to social media in society.
- Blanchard Olivier, "Social Media ROI: Managing and Measuring Social Media Efforts in Your Organization", Que Publishing, edition 1: this book categorized people in a two group The first group knows the tools, The second group approaches social media as a strategy.

1.4 Objectives

Following are the objectives of project

1. To know about social media
2. To understand different types of social media.
3. To find out different types of earning option in social media

1.5 METHODOLOGY

Different types of social media – specially YouTube, Tinder , LinkedIn. Secondary data has been collected from different books and internet resources which was analysed through comparison table.

1.6 Limitations

- Due to the shortage of data some area remains unexplored.
- Due to the shortage of time primary data cannot be collected.

1.7 Chapter Distribution :

CHAPTER 1 ;- INTRODUCTION

CHAPTER 2 ;- CONCEPT OF SOCIAL MEDIA

CHAPTER 3 ;- TYPES OF SOCIAL MEDIA IN INDIA

CHAPTER 4 ;- DATA ANALYSIS

CHAPTER 5 ;- CONCLUSION

CHAPTER 2 : CONCEPT OF SOCIAL MEDIA

2.1 Histories of Social Media

Different theories suggest different starting points for social media, such as the birth of the telegraph in 1844, the development of the internet in 1969, or the introduction of digital bulletin boards in 1978. However, many argue that social media emerged with the launch of the first social networking websites in 1997, and credit for its invention is attributed to multiple innovative thinkers over several decades.it also highlights the historical progression of communication technologies that laid the foundation for social media. It mentions the early methods of written communication through letters, the invention of the telegraph in 1792, and the subsequent development of the telephone and radio in the late 1800s. The advancements in technology continued into the 20th century with the creation of supercomputers, networks between computers, and the birth of the internet and the World Wide Web.

In the 20th century, social media evolved rapidly. Early forms of the internet, such as CompuServe, emerged in the 1960s, and by the 1970s, digital bulletin board systems and virtual newsletters facilitated electronic communication. The 1980s witnessed the rise of personal computers, and internet relay chats (IRCs) became popular. Eventually, in 1997, Six Degrees, the first recognizable social media site, was launched, allowing users to create profiles and connect with others. Blogging sites and instant messaging apps also gained popularity in the late 1990s. Andrew Weinreich was the founder of Six Degrees and the father of social networking. Weinreich applied for the first social networking patent and named the website after the "six degrees of separation" theory. While Six Degrees did not last long, it set the stage for the future evolution of social media.

The emergence of early social networking sites like Friendster, Myspace, LinkedIn, and others is also discussed. These platforms connected people through shared connections and allowed users to post content, including photos and videos. Myspace, in particular, experienced significant popularity before being surpassed by Facebook in 2008. acknowledging the diverse landscape of social media platforms today, including Facebook, Twitter, YouTube, Reddit, Tumblr, and Flickr. The advent of smartphones and mobile devices further increased the accessibility and ubiquity of social media. The passage also mentions the value of user-generated data for social media marketing and the rise of influencer culture, where individuals with large followings can earn money through digital marketing efforts and engage with online communities.a historical overview of the origins

and evolution of social media, highlighting key milestones and influential platforms along the way.

2.2 Definition

Here are some definitions of social media provided by different authors and experts:

In the book "Social Media: A Critical Introduction" by Christian Fuchs, social media is defined as: "Web-based platforms that allow individuals to create, share, and interact with user-generated content, and to participate in social networking."

In "The Social Media Bible" by Lon Safko, social media is defined as: "A form of electronic communication through which users create online communities to share information, ideas, personal messages, and other content."

In the book "Social Media ROI" by Olivier Blanchard, social media is defined as: "A group of digital platforms that allow participants to create, share, and exchange content and information with each other."

These definitions highlight the core elements of social media, including user-generated content, interactivity, online communities, and the use of digital platforms for communication and information exchange.

2.3 Features and Functions:

Profile Creation: Users typically create a profile that represents their identity on the platform.

Content Sharing: Users can share various types of content, such as text, photos, videos, and links.

Interactions and Engagement: Social media platforms allow users to like, comment on, and share content,as well as follow other users to stay updated on their activities.

Messaging and Communication: Many platforms offer private messaging features to facilitate direct communication between users.

Groups and Communities: Users can join or create groups based on shared interests, hobbies, or professional affiliations.

Analytics and Insights: Some platforms provide users with analytics tools to track the performance and engagement of their content.

2.4 Impact and Benefits:

Global Connectivity: Social media connects people from all around the world, enabling communication and collaboration across borders.

Information Sharing: Users can quickly disseminate news, ideas, and information to a wide audience.

Community Building: Social media platforms help in creating and nurturing communities based on shared interests, fostering connections and support networks.

Marketing and Promotion: Social media has become a significant tool for businesses, organizations, and individuals to promote their products, services, and personal brand.

Entertainment and Expression: Users can find entertainment, discover new content, and express themselves creatively through social media.

2.5 Considerations and Challenges:

Privacy and Security: Users need to be cautious about their privacy settings, personal information, and potential risks associated with sharing content online.

Online Etiquette and Behavior: Social media platforms can sometimes be susceptible to cyberbullying, hate speech, and other negative behaviors that impact user experiences.

Information Overload: The vast amount of content and information on social media can be overwhelming, and users need to evaluate the credibility and reliability of the information they encounter.

2.6 Limitations

While social media offers numerous benefits, it also has some limitations and drawbacks. Here are some common limitations of social media:

Spread of Misinformation: Social media platforms can be prone to the rapid spread of false information and rumors. Due to the ease of sharing content, misinformation and fake news can quickly go viral, leading to confusion and misinformation among users.

Privacy Concerns: Social media involves sharing personal information, and privacy can be a significant concern. Users may have limited control over their data, and there have been instances of data breaches and unauthorized access to personal information on social media platforms.

Cyberbullying and Harassment: Social media can provide a platform for cyberbullying and online harassment. Users may experience abusive behavior, hate speech, or trolling, which can have negative psychological and emotional impacts.

Addiction and Time Management: The addictive nature of social media can lead to excessive usage and distraction from real-life responsibilities. Spending too much time on social media can affect productivity, mental health, and interpersonal relationships.

Filter Bubbles and Echo Chambers: Social media algorithms often personalize content based on users' preferences, leading to the formation of filter bubbles and echo chambers. This can result in limited exposure to diverse opinions and perspectives, reinforcing existing beliefs and biases.

Comparison and Negative Effects: Social media can contribute to feelings of inadequacy, low self-esteem, and negative body image due to the constant exposure to curated and idealized versions of others' lives. Comparisons and the pursuit of validation through social media can have a detrimental impact on mental health.

Digital Exhaustion and Overload: The constant flow of information, notifications, and the need to maintain online presence can lead to digital exhaustion and information overload. It can contribute to stress, anxiety, and a sense of being constantly connected.

Lack of Authenticity: Social media platforms often promote a curated and idealized version of people's lives, leading to a lack of authenticity. Users may feel pressured to present a perfect image, leading to feelings of inadequacy and a skewed perception of reality.

It's important to be mindful of these limitations and adopt healthy usage habits and critical thinking skills while engaging with social media platforms.

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CHAPTER 3 : TYPES OF SOCIAL MEDIA IN INDIA

3.1 PURPOSE OF SOCIAL MEDIA:

Social media serves various purposes for individuals, and different types of platforms have been created to cater to these interests. Here are some key purposes of social media:

Socializing and Connecting: People use social media to connect with friends, family, and acquaintances, allowing them to maintain relationships and engage in conversations.

Information Sharing and Consumption: Social media platforms serve as sources of news, knowledge, and content. Users can access a wide range of information and share valuable resources with their network.

Personal Expression and Creativity: Many individuals use social media to express their thoughts, ideas, and creativity through sharing opinions, artwork, writing, and other forms of self-expression.

Professional Networking: Platforms like LinkedIn are used for professional purposes, including networking, job searching, career development, and showcasing achievements.

Business and Marketing: Social media has become integral for businesses in marketing strategies, allowing organizations to promote products, engage with customers, build brand awareness, and drive sales.

Knowledge Exchange and Collaboration: Users can join groups and communities based on interests or professions, facilitating knowledge sharing, collaboration, and learning.

Activism and Advocacy: Social media plays a crucial role in raising awareness, organizing movements, and advocating for social causes, enabling users to support and promote various issues.

Entertainment and Leisure: Social media offers a wide range of multimedia content for entertainment purposes, including videos, memes, music, podcasts, and live streams.

Social media platforms can be categorized into different types, such as social networking sites, microblogging platforms, media sharing platforms, discussion forums and community platforms, and blogging platforms. The social media

landscape is constantly evolving, with numerous platforms and nuances within each category.

3.2 Evolution of Social Media in India

The evolution of social media in India has been marked by significant growth in internet penetration and smartphone usage. In the early 2000s, social media platforms like Orkut gained popularity in India, facilitating social connections and online communities. Facebook entered India in 2006 and quickly became the dominant social networking platform in the country, attracting millions of users. Alongside Facebook, platforms like Twitter, LinkedIn, and YouTube gained popularity, with Twitter becoming prominent for real-time news and public conversations. India witnessed the rise of homegrown platforms like ShareChat, Roposo, and Trell, catering to regional languages and diverse cultural preferences. Instagram gained traction, particularly among younger demographics, with a focus on sharing photos and videos. Influencer culture and visual storytelling became prominent. WhatsApp became a primary mode of communication, while TikTok (now banned in India) fostered a vibrant short-form video content ecosystem. YouTube became a dominant platform for video creators and viewers. Facebook Live and Instagram Live gained traction for real-time video streaming. Social media saw an increase in regional language content, and influencers in regional languages gained popularity, catering to specific regional audiences. Social media platforms integrated e-commerce features, allowing businesses and individuals to sell products directly. Facebook Marketplace and Instagram Shopping gained prominence. The Indian government introduced regulations and guidelines for social media platforms, emphasizing data privacy, content moderation, and user protection.

3.3 Different social media platform in India

3.3.1Facebook:

Launched in 2004, Facebook began as a social media site for college students. Created by Mark Zuckerberg while he studied at Harvard, Facebook soon began to gain popularity throughout the collegiate community and beyond to overtake other top social networks. By the end of 2004, it already boasted more than 1 million users

Today, more than 3 billion people around the world use Facebook to form business and personal connections with like-minded individuals. Due to the platform's massive success, its parent company, now named Meta, has made significant acquisitions and remains a force in the realms of communications, media and pop culture.

3.3.2 YouTube :

Launched in 2005 as a video-sharing platform, YouTube has grown into a popular social media site where users share content including how-to videos, recipes and humorous commentary. YouTube was created by a group of former PayPal employees after a fruitless search for a video-sharing website.

With the upload of the first YouTube video, "Me at the Zoo," a phenomenon was born. When Google purchased YouTube for $1.65 billion in 2006, there was no doubt that video would be the content of the future. Users around the world spend about 1 billion hours every day watching them, the equivalent of about 5 billion video views daily.

YouTube reached a milestone in May 2012, surpassing one billion monthly active users. This indicated its widespread adoption and popularity on a global scale.

2015-2016: YouTube's user base continued to expand, with an increasing number of users consuming content on mobile devices. The platform introduced features and optimizations to enhance the mobile viewing experience.

2018: In June 2018, YouTube reported having over 1.9 billion logged-in monthly active users, reflecting substantial growth since its inception.

3.3.3 Twitter :

Founded by Jack Dorsey, Evan Williams, Biz Stone and Noah Glass in 2006, Twitter changed the social media landscape as a microblogging platform with a maximum of 140 characters per post. Twitter's popularity as a microblogging service skyrocketed in 2009, and it saw its number of unique visitors increase by 1,300%.

Twitter found financial success when it introduced sponsored advertising. Its popularity among journalists and activists led to Twitter's role in both movements and controversies over the years. Its precise future remains in question since Twitter's somewhat chaotic purchase by entrepreneur Elon Musk.

3.3.4 Instagram:

Created in 2010 by founders Kevin Systrom and Mike Krieger, Instagram originated as a photo and video-sharing service, although the social media site also has evolved to become a community-building platform. Instagram's popularity spread like wild wire, and it reached 1 million registered users within just 2 months of its debut.

Purchased by Facebook in 2012, Instagram has expanded its list of features to include live video streaming and shoppable posts. Today, Instagram boasts more than 1.2 billion users, and it's expected to add at least 50 million more by 2024.

3.3.5 Snapchat :

Stanford University students Evan Spiegel, Reggie Brown and Bobby Murphy introduced Snapchat in 2011 after initially pitching the concept during a product design class. The idea was for a photo-sharing social media site in which messages are deleted automatically after a set period of time, and fellow students called it terrible.

Fortunately for the founders, their classmates were wrong. Just one year after launching on Android, Snapchat users were sending 20 million snaps every day. Just a couple of months later, that number was up to 50 million. Today, 363 million people, especially young adults, use Snapchat each day.

3.3.6 Pinterest: Pinterest was founded in 2010 by Ben Silbermann, Evan Sharp and Paul Sciarra as a visual discovery engine where users bookmark images, creating virtual vision boards. Initially available by invitation only, Pinterest launched for the general public in 2012. The same year reports that Pinterest had achieved 11.7 million unique U.S. visitors made it the fastest site ever to surpass 10 million unique visitors. By 2022, Pinterest boasted 431 million active users.

3.3.7 Reddit :

University of Virginia roommates Alexis Ohanian and Steve Huffman founded Reddit in 2005 after the duo received $100,000 from Y Combinator to work on this project. They envisioned a place where users could share personal stories, discuss topics of interest and vote for the most popular content.

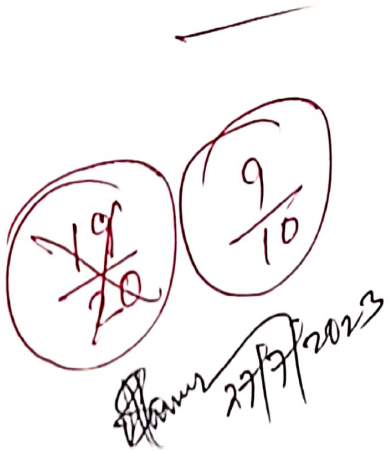
The site soon took off among younger users who appreciated the forum to share ideas. Publishing juggernaut Conde Nast acquired Reddit for between $10 and 20 million in 2006. The social media site continued to grow in popularity, and by 2020 it had 430 million monthly active users.

3.3.8 LinkedIn:

One of the earlier social network platforms to make its debut, LinkedIn launched in 2003 as a channel for business professionals to connect for enhanced career opportunities. Users not only rely on LinkedIn to network with business acquaintances, past coworkers and old schoolmates, but the platform now serves as a leading resource for job seekers and recruiters, boosted by its premium memberships. Showing no signs of slowing down in its third decade, LinkedIn boasts 875 million members in more than 200 countries around the world.

3.3.9 Tinder:

Tinder is a popular dating and social networking application that allows users to anonymously swipe right or left on profiles of other users based on their photos, brief descriptions, and mutual interests. The app was launched in 2012 by Match Group and quickly gained widespread popularity, particularly among young adults.



CHAPTER 4 :- DATA ANALYSIS

4.1 Different Types Of Job Profiles:-

4.1.1 YOUTUBE

Some potential job roles in the category of managing a youtube channel:

YouTube Channel Manager: Oversees all aspects of managing a channel, including content creation, optimization, scheduling, and audience engagement. Develops strategies for growth, increasing viewership, and monetization.

Content Strategist: Focuses on developing a comprehensive content strategy, conducting research, analyzing audience interests, and planning the types of content to produce. Ensures consistency, quality, and alignment with the channel's goals.

Video Editor: Responsible for editing and enhancing video content before uploading it to the YouTube channel. Collaborates with the channel manager or content creators to refine footage, add graphics, apply effects, and maintain video quality.

SEO Specialist: Optimizes the channel and its content to improve visibility and search rankings. Conducts keyword research, optimizes video titles, descriptions, and tags, and implements strategies for increased organic discoverability.

Community Manager: Engages with the channel's audience, responds to comments, manages discussions, and fosters a sense of community. Facilitates positive interactions, addresses inquiries or concerns, and monitors the channel's reputation.

Analytics Manager: Analyzes data and metrics related to the channel's performance. Tracks viewership, engagement, audience demographics, and provides insights to inform content optimization and growth strategies.

Social Media Manager: Promotes and cross-promotes the YouTube channel on various social media platforms. Creates and manages social media content, engages with followers, runs ad campaigns, and drives traffic to the channel.

Monetization Specialist: Optimizes revenue generation by understanding YouTube's monetization policies and exploring opportunities for ad placement, sponsorships, brand collaborations, and other monetization strategies.

Rights and Content Manager: Ensures compliance with copyright and content usage policies. Handles licensing agreements, manages content claims, resolves copyright disputes, and maintains a copyright-friendly environment.

These are just a few examples of job options related to managing a YouTube channel. The specific roles and responsibilities may vary depending on factors such as the channel's size, niche, and objectives.

Potential job roles in youtube content creation:

Content Creator: Creates and publishes videos on a YouTube channel, specializing in various niches and engaging with the audience through comments and community interactions.

Video Producer: Oversees the production process, working with a team to plan and execute video projects, manage budgets, coordinate shoots, and maintain project timelines.

Scriptwriter: Writes engaging and compelling scripts for YouTube videos, collaborating with content creators to bring their ideas to life effectively.

Video Editor: Responsible for editing and post-production work, shaping raw footage into polished videos, enhancing visuals, editing sound, and ensuring alignment with the content creator's vision and channel style.

Animator: Uses animation software and techniques to create animated videos, bringing characters, illustrations, and graphics to life.

Graphic Designer: Creates visually appealing elements for YouTube videos, such as thumbnails, banners, logos, and lower thirds, ensuring consistent and attractive visual branding.

Sound Engineer/Audio Producer: Handles audio aspects, ensuring clear and high-quality audio recording, editing soundtracks, mixing audio elements, and enhancing the viewer's experience with sound effects or music.

Social Media Manager: Promotes YouTube videos, manages posting schedules, responds to comments and messages, analyzes engagement metrics, and grows the channel's presence across social media platforms.

Brand Collaborations Manager: Establishes partnerships and collaborations with brands, identifying opportunities, negotiating contracts, and managing relationships to create sponsored content and brand integrations.

These roles can vary based on the content creator's niche, style, and business model. Many content creators handle multiple aspects themselves, while others may build teams or work with freelancers to fulfill different roles.

4.1.2 TINDER

Tinder, as a popular dating app, primarily focuses on connecting individuals for dating and relationships. Here are some potential job roles in the context of Tinder or the dating app industry:

App Development and Engineering: As a software engineer or developer, you can work on the development and maintenance of dating apps like Tinder. This involves coding, testing, debugging, and implementing new features to enhance user experience and app functionality.

UX/UI Design: User experience (UX) and user interface (UI) designers play a crucial role in creating intuitive and visually appealing dating app interfaces. They focus on optimizing user flows, designing attractive profiles, and ensuring a seamless user experience within the app.

Data Analysis and Research: Data analysts and researchers analyze user data to gain insights into user behavior, preferences, and trends. They use this information to improve matching algorithms, optimize user experience, and develop data-driven strategies to enhance the effectiveness of the app.

Marketing and Growth: Marketing professionals play a key role in promoting dating apps and acquiring new users. They develop marketing strategies, manage advertising campaigns, conduct market research, and employ growth hacking techniques to increase user acquisition and engagement.

Customer Support: Customer support teams provide assistance and address user queries and concerns. They handle user inquiries, offer technical support, resolve issues, and maintain positive user experiences within the app.

Content Moderation: Content moderators are responsible for reviewing user-generated content, ensuring that it aligns with community guidelines and policies. They help maintain a safe and respectful environment within the app by identifying and removing inappropriate or abusive content.

Community Management: Community managers engage with users, facilitate discussions, and build a sense of community within the app. They moderate user interactions, manage user feedback, and foster positive user engagement.

Business Development and Partnerships: Business development professionals identify partnership opportunities with other companies, influencers, or brands. They negotiate collaborations, strategic partnerships, and sponsorships to enhance the app's visibility and user experience.

Data Privacy and Security: Data privacy and security specialists ensure the protection of user data within the app. They implement security measures, monitor for potential breaches, and ensure compliance with data protection regulations.

4.1.3 linkedin

LinkedIn, being a professional networking platform, offers various job opportunities within its own organization as well as opportunities for professionals seeking jobs or career advancement. Here are some potential job options related to LinkedIn:

LinkedIn Careers Team: LinkedIn has its own careers team that manages job postings, recruitment, and talent acquisition for the company. They oversee the hiring process, conduct interviews, and work to attract top talent to join LinkedIn.

Sales and Business Development: LinkedIn offers opportunities in sales and business development, where professionals work to promote LinkedIn's products and services to businesses and organizations.

Marketing and Communications: LinkedIn's marketing and communications team focuses on promoting the platform, increasing user engagement, and driving brand awareness. They develop marketing strategies, manage campaigns, create content, and communicate with LinkedIn users and stakeholders.

Product Development and Engineering: LinkedIn's product development and engineering teams are responsible for building and improving the platform's features and functionalities. They work on enhancing the user experience, developing new tools and services, and ensuring the platform is technically robust.

Data Analysis and Insights: LinkedIn collects a vast amount of data, and professionals in data analysis and insights roles analyze this data to derive meaningful insights.

Customer Success and Support: LinkedIn employs professionals who specialize in customer success and support. They assist users with any issues they encounter on the platform, provide guidance, and ensure a positive user experience.

Content Development and Strategy: LinkedIn relies on quality content to engage its users and provide valuable insights. Content professionals work on creating and curating content, developing content strategies, and managing LinkedIn's content publishing platforms.

User Experience and Design: User experience (UX) and design professionals at LinkedIn focus on optimizing the platform's usability and visual appeal. They conduct user research, create wireframes and prototypes, and collaborate with engineers to implement intuitive and user-friendly interfaces.

Data Privacy and Security: LinkedIn places high importance on data privacy and security. Professionals in this field work to protect user data, implement security measures, and ensure compliance with privacy regulations.

4.2 COMPARISON OF JOB OPTIONS AMONG THREE DIFFERENT TYPES OF SOCIAL MEDIA

	Youtube	Tinder	Linkedin
Purpose	Information Sharing and Consumption, Entertainment and Leisure, Knowledge Exchange and Collaboration	Socializing and Connecting	Professional Networking, Business and Marketing
Job options	Youtube channel manager, Content strategist, Video editor, SEO specialist, Community manager, Analytics manager, Social media manager, Monetization specialist, Rights and content manager, Content creator, Video producer, Scriptwriter, Animator, Graphic designer, Sound engineer/audio producer, Social media manager, Brand collaborations manager.	App development and engineering, Ux/ui design, Data analysis and research, Marketing and growth, Customer support, Content moderation, Community management, Business development and partnerships, Data privacy and security.	Data privacy and security, User experience and design, Content development and strategy, Customer success and support, Data analysis and insights, Product development and engineering, Marketing and communications, Sales and business development, Linkedin careers team.

Some general information on their user bases based on data available up until my last knowledge update in September 2021:

Tinder: Tinder is a widely popular dating app, and as of 2021, it had over 66 million users worldwide. It's important to note that user numbers may have changed since then due to the platform's continuous growth.

YouTube: YouTube is a video-sharing platform owned by Google. As of 2021, it had over 2 billion monthly active users. YouTube's user base is global and encompasses a wide range of content creators and viewers across various interests and demographics.

LinkedIn: LinkedIn is a professional networking platform primarily used for career development, job searching, and business networking. As of 2021, it had over 740 million registered users worldwide. LinkedIn's user base mainly consists of professionals, job seekers, recruiters, and businesses.

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CHAPTER 5:- CONCLUSION

This project work focuses on exploring the employment opportunities and potential career paths that are available through social media platforms. This project work has shed light on the significant impact of social media on the job market and the ways in which individuals can leverage these platforms for professional purposes. By examining various social media platforms such as LinkedIn, Tinder, and even YouTube, this projrct have highlighted the numerous ways in which users can find job opportunities, build professional networks, and showcase their skills and expertise to potential employers.

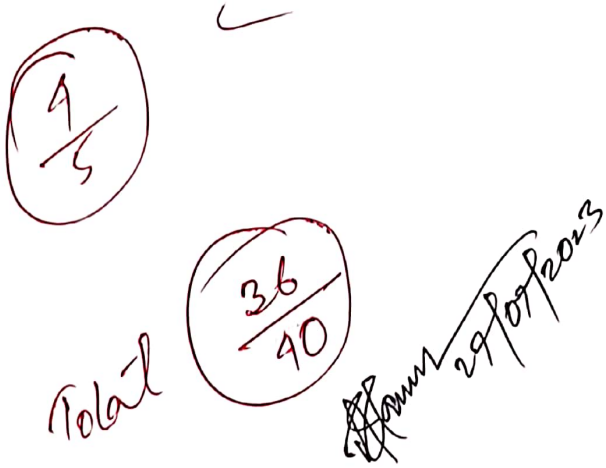
Through the research and analysis, this project have emphasized the importance of creating a strong online presence, developing a personal brand, and utilizing social media tools effectively in order to enhance one's job prospects. This project likely explored the rise of remote work and how social media platforms have facilitated this trend by connecting job seekers with remote job opportunities from all around the world. this project have mainly to compared between three different kind of social media platforms these are Tinder, YouTube and LinkedIn. We follows that YouTube, compared two others are gives the more job opportunities. Because in youtube you can make your own profession on the platform or in behind the platform.

And people doesn't need to have any education qualification or need any degree, if you can gathers some technical knowledge and have some skill like scripting, editing, videography etc. people can make videos on youtube and can make lots of money in a monthly basis, or they can also make money by promoting products, doing collab with the brand as well. People can make money from youtube in mainly five ways they can make money by ad revenues, brand promotion, super chat, subscription and by selling there own product or merchandise.

There are also many other way to earn from youtube. Youtube paid there content creator $7 per 1000 views, The amount of money a YouTuber can make from 1,000 ad views, also known as CPM (cost per thousand views), can vary significantly. Several factors influence this, including the content niche, audience demographics, viewer engagement, geographic location, ad formats, and the specific advertisers involved. CPM rates can range from a few dollars to several tens of dollars, and in some cases even more, but it depends on the factors mentioned above. Different advertisers bid for ad placements, and the competition in the market can affect the CPM rates.

but other two platform Tinder and Linkedin is not like youtube. These are a little different than that. In tinder and linkedin you cannot find a job on platform as a content creator or as a individual. Linkedin is a platform that find jobs or works for people and Tinder is a dating site which help you to find your partner. So in these platform the only jobs you can do is from behind the platform. Those are mentioned in above in data analysis chapter.

And also one important thing that this project want to highlight, like any other jobs mainly any private jobs these jobs or works are can be very vulnerable.



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Department of Botany

Dissertation

Effect of NaCl Stress on Seedling Growth and Hydrogen Sulfide(H_2S) Accumulation in Sunflower (*Helianthus annuus* L.) Seedling Cotyledons.

DISSERTATION

Submitted by

SONIA KHATUN

Roll No:- 2116220-1953841(SEM-VI ,B.SC BOTANY)

DEPARTMENT OF BOTANY

JANGIPUR COLLEGE

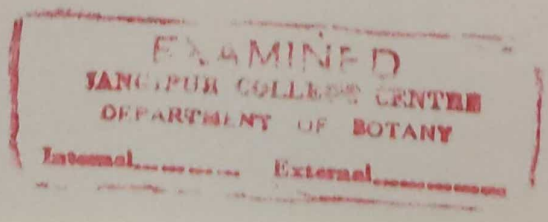
UNIVERSITY OF KALYANI

CERTIFICATE

This work entitled " ***Effect of Nacl stress on seedling growth and hydrogen sulfide accumulation in sunflower seedling cotyledons***" has been performed by SONIA KHATUN(ROLL NO: 2116220 -1953841)for submeting as a part of Dissertation (semester 6the DSE 04B) for fulfilment of B.SC Botany (H).

Sonia Khatun
Candidate Signature

15/7/22
Teacher's Signature



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I would like to espress my special thanks of gratitude to my assisntance professor (Dr.soumya Mukherjee)who also gave me the golden apportunity to do this wonderful project,which also helped me in doing a lot of research and I come to know about so many new things I am really thakful to them.

Secondly I would also like to thank labrotary worker and Friends who helped me a lot in finalizing this research project whithin the limited time frame

Preface

The perform the essential and biological function of the species perpetulation and survival,retaining and genetic information.It is also important of agriculture production,human nutrition,ensure food security.The first step of the plant 's life cycle is the germination conditions,a germination starts withe the seed imbibition and radicle protrusion (Taize et al.2017).The process was influenced by the environmental factor,dormancy,seed quality,as inhibitors and promoters of the germination.The characterstic was the seed quality include viability,seed lot purity,health,mechanical damage,seed v.gor (Finch-savage and Bassal .2016).The stessful field conditions,seeds in display was different levels of germination,contrasting abilities to establish plants.Varying vigor (Finch- savage and Bassel.2016).The agriculture practies,as important trait that influence in the potential performance of viable seeds.(Finch-savage and Vassal.2016).The chemicals are exogenously applied at appopriate concentrations was improve in the seeds germination of parcentage (Liet et al.2012).The seeds are treated with the hydrogen sulfide (H_2S) showed into the seed germination rate and plant gruwth (Zahang et al.2008,2010b,2010c,2015; et al.2012,2013,Dolley et al,2013;Carteret al.2018;Chen et al.2018,2019;Zhou et al.2010).It has recently emerged a important gas- signaling of molecule in the enimal and plant systems.H_2s is the component of sulfur and cysteine meta bolism (corps 2019) and is generated by via enzymatic and nonenzymatic mechanisms in the plant cells (Huo et al.2018; corpas 2019).H_2S metabolism was dependent into the type of subcellular compartment and the palnt organ.

ABSTRACT

That the review recent advances in the salinity stress of research in the plant.Different types of membrane transporters in the Na^+ and cl^- the intracellular ion is distribution.In the plants melatonin has a similar action to the auxin indole-3-acetic acid(IAA), and IAA melatonin has the same biosynthetic precursor, tryptophan. The initial phases of salinity stress is a relatively high osmotic potential of the rhizophere enforces in the plant. A divers spectrum of the strategles of the optimize ptake. Salinity is the mejor a biotic stress that was affected into the plant growth and development in leads to crop field loss. A highly efficient and reliable method of the salinity talesence into the sunflower seed germination and established. The plant roots was showed in the morphological plasticity and played into the substantial role in tolerance to the various edaphic stress. The salt stress was significantly reduced into the plant height, number of leaves, fresh and dry plant meight. The salinity was inereased the moisture i seeds. The morphological traits such as a number of nodes should and significant into the heritabilities (narroue and broad sense) across in the environment. The traits was explained by the selection of inbred lines across and salinity levels.

Review of Literature

1.1 NaCl stress in plants

This is a major threat of the modern agriculture causing in hinbition to impairment of crop growth and development.The review recent advances in the salinity stress of research in the plant also some perennial question it sill remaining the unanswered.The review is analyze the physiological,biochemical,and molecular asects in Na^+ and Cl^- uptake,sequestration,and transport associated in salinity.The role of symplastic versus apoplastic pathways of ion uptake and critically evaluate.Different types of membrane transporters in Na^+ and Cl^- the intracellular ion is distribution.The incomplete knowledge are regarding to possible mechanisms of the salinity sensing plants is evaluated.

Characteristic of plant nacl stress. One of the most global problem is soil salinity this is affects of crop productivity.The plant salinity impairs to growth and development via water stress.Cytotoxicity proper to excessive of ions as sodium (Na^+) and chloride (Cl^-) ,and nutritional imbalance.The salinity is typically accompanied by oxidative stress to generation of reactive oxygen species (Ros) (Tsugane et al,1999; Hernandez et al,2001;Isayen kov,2012).

1.1.1 Role of Calcium in NaCl stress

Soluble salt available in the soil source is essential nutrients for growth and development.A over-salinized soil is the global concern that threatens approximately20%of irrigated land of significant crop reduction(Negro et al.2017;Qadirm et al.2014).The salt stress frequently inhibits growth and influence key of the developmental stages,triggering premature senescence and death during prolonged exposure(Valenzuela CE et al.2016;Zahu J-K et al.2016).The salinization has a osmotic effect in the plant cell,leading to shrinkage by dehydration.Salinization effect is transient,the cells are regainding in their original valume in few hours of their initial exposure to chronic salt concentration.This is recovery,cell division and mostly cell expansion is negatively impact,resulting in reduced leaf and root growth.The plant are developmental stages comprising germination,vegetative and reproductive growth is also affected by the salt exposure,in extreme condition that the response is accompained to programmed cell deth5(Lup et al.2018).The osmotic stress is caused by salt environment constrains water uptake from rhizosphere.The resulting in nutriend deficiency and dehydration damage to the plant.The instance,phosphorus (p)uptake is reducd under saline condition because ca^{2+} inhibits P ions uptake by the root system,in the plant cell is increase in potassium (K^+)absorption and transport(Bono A et al.2009;Keishham M et al .2018).The K^+ is pivotal component to modulating ion hemostasis and osmotic pressure.The plants are define adaptable strategy to regulate cation transporters in the plasma membrane (PM) to fulfill hampared ion hemostasis during saline stress event.

1.1.2 Role of Melatonin in NaCl stress 06

The melatonin was found in animals and plants.Melatonin considered to a candiate phytohormone,they effects responses to a variety of biotic and abiotic stress.In the plants melatonin has a similar action to the auxin indole-3-acetic acid (IAA),and IAA and melatonin has the same biosynthetic precursor,tryptophan.The salt stress results in the ralid accumulation of melatonin in the plants.The plant resistance to the salt stress in two ways: one is via direct pathway,such as the direct clearance of reactivty oxygen species; two is via an indirect path way by enhancing antioxidant enzyme activity,photosynthetic factors associate withe stress.Addition the melatonin are affecting the expression of genes.The other palnts precursors and metabolite molecules associate with melatonin are also increase the tolerance of plants to salt stress.

1.1.3 Effect of NaCl stress in sunflower seed

A major abiotic stress is affects into plant growth and development, and resulting in cropyield loos. A high salt stress disrupts homeostasis of water potentials and ion distributions, leading to a malecular damage, and reduced growth and the cell death(Zhu et al.2001). World wide, more than 800 million heetares in the land are affected by the salt stress, equivalent to 6% of the total land area(T.I.et al.2018), was affecting more than 20% of today agriculture(Mickelbart et al.2015). A efficient way to use land saline sail are screen existing germplasmas and davelop Ina new crop varieties in high talerence salinity stress(Ashraf et al.2012). The sunflower is edible oil crop in the world. Planting area is 22.9 million haetares, 60 countries with a total value of over & 40 billion annually(Hu et al.2018). The breeding of salt-tolerant sunflower varieties is very necessary and economic portential(Rauf et al.2017;Dimitrijevis et al.2017). A cross breeding is still a commonly used breeding method, the traditional breeding methods is focus to screening germplasms desired traits, that was a high tolerance to salinity.

The third highest source of edible oil after soybean and palm. Brassica napus L is a dominant special cultivated globally. In 2017-2018, 74.91 million tons mustard seed was produced globally in 36.53 million hectares in land(USDA et al.2018). Bangladesh is the top-ranked oilseed crop. A oilseed crop is a hug margin in terms of total cropped area was covered 67% total amount of oilseed production (SID et al.2018). A Tap root system Brassica napus is consists of a single main root axis (embryonic roots)and lateral roots (postembryonic roots). The fast root is the tap root to emerge to the embryo, this is anatomically well-defined (Dickison et al;zobel et.2010). A lateral root was postembryonically fromed into initiated existing roots is generally branched (Alkinson et al.2014;Bellini et al.2014 ;zobel et am.2010;Osmont et al.2007). A roots hairs is unicellular, tubular projection in the modified epidermal cells of the root. The root was increase into sunface area of the root was nutrient and water uptake.

1.1.5 Effect of NaCl stress in protein content

The sunflower is make into the genus Helianthus. In Greek Helios its means sun and annus means flower. The genus was containted about 67 species, is throught into native to the Americas(North,South) originally. It was domesticated into 1000 BC. The sunflower was distributed into the worldwide. This small black seed are very hight in the oil content and the processed into the sunflower oil and meal. The seed is choice of the most bird feeders. The second type are Non-oilseed (confectionery sunflower). This is the larger black and white striped seed was used in a variety of food products from snacks into the bread. The sunflower oils are three types, Mid-oleic, Linoleic and High oleic sunflower oil. All are the developed into standard breeding technique. They are differin oleic levels and each offers unique properties. Three types of sunflower oil available, the sunflower oil meets the needs of consumer and food manufactuers alike is a healthy and high performance non transgenic vegetable oil.

1.1.6 Effact of NaCl stress in Biomass

Sunflower (Helianthus annus L.) is a important oilseed in a crop supplying into more than 13% total oil produced into the globally (Rauf et al. 2008a). The sunflower was required into fewer day complete life cycle than other field crops. High quantities area and quality edible oil of the prime factor providing into the versatilly this crop was grown into 68 countries (FAO 2010). Robustness and extensive top root system and somo-regulatory mechanisms was induced tolerence into the crop of perform better of the mater-limited conditions (Rauf and sadagat 2008a; Rauf et al. 2009b).

1.1.7 Effact of H_2S in NaCl stress

H_2S was a estimated into over 800 million hectares in the land the world was overloaded with salt, this is represents more than 6% in the world in the land area (Munns and Tester 2008). A Hight salinity leads into the osmotic stress. The cell toxicity ions excess and ultimately nutrition was disorders and oxidative stress into the plants (Munns and Tester 2008). The signaling was involved expression into specific genes and accumulation of certain metabalites it is pivotal of the plant was successfully acclimating and toleration into the high salinity (Gupta and Huang 2014). Nitric oxide (NO), and hydrogen sulfide (H_2S) was recognized important in the cell signiling triggered into during plant respond into the abiotic and biotic stress (Delledonne et al. 1998; Durneret al. 1998; Zhang et al. 2008). The role of signaling molecules into the salt stress it is explored over the past few years.

Material & Method

2.1 Seed germination, Treatments and Growth Parameters

Sunflower (*Helianthus annuus* L.) seeds (var. microgreen) were sterilized with $HgCl_2$ (0.005%) and soaked for 4h at room temperature. Following imbibition, seeds were sown on moist germination sheet laid on plastic trays and transferred to growth chambers in dark. Seeds were observed to exhibit a mean germination of 70%. Following radicle emergence (germination) in dark at 25 °C, seedlings were regularly irrigated with half-strength Hoagland nutrient solution (containing 120 mMNaCl for salt treatment, 10 mM $CaCl_2$, 5 mM EGTA, 15 µM melatonin, in the respective combinations for 8d . The concentrations of NaCl treatment was chosen after preliminary screening of seedling growth over a wide range of concentrations (40-180 mM). Control seedlings were irrigated with half-strength Hoagland nutrient solution in the absence of NaCl and other treatments. Exogenous melatonin (15 µM), and $CaCl_2$(10 mM) concentrations were chosen for pharmacological treatments on the basis of preliminary work over a wide range of concentrations for melatonin (5–45 µM), $CaCl_2$ and (2, 5 and 10 mM) respectively. Exogenous treatments of melatonin, $CaCl_2$, and EGTA were prepared in half-strength Hoagland nutrient solution in the absence or presence of 120 mMNaCl. Following growth of etiolated seedlings, observations for hypocotyl length, primary root length, lateral root number and lateral root branching were recorded as mean value from ten seedlings showing uniform growth pattern.

2.2 10 Estimation of H_2S Content

H_2S estimation from sunflower seedling roots and cotyledons were performed by the methylene blue (MB) method, according to Mukherjee and Bhatla, (2020) with certain modifications. Roots (1000 mg FW) and cotyledons (500 mg FW) were harvested and ground to power in liquid nitrogen. The powder was dispersed in 1 ml of extraction bufer [20 mMTrisbufer containing 10 mMHCl, 10 mM EDTA and 20 mM Zn(OAc)2] pH 6.5. The homogenates were centrifuged at 10,000 g for 15 min at 4 °C. Following centrifugation supernatants were incubated in a reaction mixture containing 1 ml of 30 mM $FeCl_3$ (dissolved in 1.2 M HCl) and 1 ml of 20 mM N, N-dimethylp-phenylenediaminedihydrochloride (DMPD; dissolved in 7.2 M HCl) in dark for 20 min at 25 °C. The amount of H_2S generated was measured from the product of reaction in terms of the amount of methylene blue. It was measured spectrophotometrically at 670 nm. Quantifcation of H_2S from samples were performed from molar extinction coefficient of MB which corresponds to $1.5 \times 10^6\ M^{-1}\ cm^{-1}$ at 670 nm.

2.3 Statistical Analysis

All experiments were performed thrice and the results were represented as means with standard errors.

RESULT

3.1 Effect of nacl stress on Hypocotyl growth.The hypocotyl was changed into large in size.In this stress hypocotyl length increase its size.

3.2 In nacl is the primiry roots length decreased their length as compare to the control situation.

3.3 In this stress the lateral root extansens in increase their length as comparing into control

The graph mention all the details

Control -793nM

Nacl-240 Nm

=793/240

=3.3 fold

Increased by the comparise with control .

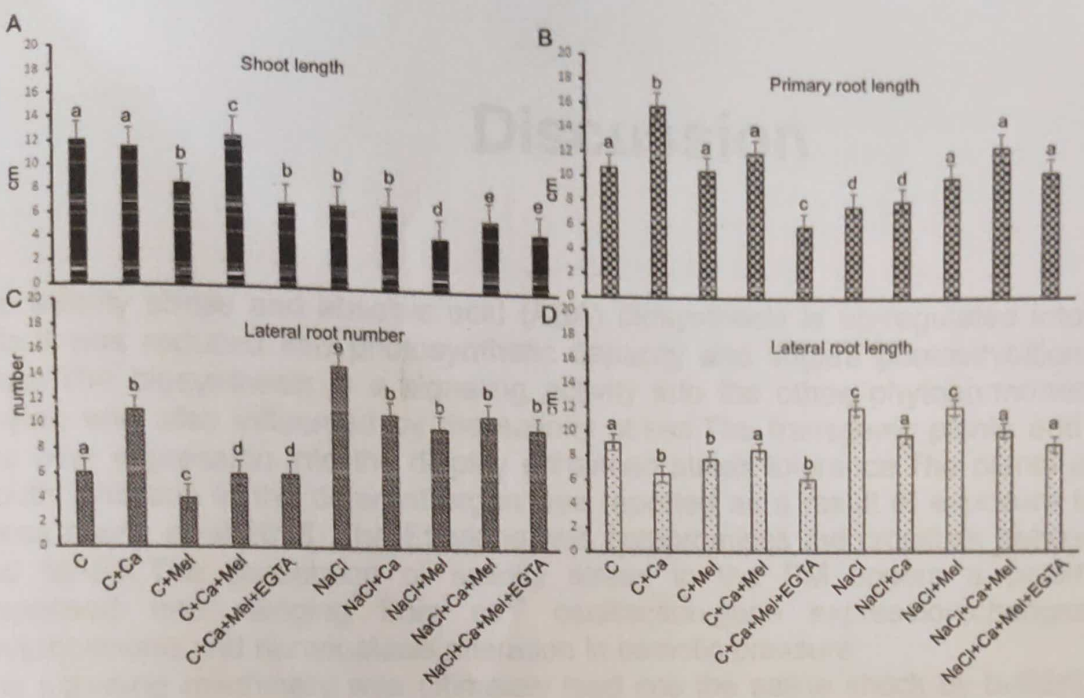
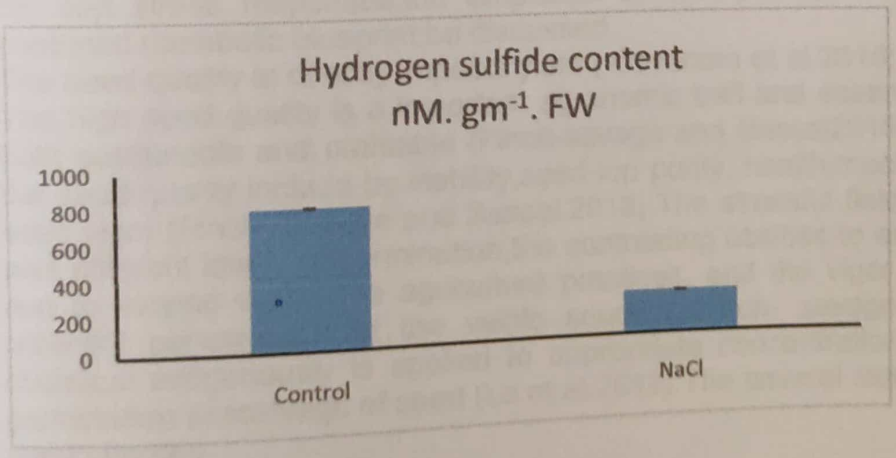


Fig 1. Effect of NaCl stress, exogenous Ca^{2+} ($CaCl_2$ 10 mM), EGTA (5 mM), and melatonin (15 µM) alone or in combination on hypocotyl length (A), primary root length (B), lateral root number (C) and lateral root length (D) in 8d old etiolated sunflower seedlings. Means were calculated from ten replicates for each parameter ±SE. Different letters on the bars show the significant differences between the values at $P \leq 0.05$ based on Duncan's multiple range tests



Effact of NaCl stress on seedling Growth and hydrozen sulphide accumulation in sunflower seedling cotyledons

Discussion

The salinity stress and abscisis acid (ABA) biosynthesis is up-regulated into the gurd cells.It was reduced into photosynthetic capacity and tiggers photoinhibition,oxidative stress.The biosynthesis is a signaling activity into the othee phytohormones and the ethylen was also influerced by the salinity stress.The transgenic plants and ethylene was over expression into the display enhanced stress tolerance.The plants are strong grouth inhibition in the different organ was reported as a result of exposure to the salt stress (Feng et al.2018).The Ethylene was compromises the crosstalk between CDPK and MAPK.The perception of salinity stress in the PM tiggers a pelethora was responsed into rainging from ca^{2+} oscillaction,gene expression,changes in the phytohormone and homeostasis alteration in osmotic pressure.

The signaling mechinery was ultimately lead into the saline shock by building multiple cross node throug generation of the dynamic amplitudes (Schmockel SM et al.2015). It capable of adjusting to arange of the variable downstream into signaling cas cod and influences the plant compatibility.FER, aPR localized recptor of kinase, a critical role in the maintaining in the cell wall of the struture in plants,the plant is exposed to saline shocked;the role is mainly related to the ca^{2+} signaling cascode.The Na^{+} is damaged by the cell wall structure,and FER is turn activates into ca^{2+} channel in the via path way,and the resulting in a transient in ca^{2+} signaling in the root cells (Feng w et al.2018; Okubo- Kurihara E et al.2016).The Na^{+} concentration in the surinding environment leads of Na^{+} into the cells through NSCCS.In thisliht or the findings ca^{2+} involvement in the salt stress responsed,the emphasis on salt perception,and signaling and ca^{2+} mediated metabolic blueprint.be discussed.

The seed quality is directly impacts yield (Caverzan et al.2018; Ebone et al.2019,2020) The high seed quality is a important agronomic trait and essential of cropproduction to both sustainable and profitable (Finch-savage and Bassel2016). The characteristics of the seed quality include by viability,seed lop purity, health,mechanical damage,and the seed vigor (Finch- Savage and Bassel.2016).The stressful field condition and the seed was different levels of germination,the contrasting abilities to establish plants, the plant due to varying vigor. The agriculture practices, and the vigor is important trait in the potential performance of the vaible seeds (Finch- savage and Bassel.2016).The chemical exogenously is applied to appropriate concentration it can be improve the germination percentage of seed (Lo et al.2013).The several studies was reported by the seeds treated

of a hydrogen sulfide (H_2o) was showed of improved in the germination rate and plant growth (Zhang et al.2008,2010b,2010c,2015; Li et al.2012,2013;Dooley et al.2013;Carter et al.2018;Chen et al.2018,2019;Zhou et al.2018). H_2S,is the membre of small reactive molecules,a cototoxin is a high concentration.A signaling molecule is a low concentration.The gas- signaling molecule in the animal and plant systems. A H_2S metabolism is dependent o the type of the subcellular component organ in the plant.The optimal environmental condition ,and the stress factor (Corpas.2019). As the H_2S is

endogenously in the produced and freely passes in cellular membranes, and the important roles in plants (Huo et al.2018). A signaling role in the higher plant of regulating physiological function and defense mechanisms against adverse in the environment situations. The physiological function was include in the seed germination,root organogenesis,photosynthesis ,stomatal movment,leaf senescence,fruit ripening,nodulation and the nitrogen fixation.

The H_2S was improved in the ability of the plant adapt in situation of environmental stress, havy metal toxicity, and the biotic stress resistance (Banerjee et al.2018; Hancock.2019; Corpas and palma2020).The seed quality is determined in the interaction of genetic and environmental factors.The seed quality is represented by the higher germination rate and longevity,the lower deterioration of reserves,and the higher vigor. The physiological quality was decreased in the germination,and vigor of the seed (Ebone et al.2019).H_2S of the exposure in to seed stress and high temperature (Lo et al.2013; Zhou et al.2018;Chen et al.2019),drought (Zhang et al.2010c) ,and the havy metals (Zhang et al.2018,2010b;Chen et al.2018), to seeds under normal condition, generated in positive effects on the germination percentage time,seedling growth, fresh weight,root length,and the other metabolic changes (Corpas and Palma2020).The H2S was regulates the transcript levels in the multiple abiotic and biotic stress- releted genes (Shi et al.2015) and stimulates in the transcriptional reformation of miRNAs (Shen et al.2013).The plants is overexpressing in the genes involved of in H_2S biosynthesis display tolerance

to the stress factor.The role of H_2S in the seed germination and potential to improve the establishment of plant.The effects of the H_2S seed treatment,antioxidant activities,programmed cell death, and plant maturation,energy production,phenotupic expression.The effects of H_2s in the seed germination documented to some extent.

Conclusion

1.The NaCl stress on hypocotyle growth was changed and it is larged in size.In this stress hypocotyle length is increase its size.

2.In this stress a lateral root in increase their length as comparing to control.

3.The common sunflower is valuable from an economic as well as from an ornamental point of view.The leaves are used as fodder,the flowers yield a yellow dye,and the seeds contain oil and are used for food.

4. Hydrogen sulfide (H_2S) is a signaling molecule that is actively synthesized in the tissues and is involved in the regulation of vascular tone,neuromodulation,cytoprotection, inflammation and apoptosis.

5.calcium (Ca)plays an estremely important role in producing in plant tissue and it enables plants to grow better calcium is responsible for holding together the cell walls of plants.

6. Hydrogen sulfide (H_2S) is formed during manure decomposition.This is from the organic from.Hydrogen sulfide is toxic, combustible,and because it is heavier than air,it dissipates oxygen and can suffocate an unsuspecting farmer.

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Department of Chemistry

Dissertation

Semester -VI, 2022-2023 , Chemistry Hons. CHEMHTDSE-4

Topics for dissertation/project work

1. Overview on Click Chemistry
2. Overview on lithium ion battery
3. Overview on photo catalysis
4. Recent advances in nano catalysis
5. Overview on insertion reaction
6. Overview on oxidative and reductive elimination
7. Green substitution of pesticides
8. The environmental impact of additional plastic and polymers
9. Recent advances in biodiesel and bio plastic
10. Arsenic pollution in drinking water
11. Discuss the composition, synthesis and course of action of various pain relief medicines
12. Asymmetry catalysis in modern synthesis
13. Reduced carbon emission
14. Elaborate the chemical composition and course of action of different vitamins
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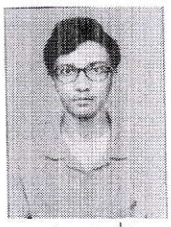

Arindam Baghira

ADMIT

B.SC. HONOURS 6th SEMESTER EXAMINATION , 2023.
[C.B.C.S]

NAME: **ARINDAM BAGHIRA**

REGN NO: 057062 SESSION: 2020-2021

SON OF: AMIT KUMAR BAGHIRA

ROLL NO. COLLEGE

2116220-2057349 JANGIPUR COLLEGE, JANGIPUR

HONOURS CORE COURSE	:	**CEMHCC**	(Chemistry)
D.S.E. COURSE	:	**CEMHDS**	(Chemistry)

Bimalendu Biswas

Controller of Examinations

RULES FOR GUIDANCE OF THE CANDIDATE

1. The examination will be held according to the programme previously notified.
2. The doors of the Examination Hall will be opened, half an hour on the first day and 15 minutes on subsequent days, before the time appointed for the commencement of the examination. Five minutes before the commencement of the examination, a Warning-Bell will be rung as a signal for all students to take their seats when all candidates must take their respective allotted seats bearing the Roll number given in the Admit Card.
3. Candidates shall bring their respective Admit Card and the University Registration Certificate every day of the Examination and shall produce them for inspection, whenever required. Candidates are liable to be expelled from the Examination Hall for failure to produce the Admit Card or the University Registration Certificate.
4. Candidate suffering from any form of contagious or infectious diseases, or from any illness or diseases considered to be prejudicial to the general body of students under examination, will not be admitted into or allowed to remain in the Examination Hall. Special arrangements may however, be made for candidates who are suffering from certain categories of diseases if application is made to the officer-in-charge with sufficient notice.
5. Before entering the Examination Hall candidates must deposit at a place set aside for the purpose books notes or other incriminating materials which are forbidden for candidates to have in their possession. Such articles may be left there only at the candidates' own risk. No clipboard, except absolutely bank one, should be used by a candidate as a support of the answer book during writing. Candidates found in possession of any incriminating materials(s) while under examination in contravention of these rules shall be liable to penalties including expulsion.
6. Under no circumstances will a candidate be allowed to appear at an examination at any place other than one approved by the University.
7. No candidate will be admitted or given a question paper more than 15 minutes after the examination has commenced provided that in special circumstances the officer-in-charge may admit a candidate who is late by not more than half an hour. In such case(s) he/she must complete the examination within time as specified in the examination programme.
8. Communication of any sort or in any form is strictly forbidden between candidates and other person whether inside or outside the Examination Hall. Smoking in the Examination Hall is strictly forbidden.
9. Candidates are required to sign their names and prove their identity as and when required to do so.
10. Candidates shall use main answer books and additional loose sheets supplied by the University. The answer books and loose sheets should be properly filled in by the candidates. Candidates must not write their names, names of the colleges or any other things which may disclose their identity on any page of the answer books. Candidates must not write any objectionable or improper remarks in their answer books.
11. Candidates must not write anything on any question paper or other paper, or carry away any writing or scribblings from the Examination Hall.
12. No candidate will be allowed to leave the Examination Hall until an hour has elapsed from the time when the papers are given out.
13. No candidate shall be allowed to finally leave the Examination Hall without submitting the answer book tagged with all the loose sheets. No candidate shall be allowed to re-enter the Examination Hall during the hours of examination once leaving it after submission of the answer book.
14. A warning bell will be rung every day five minutes before the time fixed for the close of the examination.
15. At the close of the examination a candidate must remain seated until his/her answer book is collected by the invigilator. No candidate will be allowed to remain in the Examination Hall after the close of the examination, except to allow respective answer books to be collected by the invigilator.
16. Candidates are warned against any attempt tp adopt unfair means at the examination. Any breach or attempted breach of any of these or other examination rules will render them liable to expulsion and to any other penalty as the University may deem it.
17. Non programming calculators not having memory safeguard facility may be used during examination for calculation purpose.
18. Applications for review of results, if permissible as per the regulation, must be submitted within 15 working days from the date of issue (as will be indicated on the body of the marksheet) to the relevant marksheets.
19. Candidates securing pass/qualifying marks in subject even after remaining absent in one or two papers at any University Examination (both P.G. and U.G.) will be considered to have passed/qualified in that subject if not otherwise specifically stated in the regulations for any particular examination, provided that such candidates who will remain absent in one or two papers in a subject may apply for cancellation of their examinations within 7 days of completion of the examination. Such cancellation shall be treated as loss of one chance.
20. Notwithstanding the issue of the Admit Card, the University shall have the right for any reasons which may appear to them sufficient, to cancel the admission of any candidate to any examination, whether before, during or after the examination. The University may also debar a candidate from appearing at any subsequent University Examination or Examinations. The decision of the University in all such cases shall be final.
21. In any case not covered by the foregoing rules, reference shall be made to the officer-in-charge for special direction, and his decision shall be accepted as final.
22. **Carrying Mobile Phone in Examination Hall is strictly prohibited.**

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Affiliated to the University of Kalyani, Nadia, West Bengal

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OF:2020-21

TOPIC:OVERVIEW ON LITHIUM ION BATTERY

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ArindamBaghira

B.Sc 6th semester

Jangipur College

Deparment of Chemistry

University of Kalyani

v. good

DSE-4

F.M: 75

1) Project : 40
2) Presentation & viva : 20
3) Internal : 15

M.O.

37+16+14

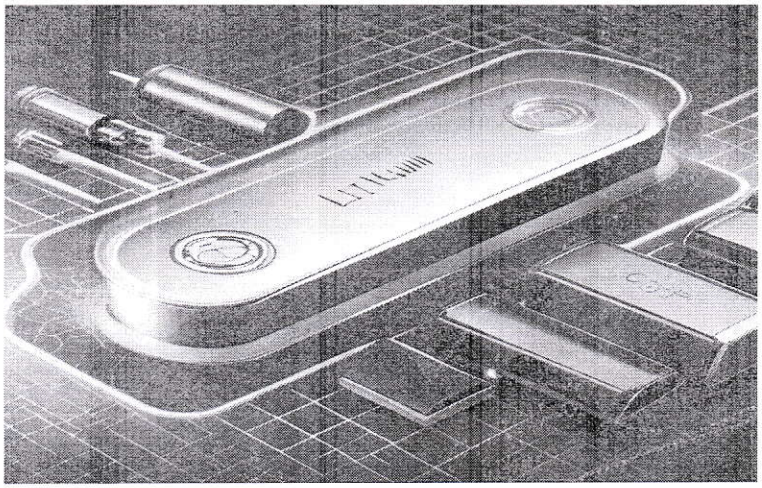
= 67

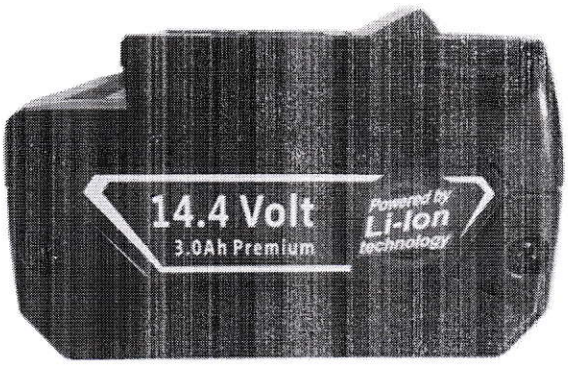
10/8/23

OVERVIEW ON LITHIUM ION BATTERY

ABSTRACT:

Lithium batteries are characterized by high specific energy, high efficiency and long life. These unique properties have made lithium batteries the power sources of choice for the consumer electronics market with a production of the order of billions of units per year. These batteries are also expected to find a prominent role as ideal electrochemical storage systems in renewable energy plants, as well as power systems for sustainable vehicles, such as hybrid and electric vehicles. However, scaling up the lithium battery technology for these applications is still problematic since issues such as safety, costs, wide operational temperature and materials availability, are still to be resolved. This review focuses first on the present status of lithium battery technology, then on its near future development and finally it examines important new directions aimed at achieving quantum jumps in energy and power content.



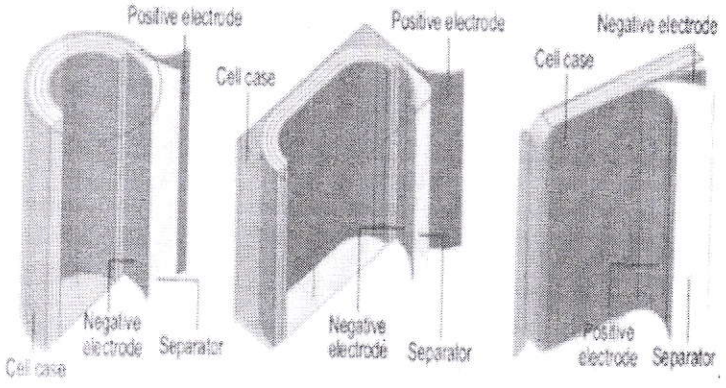


INTRODUCTION:

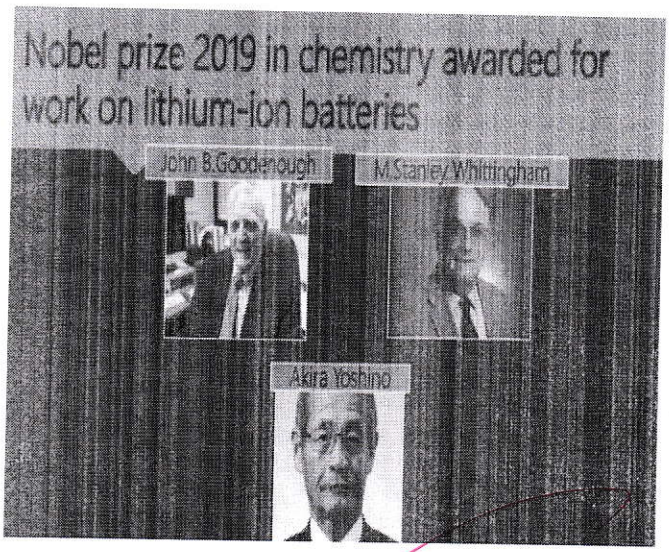
Renewable energy sources, including wind and solar energy, play a key role in the decarbonization of the energy system of the whole world. According to the World Energy Council, the total capacity of wind turbines around the world by 2020 will be 474 GW. Electricity received from photovoltaic modules should reach 100 GW by 2020 .However, it is now obvious that in order to smooth out the unregularly production of renewableenergy, highly efficient and low-cost energy storage devices are needed.

For such systems, the rate of energy storage and long service life (number of cycles), as well as the relatively low cost, are extremely important. There is an opinion [1], that in order to be competitive, the capital costs of storage technologies for energy applications must be comparable or lower than $ 250/kWh, provided that the life cycle is 15 years or 3900 cycles. Capital cost of $ 1,250/kW or less is desirable. To some extent, the electrochemical technologies satisfying these requirements could be divided into two main groups: batteries and hydrogen technologies based on electrolyzers and fuel cells . Currently, lithium-ion batteries are beginning to dominate in the field of relatively short-term energy storage.

The importance of the lithium-ion technology is so great that in 2019, John B. Goodenough, M.StanleyWhittingham and Akira Yoshino won the Nobel Prize in Chemistry for the invention of the first prototype of a lithium-ion battery with a positive electrode made of $LiCoO_2$ and a negative electrode made of graphite .Lithium-ion batteries operate with a voltage of about 3.7 V and exhibit an energy density of about 220 Wh/kg . Electrical energy powers our lives, whenever and wherever we need it, and can now be accessed with evermore ease and efficiency – even in the absence of nearby power outlets. We increasinglymove in unbound and wireless ways, and enjoy high mobility in a potentially healthier local environment. This dramatic development has been made possible by efficient energy storage devices, where high-capacity batteries enable, for example, a variety of electrically-driven toolsand vehicles. In principle, we all can enjoy the use of mobile phones, cameras, laptops, power tools, etc., relying on efficient batteries to power them. As a consequence of modern battery technology, electric vehicles are also becoming increasingly popular, and we are in the middle of a switch away from vehicles powered by fossil fuels. In addition, efficient energy storage is an important complement to fluctuating energy sources, such as wind and sunlight. With batteries, the supply-demand chain can thus be balanced over time, even in situations when no energy can be produced.To a large extent, these developments have been made possible by the lithium-ion battery. This type of battery has revolutionized the energy storage technology and enabled the mobile revolution. Through its high potential, and high energy density and capacity, this battery type has already contributed to improving our lives, and arguably will continue to do so in the years to come. However, battery development is very daunting and challenging in general, and perhaps particularly so when it comes to lithium-based cells. Ever since Alessandro Volta presented his famous "pile" around 1800,1 tremendous effort has been invested in the development of batteries. Many scientists and engineers, working in academia, industry, and even independently, have contributed to this development, realizing that the identification of solutions for efficient batteries is a highly difficult task. The development has thus been relatively sluggish and only very few efficient battery configurations have been successfully designed over the years. For example, we still rely on the lead–acid battery discovered in the mid-19th century.2,3 Nevertheless, due to several ground-breaking multidisciplinary scientific discoveries, encompassing electrochemistry, organic/inorganic chemistry, materials science, etc., these challenges could indeed be met, and the lithium-ion battery become a reality that essentially changed our world.



(a) Cylindrical cell (b) Prismatic cell (c) Pouch cell



BACKGROUND :

Much of the basic research that led to the development of the intercalation compounds that form the core of lithium-ion batteries was carried out in the 1960s by Robert Huggins and Carl Wagner, who studied the movement of ions in solids. Reversible intercalation of lithium ions into graphite as anodes and intercalation of lithium ions into cathodic oxide as cathodes was discovered during 1974–76 by Jürgen Otto Besenhard at TU Munich. Besenhard proposed its application in lithium cells.What was missing in Besenhard's batteries is an electrolyte, that would prevent solvent co-intercalation into graphite, electrolyte decomposition and corrosion of current collectors. Thus, his batteries had very short cycle lives.British chemist M. Stanley Whittingham, then a researcher at ExxonMobil, first reported a charge-discharge cycling with a lithium metal battery (a precursor to modern lithium-ion batteries) in the 1970s.Drawing on previous research from his time at Stanford University, he used a

Historical Context

1791	Galvani (Italy)	Animal Electricity
1800	Alessandro Volta (Italy)	Invention of Voltaic Cell (Cu/brine/Zn)
1833	Micchael Faraday (UK)	Faraday's Law of Electrolysis
1836	John Danieli (UK)	Danieli Cell ($Cu/CuSO_4//ZnSO_4/Zn$)
1859	Gaston Plante (France)	PbO_2 (s) + Pb(s) + $2H_2SO_4$ =2 $PbSO_4$ (s) + 2 H_2O
1868	Georges Leclanche (France)	Zn(s) + 2 MnO_2(s) + 2 NH_4Cl(aq) → $ZnCl_2$ + Mn_2O_3(s) + 2 NH_3(aq) + H_2O
1899	Waldemar Jugner (Sweden)	$Cd+2NiO(OH)+2H_2O=Cd(OH)_2+2Ni(OH)_2$
1901	Thomas Edison (USA)	$Fe+2NiO(OH)+2H_2O=Fe(OH)_2+2Ni(OH)_2$
Mid 1960	Union Carbide (USA)	Zn (s) +2MnO_2 (s) → ZnO (s) +Mn_2O_3 (s)
1970s	Various	Valve Regulated Lead Acid Cells
1990	Various	$MH+NiO(OH)=M+Ni(OH)_2$
1991	Yoshio Nishi (Japan)	Lithium Ion Cell

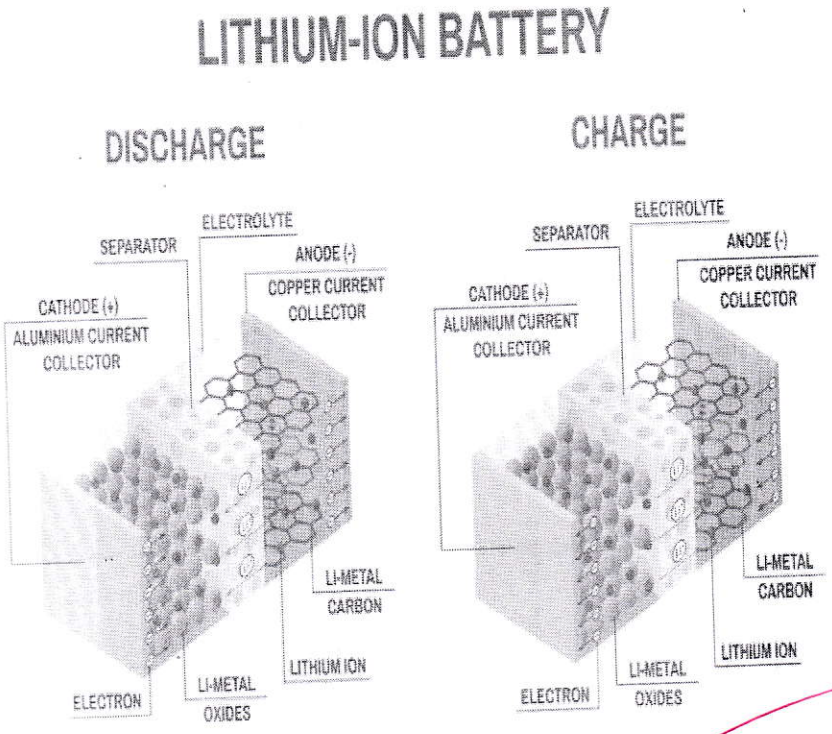
layered titanium(IV) sulfide as cathode and lithium metal as anode. However, this setup proved impractical. Titanium disulfide was expensive (~$1,000 per kilogram in the 1970s) and difficult to work with, since it has to be synthesized under completely oxygen and moisture-free conditions. When exposed to air, it reacts to form hydrogen sulfide compounds, which have an unpleasant odour and are toxic to humans and most animals. For this, and other reasons, Exxon discontinued development of Whittingham's lithium-titanium disulfidebattery.Batteries with metallic lithium electrodes presented safety issues, as lithium metal reacts with water, releasing flammable hydrogen gas. Consequently, research moved to develop batteries in which, instead of metallic lithium, only lithium compounds are present, being capable of accepting and releasing lithium ions.

STRUCTURE :

A lithium-ion battery is a rechargeable type of battery that uses lithium ions to facilitate the flow of electrical current. It consists of several key components, each playing a specific role in the battery's operation. Here is a simplified overview of the typical structure of a lithium-ion battery:

🔍 **Cathode:** The cathode is the positive electrode of the battery and is usually made of a lithium metal oxide compound, such as lithium cobalt oxide (LiCoO2), lithium iron phosphate (LiFePO4), or lithium nickel manganese cobalt oxide (LiNiMnCoO2). The cathode material determines the battery's energy density.

🔍 **Anode:**The anode is the negative electrode and is typically made of graphite, which can intercalate (absorb) lithium ions during charging. Graphite anodes provide a stable structure for the lithium ions to be stored.



🔍 **Separator:** The separator is a permeable material that physically separates the cathode and anode while allowing the passage of lithium ions. It prevents short circuits and maintains the electrical isolation of the two electrodes.

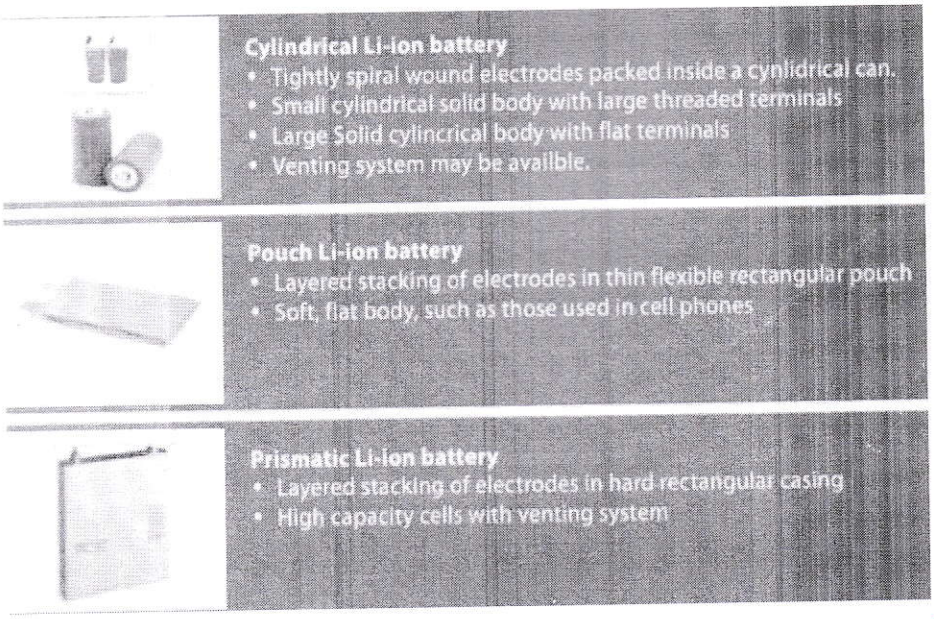
🔍 **Electrolyte**: The electrolyte is a conductive solution or gel that allows the movement of lithium ions between the cathode and anode. It typically consists of a lithium salt dissolved in an organic solvent or a polymer gel. The electrolyte also acts as a medium for transporting the lithium ions during charge and discharge.

🔍 **Current Collectors:**Each electrode is connected to a current collector, which is usually made of a metal foil . The current collector collects the current generated during charge or discharge and facilitates its flow in and out of the battery.

🔍 **Cell Casing:** The battery cell is enclosed in a casing, typically made of metal or plastic, to protect the internal components and prevent leakage or damage. The casing also acts as a current collector and provides structural integrity to the battery.

When a lithium-ion battery is charged, lithium ions move from the cathode through the electrolyte to the anode, where they are stored within the graphite structure. During discharge, the ions flow back from the anode to the cathode through the electrolyte.

Different shapes of the lithium-ion cell:



❁ □ **Cylindrical:** Cylindrical lithium cells are used for high specific energy density and good mechanical stability. This shape offers good safety and a high cycle life at a low cost. The disadvantage is that it has low packaging density

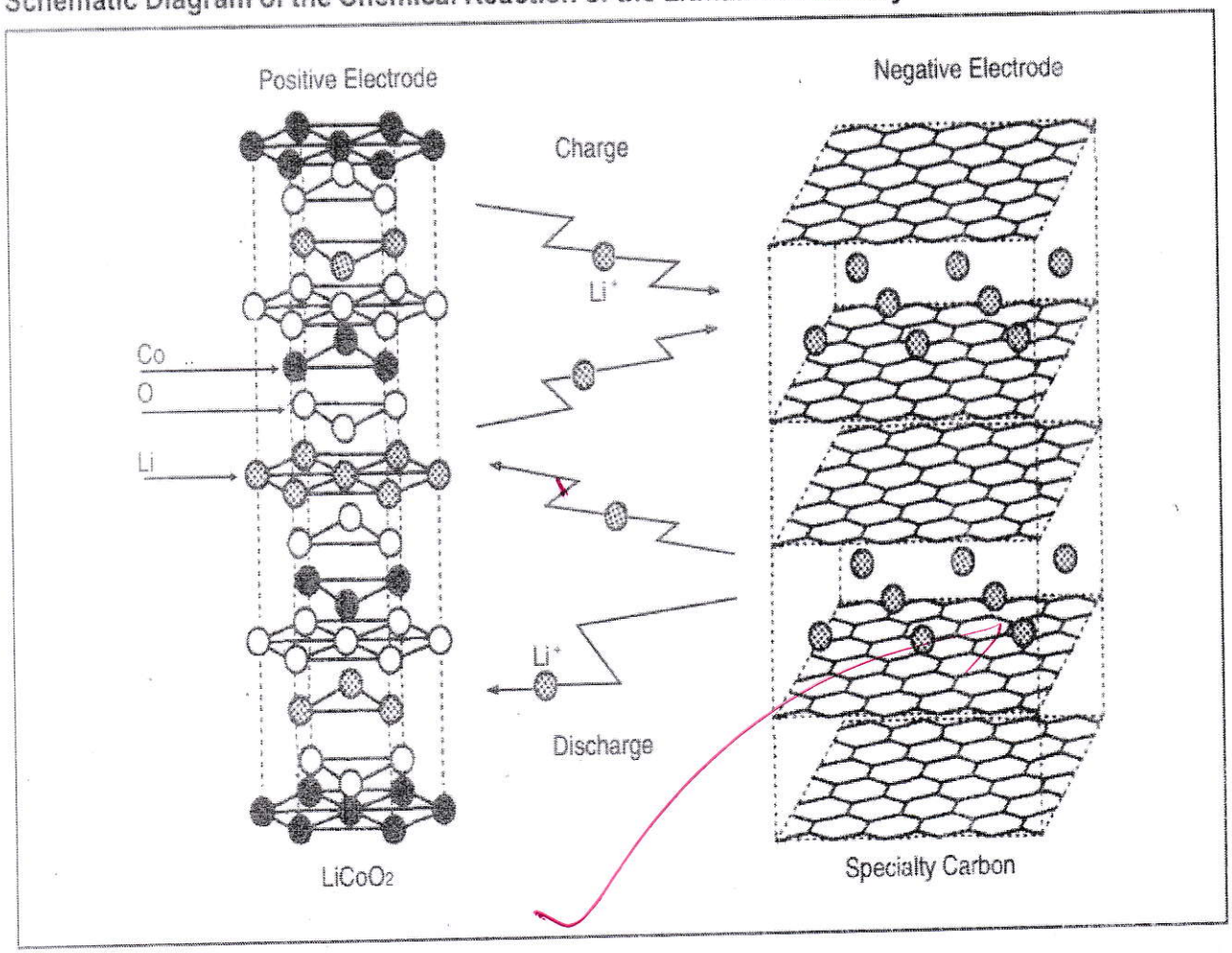
❁ □ **Pouch**: Cells in this shape have a laminated architecture in a bag. Exposure to high temperature Land humidity can shorten the life of this cell, but it is light and cost effective

⊗ **Prismatic:** These cells are packaged in Aluminum or steel for good stability. It is expensive to manufacture but is a space effective solution compared to the Cylindrical cel

Battery reaction:

The lithium ion battery makes use of lithium cobalt oxide as the positive electrode and a highly-crystallized specialty carbon as the negative electrode. It uses an organic solvent, optimized for the specialty carbon, as the electrolytic fluid.The chemical reactions for charge and discharge are as shown below:

Schematic Diagram of the Chemical Reaction of the Lithium Ion Battery



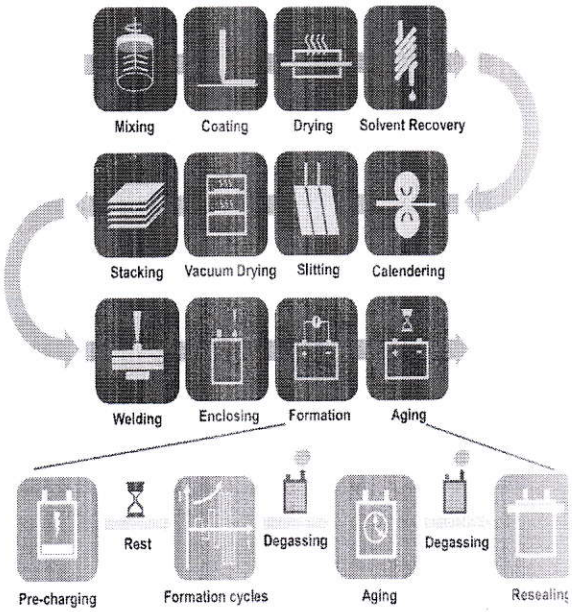
MANUFACTURE PROCESS :

➢ **Starting material :**

Lithium compounds: Lithium-ion batteries contain lithium in the form of lithium salts, such as lithium carbonate or lithium hydroxide. These compounds are used as the source of lithium ions for the battery's electrolyte.

Electrode materials: Lithium-ion batteries have two electrodes, the cathode (positive electrode) and the anode (negative electrode). The cathode material is usually a lithium metal oxide, such as lithium cobalt oxide (LiCoO2), lithium manganese oxide (LiMn2O4), or lithium iron phosphate (LiFePO4). The anode material is typically made of graphite or other carbon-based materials.

Electrolyte: The electrolyte in a lithium-ion battery is responsible for facilitating the movement of lithium ions between the cathode and the anode during charging and discharging. The electrolyte is usually a lithium salt dissolved in an organic solvent, such as lithium hexafluorophosphate (LiPF6) in a mixture of ethylene carbonate and dimethyl carbonate.



Separator: A separator is placed between the cathode and the anode to prevent direct contact and short-circuiting while allowing the passage of lithium ions. The separator is typically a thin, porous membrane made of materials like polyethylene or polypropylene.

Current collectors: Current collectors are used to collect the current generated during the battery's operation. They are usually made of metal foils, such as aluminum for the cathode and copper for the anode.

➢ Lithium-ion Battery Manufacturing Process :

Manufacturing processes	Developed method	Significance	Challenge
Mixing	3D hydrodynamic shear mixing	Low cost, easy to scale-up	Limited improvement
	Ball milling	High efficiency, good uniformity	The risk of damaging the structure of active materials particles
	Ultrasonic mixing	High efficiency especially for high concentration slurry	Instrumental cost and hard to scale-up
	Different mixing sequence	Improve the uniformity without marginal modifications	Need more study for different materials
Coating/drying	Low solvent content extrusion	Lower the drying time and energy consumption	Cannot avoid the toxic organic solvent and potential instrumental investment
	Dry calendering	Save the drying time and energy	Potential instrumental investment, scale-up ability
	Dry printing		Potential instrumental investment, scale-up ability, and spray uniformity
	Electrostatic coating		Potential instrumental investment, scale-up ability, and coating uniformity
	Three-stage drying	Lower the drying time without extra instrument cost	Limited improvement
	Laser annealing Infrared heating	Lower the drying time and energy consumption	
Slitting	Laser cutting	Improve the cutting quality and flexibility for different shape design	Potential instrumental investment and relatively low throughput
Vacuum drying	Argon purging	High throughput and room-temperature operation	The efficiency after scale-up needs to be verified
Welding	Laser welding	Low contact resistance and high tensile force	Difficulty to join dissimilar and high-reflective materials
	Wire bonding	Low energy consumption	Only feasible for cylindrical cell
Formation	Narrow the voltage window	Save the formation time without extra cost	Mechanism still unclear
	Pulse current charging	Save the formation time, low cost	Specific frequency needs to be discovered for different types of cells
	Artificial SEI layer	Save the formation time	Potential instrumental investment and scale-up ability

ADVANTAGES :

There are many advantages to using a li-ion cell of battery. Everything from small electronic devices, through smartphones and laptops to vehicles and many other applications.When selecting a lithium ion battery over another technology such as a lead acid battery or a nickel metal hydride battery (NiMH battery), it is necessary to look at the advantages.

The li-ion battery advantages include:

High energy density: The high energy density is one of the chief advantages of lithium ion battery technology. With electronic equipment such as mobile phones needing to operate longer between charges while still consuming more power, there is always a need to batteries with a much higher energy ddensity.

Self-discharge: One issue with many rechargeable batteries is the self discharge rate. Lithium ion cells is that their rate of self-discharge is much lower than that of other rechargeable cells such as Ni-Cad and NiMH forms. It is typically around 5% in the first 4 hours after being charged but then falls to a figure of around 1 or 2% per month.

Low maintenance: One major lithium ion battery advantage is that they do not require and maintenance to ensure their performance.Ni-Cad cells required a periodic discharge to ensure that they did not exhibit the memory effect. As this does not affect lithium ion batteries and cells .Likewise lead acid cells require maintenance, some needing the battery acid to be topped up periodically.Fortunately one of the advantages of lithium ion batteries is that there is no active maintenance required.

Cell voltage: The voltage produced by each lithium ion cell is about 3.6 volts. This has many advantages. Being higher than that of the standard nickel cadmium, nickel metal hydride and even standard alkaline cells at around 1.5 volts and lead acid at around 2 volts per cell, the voltage of each lithium ion cell is higher, requiring less cells in many battery applications. For smartphones a single cell is all that is needed and this simplifies the power management.

Variety of types available: There are several types of lithium ion cell available. This advantage of lithium ion batteries can mean that the right technology can be used for the particular application needed. Some forms of lithium ion battery provide a high current density and are ideal for consumer mobile electronic equipment. Others are able to provide much higher current levels and are ideal for power tools and electric vehicles.

DISADVANTAGES:

Like the use of any technology, there are some disadvantages that need to be balanced against the benefits. Knowing the disadvantages means that work arounds can often be included in the electronic design or electrical system, etc to reduce the effects of the shortcomings.

The li-ion battery disadvantages include:

Cost:A major lithium ion battery disadvantage is their cost. Typically they are around 40% more costly to manufacture than Nickel cadmium cells. This is a major factor when considering their use in mass produced consumer items where any additional costs are a major issue.

Protection / battery management system required: Lithium ion cells and batteries are not as robust as some other rechargeable technologies. They require protection from being over charged and discharged too far. In addition to this, they need to have the current maintained within safe limits. Accordingly one lithium ion battery disadvantage is that they require protection circuitry incorporated to ensure they are kept within their safe operating limits.

Ageing: One of the major lithium ion battery disadvantages for consumer electronics is that lithium ion batteries suffer from ageing. Not only is this time or calendar dependent, but it is also dependent upon the number of charge discharge cycles that the battery has undergone.

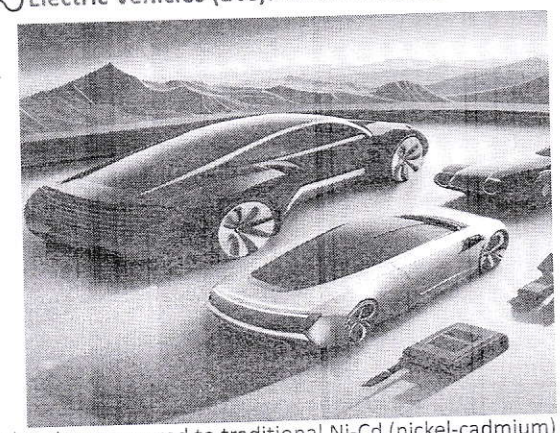
Transportation: This li-ion battery disadvantage has come to the fore in recent years. Many airlines limit the number of lithium ion batteries they take, and this means their transportation is limited to ships.

APPLICATIONS :

Lithium-ion batteries are widely used in various applications due to their high energy density, long cycle life, and lightweight design. Here are some common uses of lithium-ion batteries:

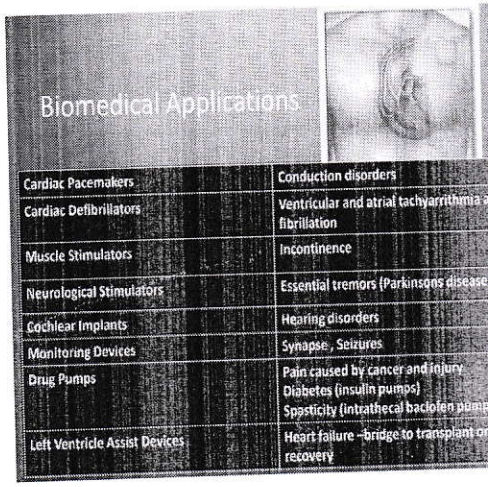
Consumer Electronics: Lithium-ion batteries power a wide range of portable consumer electronic devices, including smartphones, tablets, laptops, digital cameras, and wearable devices.

Electric Vehicles (EVs): Lithium-ion batteries are the primary energy storage technology in electric vehicles. They provide the necessary power for propulsion and enable longer driving ranges compared to other battery technologies.

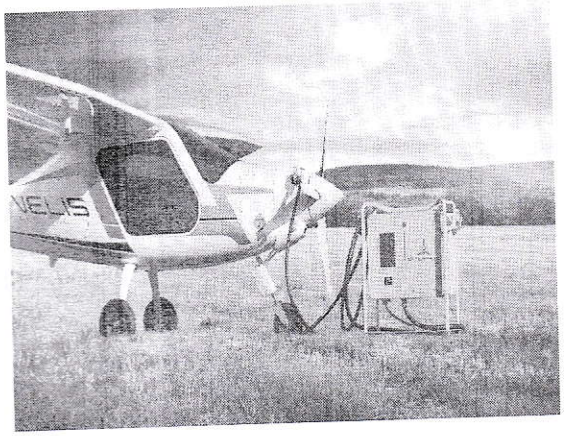


Energy Storage Systems: Lithium-ion batteries are used in energy storage systems at both residential and utility scales. These systems store excess electricity generated from renewable energy sources, such as solar or wind, and release it when needed, helping to balance the grid and enhance energy reliability.

Power Tools: Cordless power tools, such as drills, saws, and screwdrivers, often utilize lithium-ion batteries. They offer high power output, longer runtime, and faster charging compared to traditional Ni-Cd (nickel-cadmium) or Ni-MH (nickel-metal hydride) batteries.



Aerospace and Defense: Lithium-ion batteries are utilized in aerospace and defense applications, including satellites, spacecraft, unmanned aerial vehicles (UAVs), and military equipment. They provide lightweight energy storage solutions for powering various electronic systems.Beyond consumer electronics and electric vehicles, Lithium ion batteries are also being used in aerospace applications such as satellites and spacecraft. They are ideal for these applications due to their high energy density and low self-discharge rate.Additionally, Lithium ion batteries have the potential to revolutionize the energy storage industry, as they can be used to store energy from renewable sources such as solar and wind power



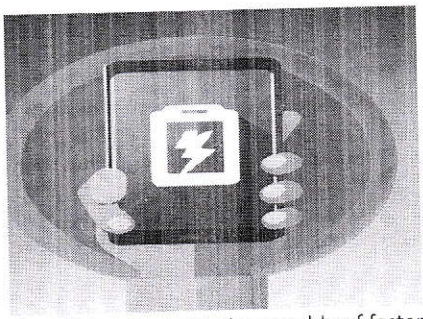
Medical Devices: Many medical devices, such as portable monitors, insulin pumps, defibrillators, and prosthetics, rely on lithium-ion batteries. These batteries offer compact size, high energy density, and reliable performance, making them suitable for medical applications.

Renewable Energy Systems: Lithium-ion batteries play a vital role in off-grid and hybrid renewable energy systems. They store energy generated from renewable sources, such as solar panels or wind turbines, and supply power during periods of low generation or high demand.

RECENT ADVANCES ON LITHIUM ION BATTERY:

High-capacity electrodes: Researchers are continuously working on developing materials for electrodes that can store more lithium ions, thereby increasing the energy density of lithium-ion batteries. Various approaches include using silicon-based anodes, lithium-rich cathodes, and sulfur-based cathodes.

Solid-state batteries: Solid-state batteries have been a significant focus of research and development. These batteries replace the liquid electrolyte found in traditional lithium-ion batteries with a solid-state electrolyte. Solid-state batteries offer potential advantages such as higher energy density, improved safety, and longer lifespan.



Advanced electrolytes: The development of new electrolyte formulations is crucial for improving the performance and safety of lithium-ion batteries. Researchers are investigating electrolytes with improved stability, higher conductivity, and enhanced resistance to degradation, enabling longer cycle life and higher operating voltages.

Fast charging: Rapid charging is a desirable feature for electric vehicles and portable electronics. Researchers are working on developing lithium-ion batteries capable of faster charging without compromising safety or cycle life. Advanced electrode materials and optimized cell designs are being explored to facilitate faster charging rates.

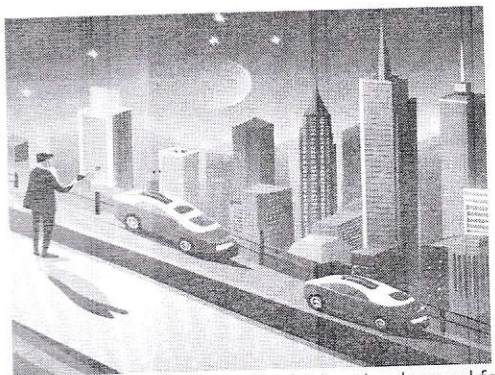
Recycling and sustainability: As the demand for lithium-ion batteries increases, there is growing interest in developing efficient recycling processes to recover valuable materials and reduce environmental impact. Researchers are exploring methods to recover and reuse materials like lithium, cobalt, nickel, and other metals from spent batteries.

Beyond lithium-ion: While lithium-ion batteries dominate the current market, researchers are also exploring alternative battery chemistries. These include lithium-sulfur (Li-S) batteries, lithium-air (Li-Air) batteries, solid-state batteries, and various post-lithium technologies. These alternatives aim to achieve higher energy densities, longer lifespans, and improved safety compared to lithium-ion batteries.

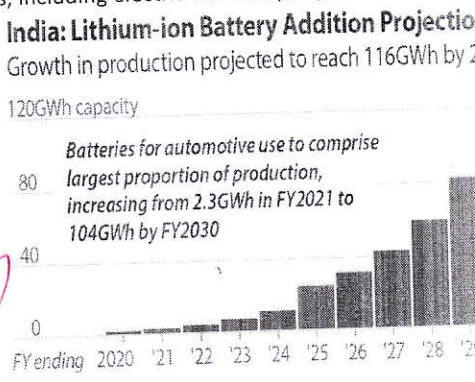
Aerospace application : Beyond consumer electronics and electric vehicles, LiLitLithium ion batteries are also being used in aerospace applications such as satellites and spacecraft. They are ideal for these applications due to their high energy density and low self-discharge rate.Additionally, Lithium ion batteries have the potential to revolutionize the energy storage industry, as they can be used to store energy from renewable sources such as solar and wind power.

It's Important to note that battery technology is a rapidly evolving field, and there may have been further advancements in lithium-ion batteries since my knowledge cutoff date.

LITHIUM ION BATTERY FUTURE IN INDIA:



India is poised to play a significant role in the future of lithium-ion batteries. Lithium-ion batteries are widely used in various applications, including electric vehicles (EVs), renewable energy storage, and portable electronics. India, with its ambitious goals in renewable energy and electric mobility, recognizes the importance of lithium-ion battery technology and is taking several initiatives to secure its position in this field



Electric Vehicle Adoption: India has set a target to transition entirely to electric vehicles by 2030. This goal is driving the demand for lithium-ion batteries in the country. The Indian government has launched several initiatives, including the Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme, to promote the manufacturing and adoption of electric vehicles.

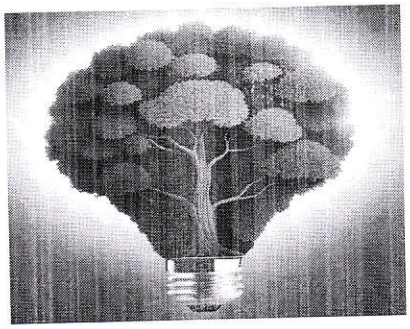
Raw Material Resources: India has substantial reserves of lithium, a key raw material for lithium-ion batteries. The government is actively exploring lithium reserves and encouraging domestic production of lithium to reduce dependence on imports.

Research and Development: India is investing in research and development activities to enhance lithium-ion battery technology. Academic institutions and research organizations are working on developing advanced battery materials, improving energy storage efficiency, and exploring alternatives to lithium-ion batteries.

International Collaboration: India is forging partnerships with other countries to strengthen its battery technology capabilities. For instance, India and Australia have entered into a strategic partnership to promote research collaboration and the development of critical mineral resources, including lithium.

India is positioning itself for a prominent role in the future of lithium-ion batteries. These efforts align with India's broader objectives of achieving energy security, reducing carbon emissions, and fostering sustainable development.

CONCLUSION :



Current research focuses on increment of battery life, energy density, safety, cost reduction etc. These batteries are already in widespread use in electronic devices, electrically powered vehicles, aerospace applications etc. Safety is still a concern for these batteries. Various researchers have come up with combinations of different materials for positive and negative electrodes. Lithium Iron Phosphate, Lithium Manganese Oxide, Lithium Manganese Oxide etc. are deployed as positive electrodes while Hard Carbon, Lithium Titanate, Tin/Cobalt Alloy etc. are being deployed as negative electrodes. Thus, it is to be seen how these battery technologies develop over time and is an active area of research for Chemists & Chemical Engineers.

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Department of Environmental Science

Dissertation

A study on medeicinal & Herbal plants in Jangipur area

A Dissertation submitted to Environmental Science Department of Jangipur College, Jangipur,Murshidabad

Guided By-

Mrs. Debjani Pal & Mr. Rizwanul

Roll No. - 2116220-1953815

Registration No- 053766

Session- 2019-2020

6 th Semester (UG-ENVS-H-DSE-04)

In partial fulfillment of the syllabus of Under Graduate course of (B.Sc) Environmental Science (Hons.), 2022

Submitted By-NAJMIN KHATUN

Marks obtained 67 out of 75

DECLARATION BY THE CANDIDATE

I hereby certify that the work which is being presented in the Dissertation entitled, ***"a study on medicinal & herbal plants in jangipur locality",*** in partial fulfillment of the requirements for the award of the Degree of B.sc Honours in Environmental Science in Department of Environmental Science is an authentic record of my own work carried out during Dissertation period under the supervision of Mrs. Debjani Pal & Mr. Rizwanul Islam.

The matter embodied in this Dissertation has not been submitted by me for the award of any other Degree of this or any other University/ Institute.

Najmin Khatun

Signature of the Candidate

Najmin Khatun

6 th Semester, 2022

B.Sc in Environmental Science (Hons.)

Department of Environmental Science

Place- Jangipur

Date-

Certificate

This is to certify that the project entitled ***"a study on medicinal & herbal plants in Jangipur locality" is*** the bonafide work of **Najmin Khatun** submitted to Department of Environmental Science of Jangipur College, Jangipur, Murshidabad, West Benagl in partial fulfillment of the requirement for the award of the Degree of B.Sc (Hons.) in Environmental Science.

No part of this dissertation has been submitted elsewhere for award of any other degree.

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Signature of External Examiner
Full Name (in Block letters)-

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Examiner

2/7/2022

2/7/22

Abstract

Medicinal plants from the Mediterranean region show great potential in the improvement of health and in the prevention of disease. Epidemiological studies indicate that some of these plants reduce the incidence of inflammatory diseases and cancer by inducing programmed cell death, thus arresting proliferation. These medicinal properties are related to the presence of compounds such as phenolics with antioxidant properties or nonphenolic compounds, including essential oils, terpenoids, or saponins. Medicinal plants and foods have long been used in China and other parts of East Asia to slow cognitive decline in aging and to manage age-related memory impairment. The historical Chinese medical literature is voluminous and provides numerous citations of disorders consistent with Alzheimer's disease and mild cognitive impairment for which plant-based formulations were recommended. Although some of the plants referred to in the pre-modern literature have fallen out of use, others continue to be used in traditional medicine including *Polygala tenuifolia*, *Poria cocos*, *Panax ginseng*, *Acorus* species, and *Rehmannia glutinosa*. In recent decades, a number of traditional formulations have received research attention, and clinical trials have shown some promising results. Extracts from *Ginkgo biloba* and *Huperzia serrata* have undergone considerable experimental and clinical testing, and commercial preparations have been developed. The ethnobiology of medicinal plants from the tropics has been rediscovered, complete with an understanding of how traditional uses reflect alternative medical systems. The traditional system of medicine in India, *Ayurveda*, provides many medicines from the Neem tree, *Azadirachta indica*. Recent studies have focused on the health benefits of aromatic and medicinal plants that have antioxidant, antimicrobial, and mutagen properties. The dietary intake of antioxidant compounds is important for health, and increasing interest in nutraceuticals and functional foods has led plant breeders to begin selecting for and cultivating crops with higher phenolic and antioxidant contents .

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Review of Literature

The term "**medicinal plant**" include various types of plants used in herbalism ("herbology" or "herbal medicine"). It is the use of plants for medicinal purposes, and the study of such uses.

The word "**herb**" has been derived from the Latin word, *"herba"* and an old French word *"herbe"*. Now a days, herb refers to any part of the plant like fruit, seed, stem, bark, flower, leaf, stigma or a root, as well as a non-woody plant. Earlier, the term "herb" was only applied to non-woody plants, including those that come from trees and shrubs. These medicinal plants are also used as food, flavonoid, medicine or perfume and also in certain spiritual activities.

Plants have been used for medicinal purposes long before prehistoric period. Ancient Unani manuscripts Egyptian papyrus and Chinese writings described the use of herbs. Evidence exist that Unani Hakims, Indian Vaids and European and Mediterranean cultures were using herbs for over 4000 years as medicine. Indigenous cultures such as Rome, Egypt, Iran, Africa and America used herbs in their healing rituals, while other developed traditional medical systems such as Unani, Ayurveda and Chinese Medicine in which herbal therapies were used systematically.

Traditional systems of medicine continue to be widely practised on many accounts. Population rise, inadequate supply of drugs, prohibitive cost of treatments, side effects of several synthetic drugs and development of resistance to currently used drugs for infectious diseases have led to increased emphasis on the use of plant materials as a source of medicines for a wide variety of human ailments.

Among ancient civilisations, India has been known to be rich repository of medicinal plants. The forest in India is the principal repository of large number of medicinal and aromatic plants, which are largely collected as raw materials for manufacture of drugs and perfumery products. About 8,000 herbal remedies have been codified in AYUSH systems in INDIA. Ayurveda, Unani, Siddha and Folk (tribal) medicines are the major systems of indigenous medicines. Among these systems, Ayurveda and Unani Medicine are most developed and widely practised in India.

Recently, WHO (World Health Organization) estimated that 80 percent of people worldwide rely on herbal medicines for some aspect of their primary health care needs. According to WHO, around 21,000 plant species have the potential for being used as medicinal plants.

As per data available over three-quarters of the world population relies mainly on plants and plant extracts for their health care needs. More than 30% of the entire plant species, at one time or other were used for medicinal purposes. It has been estimated, that in developed countries such as United States, plant drugs constitute as much as 25% of the total drugs, while in fast developing countries such as India and China, the contribution is as much as 80%. Thus, the economic importance of medicinal plants is much more to countries such as India than to rest of the world. These countries provide two third of the plants used in modern system of medicine and the health care system of rural population depend on indigenous systems of medicine.

Treatment with medicinal plants is considered very safe as there is no or minimal side effects. These remedies are in sync with nature, which is the biggest advantage. The golden fact is that, use of herbal treatments is independent of any age groups and the sexes.

The ancient scholars only believed that herbs are only solutions to cure a number of health related problems and diseases. They conducted thorough study about the same, experimented to arrive at accurate conclusions about the efficacy of different herbs that have medicinal value. Most of the drugs, thus formulated, are free of side effects or reactions. This is the reason why herbal treatment is growing in popularity across the globe. These herbs that have medicinal quality provide rational means for the treatment of many internal diseases, which are otherwise considered difficult to cure.

Medicinal plants such as *Aloe*, *Tulsi*, *Neem*, *Turmeric* and *Ginger* cure several common ailments. These are considered as home remedies in many parts of the country. It is known fact that lots of consumers are using Basil (*Tulsi*) for making medicines, black tea, in *pooja* and other activities in their day to day life.

In several parts of the world many herbs are used to honour their kings showing it as a symbol of luck. Now, after finding the role of

herbs in medicine, lots of consumers started the plantation of tulsi and other medicinal plants in their home gardens.

Medicinal plants are considered as a rich resources of ingredients which can be used in drug development either pharmacopoeial, non-pharmacopoeial or synthetic drugs. A part from that, these plants play a critical role in the development of human cultures around the whole world. Moreover, some plants are considered as important source of nutrition and as a result of that they are recommended for their therapeutic values. Some of these plants include ginger, green tea, walnuts, aloe, pepper and turmeric etc. Some plants and their derivatives are considered as important source for active ingredients which are used in aspirin and toothpaste etc.

Apart from the medicinal uses, herbs are also used in natural dye, pest control, food, perfume, tea and so on. In many countries different kinds of medicinal plants/ herbs are used to keep ants, flies, mice and flee away from homes and offices. Now a days medicinal herbs are important sources for pharmaceutical manufacturing.

Recipes for the treatment of common ailments such as diarrhoea, constipation, hypertension, low sperm count, dysentery and weak penile erection, piles, coated tongue, menstrual disorders, bronchial asthma, leucorrhoea and fevers are given by the traditional medicine practitioners very effectively.

Over the past two decades, there has been a tremendous increase in the use of herbal medicine; however, there is still a significant lack of research data in this field. Therefore since 1999, WHO has published three volumes of the WHO monographs on selected medicinal plants.

Importance of some herbs with their medicinal values

- Herbs such as black pepper, cinnamon, myrrh, aloe, sandalwood, ginseng, red clover, burdock, bayberry, and safflower are used to heal wounds, sores and boils.
- Basil, Fennel, Chives, Cilantro, Apple Mint, Thyme, Golden Oregano, Variegated Lemon Balm, Rosemary, Variegated Sage are some important medicinal herbs and can be planted in kitchen garden. These herbs are easy to grow, look good, taste and smell amazing and many of them are magnets for bees and butterflies.

- Many herbs are used as blood purifiers to alter or change a long-standing condition by eliminating the metabolic toxins. These are also known as 'blood cleansers'. Certain herbs improve the immunity of the person, thereby reducing conditions such as fever.
- Some herbs are also having antibiotic properties. Turmeric is useful in inhibiting the growth of germs, harmful microbes and bacteria. Turmeric is widely used as a home remedy to heal cut and wounds.
- To reduce fever and the production of heat caused by the condition, certain antipyretic herbs such as *Chirayta*, black pepper, sandal wood and safflower are recommended by traditional Indian medicine practitioners.
- Sandalwood and Cinnamon are great astringents apart from being aromatic. Sandalwood is especially used in arresting the discharge of blood, mucus etc.
- Some herbs are used to neutralize the acid produced by the stomach. Herbs such as marshmallow root and leaf. They serve as antacids. The healthy gastric acid needed for proper digestion is retained by such herbs.
- Indian sages were known to have remedies from plants which act against poisons from animals and snake bites.
- Herbs like Cardamom and Coriander are renowned for their appetizing qualities. Other aromatic herbs such as peppermint, cloves and turmeric add a pleasant aroma to the food, thereby increasing the taste of the meal.
- Some herbs like aloe, sandalwood, turmeric, sheetraj hindi and khare khasak are commonly used as antiseptic and are very high in their medicinal values.
- Ginger and cloves are used in certain cough syrups. They are known for their expectorant property, which promotes the thinning and ejection of mucus from the lungs, trachea and bronchi. Eucalyptus, Cardamom, Wild cherry and cloves are also expectorants.
- Herbs such as Chamomile, Calamus, Ajwain, Basil, Cardamom, Chrysanthemum, Coriander, Fennel, Peppermint and Spearmint, Cinnamon, Ginger and Turmeric are helpful in

promoting good blood circulation. Therefore, they are used as cardiac stimulants.

- Certain medicinal herbs have disinfectant property, which destroys disease causing germs. They also inhibit the growth of pathogenic microbes that cause communicable diseases.
- Herbal medicine practitioners recommend calmative herbs, which provide a soothing effect to the body. They are often used as sedatives.
- Certain aromatic plants such as Aloe, Golden seal, Barberry and Chirayata are used as mild tonics. The bitter taste of such plants reduces toxins in blood. They are helpful in destroying infection as well.
- Certain herbs are used as stimulants to increase the activity of a system or an organ, for example herbs like Cayenne (Lal Mirch, Myrrh, Camphor and Guggul.
- A wide variety of herbs including Giloe, Golden seal, Aloe and Barberry are used as tonics. They can also be nutritive and rejuvenate a healthy as well as diseased individual.
- Honey, turmeric, marshmallow and liquorice can effectively treat a fresh cut and wound. They are termed as vulnerary herbs.

A medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes or which are precursors for the synthesis of useful drugs. This description makes it possible to distinguish between medicinal plants whose therapeutic properties and constituents have been established scientifically, and plants that are regarded as medicinal but which have not yet been subjected to a thorough scientific study.

A number of plants have been used in traditional medicine for many years. Some do seem to work although there may not be sufficient scientific data (double-blind trials, for example) to confirm their efficacy. Such plants should qualify as medicinal plants. The term 'crude drugs of natural or biological origin' is used by pharmacists

and pharmacologists to describe whole plants or parts of plants which have medicinal properties.

The growing importance of medicinal plants can be appreciated from the economic stand point when the following facts are considered:

- Global trade in herbs is over USD 100 Billion per annum
- India and China's medicinal plant trade is about two to five billion US dollars annually
- In Germany, it is over one billion US dollars annually
- Rose Periwinkle which is endemic to Madagascar fetches US$100 million per annum
- China trades in 7,000 species and 700,000 tons of medicinal plants per annum
- India trades in 7,000 species of medicinal plants
- Morocco exports 58.7 tons of medicinal plants annually
- In the last 5 years, sales of medicinal plants doubled in China, tripled in India and grew by 25% in Europe.

Healing with medicinal plants is as old as mankind itself. The connection between man and his search for drugs in nature dates from the far past, of which there is ample evidence from various sources: written documents, preserved monuments, and even original plant medicines. Awareness of medicinal plants usage is a result of the many years of struggles against illnesses due to which man learned to pursue drugs in barks, seeds, fruit bodies, and other parts of the plants. Contemporary science has acknowledged their active action, and it has included in modern pharmacotherapy a range of drugs of plant origin, known by ancient civilizations and used throughout the millennia. The knowledge of the development of ideas related to the usage of medicinal plants as well as the evolution of awareness has increased the ability of pharmacists and physicians to respond to the challenges that have emerged with the spreading of professional services in facilitation of man's life.

Ever since ancient times, in search for rescue for their disease, the people looked for drugs in nature. The beginnings of the

medicinal plants' use were instinctive, as is the case with animals. In view of the fact that at the time there was not sufficient information either concerning the reasons for the illnesses or concerning which plant and how it could be utilized as a cure, everything was based on experience. In time, the reasons for the usage of specific medicinal plants for treatment of certain diseases were being discovered; thus, the medicinal plants' usage gradually abandoned the empiric framework and became founded on explicatory facts. Until the advent of iatrochemistry in 16th century, plants had been the source of treatment and prophylaxis. Nonetheless, the decreasing efficacy of synthetic drugs and the increasing contraindications of their usage make the usage of natural drugs topical again.

Traditional medicine is still recognized as the preferred primary health care system in many communities, with over 60% of the world's population and about 80% in developing countries depending directly on medicinal plants for their medical purposes . This is due to a number of reasons including affordability, accessibility and low cost .

The use of plants to cure several kinds of human diseases has a long history. Various parts of plants such as leaf, stem, bark, root, etc. are being used to prevent, allay symptoms or revert abnormalities back to normal. Since the practice of "herbal remedies" does not adhere strictly to facts accrued using scientific approaches, orthodox medicine sees "herbal medicines" as an alternative medicine. However, most of the pharmaceutical products currently dispensed by physicians have a long history of use as herbal remedies, including opium, aspirin, digitalis and quinine. Modern medicine today utilizes active compounds isolated from higher plants, and about 80% of these active ingredients indicate a positive correlation between their modern therapeutic use and the traditional uses .

The search for, and use of drugs and dietary supplements obtained from plants have increased in recent years.

Methodology

While taking information about medicinal & herbal plants I had visited mostly in village area of my locality. I found lots of shrubs, herbs & other plants which has certain medicinal values. The common medicinal plants are neem, tulsi, basok, aloe vera, papaya etc. Besides these there are more plants.

Local people use these plants as home therapy knowledge. These plants are useful in the procurement of various types of diseases. Homeopathic medicines also produce with the help of these plants.

I had collected & studied about fifteen or more plants from my locality in different location.
I had least knowledge but while preparing this project work I was endowed with proper uses in our daily life.
In ancient times people of India actually dependent on these types of plants.

The World Health Organization estimates, without reliable data, that some 80 percent of the world's population depends mainly on traditional medicine (including but not limited to plants); perhaps some two billion people are largely reliant on medicinal plants. The use of plant-based materials including herbal or natural health products with supposed health benefits, is increasing in developed countries. This brings attendant risks of toxicity and other effects on human health, despite the safe image of herbal remedies. Herbal medicines have been in use since long before modern medicine existed; there was and often still is little or no knowledge of the pharmacological basis of their actions, if any, or of their safety. The World Health Organization formulated a policy on traditional medicine in 1991, and since then has published guidelines for them, with a series of monographs on widely used herbal medicines.

Figure-01-Aloe barbadensis miller (Aloe vera)

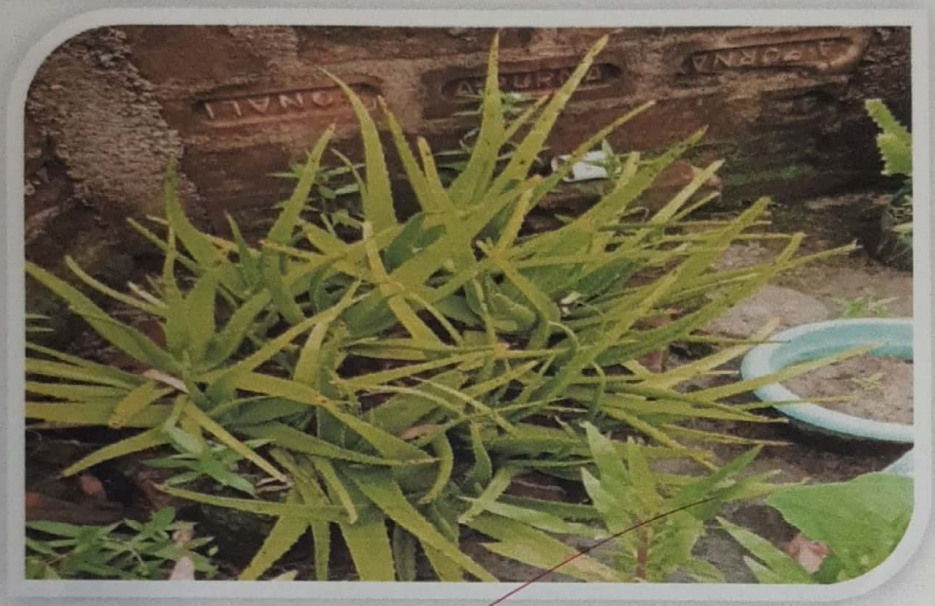


Figure-02- Centella asiatica **(Thankuni)**

Figure-03-Azadirachta indica (Neem)

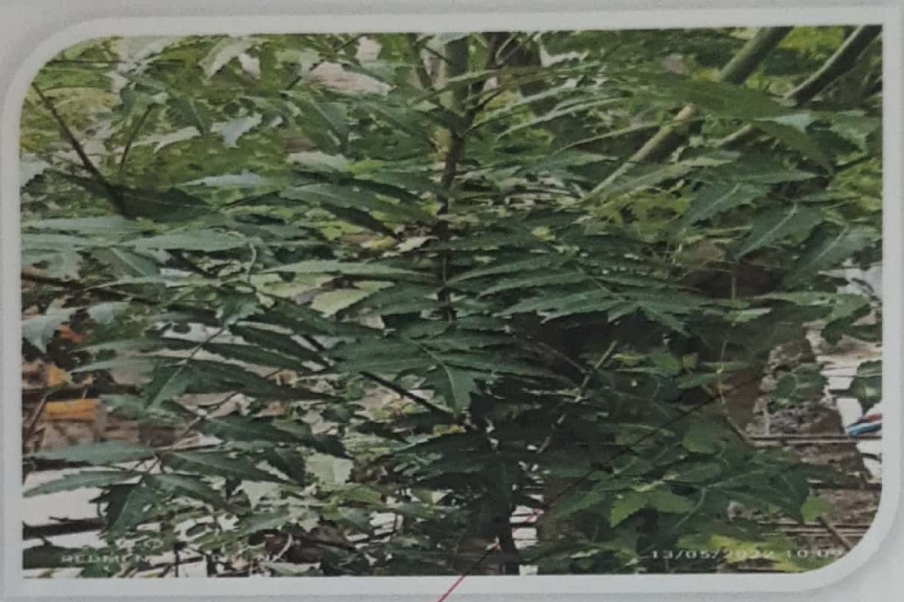


Figure-04-Ocimum tenuiflorum(tulsi)

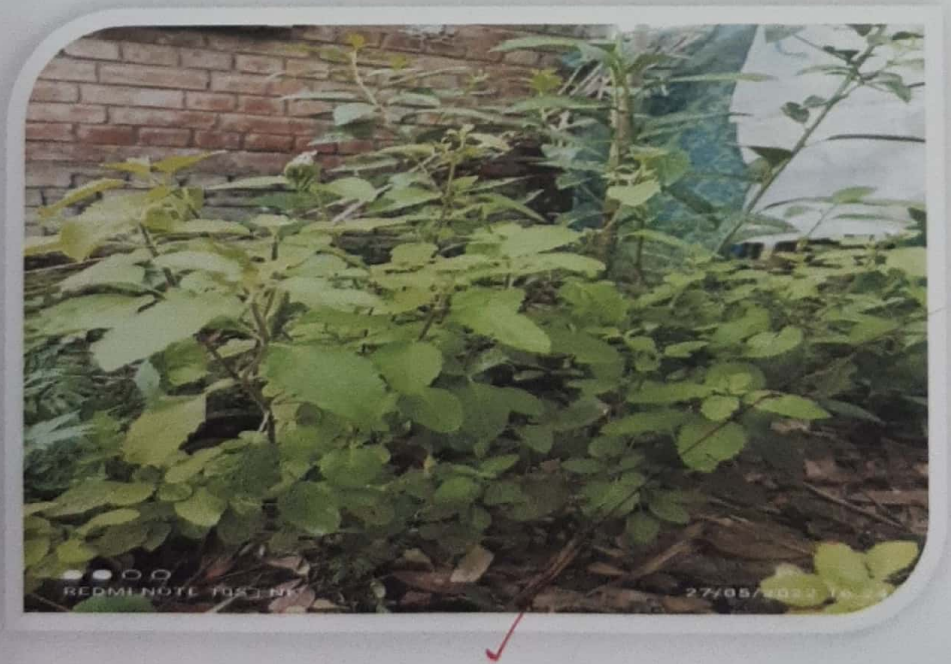


Figure-05-Calotropis Gigantea (AAkondo)

Figure-06-Moringa oleifera (Drumstick leaf)

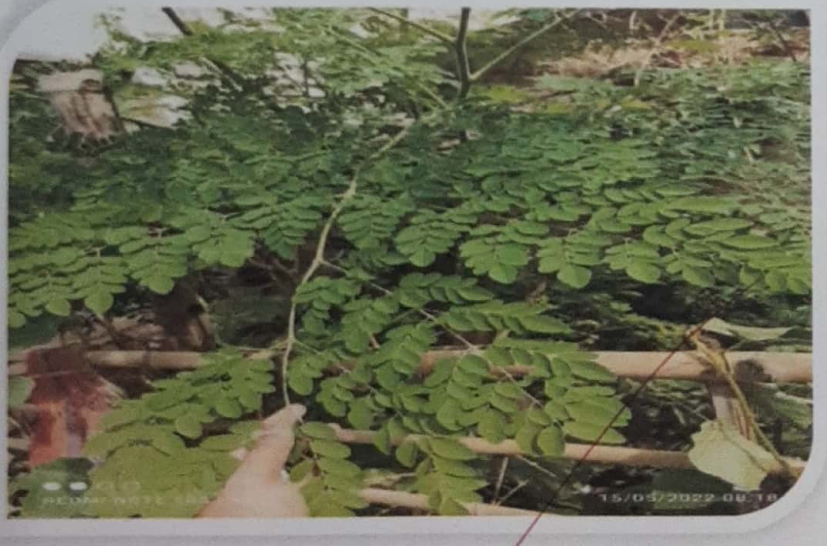


Figure-07-Curcuma longa(Turmeric)

Figure-08-Bacopa monnieri (Brahmi leaf)

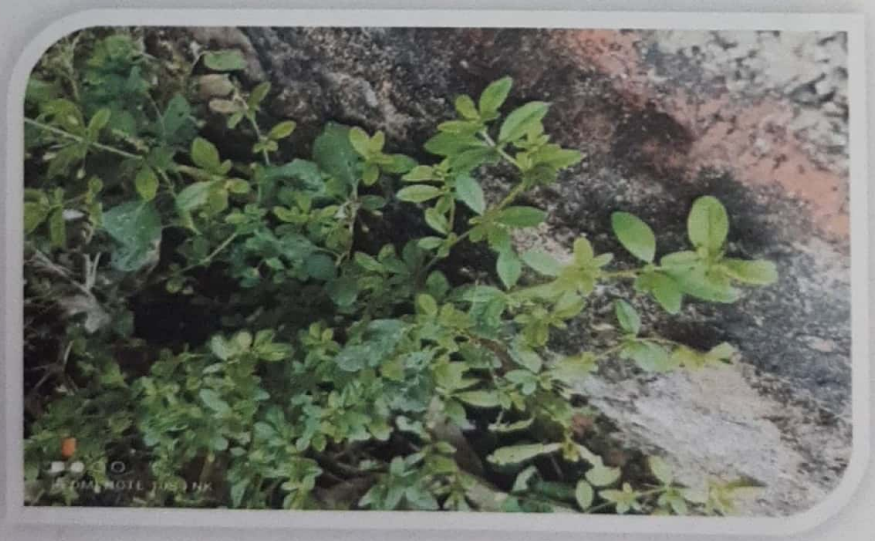


Figure-09-Justicia adhatoda (Basok)

*Figure-10-*Me with sample collection

Figure-11-Carica papaya (Papaya)

Figure-12- Zingiber officinale (Ginger)

Figure-13-Hygrophila auriculata(Kulekhara)

Figure-14-Andrographis paniculata (kalmegh)

Figure-15-Catharanthus roseus (Nayantara)

Figure-16-Tinospora cordifolia (Gudhuchi)

Figure-17-Cannabis sativa(Hemp)

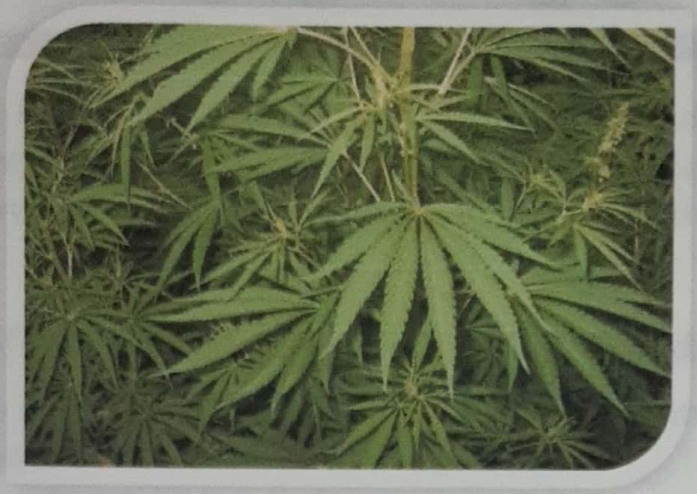
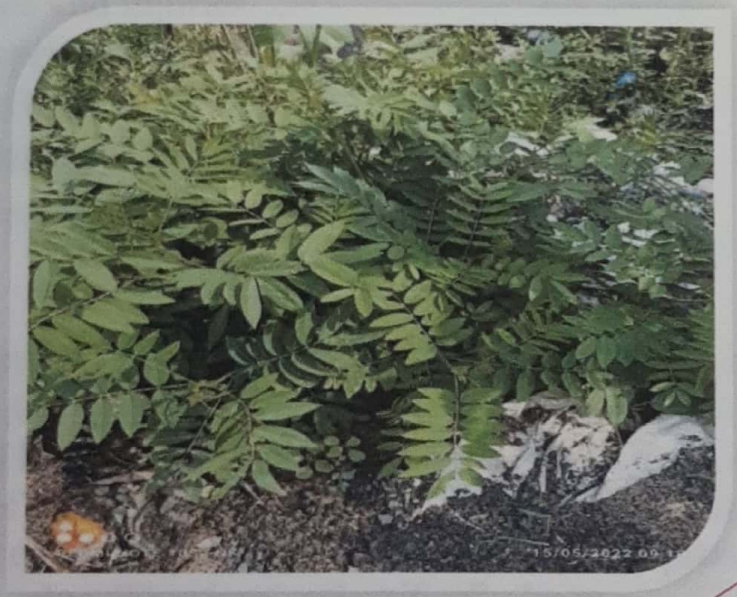


Figure-18- *Cassia sophera* (kolkasunda)



Result

Aloe Vera:- Clear skies and blazing sun, drying winds and ocean surf are the perfect combination for damaging your skin. Unless, of course, you have aloe vera plants nearby to protect you from the elements.

10 Benefits of Natural Aloe Vera: A Tropical Wonder Plant

1. Soothes Burns and Heals Wounds. Whether it's sunburn, burns, cuts and scraps aloe is the best. ...
2. Eases Intestinal Problems. ...
3. Reduces Arthritic Swelling. ...
4. Heals Psoriasis Lesions. ...
5. Gum Infections. ...
6. Eye irritations and injuries. ...
7. Strains and sprains. ...
8. Lung congestion.
9. Rashes and allergic reactions on the skin.
10. Lowering blood sugar levels in the blood

Thankuni:-Thankuni, scientifically known as Centella asiatica is a ground creeper and whole plant is used for medicinal purpose. The leaf juice is used as a good health tonic and also gives relief from hypertension, CNS and gastrointestinal diseases. Thankuni extract is incorporated with dahi to improve the medicinal value. Thankuni, scientifically known as Centella asiatica is a ground creeper and whole plant is used for medicinal purpose. The leaf juice is used as a good health tonic and also gives relief from hypertension, CNS and gastrointestinal diseases. Thankuni Extract is incorporated with dahi to improve the

medicinal value. These properties have been ascribing to the active principles viz., Asiatic acid, Asiaticoside, madecassic acid, and madecassocide. These are pentacyclic triterpenes, found to display venous insufficiency, various vein and wound healing properties. Key words: Central nervous system (CNS); Thankuni; Venous insufficiency and various vein.

Neem:- Neem is a tree. The bark, leaves, and seeds are used to make medicine. Less frequently, the root, flower, and fruit are also used.

Neem leaf is used for leprosy, eye disorders, bloody nose, intestinal worms, stomach upset, loss of appetite, skin ulcers, diseases of the heart and blood vessels (cardiovascular disease), fever, diabetes, gum disease (gingivitis), and liver problems. The leaf is also used for birth control and to cause abortions.

The bark is used for malaria, stomach and intestinal ulcers, skin diseases, pain, and fever.

The flower is used for reducing bile, controlling phlegm, and treating intestinal worms.

The fruit is used for hemorrhoids, intestinal worms, urinary tract disorders, bloody nose, phlegm, eye disorders, diabetes, wounds, and leprosy.

Neem twigs are used for cough, asthma, hemorrhoids, intestinal worms, low sperm levels, urinary disorders, and diabetes. People in the tropics sometimes chew neem twigs instead of using toothbrushes, but this can cause illness; neem twigs are often contaminated with fungi within 2 weeks of harvest and should be avoided.

The seed and seed oil are used for leprosy and intestinal worms. They are also used for birth control and to cause abortions.

The stem, root bark, and fruit are used as a tonic and astringent.

Some people apply neem directly to the skin to treat head lice, skin diseases, wounds, and skin ulcers; as a mosquito repellent; and as a skin softener.

Inside the vagina, neem is used for birth control.
Neem is also used as an insecticide.

Tulsi:-Tulsi also referred to as Ocimum sanctum or Holy Basil, is a medicinal herb that belongs to the mint family and is found in 150 different varieties worldwide. It emits a sort of spicy scent when applied to a wound and this is the reason why it is called the wonder herb. It usually has a bitter taste and its roots, leaves and seeds consist of several medicinal properties.

Unique health benefits of Tulsi

1.Helps beat stress

Tulsi is a natural herb with anti-stress qualities. Hence, sipping a cup of Tulsi tea can help a person rejuvenate when they feel stressed or anxious.

2.Protection against infection and treating wounds

Tulsi is long known to have anti-inflammatory properties and anti-bacterial, anti-fungal and anti-viral properties. It can also act as a painkiller.

3.Improves digestion system

Tulsi plant is known to enhance livers health which is why it aids in improving the digestion system.

4.Aids in losing weight

Tulsi also helps you lose weight by releasing toxins from your body by improving your gut health. It accelerates the rate of metabolism in the body, which further accelerates the fat burning process in the body.

5.Dissolving kidney stones

Tulsi is a great detox agent; therefore, it can help people who suffer from kidney stones. It helps to reduce uric acid levels in the body, which is a leading cause of kidney stones.

6.Helps fight Diabetes

Tulsi tea can be effective in managing type 2 Diabetes. It's one of the most preferred herbal teas for managing Diabetes.

7.Dental and oral health

Tooth cavity is the most common dental problem that people face in their life. The good news is that Tulsi has antimicrobial properties that help fight bacteria and germs in the mouth.

8.Skin and hair benefits

Tulsi is packed with antioxidants coupled with minerals and vitamins, which can help fight the signs of ageing. It can also reduce the itchiness of the scalp as well as control hair fall.

9.Good for the skin

Tulsi drops help the skin to get rid of blemishes and acne. It is rich in antioxidants and that helps to prevent premature ageing.

10.Enhances immunity

Tulsi contains zinc and vitamin C, two components that help fight infections. Daily intake of Tulsi leaves or Tulsi tea helps to boost immunity.

Aakondo(Calotropics):- Calotropis is a plant. People use the bark and root bark for medicine.

Despite serious safety concerns, calotropis is used for digestive disorders including diarrhea, constipation and stomach ulcers; for painful conditions including toothache, cramps, and joint pain; and for parasitic infections including elephantiasis and worms. Some

people use calotropis for syphilis, boils, inflammation (swelling), epilepsy, hysteria, fever, muscular spasm, warts, leprosy, gout, snakebites, and cancer.

In inhalation therapy, smoke from the bark is inhaled for coughs, asthma, and to cause sweating.

USES & EFFECTIVENESS

Insufficient Evidence to Rate Effectiveness for...

- Toothache.
- Syphilis.
- Epilepsy.
- Fever.
- Leprosy.
- Gout.
- Snakebites.
- Digestive disorders.
- Diarrhea.
- Cramps.
- Boils.
- Cancer.
- Swelling (inflammation).
- Joint pain.
- Ulcers.
- Cough, when inhaled.
- Asthma, when inhaled.
- Other conditions.

Calotropis contains chemicals that might help thin mucous and make it easier to cough up. In studies in animals, calotropis has shown some activity against pain, inflammation, bacteria, fever, and ulcers caused by alcohol and medications such as aspirin, indomethacin (Indocin), and others.

SIDE EFFECTS

Calotropis is UNSAFE, especially in high doses. It contains chemicals that can interfere with heart function, particularly at high doses. It can cause serious side effects including vomiting, diarrhea, slow heartbeat, convulsions, and death.

Drumstick Tree:-*Moringa oleifera* is a plant that is often called the drumstick tree, the miracle tree, the ben oil tree, or the horseradish tree. Moringa has been used for centuries due to its medicinal properties and health benefits. It also has antifungal, antiviral, antidepressant, and anti-inflammatory properties.

The health benefits of moringa leaves.

Rich in Vitamins and Minerals
Moringa leaves are rich in vitamins A, C, B1 (thiamin), B2 (riboflavin), B3 (niacin), B6 and Folate. They are also rich in magnesium, iron, calcium, phosphorus, and zinc.
One cup of moringa leaves will contain 2 grams of protein, magnesium (8 per cent of the RDA), Vitamin B6 (19 per cent of the RDA), Iron (11 per cent of the RDA), Riboflavin (11 per cent of the RDA) and Vitamin A (9 per cent of the RDA).

Rich in Amino Acids
Moringa leaves are rich in amino acids, the building blocks of proteins. 18 types of amino acids are found in them and each of them makes an important contribution to our wellbeing.

Fight Inflammation
Inflammation is how a body naturally responds to pain and injury. Moringa leaves are anti-inflammatory in nature due to the presence of isothiocyanates. They have niazimicin that is known to reign in the development of cancer cells. Inflammation is the root cause of many diseases like cancer, arthritis, rheumatoid arthritis, and many autoimmune diseases. When we suffer an injury or infection, the body suffers increased inflammation.
Basically, it is a protective mechanism against trauma but because of a wrong lifestyle and an unhealthy diet, inflammation can increase in

the body. Long-term inflammation leads to chronic health issues. Eating moringa leaves helps to reduce inflammation.

Rich in Antioxidants

Moringa leaves have anti-oxidative properties and protect against the damaging effects of free radicals present in the environment. The damage caused by free radicals is responsible for many chronic diseases like type 2 diabetes, heart problems and Alzheimer's. Moringa leaves are rich in vitamin C and beta-carotene that act against free radicals.

They also have Quercetin which is an antioxidant that helps to lower blood pressure. Another antioxidant that is present in moringa leaves is Chlorogenic acid which helps to stabilize blood sugar levels post meals.

A study in women showed that taking 1.5 teaspoons of moringa leaf powder regularly for three months had shown a significant increase in blood antioxidant levels.

Lower Blood Sugar Levels

Sustained high blood sugar levels lead to the development of diabetes in individuals. Diabetes, in turn, can cause heart problems and organ damage in the body. To avoid this, it is good to keep the blood sugar levels in check. Moringa leaves are a perfect resource for that as they stabilize the blood sugar levels due to the presence of isothiocyanates.

Lowers Cholesterol

Apart from oats, flaxseeds, and almonds, moringa leaves are a dependable remedy against high cholesterol. Cholesterol is the major reason why people suffer from heart diseases and eating moringa leaves has known to show considerable improvement against high cholesterol levels. **Moringa oleifera** can lower those levels and protect against the risk of heart disease. Pregnant women usually experience higher levels of cholesterol, which can in turn increase the risk of developing gestational diabetes during their term. **What is gestational diabetes?** It is a type of diabetes that is first detected in pregnant women who did not have diabetes before they were pregnant. Moringa leaves can certainly be included in the **diet for gestational diabetes**.

Protects the Liver

Those who have tuberculosis can benefit greatly from moringa leaves as they reduce the negative effects of anti-tubercular drugs. The leaves accelerate the repair of the liver cells. The leaves have a high concentration of polyphenols that protect against oxidative damage to the liver and may even reduce it. They increase the protein levels in the liver.

The liver is the site of blood detoxification, fat metabolism and nutrient absorption and it can function properly only if the liver enzymes are normal. Moringa leaves stabilize these liver enzymes.

Protects Against Arsenic Toxicity

In many parts of the world, arsenic contamination is a common problem. Arsenic has found its way in our systems through many food items, particularly rice.

Long-term exposure to this element can lead to the development of cancer and heart disease. Research on lab animals has shown that moringa leaves to combat the effects of arsenic toxicity.

Good for the Stomach

Moringa leaves are beneficial against digestive disorders. Those who suffer from constipation, bloating, gas, gastritis and ulcerative colitis should add Moringa leaves to their diet.

The leaves have antibiotic and antimicrobial properties which make them an ideal remedy against digestive disorders. Even the high amount of B vitamins in the leaves helps in improving digestion.

Improves Bone Health

Moringa leaves are rich sources of calcium and phosphorus. Both of these elements are needed for good bone health. Since moringa leaves have an anti-inflammatory nature, they help combat arthritis and may even heal bones that are damaged.

Moringa oleifera also fights against osteoporosis and keeps bone and teeth strong

An Antiseptic

Moringa leaves are antiseptic and fight off many bacterial infections. They are even beneficial towards wound healing and help to heal

bruises, minor cuts, and burns quickly as they reduce the clotting time.

Improve Lactation
In traditional Ayurvedic medicine, moringa leaves were used to increase lactation in nursing mothers. Since they are a rich source of protein, important vitamins, and essential nutrients, consuming moringa leaves is very good for the health of the mother and the baby.

Helps in Weight Management
Moringa leaves increase fat burning in the body. They slim down the person without depleting energy reserves. This keeps the person feeling buoyant and nourished. They reduce cravings for food and boost metabolism. They also lower cholesterol.

Good for Skin and Hair
Due to an abundance of antioxidants and nutrients, moringa leaves improve the health and appearance of skin and hair. They add suppleness to the skin and shine to the hair. The antioxidants present in moringa leaves reduce the appearance of fine lines and wrinkles on the skin. They have about 30 antioxidants present. Not just this, a paste of moringa leaves when applied to the scalp and the hair **reduces dandruff** and adds life and bounce to dull, lifeless hair. The leaves also strengthen the hair follicles. They are also good for acne-prone skin. This is why moringa leaves are part of many cosmetics. They improve the skin tone and add a glow due to their purifying nature and therapeutic properties.

Good for Nervous System
Many nervous disorders have been known to show positive results against the use of moringa leaves. They support brain health and work as neuro-enhancers. The high concentration of vitamins E and C combat neural degeneration and helps improve brain function. Those who have a migraine or suffer from recurring headaches must eat moringa leaves regularly. These leaves also work as mood balancers as they stabilize the production of neurotransmitters like serotonin, dopamine, and noradrenaline which are important for memory, mood and for stimulus-response.

Good for Detoxification

Moringa leaves are natural cleansers and help to detoxify the system. This helps to keep the body and **increases immunity** against various infections. They also increase the energy levels in the body.

Potential Downsides

- Moringa and its leaves may not be for everyone. While generally considered safe and healthy for most, there are some minor side effects to watch out for. In large doses, the leaves, bark, roots and moringa fruit may have laxative properties.
- In pregnant women, the roots, bark and extract of Moringa may cause uterine contractions. Pregnant women should take the advice of their doctors before including Moringa leaves or products into their diets.
- Similarly, breastfeeding women should avoid Moringa leaves since it is unknown whether any of the chemicals or substances present can pass through the milk to the child.

- **Interactions with Moringa Table:-01**

Thyroid Medicines	Particularly, Levothyroxine medicine. Since moringa may increase thyroid function, it should not be taken along with other thyroid medicines.
Medicines broken down by the liver	Moringa may slow down the breakdown of medicines in the liver, this may lead to subsequent issues.
Diabetes	Both moringa and diabetes medicines reduce the amount of glucose in the blood. If both are taken together then the blood sugar may drop too low.
Blood pressure	Moringa has blood pressure-lowering properties, when taken

	with pressure medication it may cause your blood pressure to drop.

Turmeric:-Turmeric is one such herb. Turmeric is used as an herbal medicine for rheumatoid arthritis, chronic anterior uveitis, conjunctivitis, skin cancer, small pox, chicken pox, wound healing, urinary tract infections, and liver ailments .

Possibly Effective for

- Hay fever. Taking turmeric by mouth seems to reduce hay fever symptoms such as sneezing, itching, runny nose, and congestion.
- Depression. Most research shows that taking curcumin, a chemical found in turmeric, by mouth reduces depression symptoms in people already using an antidepressant.
- High levels of cholesterol or other fats (lipids) in the blood (hyperlipidemia). Taking turmeric by mouth seems to lower levels of blood fats called triglycerides. But the effects of turmeric on cholesterol levels are conflicting. Also, there are many different turmeric products available. It is not known which ones work best.
- Buildup of fat in the liver in people who drink little or no alcohol (nonalcoholic fatty liver disease or NAFLD). Taking turmeric extract by mouth reduces markers of liver injury in people who have this condition. It also seems to help prevent the build-up of more fat in the liver.
- Swelling (inflammation) and sores inside the mouth (oral mucositis). Taking curcumin, a chemical found in turmeric, by mouth, or as a lozenge or mouthwash, seems to prevent swelling and sores in the mouth during radiation treatment for cancer.
- Osteoarthritis. Taking turmeric extracts, alone or together with other herbal ingredients, can reduce pain and improve function in people with knee osteoarthritis. Turmeric might work about

as well as ibuprofen for reducing pain. But it doesn't seem to work as well as another drug, called diclofenac.

- Itching. Taking turmeric by mouth might reduce itching that is caused by various conditions.

Brhmi Leaf:- One of the oldest and most powerful brain tonic used in ayurvedic system from ancient times is Brahmi. **Leaf of the Brahmi resembles to structure of cerebellum** and this herb is best used in brain related disorders that promotes intelligence.

1. Contains powerful antioxidants

Antioxidants are substances that help protect against cell damage caused by potentially harmful molecules called free radicals.

Research suggests that damage caused by free radicals is linked to many chronic conditions, such as heart disease, diabetes, and certain cancers .

Bacopa monnieri contains powerful compounds that may have antioxidant effects .

For example, bacosides, the main active compounds in *Bacopa monnieri*, have been shown to neutralize free radicals and prevent fat molecules from reacting with free radicals

2. May reduce inflammation

Inflammation is your body's natural response to help heal and fight disease.

However, chronic, low-level inflammation has been linked to many chronic conditions, including cancer, diabetes, and heart and kidney disease .

In test-tube studies, *Bacopa monnieri* appeared to suppress the release of pro-inflammatory cytokines, which are molecules that stimulate an inflammatory immune response

3. May boost brain function

Research suggests that *Bacopa monnieri* may help enhance brain function.

For example, one study in mice showed that supplementing with *Bacopa monnieri* improved their spatial learning and ability to retain information .
The same study also found that it increased dendritic length and branching. Dendrites are parts of nerve cells in the brain that are closely linked to learning and memor

4. May help reduce ADHD symptoms
Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder that is characterized by symptoms like hyperactivity, impulsivity, and inattentiveness .
Interestingly, research has shown that *Bacopa monnieri* may help reduce ADHD symptoms.

5. May prevent anxiety and stress
Bacopa monnieri may help prevent anxiety and stress. It's considered an adaptogenic herb, meaning that it increases your body's resistance to stress .
Research suggests that *Bacopa monnieri* helps reduce stress and anxiety by elevating your mood and reducing levels of cortisol, a hormone that is closely linked to stress levels .

6. May help lower blood pressure levels
High blood pressure is a serious health concern, as it places strain on your heart and blood vessels. This can weaken your heart and increase your risk of heart disease .
Research suggests that *Bacopa monnieri* may help keep blood pressure within a healthy range

7. May have anticancer properties
Test-tube and animal studies have found that *Bacopa monnieri* may have anticancer properties.
Bacosides, the active class of compounds in *Bacopa monnieri*, have been shown to kill aggressive brain tumor cells and inhibit the growth of breast and colon cancer cells in test-tube studies.

vasaka leaf:-the Basok (Adhatoda Vasica, or Malabar Nut) leaf is used to make herbal medicines. It is used to loosen chest congestion, open the breathing tubes, and treat spasms. The leaf is also used to treat upper airway infections, common colds, coughs, asthma, and tuberculosis.

Health Benefits of Vasaka

Remedies Cough And Cold

Recurrent coughs and congested throat can cause a lot of discomfort and prevent a peaceful good night's sleep while making you feel tired and exhausted. Being rich in anti-inflammatory, antibiotic and expectorant properties, Vasaka holds high significance in treating the common cold, cough and flu symptoms. It also reduces chest and nasal congestion gets rid of excess sputum and stops nasal discharge. It is also highly effective in treating asthma, bronchitis, sinusitis and other respiratory illnesses.

Prepare a decoction of Vasaka leaves by boiling it in water. Add a spoon of honey and drink this concoction daily to prevent respiratory infections.

Promotes Gut Health

Vasaka is a powerful digestive stimulant. The carminative and appetite-stimulant properties of the herb help in breaking down food particles in the stomach and intestine, promote the secretion of the digestive juices and thereby increase the absorption of essential nutrients through the intestines. It also helps to eliminate abdominal gas and in turn reduces abdominal distension, bloating and gaseous cramps. It offers an amazing cure for a wide range of gastrointestinal disorders like esophagitis, dyspepsia, heartburn, diarrhoea, flatulence, peptic ulcer and gastroesophageal reflux disease (i.e. GERD).

Purifies Blood

Being a potent cardiac tonic, the herb is extremely essential in purifying the blood. It effectively improves blood count, manages blood pressure and hence prevents a host of heart rhythm disorders. The presence of anti-coagulant and anti-fibrinolytic properties also prevents blockage and formation of clots in the arteries causing heart block.

Prevents Infections

The abundance of antimicrobial, anti-bacterial, and antiseptic properties, make Vasaka the ultimate solution to ward off the various infections. The bio-active components in the Malabar nut tree bolster immunity and prevent bacterial infestation. It not only helps reduce the risk of various bacterial and fungal infections like fever, tuberculosis, dengue, etc but also prevents allergic conditions on the skin.

Heals Ulcers

Vasaka leaves are famed for their anti-ulcer properties. It plays a pivotal role in reducing ulcers and sores in various parts of the body. It also helps in treating bleeding disorders and offers a potent remedy for peptic and duodenal ulcers.

Relieves Pain And Inflammation

Thanks to the strong analgesic, anti-inflammatory, and pain-relieving properties of the bio-active components, Vasaka offers extensive relief from pain and inflammation in case of arthritis and joint pain. Joint pain usually arises due to a raised level of uric acid in the blood. Powdered vasaka extensively helps reduce the uric acid levels and also works well to diminish the pain and tenderness that happens due to gout. Being a natural vasodilator, it is also used to treat painful muscle spasms, sore muscles, arthritic conditions, and other inflammatory situations.

Treats Uremia

Uremia is a chronic condition that arises due to a raised level of urea and other nitrogenous waste compounds in the blood that are normally excreted by the kidneys. This condition chiefly occurs due to malfunctioning of the kidneys or renal failure. The horde of bioactive constituents in vasaka helps in eliminating the toxic wastes from the body through urine and uplifts the urinary functions.

Augments Skin Health

The host of anti-bacterial and antioxidant properties of the essential alkaloids in vasaka plays a crucial role in treating skin infections like acne, warts, boils, eczema, blisters, itching etc. Beauty essentials imbued with vasaka extract or malabar nut oil also improves complexion by evening out the skin tone, clearing blocked pores, and also reducing various signs of ageing. Owing to the antiseptic nature, the juice obtained from vasaka also prevents wounds and injuries and facilitates healing.

Papaya:-Papaya is used for preventing and treating gastrointestinal tract disorders, intestinal parasite infections, and as a sedative and diuretic. It is also used for nerve pains (neuralgia) and elephantoid growths.

Papaya leaf contains unique plant compounds that have demonstrated broad pharmacological potential in test-tube and animal studies.

Although human research is lacking, many papaya leaf preparations, such as teas, extracts, tablets, and juices, are often used to treat illnesses and promote health in numerous ways.

Here are 7 emerging benefits and uses of papaya leaf.

1. May treat symptoms related to dengue fever

One of the most prominent medicinal benefits of papaya leaf is its potential to treat certain symptoms associated with dengue fever.

2. May promote balanced blood sugar

Papaya leaf is often used in Mexican folk medicine as a natural therapy for treating diabetes and improving blood sugar control

3. May support digestive function

Papaya leaf teas and extracts are often used as an alternative therapy to alleviate uncomfortable digestive symptoms, such as gas, bloating, and heartburn.

4. May have anti-inflammatory effects

Various papaya leaf preparations are frequently used to remedy a broad range of internal and external inflammatory conditions, including skin rashes, muscle aches, and joint pain.

5. May support hair growth

Topical applications of papaya leaf masks and juices are often used to improve hair growth and scalp health, but evidence to support its efficacy for these purposes is extremely limited.

6. May promote healthy skin

Papaya leaf is frequently consumed orally or applied topically as a way to maintain soft, clear, and youthful-looking skin.

A protein-dissolving enzyme in papaya leaf called papain can be used topically as an exfoliant to remove dead skin cells and potentially reduce the occurrence of clogged pores, ingrown hairs, and acne.

7. May have anticancer properties

Papaya leaf has been used in traditional medicine practices to prevent and treat certain types of cancer, but modern research is still lacking.

Ginger:-Ginger is loaded with antioxidants, compounds that prevent stress and damage to your body's DNA. They may help your body fight off chronic diseases like high blood pressure, heart disease, and diseases of the lungs, plus promote healthy aging.
10 Health Benefits Of Ginger That Are Seriously Impressive

- It can reduce pain. ...
- It can heal irritated skin. ...
- It may help protect against cancer. ...
- It can help you look younger. ...
- It can help you digest quicker after a meal. ...
- It can reduce nausea. ...
- It can reduce bad cholesterol. ...
- It can ward off cardiovascular disease
- It can help boost immunity
- It can ease period cramps

Kulekhara:-The Khulekhara leaf extract is also used for **treating diarrhoea, inflammation, stomach pain and anaemia**. The seeds of this plant are also medicinal and used for many blood diseases and urinary problems. As per our National Family Health Survey in India, **more than 60% of women and children are anemic**. That

means they lack enough healthy red blood cells to carry oxygen all over the body.

Therefore most of the time they experience fatigue, tiredness, sometimes difficulty in breathing, become pale, etc.

The formation of healthy blood is a complex process like any other biological function. Only an iron-rich diet often does not help to improve the situation.

Many studies have suggested that the leaf extract has significantly increased the hemoglobin level and red blood cell count in lab test animals within 1-3 weeks' time.

It was noticed that within 2 weeks of giving kulekhara leaf extract –

- iron availability,
- iron circulation,
- total iron binding capacity,
- transferring (a protein that binds the iron to transport in blood) saturation,
- serum copper, cobalt concentration,
- all these major indicators were significantly improved.
    - Kulekhara leaf extract helps to **reduce the blood glucose level**. Therefore if you are diabetic you may consider taking this on a regular basis. Studies showed that kulekhara extract increases the level of glutathione – a chemical that improves insulin sensitivity – in the body.
    - These leaves have **anti-inflammation properties**. It helps to prevent and cure inflammation in our bodies.
    - Regular consumption of leaves helps to **destroy parasitic worms**. The leaf extract has strong antihelminthic activity.
    - The study suggests kulekhara leaves also have **antibacterial properties**. It can prevent bacterial infestation.
    - It also **relieves pain** because of its strong analgesic properties. So next time you suffer from any pain, try having some kulekhara leaves.
    - Traditionally kulekhara leaf extract was used to **cure diarrhea and dysentery**. This has also been proved scientifically.

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    - Traditionally kulekhara leaf extract was used to **cure diarrhea and dysentery**. This has also been proved scientifically.

- The leaf extract has been shown to possess **significant antioxidant properties**. Various studies have been conducted with different parts of kulekhara plant. However, it is clear that the leaf extract can be very effective in diseases where free radicals play a crucial role.

Kalmegh:-Kalmegh has been used to **treat tonsillitis and tuberculosis**. It has also been used to treat cases of pneumonia, chronic bronchitis and lung infection.

Benefits of Kalmegh:

Benefits of kalmegh in infections:
Kalmegh may not be a substitute for antibiotics, but it could have a complementary effect when used along with antibiotics in several infections.

Gastrointestinal Tract Infections:
It is remarkably beneficial in managing diarrhoea and symptoms arising due to bacterial infections.[4]

Upper Respiratory Tract Infections:
Kalmegh has been conventionally used in Asia to treat respiratory infections, fever, sore throat, and a variety of other chronic and infectious diseases.

Fever & Cold:
- Kalmegh is a herb having cold properties, which is useful to reduce the heat of the body in fevers, and to dispel toxins from the body.
- It is used to prevent and treat common colds in Scandinavian countries.
- It thus serves as an antipyretic herb as it reduces fever both in humans and animals, which may be due to several toxins and infections.

Throat Infections

Kalmegh has been used to treat tonsillitis and tuberculosis. It has also been used to treat cases of pneumonia, chronic bronchitis and lung infection.

Benefits of Kalmegh as an Analgesic & Anti-inflammatory Herb

- Kalmegh may act as a pain killer, and it is also known to reduce swelling and blood loss.
- The anti-inflammatory action of kalmagh may probably be mediated, in part, by its adrenal function.

Benefits of Kalmegh Against HIV

- Kalmegh stimulates specific antibodies production, and as a result, it enhances immune response.
- Further, it inhibits replication of HIV-1 and improves white blood cells count.
- Since low immunity is the basis of the acquired immune deficiency syndrome (AIDS), kalmegh may be helpful in the treatment of the diseases.

Benefits of Kalmegh in Improving Digestion

- Kalmegh helps improve digestion due to its laxative properties; it aids in the elimination of faeces.
- It is also choleretic (helps in improving the properties of bile and causes a substantial increase in the flow of bile) and thus aids in digestion.

Benefits of Kalmegh for Protecting the Liver

- Kalmegh may be effective against liver toxicity by producing a cleaning solvent and inhibiting the production of free radicals that destroy cellular membranes that surround liver cells. Free radicals might cause liver cirrhosis.

Benefits of Kalmegh for Cancer Treatment

- Kalmegh is believed to have a cancerolytic effect; it fights and may even kill cancer cells.
- Extract from kalmegh is said to enhance immune system functions.

- Studies show the potential of kalmegh as it activates dual responses making it effective against a variety of infectious and cancer-causing agents.
- It is effective in the treatment of cancers like skin cancer, leukaemia and breast cancer.
- Due to this ability, National Cancer Institute terms it as a cytotoxic substance.
- It is believed to have lesser toxicity than most chemotherapeutic agents.
- While kalmegh shows potential in treatment for cancer, further research is needed to find which types of cancer respond to it.

Benefits of Kalmegh in Treatment of Ulcers

- Kalmegh extract demonstrated antiulcerogenic activity.
- It reduces the development of ulcers as it significantly decreases stomach acidity without any major side effects.

Benefits of Kalmegh in Treatment of Filaria

- Kalmegh extracts may be effective in the treatment of filaria, in which there is obstruction of lymph channels leading to gross swelling termed elephantiasis.
- It shows no apparent toxic effects.

Benefits of Kalmegh for Treatment of Inflammation

- Researches show the anti-inflammatory activity of kalmegh; it was found to inhibit oedema

Benefits of kalmegh as Thrombolytic & Cardioprotective Substance

- Studies show that kalmegh has the potential to increase the time taken for clot clotting.
- It, therefore, reduces the risk of restenosis (closing of blood vessels) observed post angioplasty.
- Contraction of blood vessels caused by injuries to the inner lining of blood vessels or by high cholesterol in the diet may also be reduced significantly by using kalmegh.
- Reduced blood supply and oxygen availability to heart muscles may cause the heart tissues to die.

- Kalmegh was found to stimulate the natural process in the body called fibrinolysis that dissolves blood clots.

Benefits of Kalmegh in Brain-related Disorders

- Kamegh helps in maintaining the flow of blood and oxygen to the brain.
- It is therefore helpful in reducing the occurrence of memory loss, impaired mental performance, dizziness, headaches, depression, and ringing in the ears.

Benefits of Kalmegh for Treatment of Malaria

- Kalmegh extract comprises of antimalarial substance, which is known to show activity against Plasmodium berghei (malaria-transmitting parasite).
- Its effects were found to be even better than that of an antimalarial drug.

Benefits of Kalmegh as An Antivenom

- Studies have demonstrated the antivenom activity of kalmegh.
- It prolongs the survival time and delays respiratory failure caused by venom.

Nayantara(periwinkle):- Periwinkle is an herb. The parts that grow above the ground are used to make medicine. the plant shows extensive health benefits and is used for treating a host of health anomalies including diabetes, sore throat, lung congestion, skin infections, eye irritation.

USES & EFFECTIVENESS

Insufficient Evidence to Rate Effectiveness for...

- Diabetes.
- Cancer.
- Fluid retention.
- Cough.
- Lung congestion.
- Sore throat.

- Eye irritation, when applied to the eye.
- Skin infections, when applied to the skin.
- Stopping bleeding, when applied to the skin.
- Other conditions.

More evidence is needed to rate the effectiveness of Madagascar periwinkle for these uses.

Gudhuchi:-Guduchi is known in Ayurvedic medicine for the power to **detoxify, rejuvenate, boost the immune system, and more**. This popular adaptogenic herb is thought to prolong life and was recognized by ancient rishis of the Vedic era in the classic healthcare text, the revered Charak Samhita, written by Maharishi Agnivesha.

Guduchi has been used in traditional ayurvedic medicine for ages in the treatment of a variety of medical conditions including hay fever, diabetes, high cholesterol, jaundice, chronic diarrhea, dysentery, gout, cancer, bone fracture, pain, asthma, scabies (an itchy skin infection caused by mites), skin disease, poisonous insect, snake bite, eye disorders, and more.
In Ayurveda, Guduchi is described as having these actions: increases appetite, quenches thirst, increases strength, promotes life, increases life span, aphrodisiac, increases sexual potency, purifier of sperm, cleans the blood, destroys toxins, relieves pain, and rejuvenative.
According to Ayurvedic herbalists, Guduchi has these qualities:

- Rasa (taste): bitter and astringent
- Guna (quality): light and unctuous
- Virya (potency): heating
- Vipaka (post-digestive effect): sweet
- Prabhava (special action): destroys toxins both internally and externally
- Doshakarma (energetics): Tridoshic in nature, it reduces pitta, kapha.

However, there is no strong scientific evidence to support these uses. Also, most studies have been done in test tubes (in vitro) or in animals (in vivo), and thus there isn't enough information to know

its effects in the human body. More research is needed to understand the effectiveness of Tinospora cordifolia for these uses.

Hemp:-It reduces the risk of Heart diseases, promotes healthy & glowing Skin, and provides relief from aches, soreness, and joint irritation, aids digestion, promotes calm and restful sleep. Other than being a medicinal supplement it is also used traditionally in Indian Cuisines.

Health Benefits

The vitamins, minerals, and nutrients in hemp seeds can provide some significant health benefits. For example, hemp oil is rich in **vitamin E**, which is useful for helping keep your immune system functioning. It also acts as an antioxidant, helping reduce free radicals that can cause cell damage in your body.

Reduced Risk of Heart Disease

Getting enough healthy fats in your diet is important for keeping your heart and cardiovascular system healthy. Hemp seeds are particularly rich in these healthy fats, including **omega-3** and **omega-6** fatty acids. Both of these fats are known for improving heart health by reducing **cholesterol**, blood pressure, and triglycerides. Adding hemp oil to your diet may reduce your risk of heart problems in the future.

Reduced Symptoms of PMS

Hemp oil is also rich in **gamma linolenic acid (GLA)**, which has been linked to reduced symptoms of PMS. It appears that GLA reduces the effect of the hormone prolactin on the body. Prolactin is often identified as a major cause of the negative symptoms of PMS, especially **breast tenderness**, irritability, bloating, and depression. Hemp seed oil could be an important tool to help relieve these unpleasant symptoms.

Improved Digestion

Fiber is critical for a healthy digestive system, and whole hemp seeds are an excellent source of both **soluble and insoluble fiber**. Insoluble fiber helps add bulk to your stool and may be linked to a lower risk of bowel cancer. Meanwhile, soluble fiber acts as a **prebiotic** and feeds the **"good" bacteria** that live in your intestines.

In combination, soluble and insoluble fiber from hemp seeds help keep your digestive system running smoothly and prevent a number of common conditions such as constipation, **ulcers**, and **hemorrhoids**.

May Help Reduce Eczema

The combination of omega-3 and omega-6 fatty acids in hemp is good for more than just your heart. Early studies suggest that adding hemp seed oil to your diet may help relieve symptoms of eczema. It appears the oil in hemp seeds helps balance the lipids in your blood, reducing skin dryness and itchiness. While more studies need to be done, substituting hemp seed oil for other types of oil in your diet could be a safe and easy way to reduce skin irritation.

Healthy Source of Plant-Based Protein

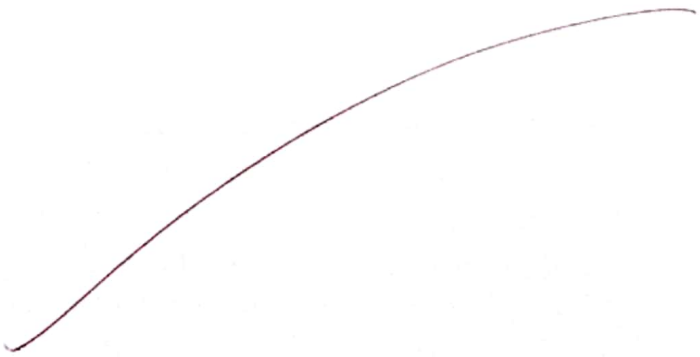
Protein is critical for the health of your muscles and organs. Hemp seeds are one of just a few plant foods that are considered "complete" proteins, containing all the essential amino acids. Your body can also absorb hemp seed protein better than many other plant-based proteins. If you choose to follow a plant-based diet, adding hemp seeds to your food is a quick and easy way to get more protein.

Kalkasunda:- *Cassia occidentalis L.* is an annual or perennial Ayurvedic plant which is used in several traditional medicines to cure various diseases. This weed has been known to possess antibacterial, antifungal, antidiabetic, anti-inflammatory, anticancerous, antimutagenic and hepatoprotective activity.

The young shoots, leaves and unripe pods of the Cassia occidentalis, C. marilandica and C. tora, are edible AFTER boiling in a change of water to reduce the strong smell. The torrefied seeds are used as a coffee substitute, though nothing really substitutes for coffee.

The paste of seeds and leaves is applied over skin lesions, ulcers, ringworm, herpes, infection etc.

1. The paste of root of this plant is mixed with lemon juice and applied on eczema and psoriatic patches.
2. The paste of the root of Cassia occidentalis plant mixed with cow ghee should be taken internally in filaria.



Discussion

Herbal drugs constitute a major share of all the officially recognised systems of health in India *viz.* Ayurveda, Yoga, Unani, Siddha, Homeopathy and Naturopathy, except Allopathy. More than 70% of India's 1.1 billion population still use these non-allopathic systems of medicine. Currently, there is no separate category of herbal drugs or dietary supplements, as per the Indian Drugs Act. However, there is a vast experiential-evidence base for many of the natural drugs. This offers immense opportunities for Observational Therapeutics and Reverse Pharmacology. Evidence-based herbals are widely used in the diverse systems and manufactured, as per the pharmacopoeial guidelines, by a well-organised industry. Significant basic and clinical research has been carried out on the medicinal plants and their formulations, with the state-of-the-art methods in a number of Institutes/Universities. There are some good examples. Indian medicinal plants also provide a rich source for antioxidants that are known to prevent/delay different diseased states. The antioxidant protection is observed at different levels. The medicinal plants also contain other beneficial compounds like ingredients for functional foods. Hence, the global knowledge about Ayurveda and Indian herbals will hopefully be enhanced by information on the evidence-base of these plants. This will yield rich dividends in the coming years.

Medicinal plants based traditional systems of medicines are playing important role in providing health care to large section of population, especially in developing countries. Interest in them and utilization of herbal products produced based on them is increasing in developed countries also. To obtain optimum benefit and to understand the way these systems function, it is necessary to have minimum basic level information on their different aspects. Indian Systems of Medicine are among the well known global traditional

systems of medicine. In this review, an attempt has been made to provide general information pertaining to different aspects of these systems. This is being done to enable the readers to appreciate the importance of the conceptual basis of these system in evolving the material medica. The aspects covered include information about historical background, conceptual basis, different disciplines studied in the systems, Research and Development aspects, Drug manufacturing aspects and impact of globalization on Ayurveda. In addition, basic information on Siddha and Unani systems has also been provided.

The cases of COVID-19 are still increasing day-by-day worldwide, even after a year of its first occurrence in Wuhan city of China. The spreading of SARS-CoV-2 infection is very fast and different from other SARS-CoV infections possibly due to structural differences in S proteins. The patients with severe diseases may die due to acute respiratory distress syndrome (ARDS) caused by systemic inflammatory reactions due to the excessive release of pro-inflammatory cytokines and chemokines by the immune effector cells. This may be due to the routine use of many immunomodulator medicinal plants and traditional AYUSH formulations by the Indian people. This communication reviews the AYUSH recommended formulations and their ingredients, routinely used medicinal plants and formulations by Indian population as well as other promising Indian medicinal plants, which can be tested against COVID-19. Special emphasis is placed on Indian medicinal plants reported for antiviral, immunomodulatory and anti-allergic/anti-inflammatory activities and they are categorized for prioritization in research on the basis of earlier reports. The traditional AYUSH medicines currently under clinical trials against COVID-19 are also discussed as well as furtherance of pre-clinical and clinical testing of the potential traditional medicines against COVID-19 and SARS-CoV-2. The results of the clinical studies on AYUSH drugs will guide the policymakers from the AYUSH systems of medicines to maneuver their policies for public health, provide information to the global scientific community and could form a platform for collaborative studies at national and global levels.

Conclusion

India has 15 agroclimatic zones that comprise ~18,000 types of plants, of which 6,000-7,000 have therapeutic properties.

These medicinal plants are used in numerous applications in the Indian society and used to make medicines in traditional medical practices such as Ayurveda, *Unani*, *Siddha*, *Sowa-Rigpa* and homeopathy; also used in plant-based pharmaceutical companies. ~960 types of medicinal plants are traded, of which 178 species have yearly consumption levels of >100 metric tonnes. ~80% medicinal plants are extracted from the wild, while 69% plants are collected using destructive farming practices.

There is a huge gap between the supply and demand of medicinal plants to manufacture Ayurvedic medicines in India. According to the 'All India Trade Survey of Prioritised Medicinal Plants, 2019', demand for high-value medicinal plants increased by 50%, while the availability declined by 26%. This led to increased habitat degradation and levels of over-exploitation by pharmaceutical industries. This also resulted in 65 species (i.e., 10% of the total species) falling into the critically endangered, endangered, vulnerable, and nearly threatened categories.

For ayurvedic medicines, raw materials such as herbs and shrubs can be grown and harvested in a period of one year, while medicinal trees take >10 years to get ready for harvesting. Therefore, it is important to engage in conservation, cultivation, and research & development of medicinal plants.

Cultivation of medicinal plants in a commercial mode is one of the most profitab

le agri-business for farmers in India. If anyone has sufficient land and knowledge of herb marketing, then they can earn a high income with moderate investments. Cultivation of medicinal herbs such as *shankhapushpi, atis, kuth, kutki, kapikachhu* and *karanja* are changing the Indian agrarian ayurvedic scenes and providing extraordinary opportunities for farmers to increase their incomes. According to the

traditional treatment health centre, there are 25 significant medicinal plants that are always in full demand. These plants include the Indian Barberry, Liquorice, *Bael, Isabgol, Atis, Guggal, Kerth, Aonla, Chandan, Senna, Baiberang,* Long Pepper, *Brahmi, Jatamansi, and Madhunashini, Kalmegh, Satavari, Ashwagandha, Chirata, Katki, Shankhpushpi, Ashoka, Giloe, Kokum* and *Safed Musli.*

The market for medical plants in India stood at Rs. 4.2 billion (US$ 56.6 million) in 2019 and is expected to increase at a CAGR 38.5% to Rs. 14 billion (US$ 188.6 million) by 2026. The total world herbal trade is currently assessed at US$ 120 billion. India's share in the global export of herbs and herbal products is low due to unsophisticated agricultural and quality control procedures, lack of processing, research & development, standardisation in products and regulatory framework in trade of medicinal plants.

Government Initiatives

The Government of India has taken several measures to promote cultivation and export of medicinal plants. The National Medicinal Plants Board (NMPB) offers up to 75% subsidy to farmers; formulates schemes and guidelines for financial assistance in various zones of medicinal plant divisions, secured under promotional and commercial plans, which are relevant for government and non-government associations.

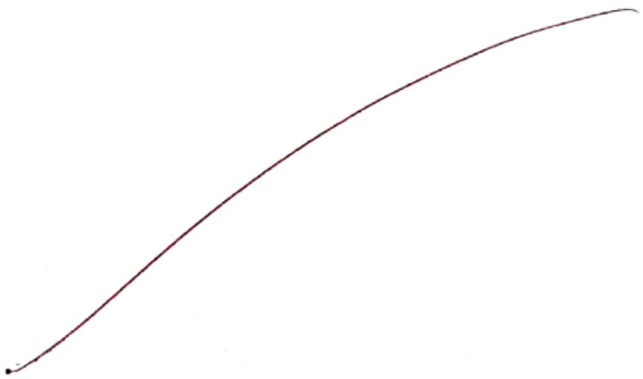
The Department of Commerce has set up export promotion councils (EPCs) to promote exports of various product groups and has assigned Shellac & Forest Products Export Promotion Council (SHEFEXIL) to mandate exports of herbs and medicinal plants. The export promotion of several herbal products has been assigned to Pharmaceuticals Export Promotion Council (PHARMEXCIL). The

EPCs facilitate the exporting community and undertake various promotional measures to promote exports of their products.

Under the Market Access Initiative (MAI) Scheme of the Department of Commerce, the EPCs/trade bodies are provided with financial assistance to participate and organise trade fairs, buyer–seller meets (BSMs), reverse buyer–seller meets (RBSMs), research & product development, market studies, etc.

Future of Medicinal Plants Industry in India

In India, the production and cultivation of medical plants is mostly unorganised. An equipped supply chain management and formation of farmer associations will improve the production and sales of medicinal plants in the country. The sector has observed recent entries of start-ups bringing in technology upgradation. These start-up are using precise farming techniques by integrating artificial intelligence (AI) and data analytics for crop profiling, seed analysis for better germination, among others.



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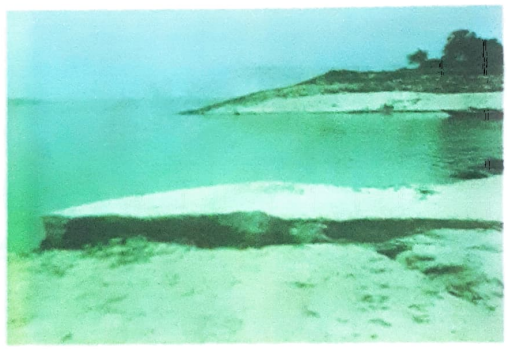
Department of Geography

Field Work

Department of Geography
Jangipur College
Semester :6th
Course Code: GEO/H/CC/P/14
Date:08.06.2022
Place:Moya gram panchayat,lalgola block,murshidabad

A field survey had been conducted to fulfill the requirements of KU syllabus of Disaster Management(CC-P-14).Total number of students were 69.The main purpose of this field study is about a common disaster of this study area i.e River Bank Erosion by Padma river. A geomorphic hazard river bank erosion is a major problem of the study area.Here multifarious problem is created by river bank erosion which has a negative impact on human life as well as livelihood. The main objective of the study was to teach methodology of preparing a project report about river bank erosion by data collection,data analysis, representation of data through statistical methods and cartographic techniques.



Some photograph of field visit

Department of Geography
Jangipur College
Semester:4th
Course Code:GEO/H/SEC/P/02 ,GEO/G/SEC/P/02
Date:06.07.2022
Place:Giria Kismot Mouza,Raghunathganj –II block,Murshidabad

A field survey had been conducted to fulfill the requirements of KU syllabus of Field survey(Skill Enhancement Course).Total number of students were 89(Hons and PCC both).The main purpose of the study was to study the Changing pattern of Landuse .The main objectives of this study is to teach methodology of preparing a field report by different ways of data collection,data interpretation through statistical methods and cartographic representation using MS-excel and MS-word.Overall study emphasizes on existing landuse pattern and changing pattern of landuse with responsible factors.

Group photo

Department of Geography
Jangipur College
Semester-5th
Course Code :GEO/H/CC/P/11,GEO/G/SEC/P/03
Date:07.12.2022
Place:Enayetnagar mouza,Raghunathganj –II block,Murshidabad

A field survey had been conducted to fulfill the requirements of KU syllabus of Field survey(Hons and PCC both).Total number of students were 93(Hons and PCC both).The main purpose of the study was to explain the socio-economic status of this study area.Socio economic features of a area is very significant for assessment the human development.It is measured by individuals education,occupation,income,health,housing condition etc. The main objectives of this study is to teach methodology of preparing a field report by different ways of data collection,data interpretation through statistical methods and cartographic representation.

Group photo

Department of Geography
Jangipur College
Semester-6th
Course Code :GEO/H/CC/P/14
Date:22.05.2023
Place:Panditpur ,lalgola block,murshidabad

A field survey had been conducted to fulfill the requirements of KU syllabus of Disaster Management(CC-P-14).Total number of students were 70. The main purpose of this field study is about a common disaster of this study area i.e River Bank Erosion by Padma river. A geomorphic hazard river bank erosion is a major problem of the study area.Here multifarious problem is created by river bank erosion which has a inverse effect on human life as well as livelihood. The main objective of the study was to teach methodology of preparing a project report about river bank erosion by data collection,data analysis, representation of data through statistical methods and cartographic techniques.

Some photograph captured during field survey

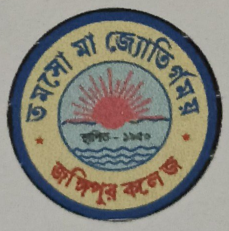
Department of Physics

Dissertation

GEOMETRICAL FRUSTRATION

Submitted by
Shibnath Mondal
Roll No. : 2116220-2057471
Registration No. : 057295 OF 2020-21
in
partial fulfillment of the requirements
for the degree of B.Sc. in Physics

under the supervision of
Dr.Aksar Ali Biswas



Department of Physics
Jangipur College
Jangipur, Murshidabad , West Bengal
India, 742213

Jangipur College

CERTIFICATE

This is to certify that the project entitled "GEOMETRICAL FRUSTRATION" which is being submitted by Shibnath Mondal (Registration No: 057295 of 2020-21, Roll No.: 2116220-2057471) in partial fulfillment of the award of the degree of Bachelor of Science in Physics is a record of bonafide project work carried out by him in the Department of Physics under my supervision and guidance. The present project work has already reached the standard of fulfilling the requirements of the regulations relating to the degree.

05/08/23

Dr. Aksar Ali Biswas
Department of Physics
Jangipur College
Jangipur,W.B., 742213, India

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1 Introduction

We need to familiarize ourselves with the term "**frustration**" before proceeding further. Thus, **frustration** is a feeling associated with anger, aggravation, and disappointment that manifests when a person is prevented from achieving the desired result.Usually, the importance of the aim determines how much frustration there would be.

"Geometrical frustration"(Why?""Geometrical"" Frustration , as this is found on geometrical structure of lattice), is a concept that arises when the lattice structure of a material prevents the atoms or molecules from finding their optimal arrangement or configuration. This can occur when the interactions between the atoms or molecules are in conflict with the geometry of the lattice, leading to a state of frustration where the system cannot minimize its energy.

Chemist *Walther Nernst* theorem states that the entropy of a perfect crystal at a temperature of zero Kelvin (absolute zero) is equal to zero (also known as "The third law of thermodynamics") but it's found that in antiferromagnetic material there has a nonzero residual entropy.To explain this phenomena French physicist *Gérard Toulouse* introduce "Geometrical Frustration" in 1977. The most important consequence of this is that the entropy of the system does not go to zero at absolute zero.

The concept of geometrical frustration is not limited to a particular class of materials but is observed in various systems, including magnetic materials, liquid crystals, proteins, and even in certain forms of glasses and amorphous solids. The consequences of geometrical frustration are diverse and can give rise to a wide range of exotic and interesting phenomena, such as novel magnetic ground states, disordered phases, glassy behavior, and emergent quantum states, such as quantum spin liquids.

Geometrical frustration has become an essential area of research in condensed matter physics, materials science, chemistry, and other related disciplines. Researchers are actively studying frustrated systems to better understand the underlying principles governing their behavior and to harness their unique properties for various technological applications. The study of geometrical frustration continues to shed light on the fascinating interplay between geometry, symmetry, and the physical properties of materials, offering insights into the fundamental nature of complex systems in nature.

2 Definition of Geometrical Frustration

Geometrical frustration is a phenomenon in condensed matter physics in which the geometrical properties of the atomic lattice forbid the existence of a unique ground state, resulting in a nonzero residual entropy. The most important consequence of this is that the entropy of the system does not go to zero at absolute zero.

A simple set of model Hamiltonians that account only for antiferromagnetic interactions between nearest neighbors, that is,

$$H = J \sum_{i,j} S_i \cdot S_j \quad \text{where } i \neq j \tag{2.1}$$

is used to understand geometrical frustration well. Where J is the coupling constant, representing the strength of the interaction between neighboring spins,favors anti-parallel align-

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Geometrical frustration has become an essential area of research in condensed matter physics, materials science, chemistry, and other related disciplines. Researchers are actively studying frustrated systems to better understand the underlying principles governing their behavior and to harness their unique properties for various technological applications. The study of geometrical frustration continues to shed light on the fascinating interplay between geometry, symmetry, and the physical properties of materials, offering insights into the fundamental nature of complex systems in nature.

2 Definition of Geometrical Frustration

Geometrical frustration is a phenomenon in condensed matter physics in which the geometrical properties of the atomic lattice forbid the existence of a unique ground state, resulting in a nonzero residual entropy. The most important consequence of this is that the entropy of the system does not go to zero at absolute zero.

A simple set of model Hamiltonians that account only for antiferromagnetic interactions between nearest neighbors, that is,

$$H = J\sum_{i,j} S_i \cdot S_j \quad \text{where } i \neq j \tag{2.1}$$

is used to understand geometrical frustration well. Where J is the coupling constant, representing the strength of the interaction between neighboring spins,favors anti-parallel align-

ment of the spins S, labeled by their site indices i and j, and the sum is taken over nearest neighbor bonds.

3 Brief Explanation of Geometrical Frustration

To understand Geometrical Frustration, let us take a example. With a simple 2D Ising spins model on a triangular lattice,geometrical frustration can be observed perfectly.The Ising spin model is a mathematical and physical model used in statistical mechanics to study the behavior of magnetic materials, such as ferromagnetic and antiferromagnetic materials. It was introduced by the German physicist *Ernst Ising* in 1925 and has been fundamental in understanding phase transitions and critical phenomena.

In the Ising spin model, a magnetic material is represented by an array of discrete spins, where each spin can take one of two possible values: "up" (+1) or "down" (-1), represents a system of magnetic moments, analogous to the spin-up and spin-down states of electrons. The spins are usually arranged on a lattice, such as a square lattice or a cubic lattice, but they can also be defined on other types of geometries.

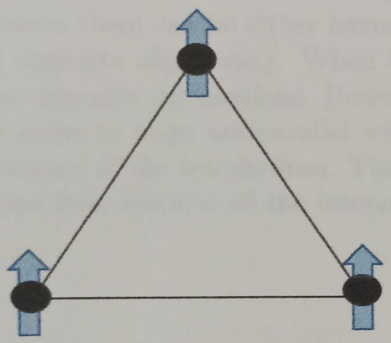

Figure 1: Ferromagnetic

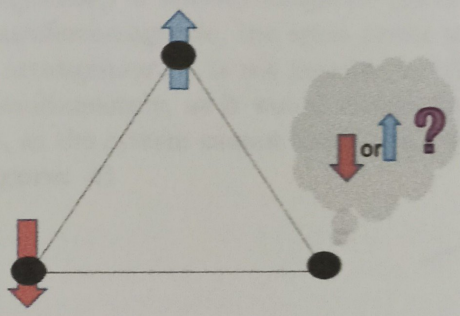

Figure 2: Anti-ferromagnetic

In the Ising model, the interaction between spins is such that they prefer to align with their neighbors. For instance, if two opposite neighboring spins are aligned in anti-ferromagnetic, it reduces the overall energy of the system. However, in a triangular lattice in anti-ferromagnetic, it is not possible for all spins to align with their neighbors simultaneously due to the geometrical constraints imposed by the lattice(**Figure:2**).
Geometrical frustration arises because the triangular lattice cannot accommodate a uniform arrangement of spins that satisfies all the interaction preferences. In other words, there is no configuration where all the spins can align with their neighbors to minimize the energy of the system. This frustration leads to complex behavior and the absence of a simple, ordered ground state.

The frustration in the Ising spins model on a triangular lattice can result in the formation of exotic states such as spin liquids or the absence of long-range order (discuss later about spin liquids and long-range order) at low temperatures. The spins can exhibit disordered or fluctuating patterns due to the competing interactions and geometric constraints, making the system interesting for studying emergent phenomena and unconventional magnetism.

In this 2d triangular lattice, there are six difference spin configuration is possible but the total energy of the triangle is same for all configuration, shown in **Figure: (3)**.

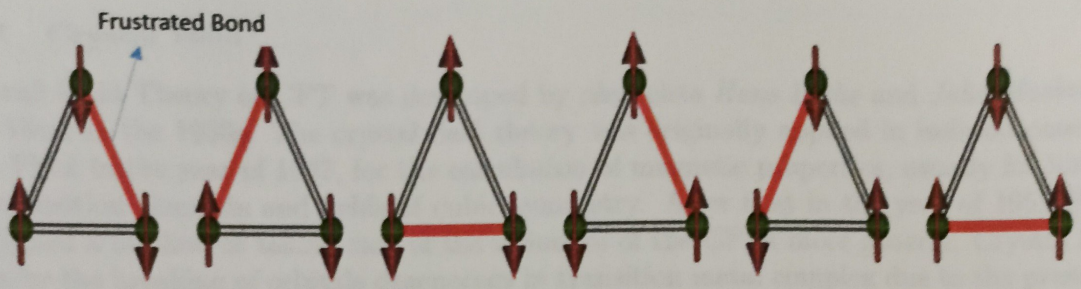

Figure 3: 6 possible configuration

Similarly, a simple 3D example of geometrical frustration can be observed in a system of four interacting spins arranged in the shape of a tetrahedron. Each spin can be in an "up" or "down" state, similar to the Ising spins in the previous example. In this system, the frustration arises from the competing interactions between the spins and the geometric constraints imposed by the tetrahedral arrangement. The spins are interconnected, and the interactions between them can be either ferromagnetic (favoring alignment) or antiferromagnetic (favoring opposite alignment). When the interactions are antiferromagnetic, the spins prefer to have opposite orientations. However, in a tetrahedral arrangement, it is not possible for all the spins to align antiparallel with their neighbors simultaneously, as it would violate the geometry of the tetrahedron. This leads to frustration, as the system cannot find a configuration that satisfies all the interaction preferences.(**Figure: 4**)

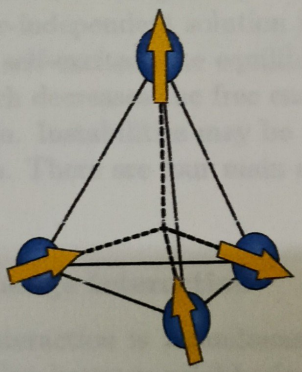

Figure 4: tetrahedron lattice structure

4 Removal or Reduction of Geometrical Frustration and Appearance of Magnetic Ordering

Geometrical frustration refers to a situation in a material's crystal lattice where competing interactions prevent the system from reaching a unique ground state, leading to degenerate or highly frustrated states. To remove or reduce geometrical frustration that is to find the lowest energy state we have deals with two major processes one of them is **intrinsic** and another is **extrinsic** process.

4.1 Intrinsic Process

Intrinsic process is divided in to three mainly, these are

4.1.1 Crystal Feild

Crysrall Field Theory or CFT was developed by physicists *Hans Bethe* and *John Hasbrouck van Vleck* in the 1930s. The crystal field theory was originally applied in isolated cases by *Van Vleck* in the year of 1937, for the calculation of magnetic properties, usually for ions of the transition elements and fields of cubic symmetry. After that in the year of 1952,*Elliot* developed a method of taking care of the influence of the CF in more general. Crystal field describe the breaking of orbitals degeneracy in transition metal complex due to the presence of ligands. It describes the strength of the metal ligand bond, the energy of the 8 system is altered. This may lead to change in magnetic property, when the central ligands approached the central metal in d or f sub-shell degeneracy is broken due to static electric field, because electron repeal each other, the d electron closer to the ligands will have higher energy than those further away, resulting in the d orbital splitting. The tendency of many materials to developed magnetic order is so weak that it's easily overwhelmed by thermal agitation of the atomic magnet. Magnetic order occurs only at low temperature. Many complex types of magnetic order exist, one of which is glass- like; so called spin-glasses, with low magnetic order that is random to the eye In the treatment of plasma waves, we assumed an unperturbed state which was one of perfect thermodynamic equilibrium: The particles had Maxwellian velocity distributions, and the density and magnetic field were uniform. In such a state of highest entropy, there is no free energy available to excite waves, and we had to consider waves that were excited by external means. We now consider states that are not in perfect thermodynamic equilibrium, although they are in equilibrium in the sense that all forces are in balance and a time-independent solution is possible. The free energy which is available can cause waves to be self-excited; the equilibrium is then an unstable one. An instability is always a motion which decreases the free energy and brings the plasma closer to true thermodynamic equilibrium. Instabilities may be classified according to the type of free energy available to drive them. There are four main categories.

4.1.2 Nearest Neighbor Exchange Interaction

The nearest neighbor exchange interaction is a fundamental concept in condensed matter physics that describes the interaction between neighboring particles or atoms in a material. This interaction effects were discovered independently by physicists Werner Heisenberg and *Paul Dirac* in 1926

In a magnetic material, the exchange interaction arises from the quantum mechanical exchange of electrons between neighboring atoms. It is a result of the Pauli exclusion principle, which states that two identical fermions (such as electrons) cannot occupy the same quantum state simultaneously. The exchange interaction can be attractive or repulsive, depending on the specific details of the electronic wavefunctions and the relative orientations of the spins.

The exchange interaction, which is quantum-mechanical in nature, is responsible for the long-range magnetic order in ferromagnets. This interaction increases (for fermions) or decreases (for bosons) the expectation value of the distance between identical particles (compared to distinguishable particles)[5]. Besides ferromagnets, this interactions pronounced

in ferrimagnets and antiferromagnets as well, where the exchange interaction between the neighboring magnetic ions will force the individual moments into parallel or antiparallel alignment with their neighbours. It actually stems from the Coulomb interaction energy and Pauli Exclusion Principle, it can be phenomenologically described by the Heisenberg exchange Hamiltonian, given by

$$H = -2J \sum_{i,j} S_i \cdot S_j \quad \text{where } i \neq j \tag{4.1}$$

where S_i is the spin operator of the i-th atom and J is known as the exchange integral.

4.1.3 Dipolar Interaction

The dipolar interaction is another important type of interaction between magnetic moments in materials. It arises from the magnetic dipole moments associated with the atoms or particles in a material. Unlike the exchange interaction, which is a short-range interaction between neighboring spins, the dipolar interaction is a long-range interaction that can extend over larger distances.

The dipolar interaction can be either attractive or repulsive, depending on the relative orientation of the magnetic moments. When two magnetic moments are aligned parallel to each other, the dipolar interaction is attractive. In contrast, when the moments are aligned antiparallel, the dipolar interaction is repulsive. The strength of the dipolar interaction depends on the magnitude of the magnetic moments and the distance between them

It's important to note that the dipolar interaction is generally weaker than the exchange interaction, especially at short distances. However, its long-range nature can make it significant in certain systems, particularly in materials with large magnetic moments or low-dimensional structures

4.2 Extrinsic process

Extrinsic process are divided into two basically , these are

4.2.1 Presence of non-magnetic impurities

Doping with non magnetic impurities in antiferromagnetic material can play a vital role to reduce Geometrical Frustration. In 2d triangular lattice we can observe it. If one of three position be spin-up magnetic moment , second one is spin-down and the third one is magnetic impurity then it is clearly seen that there would be no geometrical frustration (for better understanding see **Figure 5**) In this way , for infinity number of lattice geometrical frustration can be reduced or removed.

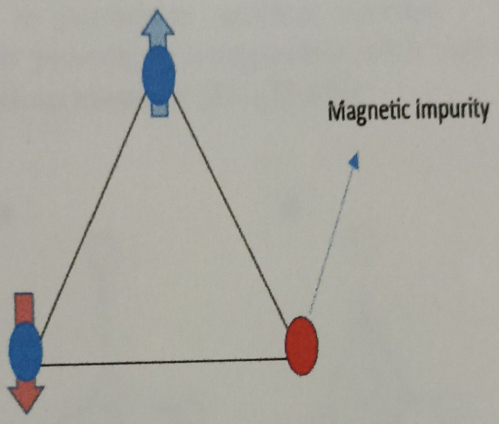

Figure 5: doping with magnetic impurities

4.2.2 External pressure

According to the study the spin liquid $Tb_2Ti_2O_7$ by single Crystal neutron diffraction under high pressure up to 2.8 GPa together with uniaxial stress, down to 0.1 k, in zero and high magnetic field, a long range order anti-ferromagnetic structure is induced by pressure. The neel temperature and ordered magnetic moment can be tuned by the anisotropic pressure components under magnetic field, the anti-ferromagnetic structure transforms into a silly Ferromagnetic one at 0.6T. Under pressure magnetic phase diagram shows a strong increase of the neel temperature with the field.

5 Some novel properties of Geometrically Frustrated compound

5.0.1 Spin Ice

The concept of spin ice was first proposed in 2001 when scientists realized that certain magnetic pyrochlore oxides behave similarly to water ice. In these materials, magnetic ions occupy the vertices of a tetrahedral lattice, and their magnetic moments behave as if they follow the "ice rules." These rules dictate that two spins point inward and two spins point outward from each tetrahedron, akin to the oxygen-hydrogen configuration in water ice. A spin-ice is a substance that does not have a single minimal-energy state. It has 'spin' degrees of freedom, with frustrated interactions with 'two-in, two-out' spin configurations [23], in a tetrahedral structure, which prevent it from completely freezing. Spin ices show low-temperature properties – in particular residual entropy – closely related to those of crystalline water-ice. The most prominent compounds with such properties are dysprosium titanate ($Dy_2Ti_2O_7$) and holmium titanate ($Ho_2Ti_2O_7$).

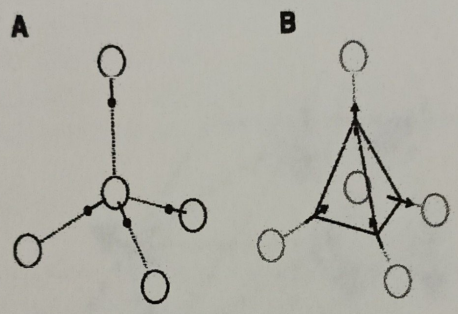

Figure 6: Two in two out spin configuration

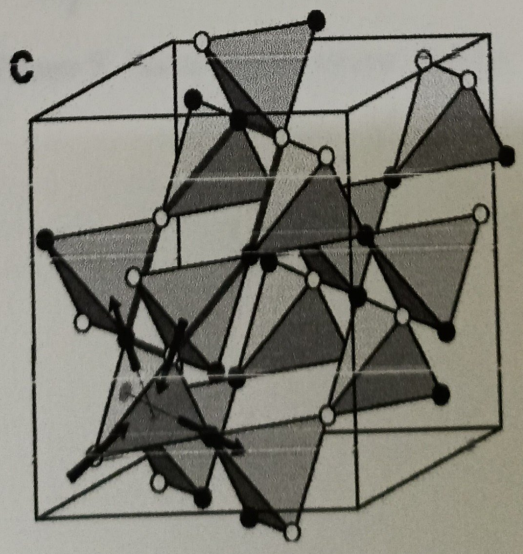

Figure 7: Two-in two-out spin configuration in pyrochlore lattice

5.0.2 Spin Glass

The concept of spin glass was originally proposed in the 1970s to describe certain amorphous metallic alloys with magnetic properties that seemed to "freeze" into a disordered state at low temperatures.Spin-glass is a disordered magnet with frustrated interactions, augmented by stochastic positions of the spins, where both ferromagnetic and antiferromagnetic bonds are randomly oriented. The term 'glass' comes from an analogy between the magnetic disorder in a spin-glass and the positional disorder of conventional, chemical glass.Spin glasses display many metastable 'cluster-like' structures, leading to a plentitude of times scale which are difficult to explore experimentally or in simulation. Spin glass systems are used as models for investigating the behavior of complex systems, such as neural networks, or even studying the behavior of disordered materials in statistical mechanics. In addition to their theoretical significance, spin glasses have practical applications in technology and material science. Understanding the behavior of spin glass materials can help in designing new magnetic materials with specific properties, such as enhanced magnetoresistance or improved data storage capabilities.

$Y_2Mo_2O_7$ shows canonical spinglass like behavior . $Tb_2Nb_2O_7$ shown spin-glass transition at T_f 0.8 k to Tb-Nb interaction . Moreover, $Tb_2Mo_2O_7$ shows spin glass transition.

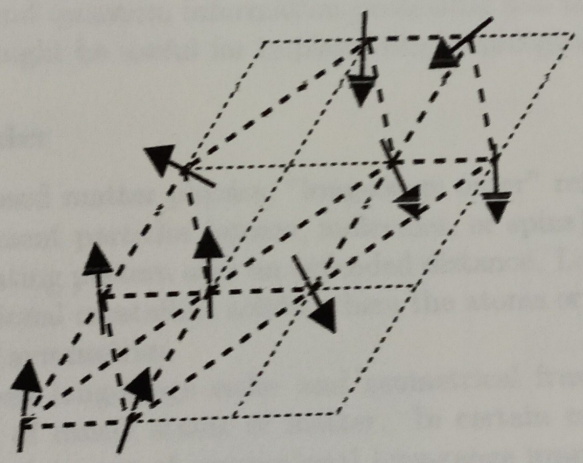

Figure 8: Random orientation of spins

5.0.3 Spin Liquid

Spin liquid is an exotic state of matter that emerges in certain magnetic materials when the magnetic moments of the atoms or ions do not settle into any long-range ordered pattern, even at very low temperatures. Unlike conventional magnets with well-defined magnetic order, spin liquids exhibit a highly disordered and dynamic magnetic structure. The concept of spin liquid was first proposed in the context of frustrated magnetic systems, where competing interactions between neighboring magnetic moments prevent them from aligning in a conventional manner. This frustration creates a unique situation where the magnetic moments remain disordered even at absolute zero temperature.

One of the most intriguing features of spin liquids is the emergence of fractionalized excitations, also known as spinons. In a spin liquid, the collective behavior of the magnetic moments can be effectively described as fractionalized quasiparticles that carry fractional spin quantum numbers. These spinons behave independently, unlike conventional magnetic systems where the collective behavior is governed by integer-spin quasiparticles.

The study of spin liquids is a cutting-edge area of research in condensed matter physics and quantum magnetism. Researchers are exploring various materials, such as certain types of frustrated magnets and quantum spin systems, to discover and understand spin liquid behavior. Spin liquids have significant theoretical implications for the understanding of quantum phases of matter and exotic quantum states. They also have potential applications in quantum computing and quantum information processing due to their unique fractionalized excitations, which might be useful for implementing topological quantum algorithms.

5.0.4 Long-range order

In the context of condensed matter physics, "long-range order" refers to a property of materials where the constituent particles (atoms, molecules, or spins) arrange themselves in a highly ordered and repeating pattern over an extended distance. Long-range order is characteristic of many conventional crystalline solids, where the atoms or molecules form a regular lattice with well-defined symmetries.

The interplay between long-range order and geometrical frustration is intriguing and leads to the emergence of exotic states of matter. In certain cases, geometrical frustration can prevent the development of conventional long-range magnetic order, giving rise to novel phases such as spin liquids or spin ices. These states are characterized by disordered magnetic arrangements and can have fractionalized excitations, magnetic monopoles, and unconventional behaviors.

$Gd_2Ti_2O_7$ and $Gd_2Sn_2O_7$ are the best example of long range order system at the lowest temperature. A specific heat study of $Gd_2Ti_2O_7$ showed two transitions at 0.97k and 0.7k . However, only one transition (at 1.0k) has been observed in $Gd_2Sn_2O_7$.

6 Example of some Geometrically Frustrated compounds

The geometrically frustrated magnetic pyrochlores have received a great deal of interest recently, both from an experimental and theoretical standpoint. A great deal of work has been reported on this subject, however it is beyond the scope of this thesis to gather it all. The electrical, magnetic, optical, thermal, nuclear, etc., experimental and theoretical works have been examined, though. Below are some of our examples.

Triangular lattice : $AgNiO_2$, Ag_2NiO_2, $NaCrO_2$,$NaTiO_2$ etc.
Kagome lattice : $Ni_3V_2O_8$, Mn_2SiO_4, $SrCr_3Ga_3O_{19}$ etc.
Pyrochlore lattice : $Dy_2Ti_2O_7$, $Mn_2Sb_2O_7$, $Y_2Mo_2O_7$, Fe_3O_4 etc

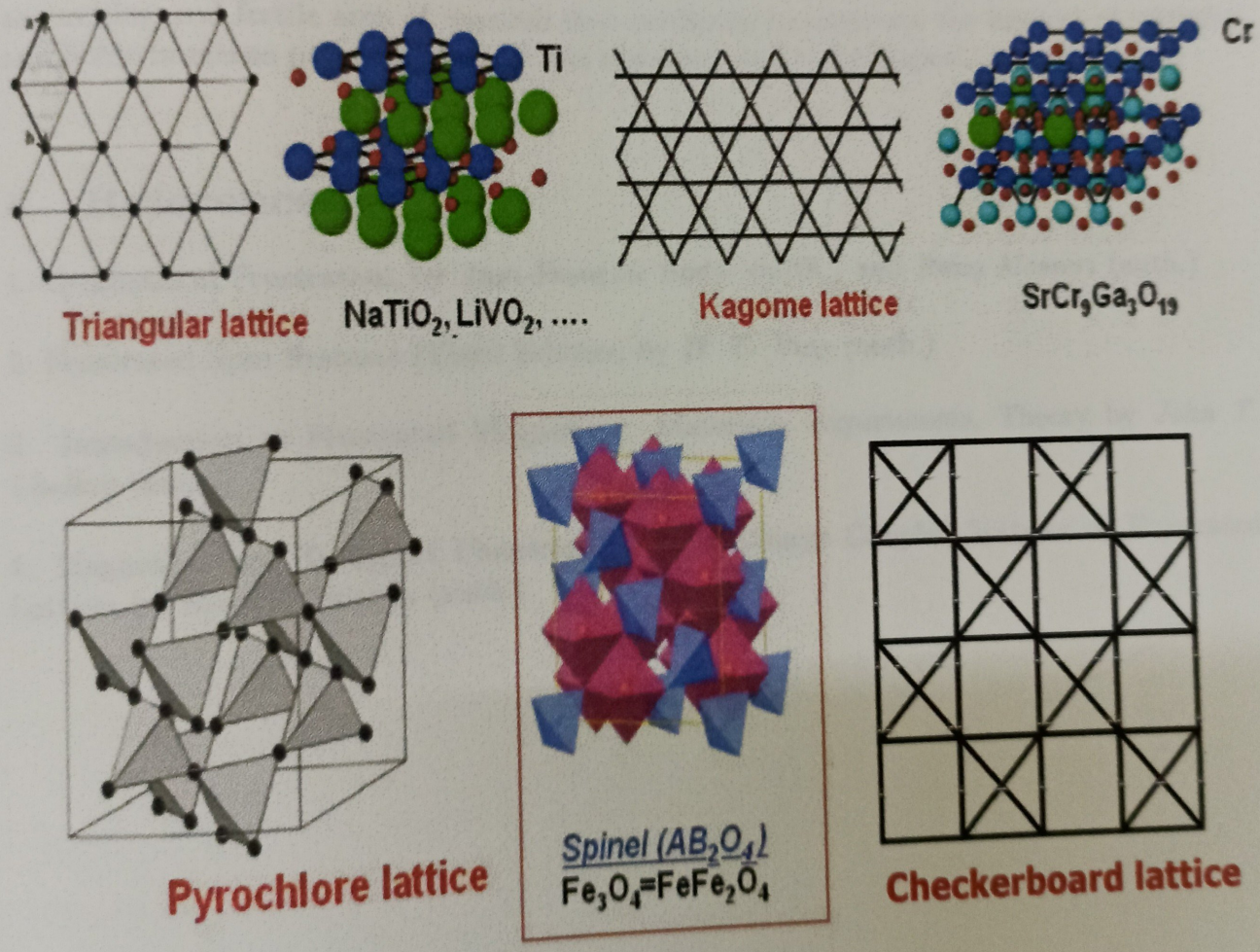

Figure 9: Some Geometrically Frustrated lattice

7 Conculation

In conclusion, the study of geometrical frustration in condensed matter physics has provided valuable insights into the behavior of complex materials and the interplay between lattice geometry and material properties. Geometrical frustration arises when the lattice structure prevents the constituent particles from arranging themselves in their energetically preferred configurations, leading to a variety of intriguing and often exotic phenomena.
Throughout this paper, we have explored the fundamentals of geometrical frustration, including its definition, the role of lattice geometry, and the energy landscape of frustrated systems. We have examined specific examples, such as the pyrochlore lattice and the kagome lattice, where geometrical frustration manifests itself in the form of spin liquids, spin ice, and other unconventional magnetic states. These examples highlight the rich and diverse behaviors that arise due to the interplay of frustration and lattice geometry.
The study of geometrical frustration has enriched our understanding of the complex behaviors exhibited by materials and has paved the way for future advancements in the field. It is an exciting and fertile area of research that continues to captivate the interest of scientists and holds immense potential for scientific discovery and technological innovation.

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Department of Political Science

Dissertation

UNIVERSITY OF KALYANI

JANGIPUR COLLEGE

বিষয়ে:- ভারতের রাজনৈতিক সংস্কৃতি

SUB:- Political culture of India

রাষ্ট্রবিজ্ঞান সম্মানিক ডিগ্রির জন্য গবেষণা মূলক তত্ত্বটি আলোচনা করছেন দিপেন মন্ডল

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Koyel Basu 28.06.23

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কৃতজ্ঞতা স্বীকার

"ভারতের রাজনৈতিক সংস্কৃতির মূল্যায়ন মূলক বিশ্লেষন" এই গবেষনার্থী কাজটি করতে গিয়ে নানান ধরনের অভিজ্ঞতা হয়েছে। এই কাজটি করতে যারা আমাকে সাহায্য করেছে তাদের মধ্যে অন্যতম হলেন আমাদের বিভাগীয় শিক্ষিকা কোয়েল বাসু (Koyel Basu), সহকারী অধ্যাপক, জাঙ্গিপুর কলেজ এবং লাইব্রেরী। একেবারে নতুন বিষয় এ কাজটি কিভাবে করব বুঝে উঠতে পারছিলাম না, এই পরিস্থিতে শিক্ষিকা মহাশয়া (ম্যাম) আমাকে বিভিন্ন ভাবে সাহায্য করেছে। এছাড়া কৃতজ্ঞতা জানাই আমাদের কলেজের বন্ধু-বান্ধবীদের, যারা এই কাজটি করতে আমাকে মানসিক ভাবে সাহায্য করেছে।

আমি আন্তরিক ভাবে কৃতজ্ঞতা জানাই আমাদের ডিপার্টমেন্টের অন্যান্য শিক্ষকদের। এছাড়াও আমি কৃতজ্ঞতা জানাই ও আন্তরিক ধন্যবাদ জানাই আমার পিতা-মাতা-কে তারা আমাকে এই কাজটি করতে পাশে থেকে সাহায্য করেছে।

ইতি

বিপ্লব মণ্ডল.

সূচিপত্র

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10 = 50

ভূমিকা (Introduction) :

বিশ্বের ভারতবর্ষ একটি বৈচিত্র্য পূর্ণ দেশ। যে দেশ সৃষ্টির আদি লগ্ন থেকে সাক্ষী হয়ে আসছে কত কত সভ্যতার গড়া ও ধ্বংসের। সাক্ষী রয়েছে ভারতের বুকে গড়ে সভ্যতা গুলির সং-স্কৃতি ও ঐতিহ্যের। সেখানে রয়েছে ধর্ম বর্ণ জাত পাত সম্প্রদায় ভাষার এক অদ্ভুত পূর্ব মিশ্রণ। ভারতের রাজনৈতিক সংস্কৃতির রূপ ও ভিন্ন ভিন্ন সময় ভিন্ন রূপ নিয়েছে। তবে আমরা রাজনৈতি-ক সংস্কৃতিকে মূলত তিনটি প্রধান শ্রেণিতে ভাগ করা যায় — i) সংকীর্ণ ভাবাদী রাজনৈতিক সংস্কৃতি, ii) অংশগ্রহনকারী রাজনৈতিক সংস্কৃতি এবং iii) নিষ্ক্রিয় রাজনৈতিক সংস্কৃতি। সংকীর্ন-ভাবাদী রাজনৈতিক সংস্কৃতিতে, জনসাধারণের মধ্যে অভাব পরি-লক্ষিত হয়। অংশগ্রহনকারী রাজনৈতিক সংস্কৃতিতে, নাগরিকেরা রাজনৈতিক বিষয়ে সক্রিয় থাকে এবং নিজের নিজের অধিকার ও কর্তব্যের ব্যাপারে সজাগ থাকে। এখানে রাজনৈতিক অংশগ্রহ-ণের মাত্রা গভীর হয়। নিষ্ক্রিয় রাজনৈতিক সংস্কৃতিতে, রাজনৈতিক ব্যবস্থা সম্পর্কে জনগণ পুরোমাত্রায় সজাগ থাকে। তবে তারা সর-কারের সিদ্ধান্তগ্রহন প্রক্রিয়াকে প্রভাবিত করার কোনো চেষ্টা করে না। এখানে ব্যক্তি মানুষ সম্পর্কে রাজনৈতিক ব্যবস্থার মনোভাব আবিপত্যমূলক। এককথায় এখানে ব্যক্তির সঙ্গে ব্যবস্থার সম্পর্ক নিষ্ক্রিয়।

ভারতের রাজনৈতিক সংস্কৃতি এই তিন শ্রেণীর কোনো একটির সঙ্গে পুরো পুরো মেলে না। ভারতের বিভিন্ন জাতি, বর্ণ, শ্রেণী, ধর্ম, ভাষা ইত্যাদি রয়েছে। আকার-প্রকারের দিক থেকেও ভারত বর্ষ বিরাট। এখানে এক এক অঞ্চলের মানুষে-র এক এক রকম মানসিকতা, আচার-ব্যবহার, অভ্যাস, বিশ্বাস, মূল্যবোধ। স্বাভাবিকভাবেই এখানে এক প্রকার মিশ্র সংস্কৃতি গড়ে উঠেছে। একদিকে শিল্পায়ন, নগরায়ন, পাশ্চাত্যায়ন প্রক্রিয়া পুরোদমে চলছে, বিজ্ঞান ও প্রযুক্তির উত্তরোত্তর উন্নতি ঘটেছে, আর মানবিক শক্তিকে কাজে লাগানো হচ্ছে।

আবার অন্যদিকে জাতপাত, বর্ণীয় মৌলবাদ, আঞ্চলিকতাবাদ, সাম্প্রদায়িক দাঙ্গা, ভাষাভিত্তিক রাজনীতি প্রভৃতি সাবেকি বা ঐতিহ্যবাহী সমাজব্যবস্থার বৈশিষ্ট্যগুলি এখানে পুরোমাত্রায় বর্তমান।

ভারত একটি বিশাল দেশ, এর সমাজব্যবস্থা বিশেষ ভাবে জটিল। স্বভাবতই এর কোন কিছুকে সহজে অনুধাবন করা সম্ভব নয়। ভারতের রাজনৈতিক সংস্কৃতির প্রকৃতিও মোটেই সহজ বোধ্য নয়। রজনী কোঠারীর অভিমত অনুসারে ভারতের রাষ্ট্রীয় কাঠামো সাবেকী ও বহুত্ববাদী সমাজের আধুনিকীকরণের উপর প্রতিষ্ঠিত।

মানুষের সামাজিক জীবনে সংস্কৃতি বিশেষভাবে গুরুত্বপূর্ণ, তদ্রূপ - ভাবে মানুষের রাজনীতিক জীবনে রাজনীতিক সংস্কৃতির গুরুত্ব ও তাৎপর্য অপরিসীম। সামাজিক ব্যবস্থার ক্ষেত্রে সাধারণ সংস্কৃতি এবং রাজনৈতিক ব্যবস্থার ক্ষেত্রে রাজনৈতিক সংস্কৃতির গুরুত্ব ও তাৎপর্য বিতর্কের ঊর্ধ্বে। রাজনীতিক প্রক্রিয়ার রাজনীতিক সংস্কৃতির সার্থকে অস্বীকার করা যায় না। যেকোন দেশের রাজনীতিক ব্যবস্থা ও রাজনৈতিক সংস্কৃতির পারস্পরিক সম্পর্ক গভীর ও ঘনিষ্ঠ। রাজনীতিক সংস্কৃতির ধারণা থেকে বিদ্যমান রাজনীতিক ব্যবস্থা সম্পর্কে সঠিকভাবে অবহিত হওয়া যায়।

ভারতীয় রাজনীতির সাম্প্রতিক চারিত্র (Recent character of Indian Politics):

স্বাধীনোত্তর যুগে ভারতের আর্থ-সামাজিক কাঠামোতে একটা বড় রকমের পরিবর্তন ঘটেছে। ভারত মিশ্রতান্ত্রিক উৎপাদন পদ্ধতিকে গ্রহণ করেছে। বড় বড় শিল্প, কারখানা গড়ে ওঠে, রাস্তাঘাট, রেলপথ, ব্যবসা-বাণিজ্য ইত্যাদির ব্যাপক প্রসার ঘটেছে। আবার একই সঙ্গে সামন্ততান্ত্রিক ব্যবস্থাও অব্যাহত রয়েছে। জাতপাতের প্রভাব, সাম্প্রদায়িকতা, আঞ্চলিক আনুগত্য, বিচ্ছিন্নতাবাদ, রাজনীতির আঞ্চলিকীকরণ, ভাষাভিত্তিক মতান্ধতা প্রভৃতি সামন্ততান্ত্রিক প্রভাব গুলি এখানে যথেষ্ট সক্রিয়। উপজাতীয়তাবাদী ও সাম্প্রদায়িক আনুগত্য রাজনৈতিক দৃষ্টিভঙ্গিকে ব্যাপকভাবে প্রভাবিত করছে। খালিস্তান, কাশ্মীর, গোর্খাল্যান্ড প্রভৃতি আন্দোলনের মাধ্যমে উপ-সংস্কৃতির একটি নতুন ধারা সৃষ্টি হয়েছে। মণিপুর, ত্রিপুরা, নাগাল্যান্ড, মিজোরামে উপজাতি যুবকদের একাংশের আন্দোলন সংকীর্ণ উপজাতীয় আত্মগত্যের চরম প্রকাশ। এসমস্ত গুলি সামন্ততান্ত্রিক সমাজের বৈশিষ্ট্য, আর এসব বৈশিষ্ট্যও বৃহত্তর জাতীয় ঐক্য ও দৃষ্টিভঙ্গি গঠনে অন্তরায় সৃষ্টি করেছে। এই সব বৈশিষ্ট্য ভারতে বুর্জোয়া শ্রেণীর বিকাশে বাধা সৃষ্টি করে নি, তাই বুর্জোয়া শ্রেণীও এই সব সামন্ততান্ত্রিক বৈশিষ্ট্যকে উচ্ছেদের ব্যাপারে সচেষ্ট হবার কোন তাগিদ অনুভব করে নি।

ভারতের কমিউনিস্ট পার্টি (মার্কসবাদী)-র কর্মসূচিতে ভারত রাষ্ট্রের শ্রেণীচরিত্র প্রসঙ্গে বলা হয়, ভারত হল বৃহৎ বুর্জোয়াদের নেতৃত্বে পরিচালিত বুর্জোয়া ও সামন্তপ্রভুদের শ্রেণী-শাসনমূলক একটি সংস্থা। এরূপ রাষ্ট্র বিচ্ছিন্নতাবাদী ও সাম্প্রদায়িক শক্তিগুলিকে লালন-পালন করে। এ অবস্থায় বুর্জোয়া শ্রেণী একদিকে সাম্রাজ্যবাদের সঙ্গে আপসরফা করে, অন্যদিকে জমিদারদের সঙ্গে ক্ষমতা ভাগাভাগি করে নেয়।

ঐতিহ্য এবং আধুনিকতার মধ্যে সমন্বয় :

এরূপ এক আধা-সামাজিক ভিত্তির পরিপ্রেক্ষিতে ভারতের রাজনৈতিক সংস্কৃতি গড়ে উঠেছে। ভারতীয় রাজনীতিতে জাত-পাত, ধর্ম, ভাষা, আঞ্চলিকতা মনোভাব অসমঞ্জস প্রাধান্য অর্জন করছে। ভারতীয় সমাজের ক্রমবিন্যস্ত কাঠামো, জাত-পাত ও বর্ণের ভিত্তিতে রাজনৈতিকদল গঠন, জন্মসূত্রে আরোপিত মর্যাদার অস্তিত্ব প্রভৃতি সামন্ততান্ত্রিক সমাজের দ্যোতক। এরই পাশাপাশি আধুনিক সমাজের বহু বৈশিষ্ট্য এখানে বর্তমান — যেমন বিজ্ঞান ও প্রযুক্তির উন্নতি, যোগাযোগ ও পরিবহন ব্যবস্থার প্রসার, অবাধ নির্বাচন, সর্বজনীন প্রাপ্তবয়স্কের ভোটাধিকার, ধর্মনিরপেক্ষতা, জাতীয় ঐক্য ও সংহতির প্রতি গুরুত্ব আরোপ, বিচ্ছিন্নতাবাদ, সংকীর্ণতাবাদ, বর্ণবাদ, মৌলবাদ প্রভৃতির বিরুদ্ধে সচেতনতা, অর্থনৈতিক পরিকল্পনা ইত্যাদি।

সুতরাং দেখা যাচ্ছে, ভারতে আমেরিকানা যেমন আছে, তেমনি আধুনিকতার বহু উপাদানও বর্তমান। তাই বলা হয়, ভারতের রাজনৈতিক সংস্কৃতিতে ঐতিহ্য ও আধুনিকতার মধ্যে সমন্বয় ঘটেছে। ভারতের রাজনৈতিক সংস্কৃতিকে সঙ্গত কারণেই মিশ্র প্রকৃতির বলা হয়। প্রখ্যাত ভারতীয় সমাজবিজ্ঞানী রজনী কোঠারী তাঁর Politics in India গ্রন্থে ভারতীয় রাজনৈতিক সংস্কৃতির প্রকৃতি বিশ্লেষণে বলেছেন, যাঁরা ভাবেন আধুনিকীকরণ মানেই সমস্ত রকম traditionalism বর্জন, অথবা traditionality আধুনিকতার পথে পরিবর্তন, তাঁদের মডেল ভারতে প্রযোজ্য নয় ("The model of those who conceive of modernization as a rejection of traditionality and a transformation on modern lines does not apply to India.") তিনি আরও বলেন, ভারতে যে আধুনিকতার ধারা প্রত্যক্ষ করা হয়েছে যায়, সেই ধারার মধ্যেও ভারতের ভারতীয়ত্বকেই জোরদার করার চেষ্টা করা হয়েছে ("The Indian response to modern stimuli consisted in assenting the Indianness of India, reformulating this Indianness, and giving it a modern character.").

ভারতের রাজনৈতিক সংস্কৃতির ঐতিহ্য ও আধুনিকতার অভিনব সহাবস্থান বর্তমান। ভারতের রাজনৈতিক ব্যবস্থা ও কার্য-প্রক্রিয়ার ঐতিহ্যবাহী উপাদানের আধুনিকতার পরিচায়ক উপাদান ও আছে। ভারতের রাজনৈতিক ব্যবস্থা ও কার্যবারার কতকগুলি ক্ষেত্রে অগ্রগতি আধুনিকতার পরিচায়ক এবং পৃথিবীর যেকোন উন্নত রাজনৈতিক ব্যবস্থার সাথে তুলনীয়। ভারতের সংসদীয় শাসনব্যবস্থার সাফল্য, সামাজিক ন্যায় প্রতিষ্ঠার ক্ষেত্রে সাফল্য প্রভৃতি উন্নত পশ্চিমী দেশগুলির আধুনিক রাজনৈতিক ব্যবস্থার কথা স্মরণ করিয়ে দেয়। অন্যদিকে ভারতের রাজনৈতিক সংস্কৃতিতে ঐতিহ্যবাহী উপাদানের অভাব নেই। নির্বাচনী সিদ্ধান্ত গ্রহণের ক্ষেত্রে এখনকার ভোটদাতারা এখনও জাতি, বর্ণ, সম্প্রদায়, গোষ্ঠী প্রভৃতি সংকীর্ণ স্বার্থচেতনা ও বিচার-বিবেচনার দ্বারা পরিচালিত হন।

রুডলফ এবং রুডলফ (L.I. Rudolph and S.H. Rudolph) তাঁদের Modernity of Tradition গ্রন্থে প্রায় একই কথাই বলেছেন। তাঁদের মতে, ভারত তার ঐতিহ্যকে বর্জন না করেই আধুনিকতার পথে এগিয়েছে। এই ঐতিহ্যের মধ্যেই আধুনিকতার প্রসার ভারতীয় রাজনৈতিক সংস্কৃতির আর একটি গুরুত্বপূর্ণ দিক বলে তাঁরা মন্তব্য করেন।

রাজনীতির ব্যক্তিকেন্দ্রীকরণ (Individualization of Politics):

ভারতের রাজনৈতিক সংস্কৃতির আর একটি গুরুত্বপূর্ণ বৈশিষ্ট্য হল 'রাজনীতির ব্যক্তিকেন্দ্রীকরণ' (Individualization of Politics)। কোনো বিশেষ বিশেষ ব্যক্তিকে কেন্দ্র করে বিশেষ বিশেষ রাজনৈতিক দলের উত্থান ও বিকাশ ভারতীয় রাজনৈতিক দল-ব্যবস্থার অন্যতম বৈশিষ্ট্য। স্বাধীন ভারতের রাজনীতির অন্যতম নির্ধারক হল সম্মোহনী ব্যক্তিত্ব (charismatic personality)। প্রথম দিকে কংগ্রেস দল নেহরুকে কেন্দ্র করে আবর্তিত হতে থাকে। পরবর্তীকালে ইন্দিরা গান্ধীর প্রভাব বাড়লে তাঁর নামেই কংগ্রেস দলের নতুন নামকরণ করা হয় কংগ্রেস (ই)। তাছাড়া এবং তাঁর কন্যা ইন্দিরা গান্ধীর এই সম্মোহী ব্যক্তিত্বের প্রতি জনসাধারণের প্রগাঢ় শ্রদ্ধা থাকার সুবাদে রাজীব গান্ধীর পক্ষে ভারতীয় রাজনীতিতে জায়গা করে নিতে অসুবিধা হয়নি। বর্তমানে রাজীব-পত্নী সোনিয়া গান্ধিকে কংগ্রেস সভানেত্রী হতে হয়েছে। তা সেই পারিবারিক ঐতিহ্যের পথ ধরেই।

সাঙ্গঠনিক সরকার (Coalition Government)

বর্তমান ভারতের রাজনৈতিক সংস্কৃতির একটি উল্লেখযোগ্য বৈশিষ্ট্য হল সাঙ্গঠনিক সরকার (Coalition Government) গঠনের প্রবণতা। 1967 সালে চতুর্থ সাধারণ নির্বাচনের পর পশ্চিমবঙ্গ, বিহার, উড়িষ্যা, পাঞ্জাব, উত্তরপ্রদেশ, কেরালা প্রভৃতি রাজ্যগুলিতে সাঙ্গঠনিক সরকার গঠনের প্রয়াস শুরু হয়।

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এবং কোথাও কোথাও সাফল্যও হয়। শুধু রাজ্য গুলিতে নয়, কেন্দ্রেও এই সাঝিমলিত সরকার গঠনের প্রক্রিয়া শুরু হয় 1977 সালে জনতা সরকার গঠনের মধ্য দিয়ে। 1996 সালের মে মাসে অনুষ্ঠিত সাধারণ নির্বাচনের পর কেন্দ্রে দেবগৌড়ার নেতৃত্বে যে যুক্তফ্রন্ট সরকার গঠিত হয়, সেটি 13টি দলের মিলিত সরকার। অতঃপর 1998, 1999 এবং 2004 সালের সালে অনুষ্ঠিত সাধারণ নির্বাচনের পর যথাক্রমে বাজপেয়ী এবং মনমোহনের নেতৃত্বে কেন্দ্রে সমিলিত সরকার গঠিত হয়।

রাজনীতির সাম্প্রদায়িকীকরন (communalisation of Politics)

ধর্মের ভিত্তিতে, ভাষার ভিত্তিতে রাজনৈতিক দল গঠন ভারতীয় রাজনীতির তথা রাজনৈতিক সংস্কৃতির অপর একটি বৈশিষ্ট্য। ভারতের মুসলিম লীগ, হিন্দু মহাসভা, আকালি দল, শিবসেনা প্রভৃতি যেসব দল রয়েছে তার প্রত্যেকটি কোনো না কোন ধর্মকে কেন্দ্র করে গড়ে উঠেছে। আবার বি.জে.পি-র মতো দল ধর্মের ভিত্তিতে গঠিত না হলেও, ধর্মকে হাতিয়ার করে ভারতীয় রাজনীতির সাম্প্রদায়িকরন (communalisation of Politics)-এর মাধ্যমে ক্ষমতা অর্জনের প্রচেষ্টা চালিয়ে যথেষ্ট সফল হয়েছে। সাম্প্রতিক কালে যে সাম্প্রদায়িক দাঙ্গা-হাঙ্গামা ভারতের রাজনৈতিক পরিমন্ডলকে বিষাক্ত করে তুলেছে তার মূলে রয়েছে এই সব দলের ধর্মভিত্তিক রাজনীতি। ভাষাকে কেন্দ্র করে ভারতবর্ষে যেসব রাজনৈতিক দল গড়ে উঠেছে তাদের মধ্যে উল্লেখযোগ্য হল ডি.এম.কে., মোর্চা লীগ, বাড়খন্ড মুক্তি মোর্চা, তেলেঙ্গানা প্রজা সমিতি প্রভৃতি। ভাষাকে কেন্দ্র করে হালেকাই ভারতের রাজনৈতিক পরিমন্ডল উত্তপ্ত হয়ে উঠেছে। স্বাধীনতার পর থেকে ভারতের উত্তরাঞ্চলের সঙ্গে দক্ষিনাঞ্চলের যে আন্তা লড়াই চলে আসছে তা এই ভাষাকে কেন্দ্র করেই।

আর ভারতের অন্যতম ঘোষিত আদর্শ হল ধর্মনিরপেক্ষতা। কিন্তু বাস্তবে সমাজে সর্বক্ষেত্রে ধর্মের অনুপ্রবেশ ঘটেছে। ভারতের সংবিধানের প্রস্তাবনায় এবং তৃতীয় অধ্যায়ে ধর্মীয় স্বাধীনতার অধিকারের অংশে ধর্মনিরপেক্ষতার আদর্শের কথা প্রচার করা হয়েছে। ভারত হল ধর্মীয় বহুত্ববাদের দেশ। কিন্তু মূলত হিন্দু প্রধান দেশ। আবার পৃথিবীর তৃতীয় বৃহত্তম মুসলিম প্রধান রাষ্ট্র হিসাবে ভারতের কথা বলা হয়। ভারতের রাজনীতিক সংস্কৃতিতে ধর্মের অনভিপ্রেত অস্তিত্ব অনেক সময় সংকট সৃষ্টি করেছে। সাম্প্রদায়িকতা ভারতীয় রাজনীতে একটি মারাত্মক দুরারোগ্য ব্যাধিস্বরূপ।

গণ রাজনৈতিক সংস্কৃতি ও এলিট রাজনৈতিক সংস্কৃতি (mass Political culture and elite Political culture):

ভারতের রাজনৈতিক সংস্কৃতিতে দুটি অংশের অস্তিত্বের কথা বলা যায়। একটি দুটি অংশ হল গণ রাজনৈতিক সংস্কৃতি (mass Political culture) এবং এলিট রাজনৈতিক সংস্কৃতি (elite Political culture)। ওয়েনারের অভিমত অনুসারে গণরাজনৈতিক সংস্কৃতি হল এক সম্প্রসারণশীল রাজনৈতিক সংস্কৃতি। সাধারণ সরকারী ব্যবস্থার আঞ্চলিক পর্যায়ে এবং মধ্য স্তরের পৌর প্রশাসনে ও গ্রামীণ পঞ্চায়েত প্রশাসনে গণরাজনীতিক সংস্কৃতির সক্রিয় অস্তিত্ব পরিলক্ষিত হয়। সাধারণত ঐতিহ্যবাহী রক্ষণশীল ও অল্পশিক্ষিত মানুষের মধ্যে এই ধরনের রাজনৈতিক সংস্কৃতি লক্ষ্য করা যায়। এদের মধ্যে জাতীয় চেতনার অভাব এবং ~~সংকীর্ণ~~ সংকীর্ণ সাম্প্রদায়িক ও জাতিগত চেতনার প্রাধান্য পরিলক্ষিত হয়। ভারতের এলিট রাজনৈতিক সংস্কৃতিবলতে,

আভ্যন্তরীণ সংস্কৃতিকে বোঝায়। প্রবাসের পাশ্চাত্য শিক্ষায় শিক্ষিত বুদ্ধিজীবী ও কাছাকাছি অবস্থিত শ্রেণী এদের রাজনৈতিক সংস্কৃতির অন্তর্ভুক্ত। ইংরেজী ভাষা বা প্রচলের মধ্য দিয়ে এই রাজনৈতিক সংস্কৃতির অভিব্যক্তি ঘটে। সাধারণত আলীকেন্দ্র, আমলা, সামরিক বাহিনী ও কেন্দ্রীয় সরকারের অন্যান্য সংস্থায় এই ধরনের রাজনৈতিক সংস্কৃতি পরিলক্ষিত হয়।

রাজনৈতিক উপসংস্কৃতি (Political sub-culture):

ভারতের রাজনীতিক সংস্কৃতির বিভিন্ন উপসংস্কৃতির উপস্থিতিও অস্বীকার করা যায় না। আঞ্চলিকতা, জাতিগোষ্ঠী, ধর্ম, সাম্প্রদায়িকতা প্রভৃতির পারিপ্রেক্ষিতে রাজনীতিক ক্ষেত্রে উপসংস্কৃতির অস্তিত্ব পরিলক্ষিত হয়। উপসংস্কৃতির কারণে বিভিন্ন গোষ্ঠীর মধ্যে কিছু কিছু স্বাতন্ত্র্য লক্ষ্য করা যায়। ভারতের মূল রাজনৈতিক সংস্কৃতি উপসংস্কৃতি গুলির মধ্যে সংযোগ সম্পর্ক সৃষ্টি করে।

ভারতে বেশকিছু উগ্রপন্থী সংগঠন রয়েছে। লস্কর-ই-তৈবা, হিজবুল মুজাহিদিন, আলফা, টি.এ.জি. প্রভৃতি এ ব্যাপারে উল্লেখযোগ্য। কাশ্মীর, নাগাল্যান্ড, মিজোরাম প্রভৃতি অঞ্চলে উগ্রপন্থীদের জঙ্গী আন্দোলন ভীষণভাবে সক্রিয়। ভারতে রাজনৈতিক সংস্কৃতির পাশাপাশি যে উপসংস্কৃতি (Political sub-culture)-র উপাদানও রয়েছে, এই সব উগ্রপন্থী সংগঠন গুলির জঙ্গী আন্দোলনের মাধ্যমে তা অভিব্যক্ত হয়।

অমল কুমার মুখোপাধ্যায় এর বিশ্লেষন:

অধ্যাপক অমল কুমার মুখোপাধ্যায় ভারতের রাজনৈতিক সংস্কৃতির আলোচনা প্রসঙ্গে প্রাথমিক কালে ভারতীয় রাজনীতির একটি বিশেষ দিকের প্রতি দৃষ্টি আকর্ষন করেছেন এবং সেটি হল চলমান রাজনৈতিক ব্যবস্থা ও রাজনৈতিক প্রক্রিয়া সম্পর্কে অনেক মানুষের, এমনকি শিক্ষিত সম্প্রদায়ের ও আস্থাহীনতা এবং ঔদাসীন্য। এর কারণ হিসাবে তিনি মূল্যবোধের অভাবকে দায়ী করেছেন। তিনি বলেছেন, "প্রায় দুঃশাসক ধরে দেখা যাচ্ছে যে ভারতীয় রাজনীতিতে সকলকেই মূল্যবোধকে বিসর্জন দেওয়া হচ্ছে।" রাজনেতিক নেতৃবৃন্দ মুখে গণতান্ত্রিক আদর্শ ও মূল্যবোধের প্রতি আনুগত্যের কথা বললেও, কার্যত তাঁরা এই আনুগত্যকে অস্বীকার করেছেন। তিনি আরও বলেছেন, রাজনীতির সর্বোচ্চ

স্তরে নানা ধরনের দুর্নীতির অভিযোগ উঠছে এবং গণতান্ত্রিক নির্বাচনের বৈধতা নিয়েও জনমানসে সন্দেহ ও অবিশ্বাস দেখা দিয়েছে। শিক্ষিত ও অশিক্ষিত সবস্তরের সাধারণ মানুষ এমন একটা ধারনা তৈরী করেছে যে রাজনীতিতে সক্রিয়ভাবে অংশগ্রহন করলেও তাঁরা এই দুর্নীতিগ্রস্থ রাজনৈতিক কাঠামোটিকে বদলাতে পারবেন না। এই হতাশা ও আত্মবিশ্বাসহীনতা থেকে ইদানীং ভারতবর্ষে নিষ্ক্রিয় রাজনৈতিক সংস্কৃতি প্রসার লাভ করেছে।

অন্যান্য বিষয়:

সমন্বয় ও সহমত ভারতীয় রাজনৈতিক সংস্কৃতির একটি ধারা। ভারতীয় জনগণ ও জননেতাদের মধ্যে সমন্বয় ও ঐক্য মতে উপনিত হওয়ার এক স্বাভাবিক ও প্রকৃতিগত প্রবনতা পরিলক্ষিত হয়। দ্বন্দ্ব-বিবাদের বিরোধীতা ভারতীয় রাজনৈতিক সংস্কৃতির অন্যতম বৈশিষ্ট্য। ভারতীয় ঐতিহ্যবাহী কে. এম. পানিক্কর এর অভিমত ও অনুসারে সমসাময়িক ভারতের ঐতিহ্য ছিল সমন্বয় ধর্মী। হিন্দু ও বৌদ্ধ ধরমের দুটি প্রধান ধর্মের মধ্যে উপলব্ধি, সহনশীলতা ও সমন্বয়ের আদর্শের অস্তিত্ব পরিলক্ষিত হয়, তাছাড়া ভারতের রাষ্ট্রীয় কাঠামো ও রাজনীতিক ব্যবস্থার মূলত সম্পর্কিত মৌলিক সিদ্ধান্ত সমূহের মধ্যে ঐকমতের প্রতিফলন পরিলক্ষিত হয়।

ভারতের রাজনৈতিক সংস্কৃতির অন্যতম উল্লেখযোগ্য আস্থা হল আইন। বিভিন্ন সমস্যা সমাধানের ক্ষেত্রে আইন ও নিয়ম কানুনের ওপর নির্ভর করা হয়। জনসাধারণ বিশ্বাস করেন উপযুক্ত বিধি ব্যবস্থার মাধ্যমে দেশ ও দেশবাসীর কল্যান সাধনের সঙ্গে সঙ্গে বিভিন্ন ধরনের জাতীয় ও আঞ্চলিক সমস্যার সমাধান সম্ভব। সরকার ও জনসাধারণের

এই মানসিকতা ভারতীয় রাজনীতিক সংস্কৃতির এক অভিনব বৈশিষ্ট।

ভারতীয়রা আশা করেন রাজনীতিক নেতারা হবেন সর্বত্যাগী, সার্বজনীন। ভারতীয়দের দৃষ্টিভঙ্গিতে একজন রাজনীতিক নেতা হবেন সৎ, ন্যায়পরায়ন, নিঃস্বার্থ এবং জনকল্যানমুখী ব্রতী। এরকম রাজনীতিক নেতারাই পরিচ্ছন্ন ও জনকল্যানমুখী সরকারকে সুনিশ্চিত করতে পারেন। জাতির জনক মহাত্মা গান্ধীই হলেন সার্বজনীন রাজনীতিক নেতৃত্বের পরাকাষ্ঠা। রাজনীতিক নেতাদের চরিত্র হবে নিষ্কলঙ্ক ও অতি উচ্চ-মানের। নির্বাচনী রাজনীতিতে এই রকম প্রার্থীরা ব্যাপক জন সমর্থন পেয়ে থাকেন। এবং এই কারনেই রাজনীতিক দলগুলিও এই রকম পরিচ্ছন্ন ভাবমূর্তির ব্যক্তিদেরই দলীয় প্রার্থী হিসাবে নির্বাচনী প্রতিদ্বন্দ্বিতায় সামিল করেন।

ভারতের রাজনীতিক ব্যবস্থায় প্রতিবাদ, বিক্ষোভ ও ধর্মঘটের পথে বিরোধী রাজনীতিক শক্তি নিজেদের সংগঠিত করে। বিরোধী রাজনৈতিক শক্তিগুলি কখন কেন্দ্রীয় সরকার, রাজ্য সরকার আবার কখনও আমলাতন্ত্রের বিরুদ্ধে প্রতিবাদ ও বিক্ষোভ সংগঠিত করে। এক্ষেত্রে বিরোধী শক্তিগুলি ধর্না, বন্ধ, ধর্মঘট, অনশন প্রভৃতি উপায় পদ্ধতি অবলম্বন করে। গন আন্দোলন ও হিংসার রাজনীতির এই সমস্ত রীতি নীতির ভারতের রাজনীতিক সংস্কৃতির অঙ্গ হিসাবে বিবেচিত হয়।

মূল্যায়ন

ভারত একটি বিশাল দেশ। এর সমাজব্যবস্থা বিশেষ ভাবে জটিল। স্বাভাবতই এর কোন কিছুই সহজে অনুধাবন করা সম্ভব নয়। ভারতের রাজনৈতিক সংস্কৃতির প্রকৃতিও মোটেই সহজবোধ্য নয়। সবশেষে ভারতের রাজনৈতিক সংস্কৃতির স্বরূপ আলোচনা প্রসঙ্গে একটি কথা স্মরণ রাখা প্রয়োজন যে এ সম্পর্কে এখনও পর্যন্ত কোন সুসংবদ্ধ পরীক্ষা-নিরীক্ষা শুরু হয়নি। রজনী কোঠারীর অভিমত অনুসারে ভারতের রাষ্ট্রীয় কাঠামো সাবেকী ও বহুত্ববাদী সমাজের আধুনিকীকরণের উপর প্রতিষ্ঠিত। ব্রিটিশ মডেলকে অনুসরণ করেই ভারতে সংসদীয় গণতন্ত্র প্রতিষ্ঠিত হয়েছে। এতদ্‌সত্ত্বেও কাঠামো ও ভাবগত দিকে ভারতে রাজনৈতিক ব্যবস্থার বিভিন্ন পার্থক্য পরিলক্ষিত হয়। অন্যভাবে কেন্দ্রিকরণ ও বিকেন্দ্রীকরণ উভয়ই প্রক্রিয়া প্রতিপন্ন হয়।

বস্তুত এদেশের রাজনৈতিক সংস্কৃতিতে সমন্বয় সাধন ও নমনীয়তার উজ্জ্বল উদাহরণবর্তমান। প্রকৃত প্রস্তাবে ভারতের রাজনৈতিক সংস্কৃতিতে কতকগুলি ক্ষেত্রে আপাত স্ববিরোধীতা পরিলক্ষিত হয়। এক্ষেত্রে উদাঃ হিসাবে বৈচিত্র্যের মধ্যে ঐক্য, ধর্মনিরপেক্ষতার সাথে সাম্প্রদায়িকতা, ঐতিহ্য ও আধুনিকতা যা বাধ্যবাধকতার সাথে পরিবর্তনশীলতা, পাশ্চাত্যীকরণের সাথে সংস্কৃতিকরণ, অংশগ্রহণের রাজনীতির সাথে রাজনীতির অনীহা প্রভৃতি উল্লেখযোগ্য।

ব্রিটিশ সাম্রাজ্য দ্বারা ভারতের উপনিবেশের কারণে, সমসাময়িক রাজনৈতিক সংস্কৃতি পশ্চিমী ধারণা দ্বারা প্রভাবিত হয়েছে, যা আগে উপস্থিত ছিল না। এরূপ প্রভাব গুলির মধ্যে রয়েছে, গণতন্ত্র এবং সংসদীয় ব্যবস্থা, দুটি প্রতিষ্ঠান যা আদর্শগত ভাবে বর্ণ ব্যবস্থার বিপরীতে দাঁড়িয়েছিল যা আগে সমাজকে বিভক্ত করেছিল। ভারতের বহু সাংস্কৃতিক জনসংখ্যার কারণে, রাজনৈতিক সংস্কৃতি দল ও অঞ্চলভেদে পরিবর্তিত হয়। ভারতের সমকাল-

গণতন্ত্রীকরণের ফলে নগরায়ন উচ্চবর্ণের ক্ষমতা দেওয়া হচ্ছে এবং সুশিক্ষিত শ্রেণী যারা জাতীয় আন্দোলনের উপর দৃষ্টি নিবদ্ধ করেছিল, সেই সাথে আরও প্রতিক্রিয়াশীল, গ্রামীণ এবং নিম্ন শ্রেণীর রাজনৈতিক অভিনেতা। আধুনিক যুগে, ভারতের শ্রেণী ব্যবস্থা ভেঙে পড়তে শুরু করেছে, এবং নিম্ন শ্রেণীর সদস্যরা এখন উচ্চতর রাজনৈতিক, অর্থনৈতিক অবস্থানে প্রবেশ করছে। এটি বিশেষত নিম্ন শ্রেণীর মহিলাদের জন্য সত্য, যারা ঐতিহাসিক ভাবে এই ধরনের কার্যকলাপ থেকে বাদ পড়েছে।

...

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Department of Zoology

Dissertation and Project Work

JANGIPUR COLLEGE

FIELD VISIT REPORT ON

PATHOLOGICAL LABORATORY

DATE- 03/12/2022

COURSE CODE- ZOOL-G-SEC-04 (Medical Diagnostic Technique)

Submitted in partial fulfilment of the requirements for the degree of

B.Sc Programme (Zoology)

By

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Firstly, I wish to extend my sincere thanks to **Mrs. Ankita Mishra** ma'am and **Mr. Prithwish Sarkar** sir my project supervisor, for their invaluable guidance, encouragement, and insightful feedback throughout the duration of this project. Your expertise and support were crucial in shaping this work.

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This project would not have been possible without the collective efforts and support of all these individuals.

I would also like to express my heartfelt thanks to **Laldighi Medical Centre** for their exceptional support and cooperation ,without their support it was crucial to the success of this project.

Thank you.

INTRODUCTION :

This section introduces the purpose of the report, providing a brief background on pathological laboratories and their importance in the medical field. Pathological laboratories play a crucial role in diagnosing diseases, monitoring patient health, and guiding treatment plans through various diagnostic tests and analyses.

OBJECTIVES OF THE VISIT:

➢ Outline the key goals of the visit:

Understanding Operations: To gain a comprehensive understanding of how a pathological laboratory operates.

Observing Sample Collection: To observe the methods and procedures used for collecting and processing samples.

Learning Diagnostic Tests: To learn about the different diagnostic tests conducted and their significance.

Quality Control: To understand the quality control measures implemented to ensure the accuracy and reliability of test results.

OVERVIEW OF THE PATHOLOGICAL LABORATORY

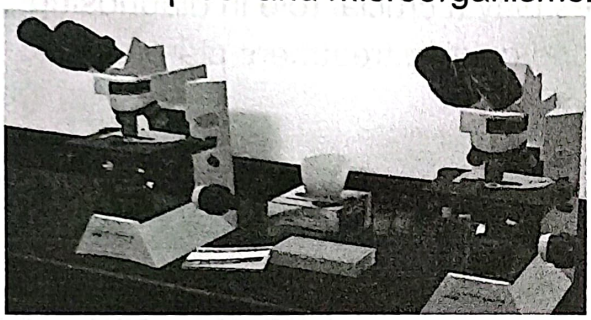
Location and Size: The Laldighi Medical Centre is located at Berhampore,Murshidabad near Netaji Subhas Sarabar. The facility covers an area of 2,500 square feet.

Types of Tests Conducted: The laboratory conducts tests in hematology, microbiology, biochemistry, immunology and histopathology with over 100 different tests available.

General Layout and Facilities: The lab includes sections for sample collection, processing areas, specialized testing rooms and a data analysis center, ensuring an efficient workflow.

EQUIPMENT AND TECHNOLOGIES USED:

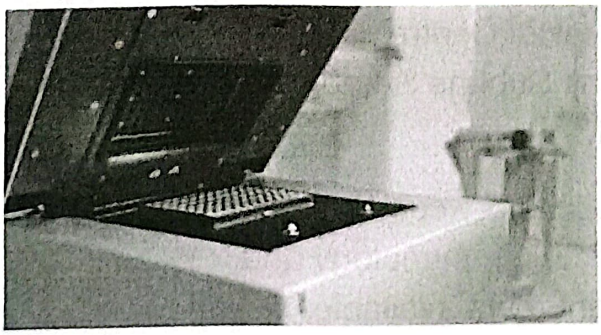
Microscopes: Microscopes used for examining blood smears, tissuesamples and microorganisms.



Centrifuges: Centrifuges used for separating different components of blood and other fluids.

Automated Analyzers: Automated analyzers for performing routine blood tests like CBC and blood chemistry.

PCR Machines: PCR machines for amplifying DNA and detecting genetic material.



Spectrophotometers: Spectrophotometers for measuring the concentration of substances in blood and other samples.

SAMPLE COLLECTION AND PROCESSING:

Types of Samples Collected: Blood, urine, tissue biopsies, throat swabs, and sputum.

Methods of Sample Collection: Venipuncture for blood, clean catch for urine, biopsy procedures for tissues, and sterile swabs for throat samples.

Labeling and Documentation: Samples are labeled with patient ID, date, and time of collection using barcoded labels to prevent mix-ups and ensure traceability.

Storage and Transport: Blood samples are stored at 4°C, urine samples at room temperature, and tissue biopsies in formalin. Samples are transported in insulated containers to maintain their integrity.

Processing Techniques: Centrifugation for separating blood components, Gram staining for microscopic examination of bacteria, and formalin fixation for tissue samples.

DIAGNOSTIC TESTS AND PROCEDURES:

Explain the various diagnostic tests and procedures observed:

➢ Blood Tests:

Complete Blood Count (CBC): Measures different components of blood like RBCs, WBCs, hemoglobin, and platelets.

Blood Glucose Levels: Measures the concentration of glucose in the blood.

Liver Function Tests (LFTs): Assesses the functioning of the liver.

➢ Urine Tests:

Urinalysis: Checks for various substances in the urine, indicating kidney function and urinary tract infections.

Urine Culture: Identifies bacteria causing infections.

➢ Microbiological Tests:

Cultures: Growing microorganisms to identify infections.

Sensitivity Tests: Determining the susceptibility of bacteria to antibiotics.

➢ Histopathological Tests:

Biopsy Examination: Examining tissue samples to diagnose diseases such as cancer.

QUALITY CONTROL AND ASSURANCE:

Calibration of Equipment: Regular calibration of microscopes, analyzers, and spectrophotometers is conducted weekly using standardized calibration kits.

Control Samples: Control samples with known values are run daily to check the accuracy of test results.

Proficiency Testing: Participating in external proficiency testing programs such as CAP (College of American Pathologists) to benchmark against other labs.

Documentation and Record-Keeping: Detailed records of all tests, calibrations, and quality control measures are maintained in a Laboratory Information Management System (LIMS) for traceability and accountability.

OBSERVATIONS AND LEARNINGS:

Laboratory Workflow: Observed a structured workflow from sample collection to reporting, ensuring efficiency and accuracy.

Importance of Accuracy: Emphasized the need for precision in diagnostic testing to avoid errors and ensure patient safety.

Technological Integration: Noted the role of advanced technology such as automated analyzers and PCR machines in improving diagnostic capabilities.

Challenges: Identified challenges such as handling high sample volumes and ensuring timely results, which require efficient workflow management.

Collaboration: Highlighted the teamwork required among pathologists, technologists, phlebotomists, and administrative staff to deliver reliable diagnostic services.

CONCLUSION:

The visit to the Laldighi Medical Centre provided valuable insights into the critical role of pathological laboratories in healthcare. The knowledge gained underscores the importance of accuracy, advanced technology and collaboration among healthcare professionals in diagnosing and treating diseases. The experience has enriched my understanding of the essential functions and challenges faced by these laboratories.

THANK YOU

-- 03/01/2023

DATE-

Amirahosa.

TEACHER'S SIGNATURE

JANGIPUR COLLEGE

FIELD VISIT REPORT ON

POND ECOSYSTEM

DATE- 10/12/2022

Submitted in partial fulfilment of the requirements for the degree of

B.Sc Programme (Zoology)

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No creation in this world is a solo effort. Neither this project. It would not have been possible without the kind support and help of many individuals and organizations. I take this opportunity to express my gratitude to all of them. Thus,I would like to express my special thanks of gratitude to my HOD sir Anup Kumar Mandal (HOD) and my other respectful teachers Nabanita Mukherjee, Ankita Mishra, Prithwish Sarkar and at last but not the least Amar Kumar Das(Lab Attendance).

I will also like to extend my gratitude to our most honourable MLA Sir Jakir Hossain (present MLA) for providing as the project area i.e. Mahisal Fish Farming Pond and for other valuable facility that was required for us.

Date:-

Place :-

♣ INTRODUCTION :-

Fresh water ecosystem includes all forms of aquatic habitats.

It may be lentic type i.e. stagnant water live pond, lake or lotic type running water likerivers, streams etc.

A pond as a whole, serves as good example of an aquatic and fresh water eco- system.Infact, it represents self sufficient and self regulating system.

It has various types of component. Ecological studies can be based by studying a smallpond.

Fig:- A Pond Ecosystem

The various components of ecosystem are described in the following:-

♣ ABIOTIC COMPONENT AND SUBSTANCE :-

a) This includes mainly organic and inorganic compounds besides climatic regimes.

b) Compounds include water, oxygen, Carbon dioxide, Ca_2 Ca, P amino acids etc.

c) Among the above mentioned substances carbon dioxide, oxygen, Ca^{+1}, N_2etc. are organic compounds.

On the other hand heat, light are the basic inorganic substance in the pond ecosystem.

d) Inorganic salts occurs in the form of phosphates, nitrates and chloride.

e) Some preparation of nutrients exists in solution state but most of them are as stored in particulate matter as well as in living organism.

f) Hayes (1951) defines pond not as a ecosystem of containing nutrients but a balanced system of water and solids under ordinary condition.

g) The abiotic substances. are taken plants with the help of sunlight into food materials.

h) The rate of release of reserve nutrients the solar input and the cycle of temperature of day length and other climate condition regulate the function of the eco- system of pond.

Fig:- Abiotic & biotic factors both impact ecosystems

♣ BIOTIC COMPONENT :-

It includes various organism which are classified into the following types:-

1. Producer:-

a) This are photoautotrophic green plants and photo synthetic bacteria.

b) Different types of water bugs can be found in a pond ecosystem. Eitherssome of themcan be seen through naked eye or by through microscope.

c) The producers fix gradient with the help of minerals derived from waterand mad andmanufacture the complex organic substances such and lipid.

Fig:- A living water bug obtained from the pond ecosystem

Producers of the pond are of filling types-

Macrophytes :-

This includes mainly rooted large sized plant which compare with various types Of hydrophytes.

I. Partially or completely, submerged floating aquatic plants.Ex. *Chara sp. ,Hydrilla sp . ,Nelumbo sp.*

II. Beside this plant some following form also occur in the pond ecosystem.Ex. *Wolfiasp. , Eichhomia sp.* etc.

Fig:- **The green macrophytes at the edge of the pond**

phytoplankton :-

These are microscopic, floating are suspended in lower plants that are Distributed throughout the water. Phytoplankton are available up to the depth of water where light penetrates.

Ex. *Ulothrix sp. , Volvox sp.*

Fig:- The phytoplankton

2. Consumer :-

Consumer are heterotrophs which depend for their nutrients on otherorganisms. Consumers are of following types-

a) Herbivore or Primary Consumer :-

These animals feed on directly living plant or plant remains. This primaryconsumers are of various type-

• Benthos:-

These organisms are the button dwelling forms such as water striders, molluscs,insects larvae.

Fig:- Molluscs obtained from the pond

Fig:- A walking insect on the pond's water

•Zooplanktons :-

These organisms feed chiefly on phytoplankton.Ex.

Cyclops sp. and *Euglena sp.* etc.Beside this small sized herbivores some mammals such as cow, buffaloes etc.who visitsthe pond normally and feed on marginal rooted macrophytes.

b) Secondary Consumer :-

Secondary consumers or carnivores feed on the herbivores and include chieflyinsect fishand amphibians.

Fig:- Specimen collected for observation

Fig:- Fingerlings collected from water

c) Tertiary Consumer :-

In the pond ecosystem there are some large fishes that feed this smaller fish and thus becomethe tertiary consumers.

3. Decomposer :-

c) They are also called micro-consumer as they absorb only a fraction of the decomposed organic materials.

d) Most of the decomposers are saprophytes but some parasites are also found.

e) They also bring about the decomposition of date organic- matters of bothproducersas well as micro-consumers to simple forms.

f) Decomposers help in returning of mineral element again to the medium of the pondand in running bio-geo-chemical cycle.

g) Generally, the decomposer either live in the soil layer underneath the wateror in themud.

h) Their activities make chemical substances available for other living being.

Example: Bacteria, Flagellates, *Fungi (Aspergillus sp.) , Pythium sp. and Eusariumsp.*

♣ THE FOOD CHAIN IN THE POND :-

Solar energy → Producer → Primary Consumer (larvae of insect) —E.F→ Secondary Consumer (snail, small fishes) —E.F→ Tertiary Consumer (large fishes) —E.F→ Decomposer (bacteria, fungi etc.) → Raw materials

★ E.F — Energy Flow

THANK YOU

Date: 10/12/2022 Teacher Singneture: A Mandal

PROJECT REPORT ON CHICK EMBRYO DEVELOPMENT UNDER NORMAL CONDITION

Submitted in partial fulfilment of the requirements for the degree of

B.SC. Honours (Zoology)

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Thank you.

Your sincerely,
TITHI SAHA

ASPECTS OF CHICK EMBRYO DEVELOPMENT UNDER NORMAL CONDITION

INTRODUCTION:

- *Chick belongs to the class-Aves*
- *Sexes are separate.*
- *Male bird is the Cock-has a pair of testes*
- *Female bird is the hen-has only one ovary located on the left side*
- *The hen is oviparous*
- *Fertilization is internal (Copulation-Cloacal Kiss)*

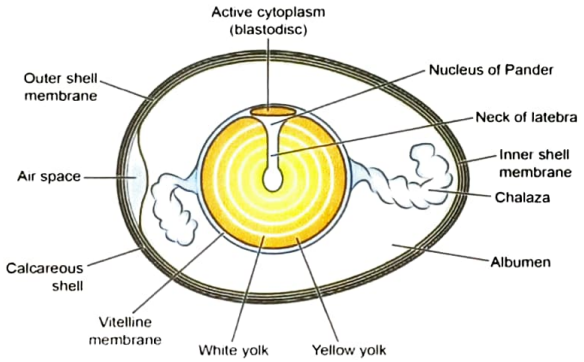


Fig.15.1: Diagrammatic longitudinal section of a hen's egg.

EGG:

A fully formed and newly egg is large and elliptical with one end broader than the other).

TYPE:

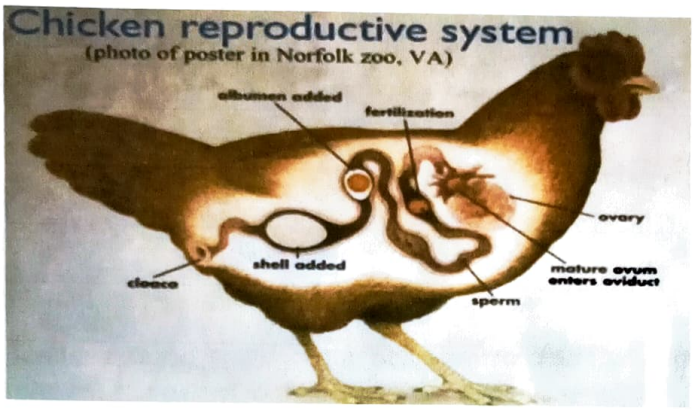
The egg of chick is telolecithal (having a large yolk situated at or near one end).

RELEASE:

The egg is released from the ovary, it takes 24 hours to pass down the oviduct. before being laid.

FERTILISATION:

The fertilization is internal. upper part of the oviduct, resulting two polar bodies degenerate and disappear.



Fig?

STRUCTURE OF EGGSHAPE:

It is oval in shape.

SIZE :

3cm wide and Sem long .

SHELL:

Made up 95%calcium carbonate, white and porous and exchange of gases occur, soft and flexible in a freshly -laid egg but soon become hard and brittle.

MEMBRANE:

Two types of membrane, shell membrane and vitelline membrane, separated at the broad end of the egg to enclose an air space.

YOLK MEMBRANE:

The layer of yellow yolk is thicker than those of the white yolks. Yolk contains about 50% water. Yolk consists of phospholipids, lecithin.

- *Yellow yolk shows 60% fats and 70% proteins.*
- *White yolk contains less fat and also less of fat soluble carotene.*

CHALAZA:

Two end of the egg are some fibrous rope like twisted structure formed during journey of the oviduct.

LATEBRA:

The central flask shaped area that is enclosed of white yolk is called latebra.

ALBUMEN:

It has two types: Thick albumen and thin albumen.

GERMINAL DISC OR BLASTODIC/ BLASTODERM:

Nucleus of the egg is surrounded by the negligible amount of yolk free cytoplasm called germinal disc

CLEAVAGE

•Cleavage is the division of the egg into blastomeres

• The Cleavage is incomplete or meroblast (blastodise alone divides)

•Area pellucida - the pellucid (translucently clear) central area that immediately surrounds
•vertebrate embryo (as of a bird) formed by discoidal cleavage.

Area opaca - the opaque region of yolk

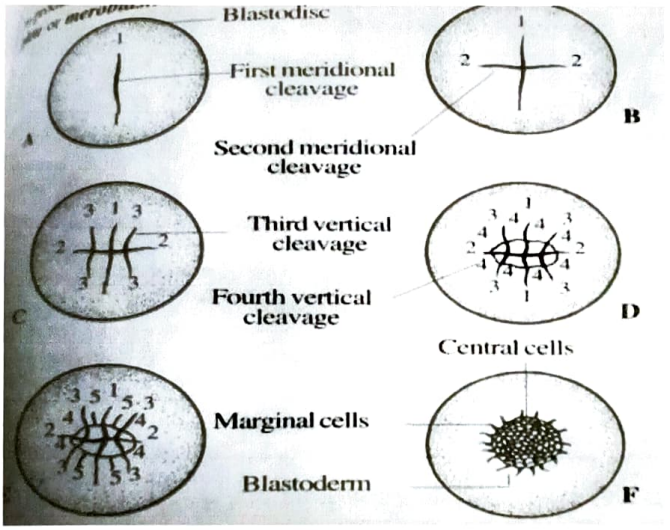


Fig. The order in which the cleavage furrows have appeared is indicated on the diagrams **A**, first cleavage; **B**, second cleavage**C**, third cleavage; **D**, fourth cleavage

First cleavage:

> V Furrow is merdional

> Appears in the middle of the blastodisc

> Production of two blastomeres

Second cleavage:

>Furrow is also meridional

>Appears at right angle to the first one.

> Production of four blastomeres.

Third cleavage:

>Furrows are two in number.

>Appears in the vertical direction across the second furrow.

> Production of eight blastomeres.

Fourth cleavage:

>Furrow is also vertical.

>Appears circular and encircles the previous furrows.

>Production of eight central cells and eight marginal cells.

>Cleavage from this point is irregular.

>Cleavage furrow appears and they progress gradually towards the margin of blastodisc.
>Thus, these cleavage furrows separate the daughter central blastomeres from each other, but not from the yolk.

> The central blastomeres are continuous with the underlying yolk at their lower ends.

>The marginal blastomeres are continuous with the uncleaved cytoplasm at their outer edges.

>Further cleavages are irregular.

>The central cells divide more rapidly.

> The marginal cells also divide by the appearance of new horizontal and radial furrows.
>The newly formed inner cells of marginal blastomeres are added to the central cells, resulting in the increase of volume of this area.
>The radial furrows extend peripherally and these peripheral cells are still continuous with the
>Un cleaved peripheral cytoplasm

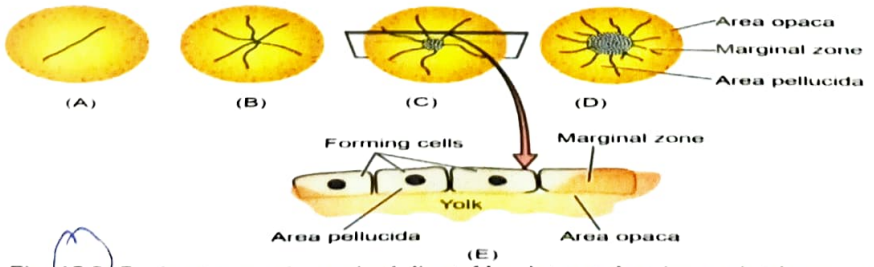


Fig. 15.3 Surface view of germinal disc of hen's egg showing early cleavage. A) Two-cell stage; B) Six-cell stage; C) Twenty-cell stage; D) Late cleavage stage E) Showing relationship between yolk and surface blastomeres.

BLASTULA

In later stage of cleavage, the blastomeres of the central area become separated from the underlying yolk due to the appearance of a horizontal cleavage in these cells. This cleavage extends peripherally cutting the inner ends of the blastomeres.

A space also appears in the beginning beneath the central cells which also extends peripherally as the horizontal cleavage extends outward .

The cavity beneath the central cells, i.e. in between central cells and yolk is called the sub germinal cavity, which is filled with a fluid diffused from the albumen through vitelline membrane.

Thus, due to further cleavage the blastodisc becomes cellular, called the blastoderm- a round dise-5 to 6 cells deep in the centre but only I to 2 cells deep at the periphery.

The appearance of sub germinal cavity separates the blastoderm from the underlying yolk, but the marginal cells remain overlapping the yolk. The embryo is now called the blastula stage.

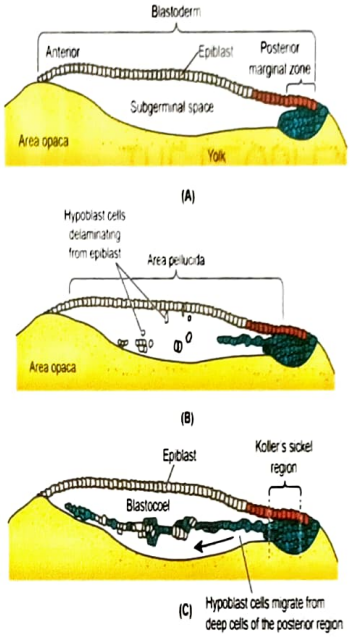


Fig.15.4: Formation of subgerminal cavity, epiblast and hypoblast and Koller's sickle in the chick blastula.

At blastula stage the embryo reaches in the uterus. Its sub-geminal cavity is equivalent to the blastocoel, the blastoderm is the animal pole, and the yolk is the vegetal pole.

During later part of cleavage, about 12 to 14 hours after the egg reaches the uterus or 6 to 8 hours before the egg is laid, some cells on the inner or under side of the blastoderm become detached or delaminated from the blastoderm and fall on the floor of sub-germinal cavity due to presence of relatively more yolk. The delamination of these yolky cells from the blastoderm starts at the posterior edge and spreads forward until whole blastoderm becomes free from yolky cells.

As a result, the epithelial layer in the central region of blastoderm becomes thinner (few layers of cells) and transparent. Thus, this region is called the area pellucida because it seems to be transparent when viewed from the upper side.

The peripheral part of blastoderm, the yolky cells is not delaminated (shed). So this part of the blastoderm seems to be opaque, because beneath these cells blastocoel is not present. This region of blastoderm is, thus, called area opaca. These delaminated cells at the posterior edge of area pellucida gradually link up with each other, forming a, continuous layer of flattened cells, which extends anteriorly. This layer is called the hypoblast and the upper layer is the epiblast containing ectoderm and mesoderm cells.

Hypoblast is exclusively composed of endoderm cells. The egg is laid by the female about the time the blastula is formed or even a little later.

FATE MAPS:

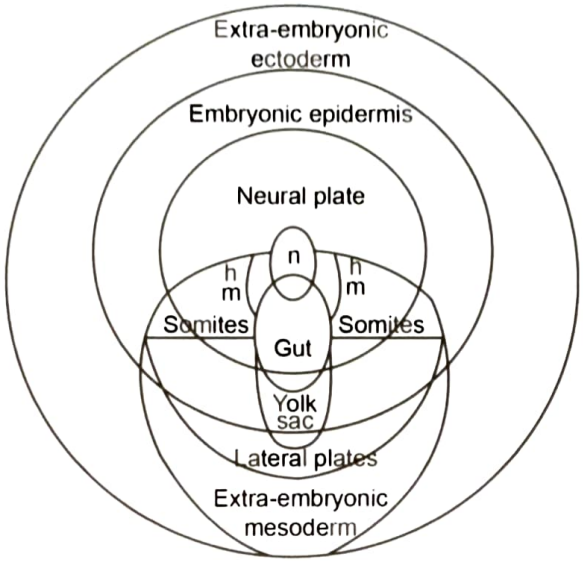


Fig. 15.5: Fate map of chick blastoderm immediately prior to gastrulation. The primitive streak is not yet formed but it will extend eventually to the region of the notochord. .

GASTRULATION

Gastrulation begins within four or five hours after the onset of incubation and it is completed by about 22 hours. It brings out a definite shape to the embryo.

Gastrulation in chick embryo can be divided into two phases-

1. Endoderm formation

2. Primitive streak formation and movement of mesodermal elements.

Formation of endoderm:

Endoderm of hypoblast develops as a single layer of cells in side of blastocoel. After the formation of endoderm, upper layer is called ***epiblast****.*

There are different theories to explain the formation of endoderm.

Infiltration theory:

This was proposed by Peter in 1923. According to this theory some cells in blastoderm which are loaded with yolk will fall into blastocoel. It starts from posterior end of blastoderm. From there the cells migrate forward one behind another and endoderm is formed.

Delamination theory:

It was proposed by Spratt in 1946. Blastoderm is two or three layered thick. The lower layer will separate from the upper layer by splitting and the lower layer is called endoderm, upper layers are called ectoderm. In between ectoderm and endoderm blastocoel is present.

Theory of involution:

In 1909 Peterson Proposed this theory. According to this theory a slit like opening at the posterior side of blastoderm forms. Through this opening the blastoderm cells will roll into the primary blastocoel. It forms an endoderm.

Theory of invagination:

This was proposed by Jockobson in 1938. According to this theory the posterior end of blastoderm will invaginate in blastocoel as a small pocket. This becomes endoderm. In this way endoderm is formed.

After the formation of endoderm. the blastoderm is called ***ectoderm****.*

The cavity lying above the endoderm is called ***blastocoels****. The cavity lying below the endoderm is called* ***archenteron****.*

Formation primitive streak:

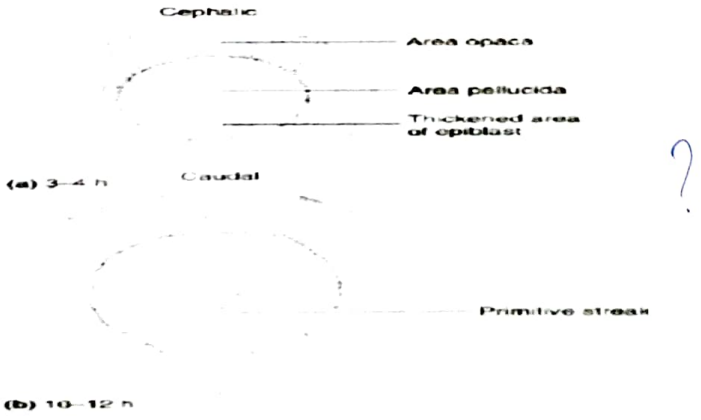
The second step in gastrulation is the formation of primitive streak.

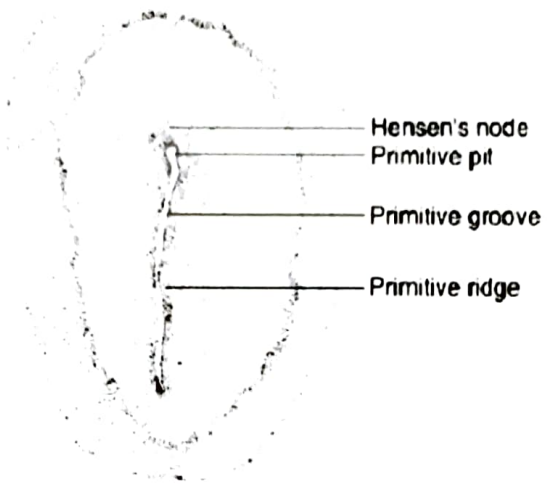
At the posterior region of area pellucida in the mid dorsal line primitive streak will appear as a thickened area. It starts eight hours after incubation.

The thickening is because convergence of cells of blastoderm towards the centre. Usually in the early stages the primitive streak is short and broad. It gradually extends to the middle of blastoderm. At eighteen to nineteen hours of incubation, primitive streak is well developed. It is called definite ***primitive streak****.*

The primitive streak has a-

- ***Primitive groove***
- ***Two primitive folds***
- ***A Hensen's node***
- ***A primitive pit***
- ***A primitive plate***





(c) 16 h

Elongationof primitive streak and formation of primitive groove & primitive pit anterior end ofprimitive ridges are thickened = Hensen's node

Along the middle line of primitive streak a narrow furrow is developed called ***Primitive groove****.*

The edges of groove are thick. They are called ***primitive folds****.*

*At the anterior end of groove a mass of closely packed cells will be present. It is called "****hensen's node****" or* ***primitive knob****.*

In the centre of this node a pit is present. It is called primitive pit. It represents the vestige of ***neurenteric canal.***

The primitive streak elongates along with this, area pellucida will also elongates. As the primitive streaks growing the cells from this region will involuteinto space between epiblast and hypoblast This process is called ***immigration****.*

The immigrated cells will become prechordal plate, notochord, and mesoderm.

Formation of mesoderm:

The mesoderm is formed as two layers.

In front of the primitive streak an area without mesoderm is present. It is called proamnion. At this place head will develop. After 48 hours of incubation the proamnion is also occupied by mesoderm. The mesoderm is divided into dorsal and intermediate and lateral mesoderms.

The notochordal cells arrange themselves to form a cylindrical, rod called notochordal process. It will begin at Hensen's node and it slowly grows. Because of its growth the

primitive streak is slowly reduced. By the end of gastrulation the primitive streak is reduced and incorporate into tail bud.

The dorsal mesoderm is located on either side of notochord. It is divided into segments. They are called somites. The first pair of somites will form after 21 hours of incubation.

The blastoderm develops a mid-dorsal thickened area called primitive streak.

Gastrulation is completed within 2 or 3 hours after laying. With its completion, the embryo becomes diploblastic containing of an outer epiblast (ectoderm) and an inner hypoblast (endoderm). The original sub germinal cavity si divided by hypoblast into a narrow outer space or secondary blastocoel and inner archenteron or primitive gut of embryo.

Structure of 48 hours Chick Embryo:

1. The 48 hours chick embryo is in? shape (In mirror view).

*2. At this stage the **area opaca** and **area pellucida** are, not visible.*

*3. The **extra embryonic area** has grown in size.*

*4. Primitive streak has **disappeared**.*

*5. The mesoderm, in front of Hensen's node, has given rise to **26-28 pairs of somites***

*6. The brain has differentiated into **telencephalon, prosencephalon, mesencephalon, metencephalon** and **mylencephalon** .*

*7.The heart has been differentiated into **ventricle** and **atrium. Sinus venous** and **truncusarteriosus** have also started developing*

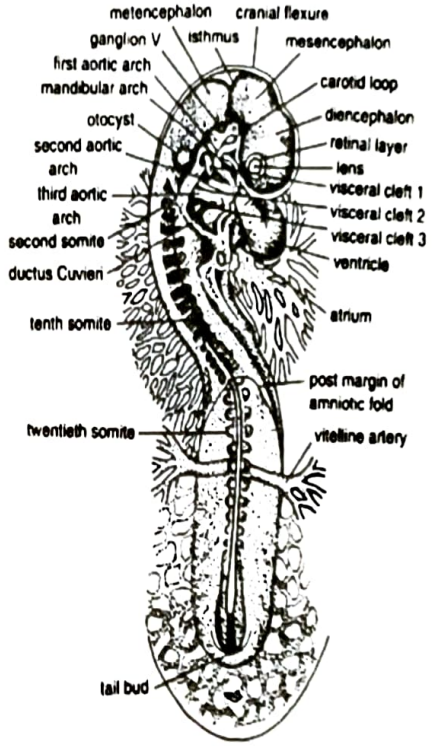
*8. The eye has been differentiated into **optic cup** and **lens** and **optic vesicle** has also developed sufficiently*

*9.The head region has curved on right side due to **cranial flexion***

*10. The **pharyngeal gill-slits** have also been differentiate*

11.Behind Hensen's node a tail bud has also developed

12. Lateral amniotic folds, anterior omphalomesentric vein and vitelline artery have appeared.



Chick embryo, 48 hours of incubation

Structure of a 72Hours Chick Embryo

*1. At this stage **area opaca** and **area pellucida** are **not visible**.*

*2. The **extraembryonic** area has grown in size.*

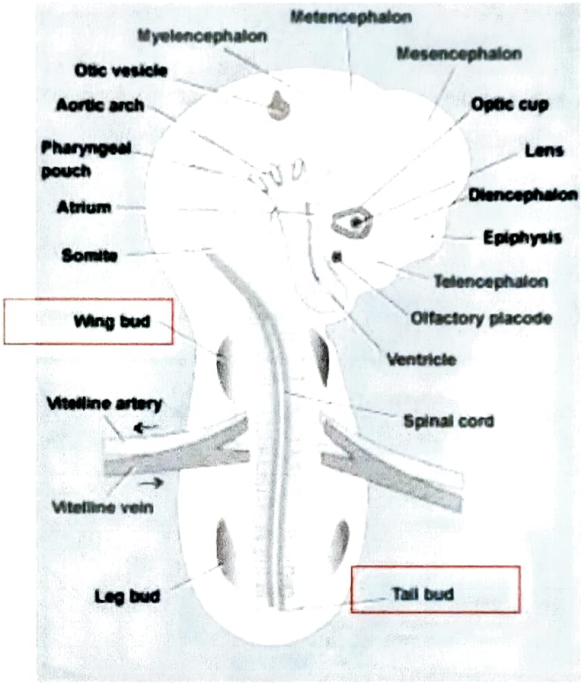
3. Primitive streak has disappeared.

4. The mesoderm, in front of Hensen's node, has given rise to 36 pairs of somites.

*5. The brain has differentiated into **telencephalon, mesencephalon, metencephalon** and **myelencephalon**.*

*6. The heart has been differentiated into **ventricle** and **atrium.***

*7.The eye has differentiated into **optic cup** and lens and **optic vesicle** has also developed sufficiently.*



*8.The head region has bent on right side due to **cranial flexion.***

*9.**Four pairs of gill-slits** have been differentiated.*

*10. Tail bud is greatly developed and has given rise to **allantoic stalk** and **tail**.*

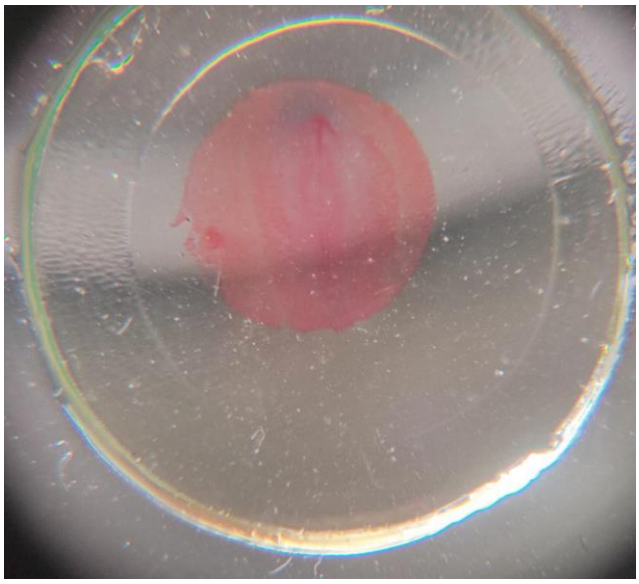
*11. **Lateral amniotic folds, vitelline artery** and **anterior omphalomesentric vein** have developed.*

*12. In the middle region a pair of **fore limb buds** and in front of tail a pair of **hind limb buds** have developed, which will give rise to fore and hind limbs.*

*13. **Olfactory pit, visceral arches, amnion, allantois** and **amniotic cavity** have also developed.*

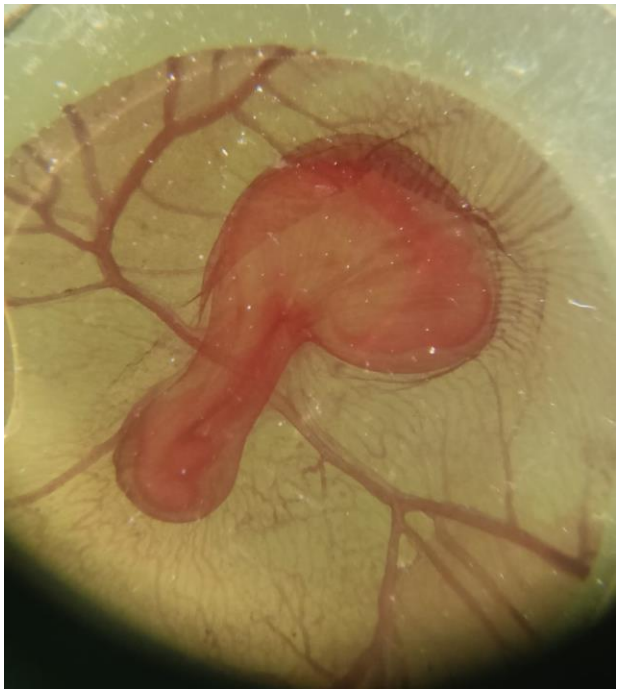
Structure of a 96 Hours Chick Embryo

1. In the chick embryo of 96-hours of incubation, the entire body has been turned through 90 degree and the embryo lies with its left side on the yolk.

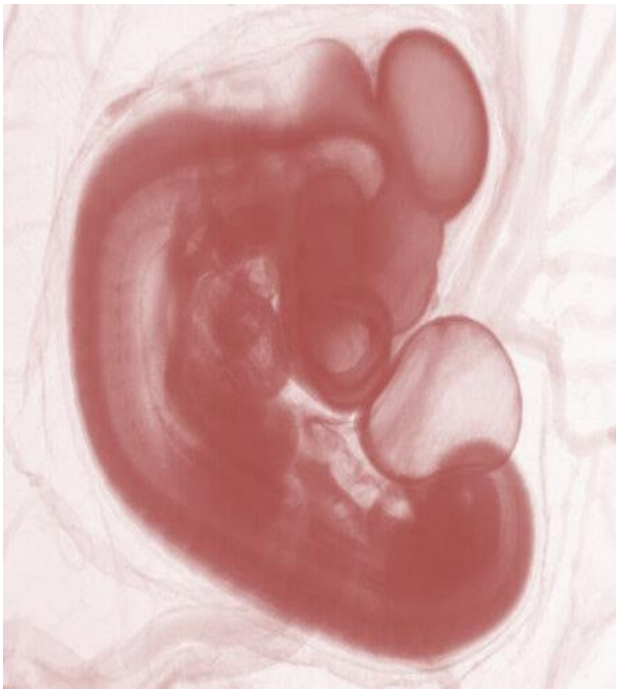


24 hours

48 hours



72 hours



96 hours

*2. At the end of 96 hours the body folds have undercut the embryo so that it remains attached to the yolk only by a **slender stalk**.*

*3. The yolk salk soon become enclogated, allowing the embryo to become first straight in the **mid-dorsal region** and then **convex dorsally.***

*4. The progressive increase in the **cranial, cervical, dorsal** and **caudal flexures** results in the bending of the embryo on itself so that its originally straight long axis becomes **C-shaped** and its head and tail lie close together.*

*5. **Optic cup** shows the more developed lens.*

*6. **Endo-lymphatic duct** arises from the **auditory vesicle**.*

*7. **Visceral arches** have become very much **thickened.***

*8. **Appendage buds** increase rapidly in size and become **elongated.***

9. The number of somites increases to 41 pairs.

10. Allantois has also appeared.

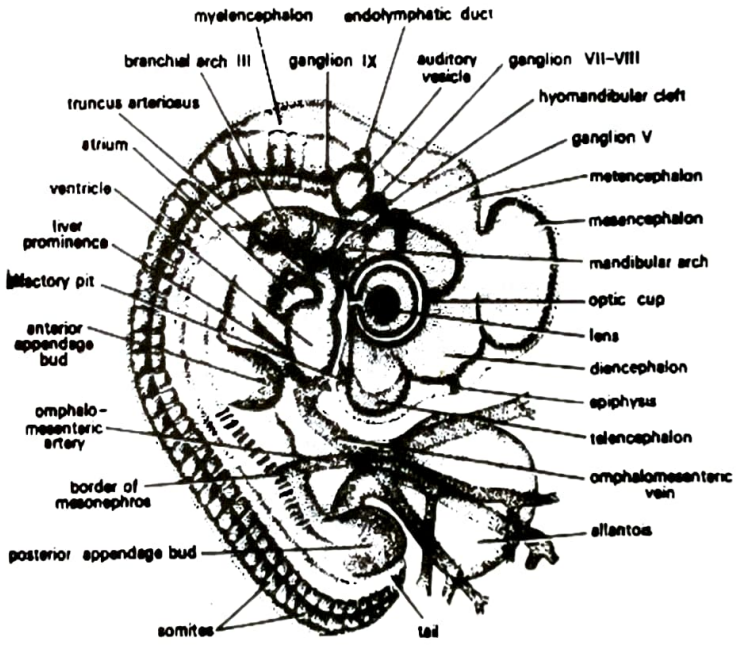


Fig. Chick embryo-96 hours (Whole mount).

11. Omphalomesenteric artery and omphalomesenteric vein are also developed.

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29/5/23

JANGIPUR COLLEGE

MURSHIDABAD,JANGIPUR-742213
FEBRUARY,2023

FIELD VISIT REPORT

POND ECOSYSTEM (FISH FARMING)

Submitted in partial fulfilment of the requirements for the degree of
B.Sc Honours(Zoology)

By

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INTRODUCTION

Fresh water ecosystem includes all forms of aquatic habitats.

It may be lentic type i.e. stagnant water live pond, lake or lotic type running water like rivers, streams etc. A pond as a whole, serves as good example of an aquatic and fresh water eco-system. Infact, it represents self sufficient and self regulating system. It has various types of component. Ecological studies can be based by studying a small pond.

FIG:- A POND ECOSYSTEM

Abiotic component or substances:

(a) This includes mainly organic and inorganic compounds besides climatic regimes.

(b) Compounds include water, oxygen, Carbon dioxide, Ca, Ca, P amino acids etc.

I. Partially or completely, submerged floating aquatic plants. Ex. *Chara* sp. ,*Hydrilla* sp.,*Nelumbo* sp.

II. Beside this plant some following form also occur in the pond ecosystem. Ex. *Wolfia* sp., *Eichhomia* sp. etc.

FIG:- THE GREEN MACROPHYTES AT THE EDGE OF THE POND

- Phytoplankton:-

These are microscopic, floating are suspended in lower plants that are distributed throughout the water. Phytoplankton are available up to the depth of water where light penetrates.

Ex. *Ulothrix* sp., *Volvox* sp.

FIG:- THE PHYTOPLANKTON

2) Consumer:-

Consumer are heterotrophs which depend for their nutrients on other organisms. Consumers are of following types-

a) Herbivore or primary consumer:-

These animals feed on directly living plant or plant remains. This primary consumers are of various type-

- **Benthos:-**

These organisms are the button dwelling forms such as water striders, molluscs, insects larvae.

FIG:- A WALKING INSECT ON THE POND'S WATER

FIG:- MOLLUSCS OBTAINED FROM THE POND

- **Zooplanktons:-**

These organisms feed chiefly on phytoplankton.

Ex. *Cyclops* sp. and *Euglena* sp. etc.

Beside this small sized herbivores some mammals such as cow, buffaloes etc. who visits the pond normally and feed on marginal rooted macrophytes.

b) Secondary consumers:-

Secondary consumers or carnivores feed on the herbivores and include chiefly insect fish and amphibians.

FIG:- COLLECTING SPECIMEN FOR OBSERVATION

c) Tertiary consumers:-

In the pond ecosystem there are some large fishes that feed this smaller fish and thus become the tertiary consumers.

3) Decomposer:-

a) They are also called micro-consumer as they absorb only a fraction of the decomposed organic materials.

b) Most of the decomposers are saprophytes but some parasites are also found.

c) They also bring about the decomposition of date organic- matters of both producers as well as micro-consumers to simple forms.

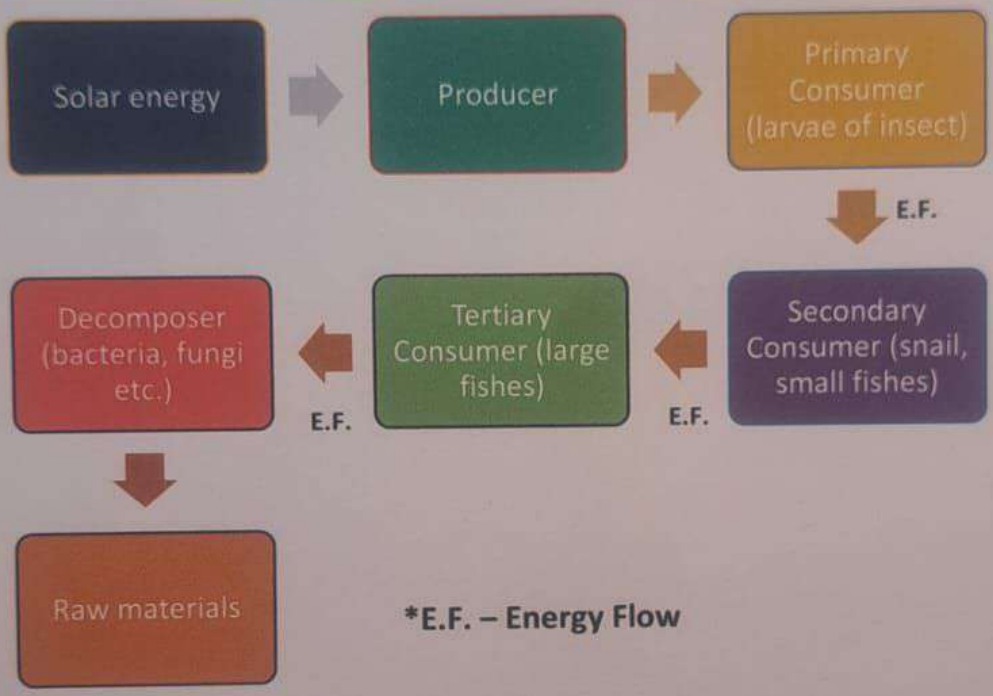
d) Decomposers help in returning of mineral element again to the medium of the pond and in running bio-geo-chemical cycle.

e) Generally, the decomposer either live in the soil layer underneath the water or in the mud.

f) Their activities make chemical substances available for other living being.

Example: Bacteria, Flagellates, Fungi (*Aspergillus* sp.), *Pythium* sp. and *Eusarium* sp. etc.

The food chain in a pond:-



*E.F. – Energy Flow

THANK YOU

Date :- 05/01/2023

Teacher's Signature :- A Mandal

EFFECT OF PROBIOTICS ON FISH PATHOGENS

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Thank you.

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1. ABSTRACT

Science has been working on fish pathogens for a long time But using probiotics to modify fish immunity is completely new. As science advances, work on probiotics continues to grow. Probiotics are typically live microorganisms which when apply in sufficient amount it's shows medical advantages. These days, probiotics are additionally turning into an indispensable piece of the aqua culture practices to get high economic growth. The normal probiotics that are utilized for fish growth and development in aquaculture system are incorporate Lactobacillus, Lactococcus, Leuconostoc, Enterococcus, Carnobacterium, Shewanella, Bacillus, Aeromonas, Vibrio, Enterobacter, Pseudomonas, Clostridium, and Saccharomyces species. There is no question about the probiotics role in fish nutrition, illness resistance, and other beneficial activities. Among the various medical advantages credited to probiotics, tweak of safe framework is one of the most regularly implied advantages of the probiotics and their power to animate the fundamental and neighborhood resistance under in vitro and in vivo conditions is critical. Various probiotics either monospecies or multispecies supplementation can ultimately lift phagocytic, lysozyme, complement, supplement, respiratory burst movement as well as articulation of different cytokines in fish. Likewise, probiotics can animate the stomach resistant arrangement of fish with stamped expansion in the quantity of Ig(+) cells and acidophilic granulocytes.

KEYWORDS

Fish Pathogen , Fish Immunity, Probiotics , Bacterial pathogens, Viral pathogens , Leuconostoc, Enterococcus, Carnobacterium, Shewanella, Bacillus, Aeromonas, Vibrio, Enterobacter, Pseudomonas, Clostridium, Saccharomyces species, vivo conditions, , organisms .

2. INTRODUCTION ON FISH PATHOGEN

Fish pathogens are microorganisms that could cause illnesses in fish. They can be micro organism, viruses, fungi, or parasites that infect and damage fish, main to various fitness troubles. These pathogens can affect both wild and farmed fish populations and can reason big economic losses in the aquaculture enterprise. Fish pathogens may be transmitted via infected water, inflamed fish, or vectors inclusive of parasites or other organisms. Common fish pathogens include bacteria like Aeromonas salmonicida, viruses like infectious hematopoietic necrosis virus (IHNV), fungi like Saprolegnia, and parasites like Ichthyophthirius multifiliis. Proper management practices, consisting of true water fine, biosecurity measures, and regular health tracking, are crucial for stopping and controlling fish diseases because of those pathogens. (I Frans, 2011)

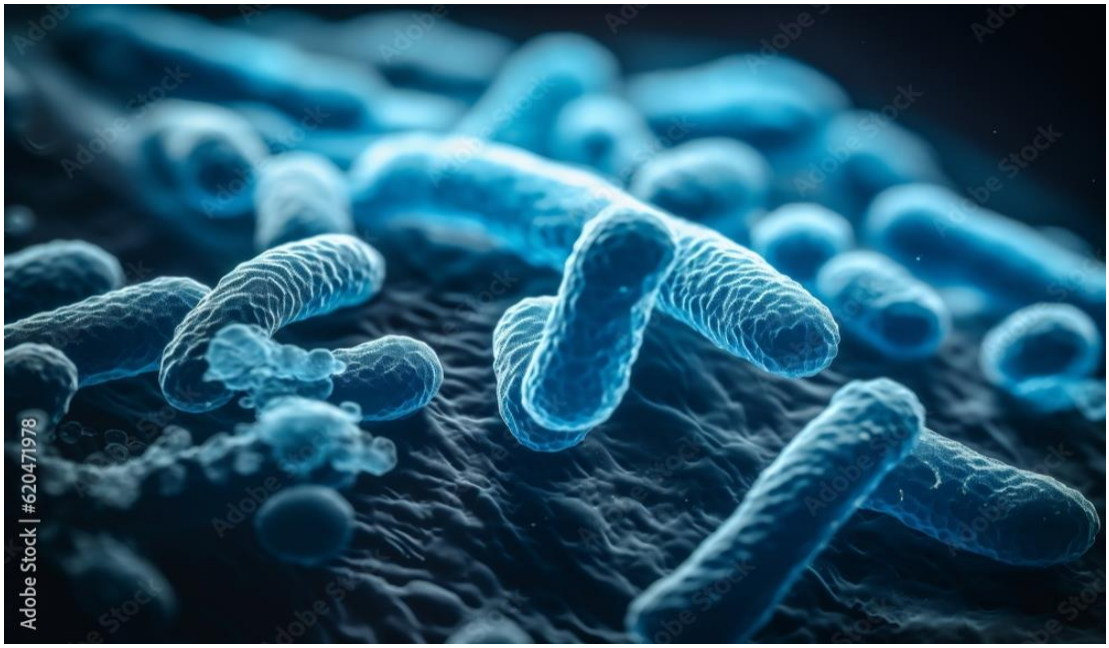
There are several types of fish pathogens that can affect aquatic organisms. Some common types include:

(Adobe Firefly (Beta))

2.1 Bacterial pathogens:

Bacterial pathogens are microorganisms that may purpose illnesses in numerous organisms, along with human beings, animals, and vegetation. They play a significant function in infectious sicknesses and might have unfavourable outcomes on fitness. Here are some critical factors regarding bacterial pathogens.

- **Structure and Classification:** Bacterial pathogens are classified primarily based on their morphological and biochemical traits. They are prokaryotic cells which have a cell wall composed of peptidoglycan. Bacteria are categorized into different groups based on their form (such as cocci, bacilli, or spirilla), staining homes (Gram-fine or Gram-poor), and other trains.



(Adobe Stock)

- **Mode of infection:** Bacterial pathogens may be transmitted thru numerous routes. They may additionally unfold through direct contact with inflamed individuals or infected surfaces, inhalation of respiratory droplets, intake of contaminated food or water, or vector-borne transmission by using bugs or other organisms.
- **Common Bacterial Pathogens**: There are numerous bacterial pathogens that can motive sicknesses in humans, animals, and flowers. Some great examples consist of Escherichia coli (E.

Coli), Salmonella, Staphylococcus aureus, Streptococcus pyogenes, Mycobacterium tuberculosis, Clostridium difficile, and Pseudomonas aeruginosa. Each bacterium has precise characteristics and might cause a number of diseases, from gastrointestinal infections to respiration infections and pores and skin infections.

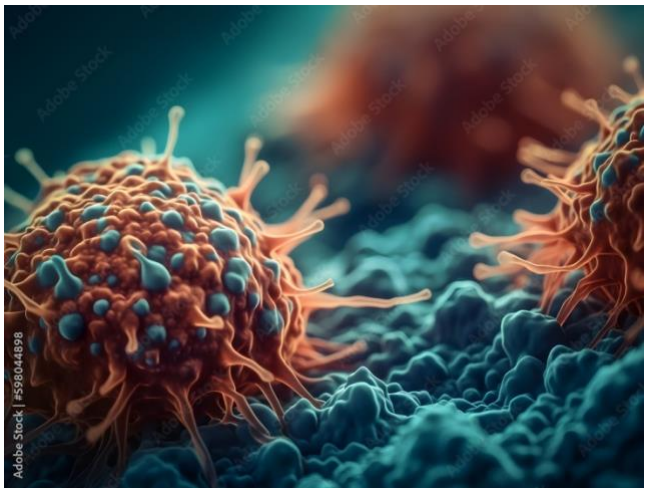
- **Antibiotic Resistance**: Bacterial pathogens have the capability to develop resistance to antibiotics, which poses a tremendous assignment in the treatment of bacterial infections. Misuse and overuse of antibiotics contribute to the emergence of resistant traces, making it crucial to apply antibodies judiciously and observe proper remedy protocols.
- **Prevention and Control:** Preventing bacterial infections includes diverse measures, inclusive of practising appropriate hygiene (handwashing, proper meals dealing with), vaccination (where available), retaining smooth and sanitary environments, implementing suitable contamination control practices in healthcare settings, and the use of antibiotics responsibly.

It's essential to word that bacterial pathogens may be numerous, and their specific characteristics and consequences can range broadly. Understanding their conduct, mechanisms of contamination, and strategies of prevention are crucial in handling and mitigating the impact of bacterial sicknesses. (Romalde, 2002)

2.2 Viral pathogens:

Virus pathogens are infectious retailers which can purpose diseases in a extensive variety of organisms, which includes human beings, animals, and vegetation. Here are some key information about virus pathogens:

- **Structure and Classification:** Viruses are microscopic particles composed of genetic cloth (either DNA or RNA) enclosed in a protein coat called a capsid. Some viruses have an outer envelope derived from the host cellular membrane. They are a whole lot smaller and simpler in shape in comparison to bacteria. Viruses are categorized based on different factors, together with their genetic fabric, capsid shape, mode of replication, and host range.



(Adobe Sstock)

- **Mode of infection:** Virus pathogens may be transmitted thru special routes. They might also spread through direct contact with infected people, breathing droplets, touch with infected surfaces or gadgets, ingestion of infected meals or water, or vector-borne transmission by means of bugs or other organisms.
- **Common Virus Pathogens:** There are numerous virus pathogens that reason sicknesses in humans, animals, and plants. Examples encompass the influenza virus, human immunodeficiency virus (HIV), hepatitis viruses, herpes viruses, coronaviruses (which include SARS-CoV-2, the virus chargeable for COVID-19), dengue virus, Zika virus, rabies virus, and lots of greater. Each virus has its very own characteristics, modes of transmission, and disease manifestations.

- **Viral Replication and Effects:** Viruses invade host cells and hijack their machinery to duplicate and bring more virus particles. This replication system can disrupt regular cell features and result in numerous disease symptoms. Viruses can target unique tissues or organs within the frame, causing respiration, gastrointestinal, neurological, or systemic illnesses, amongst others.

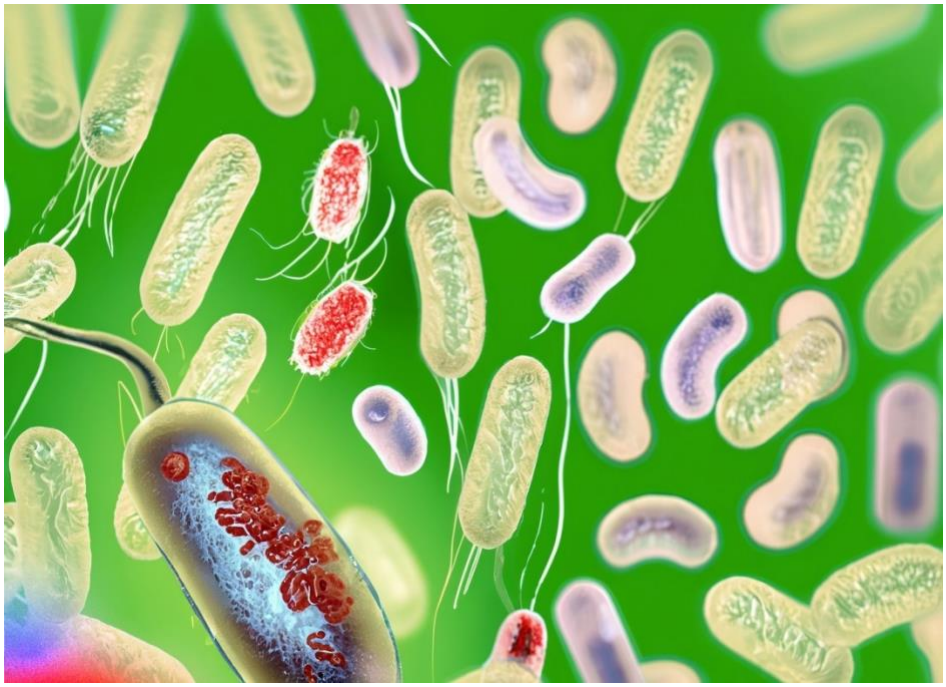
- **Prevention and Control:** Prevention of viral infections involves measures which include vaccination (where available), training right hygiene (handwashing, respiration etiquette), using private shielding gadget, imposing appropriate contamination manage protocols, and vector manage for sure viruses. Antiviral medicines may be used to deal with precise viral infections, but prevention remains a key approach

It's essential to word that viruses can be extraordinarily diverse, and each virus has its personal characteristics, transmission styles, and effects on health. Understanding the particular virus and its behavior is essential for growing powerful prevention, remedy, and control techniques for viral sicknesses. (Domachowske†, 2001)

2.3 Protozoan pathogens:

Protozoa pathogens are single-celled microscopic organisms belonging to the Protista

nation. Some protozoa can cause sicknesses in human beings, animals, and plant life. Here are a few essential elements regarding protozoa pathogens:



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- **Structure and Classification**: Protozoa are eukaryotic organisms, which means they have got a nucleus and other membrane-sure organelles. They may have numerous shapes and structures, along with amoeboid, flagellated, ciliated, or sporozoan forms. Protozoa are labeled into special businesses primarily based on their locomotion and reproductive techniques.

- **Mode of infection:** Protozoa pathogens may be transmitted through numerous routes, which include direct touch, ingestion of infected meals or water, vector-borne transmission (carried by bugs or different organisms), or through contaminated soil or surfaces.

- **Common Protozoa Pathogens:** There are several protozoa that could cause illnesses in humans. Examples include Plasmodium (causing malaria), Entamoeba histolytica (inflicting amoebiasis), Giardia intestinalis (causing giardiasis), Trypanosoma cruzi (inflicting Chagas ailment), and Toxoplasma gondii (inflicting toxoplasmosis). Each protozoan has particular characteristics and causes awesome illnesses with various signs.
- **Disease Manifestations:** Protozoa infections can result in a variety of symptoms depending at the unique pathogen and the affected body part. These can encompass gastrointestinal signs (diarrhea, belly pain), fever, fatigue, muscle aches, neurological signs, and organ harm. The severity of the disease can vary from slight to extreme.
- **Diagnosis and Treatment:** Diagnosis of protozoa infections regularly entails scientific assessment, laboratory assessments, and identity of the protozoan via microscopy or molecular techniques. Treatment normally includes precise medications focused on the unique protozoan. Prevention techniques might also encompass proper hygiene practices, get admission to to smooth water and sanitation facilities, vector manage, and in some instances, vaccination.

Understanding the traits, lifecycle, and transmission patterns of protozoa pathogens is important for effective prevention, analysis, and treatment of protozoa-associated illnesses. (Ken Stuart, 2008)

2.4 Fungi pathogens:

Fungi pathogens are organisms belonging to the dominion Fungi that may purpose sicknesses in numerous organisms, which include humans, animals, and flora. Here are some vital elements concerning

fungal pathogens:

- **Structure and Classification:** Fungi are eukaryotic organisms which might be awesome from bacteria and viruses. They have a cellular wall composed of chitin and reproduce by way of producing spores. Fungi are categorised into special companies based on their morphological traits, reproductive systems, and mode of contamination.
- **Mode of infection:** Fungal pathogens can be transmitted via various routes. They can also unfold thru direct contact with infected people or animals, inhalation of fungal spores, touch with infected soil or surfaces, or thru vectors like insects.
- **Common Fungal Pathogens:** There are numerous fungal pathogens which can motive diseases in human beings, animals, and vegetation. Examples include Candida species (causing candidiasis), Aspergillus species (inflicting aspergillosis), Cryptococcus neoformans (causing cryptococcosis), Histoplasma capsulatum (causing histoplasmosis), and Trichophyton species (inflicting dermatophytosis or ringworm). Each fungus has particular traits and may reason a number sicknesses, from superficial skin infections to invasive systemic infections.

- **Disease Manifestations:** Fungal infections can cause numerous signs and symptoms depending at the specific pathogen and the affected frame component. These can encompass skin rashes, itching, respiration signs, fever, fatigue, and organ harm. Fungal infections may be localized or systemic, and the severity of the sickness can range.

- **Diagnosis and Treatment:** Diagnosis of fungal infections often entails scientific evaluation, laboratory tests (together with microscopy, way of life, or molecular techniques), and identification of the fungus. Treatment generally includes the usage of antifungal medicines unique to the particular fungus causing the infection. Prevention strategies might also include proper

hygiene practices, heading off touch with contaminated environments, use of defensive measures, and appropriate management of underlying conditions that growth the hazard of fungal infections. Understanding the traits and behavior of fungal pathogens is important for powerful prevention, diagnosis, and treatment of fungal diseases. (Rhonda V. Fleming, 2002)

2.5 Parasite pathogens:

Parasite pathogens are organisms that depend on a bunch organism for his or her survival and duplicate, even as causing damage or ailment to the host. They can infect a wide range of organisms, inclusive of humans, animals, and flowers. Here are a few complete information about parasite pathogens:


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Types of Parasites:

- **A. Protozoa:** Protozoa are single-celled organisms that may be located in numerous environments, consisting of soil, water, and the our bodies of other organisms. They have numerous kinds of locomotion, consisting of flagella, cilia, or amoeboid motion. Examples of

protozoan parasites consist of Plasmodium (inflicting malaria), Trypanosoma (inflicting drowsing sickness and Chagas sickness), and Giardia (inflicting giardiasis).

- **B. Helminths:** Helminths are multicellular worms that may be similarly classified into primary corporations:

  - Nematodes (Roundworms): Examples include Ascaris lumbricoides (inflicting ascariasis), Enterobius vermicularis (inflicting pinworm contamination), and hookworms.

  - Trematodes (Flukes) and Cestodes (Tapeworms): Examples include Schistosoma (inflicting schistosomiasis), Fasciola (inflicting fascioliasis), and Taenia (causing tapeworm infections).

- **C. Ectoparasites:** Ectoparasites are external parasites that stay on the floor of the host organism. They encompass ticks, fleas, lice, mites, and bedbugs.

- **Mode of infection:** Parasite pathogens can be transmitted thru various routes, which include:

  - Direct touch with infected individuals or animals.

  - Consumption of contaminated food or water.

  - Exposure to infected soil or surfaces.

  - Bites from vectors inclusive of mosquitoes, ticks, or fleas.

  - Vertical transmission from mom to offspring.

- **Disease Manifestations:** Parasite infections can reason a huge variety of signs and symptoms relying on the specific parasite and the affected host organ or device. Symptoms may encompass fever, fatigue, gastrointestinal disturbances, pores and skin rashes, organ damage, anemia, weight loss, and neurological manifestations. The severity and period of the disorder can range.

- **Diagnosis and Treatment**: Diagnosis of parasite infections regularly involves a mixture of medical evaluation, laboratory checks, and identity of the parasite or its components. Diagnostic strategies consist of microscopic examination of samples, serological tests, molecular strategies, and imaging research. Treatment varies relying at the unique parasite and can contain medicines focused at killing or controlling the parasite. Prevention strategies may also include hygiene practices, vector

manage, proper meals and water sanitation, and warding off exposure to infected environments.

- **Impact on Public Health:** Parasite infections have giant implications for public health, especially in regions with restricted get right of entry to to healthcare and insufficient sanitation facilities. Parasitic sicknesses can reason morbidity, mortality, and long-term consequences, affecting individuals' satisfactory of life and socioeconomic development.

Understanding the characteristics, transmission dynamics, diagnostic procedures, remedy options, and preventive measures related to parasite pathogens is crucial for powerful management and manage of parasitic illnesses in people, animals, and plant life. (Mitchell, 2004)

3. FISH IMMUNITY

Fish, like different animals, have immune structures that help defend them towards illnesses and infections. While fish immune structures may also fluctuate from the ones of mammals, they serve a similar cause. Fish have diverse defense mechanisms to combat pathogens,


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together with bodily limitations like their scales and mucus, in addition to cell and humoral immune responses.

Fish have immune cells much like white blood cells in mammals, along with lymphocytes and phagocytes. These cells understand and do away with foreign substances, consisting of bacteria, viruses, and parasites. Fish also can produce antibodies, proteins that in particular goal and neutralize dangerous pathogens.

Additionally, fish possess an innate immune gadget that offers on the spot protection towards pathogens. This includes antimicrobial peptides, complement proteins, and different molecules which could speedy apprehend and break invading microorganisms.

It's worth noting that fish immune responses can range relying at the species, habitat, and environmental situations. Factors like water temperature, water satisfactory, and pressure stages can impact fish immunity. Therefore, retaining appropriate aquatic situations is critical for supporting the overall fitness and immune function of fish in captivity or inside the wild.

3.1 Mucosal Immunity in Fish

Mucosal immunity in fishes refers back to the immune defense mechanisms that are especially lively at the mucosal surfaces of their body, along with the gills, intestines, and skin. These mucosal surfaces serve as the primary line of defense towards pathogens, as they may be in direct contact with the outside surroundings.

The mucosal immune system in fishes entails various additives and techniques to guard towards infections. Here are some key elements:

- **Mucus production:** Fish produce a layer of mucus that covers their mucosal surfaces. This mucus carries antimicrobial materials, including lysozymes and lectins, which could inhibit the increase of micro organism and other pathogens.

- **Mucosal-associated lymphoid tissue (MALT):** Fish own specialized immune tissues, called MALT, at mucosal web sites. MALT carries immune cells, such as lymphocytes and antigen-providing cells, that assist apprehend and respond to pathogens.

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- **Immunoglobulins:** Fish produce specific antibodies, known as immunoglobulins, which might be found in their mucus and help neutralize pathogens. The foremost immunoglobulin in fish is IgM, even though other types, including IgT and IgD, will also be prese depending at the species. (L. Tort, 2003)

- **Secretory antibodies:** Fish can secrete antibodies throughout their mucosal surfaces, presenting localized safety. These secretory antibodies, including secretory IgM and IgT, assist save you the attachment and invasion of pathogens.

- **Mucosal immune responses:** Fish mucosal surfaces can mount immune responses upon encountering pathogens. This consists of the recruitment of immune cells, the release of inflammatory mediators, and the activation of particular immune pathways to do away with the invaders.

Mucosal immunity in fishes is vital for preserving their ordinary fitness and stopping infections. Understanding those mechanisms is vital for fisheries control, aquaculture practices, and the development of strategies to enhance fish health and disorder resistance. (Doaa M. Mokhtar, 2023)

4. EFFECT OF PROBIOTICS ON FISH PATHOGENS

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4.1About Probiotics:

Probiotics are live microorganisms that, when administered in ok amounts, confer fitness benefits to the host. They are generally called "properly bacteria" or "pleasant bacteria" because they could provide numerous blessings to the host's fitness and nicely-being. Here are some essential details about probiotics:

- **Types of microorganisms:** Probiotics can encompass one of a kind sorts of microorganisms, in most cases micro organism but additionally yeast or different microorganisms. The most generally used probiotics for people and animals belong to the genera Lactobacillus and Bifidobacterium. However, other genera along with Streptococcus, Bacillus, and Saccharomyces may additionally serve as probiotics.

- **Health benefits:** Probiotics offer several potential fitness advantages, which include:

- Improved digestion and nutrient absorption
- Enhanced immune device function
- Regulation of gut microbiota and prevention of dysbiosis (imbalanced microbial community)
- Reduction of gastrointestinal problems like diarrhea, irritable bowel syndrome (IBS), and inflammatory bowel ailment (IBD)
- Prevention and management of hypersensitive reactions and intolerances
- Support for vaginal and urinary tract fitness
- Potential modulation of intellectual health and mood

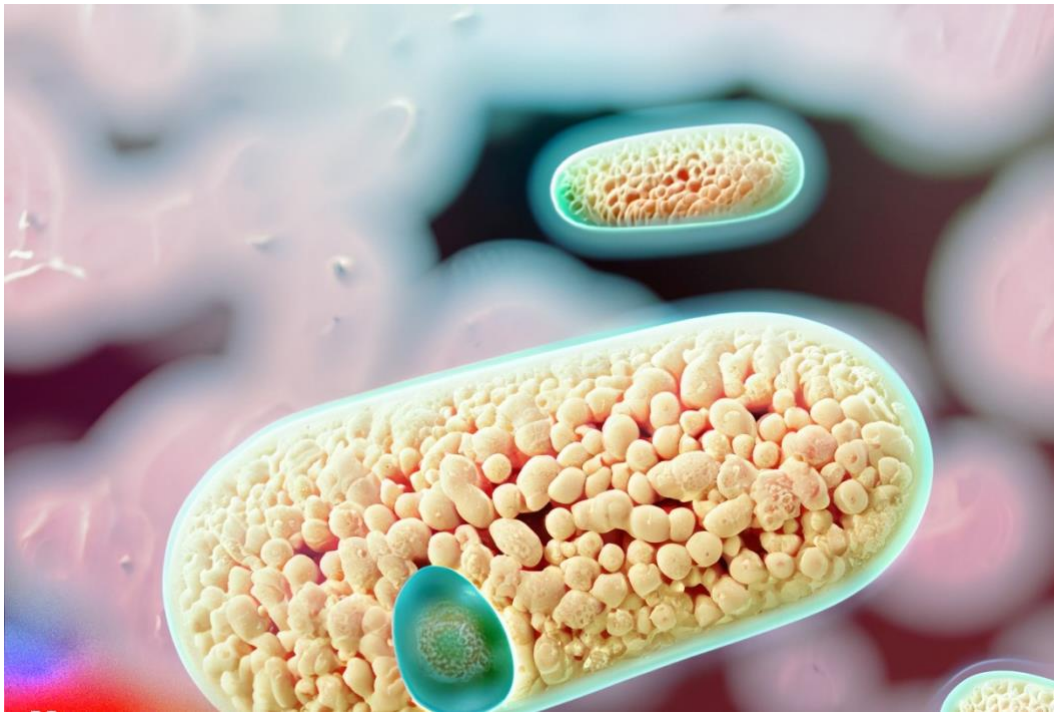
- **Sources of probiotics:** Probiotics may be discovered evidently in positive meals, such as yogurt, fermented greens (e.G., sauerkraut, kimchi), kefir, and different fermented products. Additionally, probiotics are to be had as dietary dietary supplements, including drugs, capsules, powders, and drinks.

- **Mode of action:** Probiotics can exert their useful outcomes thru several mechanisms:

- Competing with harmful micro organism for resources and attachment web sites, thereby inhibiting their increase
- Producing antimicrobial materials that directly kill or inhibit the growth of pathogens
- Modulating the immune system, improving immune responses, and lowering irritation
- Influencing the intestine surroundings and selling a wholesome microbial balance
- Producing enzymes that aid within the digestion and breakdown of complicated molecules

- **Safety considerations:** In trendy, probiotics are taken into consideration safe for intake, mainly traces that have a records of secure use. However, some individuals with compromised immune structures or serious underlying health situations may be at a higher hazard of unfavourable effects. It's essential to consult with a healthcare expert earlier than starting any new probiotic routine, particularly in those cases.
- **Strain specificity:** Each probiotic pressure may have precise traits and outcomes. Different lines may additionally showcase versions in their skills to confer specific health advantages. Therefore, the effectiveness of a probiotic can rely on the precise stress used.

When considering probiotics, it's vital to pick out traces that are nicely-studied, have documented health benefits, and are suitable for the targeted host (humans, animals, or fish). (Bijender Kumar Bajaj, 2015)



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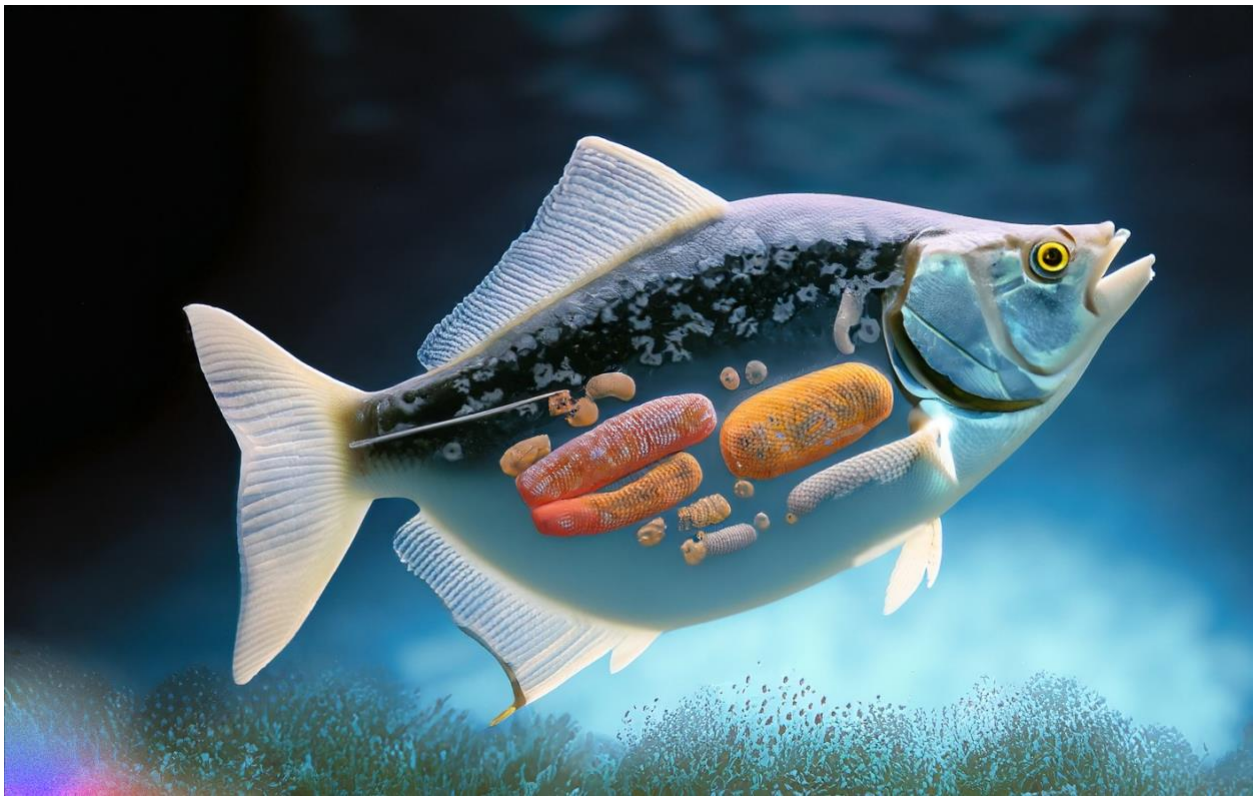
5. EFFECT OF PROBIOTICS ON FISH IMMUNITY

Probiotics could have beneficial effects on fish populations whilst used as it should be. Probiotics are live microorganisms that, while administered in ok amounts, confer fitness blessings to the host. When carried out to fish populations, probiotics can definitely effect their basic health, growth, and sickness resistance. Here are a few consequences of probiotics on fish populations:



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- **Improved gut health:** Probiotics can promote a healthful gut microbiota in fish. They assist hold a balanced microbial network inside the fish's digestive device, which aids in digestion and nutrient absorption. A wholesome intestine microbiota can beautify fish boom, feed utilization, and usual overall performance.
- **Disease prevention:** Probiotics can assist save you and manipulate fish diseases. They can inhibit the increase of harmful bacteria by means of competing for vitamins and attachment sites in the intestine, generating antimicrobial substances, and enhancing the fish's immune reaction. This can lessen the threat of bacterial infections and enhance the overall sickness resistance of fish populations.

- **Enhanced nutrient utilization:** Probiotics can enhance the digestion and absorption of vitamins in fish. They can smash down complex carbohydrates and proteins, making them more without problems available for fish to make use of. This can bring about progressed feed performance and reduced waste manufacturing.
- **Stress reduction:** Probiotics can assist alleviate pressure in fish populations. Stressors like coping with, transportation, or adjustments in environmental conditions can negatively impact fish health and performance. Probiotics were proven to modulate the fish's pressure response and decorate their ability to deal with stressful conditions.
- **Water quality improvement:** Probiotics can contribute to enhancing water excellent in fish habitats. They can help in the degradation of natural rely, along with extra feed and fish waste, leading to a reduction in nutrient accumulation and the prevention of water first-class deterioration.

It's essential to be aware that the effectiveness of probiotics can range relying on factors consisting of the specific probiotic strains used, fish species, environmental conditions, and control practices. Proper choice, dosage, and application strategies are crucial to attaining the favored benefits and minimizing any capacity poor results. (Sayyed Kamaleddin Allameh, 2017)

6.CONCLUSION

In end, probiotics may have huge results on fish pathogens by way of selling a more fit and more sturdy immune system in fish. The use of probiotics in fish populations can lead to the subsequent advantages:

Reduction of pathogen colonization: Probiotics can compete with dangerous pathogens for vitamins and attachment websites within the fish's gut and mucosal surfaces. This opposition can inhibit the boom and colonization of pathogens, reducing the chance of infections.

Production of antimicrobial materials: Probiotics have the potential to produce antimicrobial substances such as natural acids, bacteriocins, and antimicrobial peptides. These materials can directly inhibit the boom and survival of fish pathogens, proscribing their impact on fish health.

Enhancement of immune responses: Probiotics can stimulate the fish's immune device, leading to expanded production of antibodies, activation of immune cells, and the release of immune mediators. This more suitable immune reaction can improve the fish's potential to apprehend, goal, and cast off pathogens.

Prevention of opportunistic infections: Probiotics can help hold a healthful stability of microorganisms within the fish's intestine and mucosal surfaces. By stopping dysbiosis and helping a diverse and beneficial microbial network, probiotics reduce the possibility for opportunistic pathogens to proliferate and reason infections.

Mitigation of ailment outbreaks: The use of probiotics as a preventive measure in fish populations can reduce the incidence and severity of disease outbreaks. By strengthening the fish's immune gadget and proscribing the colonization of pathogenic organisms, probiotics can assist preserve fish health and reduce financial losses associated with sickness outbreaks

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It's essential to word that the effectiveness of probiotics can range relying on factors along with the precise probiotic lines used, fish species, environmental conditions, and management practices. Additionally, proper strain selection, dosage, and application techniques are important for maximizing the blessings of probiotics and minimizing the development of antibiotic resistance. Overall, probiotics provide a promising and sustainable technique to dealing with fish pathogens and enhancing fish health in aquaculture and wild fish populations.

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