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I, Shri Dr. S. P. Jagadale hereby declared that the particulars given above are true to the best of my knowledge and belief.

Sign /-
(Dr. S.P. Jagadale, Principal)
(The editor and publisher may not agree with the views expressed in articles.)

Can phylogenetic methods be used in conjunction with conventional classification systems in biology curricula?

One of the most interesting areas of science is biology. Typically, the biology curriculum in schools teaches pupils about the categorization and evolution of the kingdoms of plants and animals. Additional in-depth instruction on the Tree of Life (ToL), natural, artificial, and the overall concept of phylogenetic classification is typically provided in higher education, ideally during graduation and post-graduate coursework. The conventional approach to teaching categorization in school textbooks is essentially a rank-based hierarchy that adheres to the kingdom, phylum, class, order, family, genus, species, and infraspecific taxon groupings found in Linnaean systems. This categorization, which is taught in all Indian schools and institutions, is based only on morphological features. This conventional method is consistent with our understanding of species, according to which "morphological characters are largely used to describe most taxa." However, morphology alone cannot be used to designate many taxa; instead, cryptic species need to have their uniqueness supported by contemporary trends like genetic and cytological evidence. The phylogenetic categorization represents the relationships between species and their evolutionary history in a more comprehensive and useful manner. It is developed via the merging of multiple applied branches. But because phylogeny has not previously been taught to students, its abrupt inclusion in the curriculum alters the concept of classification to one that is difficult to understand at the postgraduate level.

Our college and school curricula still exclusively cover the rank-based classification today. The Angiosperm Phylogeny Group (APG) classification scheme, which does not distinguish between dicot and monocot flowering plants, replaces ranks in the current method of classification of angiosperms. Students are fully unaware of this.

The current opinion was formed following an evaluation of the biology textbooks used in schools and colleges by the NCERT, CBSE, and State Boards. Our biology curriculum still uses an antiquated, traditional rank-based classification scheme that obliquely expresses the evolutionary links between living things, with little emphasis on phylogenetic techniques or classification. Universities teach the fundamentals of phylogeny in their graduation and post-graduation programs. Nonetheless, this method ought to be incorporated into high school and pre-university curricula, enabling students to grasp biological principles and the fundamentals of evolutionary history clearly and effectively. Bokeretal.1 described a strategy that is somewhat feasible, demonstrated, and used in schools to teach phylogenetic trees using morphological and molecular data.

Ballen and Greene's study examined how conventional classification schemes fall short of accurately capturing significant moments in human history. Additionally,

they have shown how teaching ToL using evolutionary techniques is the simplest method. The "walking and talking the tree of life" experiment in the classroom provides a clear explanation of how organisms descended from a common ancestor and their monophyletic origin. Young biology students can benefit from further application and updating of their theoretical and applied phylogenetic knowledge. Biology courses at schools, colleges, and universities should incorporate phylogeny-based classification in addition to the succinct, traditional rank-based classification in order to instill this updated phylogeny in pupils. Inform them of facts like the fact that monocots are paraphyletic conventional dicots and that they are nested between early angiosperm dicots!

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Article by
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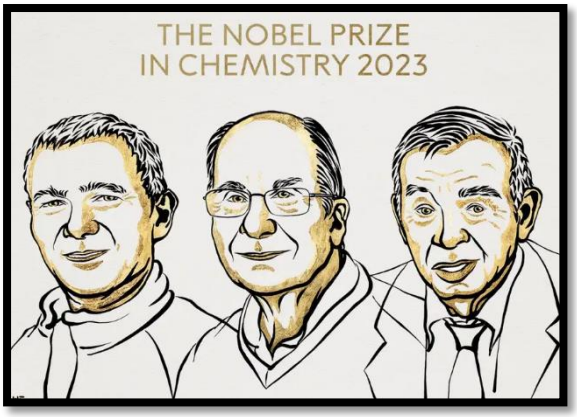
Nobel Prize for chemistry goes to trio behind quantum dots work



The 2023 Nobel prize in chemistry has been given to three developers of quantum dots – particles so small that their electrical and optical properties are influenced by quantum physics.

Two of the winners are Louis Brus at Columbia University and Alexei Ekimov at Nanocrystals Technology, both in New York, who discovered the technology in the 1980s while working separately. The third winner is Moungi Bawendi at the Massachusetts Institute of Technology in Boston, who developed better techniques for making the dots, which are also known as semiconductor nanocrystals.

The crystals are made from compounds such as lead sulphide or cadmium selenide and are only a few nanometres in size – or about one-thousandth the width of a human hair.

Because the crystals are so small, they have properties somewhere between individual atoms, which are governed by the laws of quantum physics, and ordinary larger pieces of material made from the same compounds.

Within quantum dots, electrons can only occupy discrete energy levels, which means that if excited, they emit light at specific wavelengths, depending on the properties of the crystal.

The dots are already being used to make lights, lasers and TV display screens, and are also being used in medical research, for instance to help image different structures within living tissues.

They are also being investigated as an aid to surgery for cancer because, if linked to targeting molecules and injected into someone with the condition, they home in on tumour cells and glow brightly, allowing only cancerous tissue to be removed during the operation.

The crystals may also be used to deliver toxic anti-cancer drugs only to the site of a tumour and to glow once they have dumped their cargo.

Speaking during a press conference on 4 October, Bawendi said: “I didn’t think it would be me that would get this prize. It’s a field with a lot of people that have contributed to it.”

The Nobel decision was leaked to a Swedish newspaper called Aftonbladet several hours before it was officially announced.

Reference: https://www.newscientist.com/

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Corporate Social Responsibility

In the modern workplace, the concept of corporate social responsibility (CSR) is a sense that is becoming more and more significant. In the past, businesses frequently neglected other stakeholders including staff and the environment in order to focus on increasing profit and shareholder value. However, there is a rising expectation for businesses to perform their operations in a more ethical and sustainable manner as society becomes more conscious of the social and environmental consequences of financial transactions. CSR comprises a wide range of activities, such as humanitarian efforts, ecologically responsible production techniques, and ethical sourcing.It alludes to the moral guidelines and commitments businesses have to the public good and the environment. Businesses in today's society are required to consider the effects of their decisions on a variety of stakeholders, including employees, consumers, communities, and the environment, in addition to just their own bottom line. The growing understanding that corporations have a significant impact on society and may either improve its psychological well-being or exacerbate problems related to society and the environment has led to this paradigm shift.

The place of businesses throughout society is under intense scrutiny in today's more interconnected world. Business organizations can use the idea of corporate social responsibility, or CSR, as a strong framework to not only increase profits but also improve society and the environment. The necessity and advantages of CSR will be discussed in depth in this essay, along with how it may improve a business's reputation, draw in and keep talent, and promote long-term sustainable growth. Companies can match their corporate goals with societal demands by embracing CSR, resulting in a win-win scenario for all parties concerned.Corporate social responsibility (CSR) has more than just a trendy term; it's an essential component of contemporary corporate practices.

Companies are realizing the benefits of integrating CSR into their core business strategies as customer demand for ethical and environmentally responsible corporate behavior rises. Organizations may improve the reputation of their brand, draw in and keep top talent, and promote long-term sustainability by integrating their principles with socioeconomic and environmental aims. Additionally, CSR efforts have the potential to spur innovation and generate benefits for the company's stakeholders as well.

The current on-going study aims to presents an overview of the Corporate Social Responsibility (CSR) activities conducted in the Indian companies. The purpose of the study is to ensure the stability of the environment.

The benefits of the CSR activities which will improve the growth of the business in terms of economy is explained. Moreover, the study also throws light on the CSR activities concerning the Companies Act of 2013, striving towards environmental sustainability.

Corporate social responsibility (CSR) has more than just a trendy term; it's an essential component of contemporary corporate practices. Companies are seeing the value of incorporating CSR into their fundamental strategies as the demand for moral and environmentally conscious company behavior grows. Organizations may improve the reputation of their brand, draw in and keep top talent, and promote long-term sustainability by integrating their principles with socioeconomic and environmental aims. Additionally, CSR efforts have the potential to stimulate innovation and produce rewards for the company's stakeholders as well.Instead of only considering economic impact, sustainable activity emphasizes the environmental and social effects of initiatives and the production of products. Institutions must keep an eye on what is happening within the organization, and ongoing activities must be acknowledged. A new trend of lending to and acquiring other industries while promoting social and environmental responsibility has emerged. The organizations are starting to understand that, in addition to the core function of their traditional business, they now have a social responsibility to perform. Because of the reality of the market today, this freshly developed activity mix represents a new strategy.

Companies must educate and inform the stakeholders in order to promote the CSR-based sustainable development of their firm. It is important to maintain effective internal communication and transparency. Long-term environmental preservation would benefit from this as it would improve the regulatory structure and voluntary commitment. The majority of corporate users participated in CSR activities, according to the survey, which assessed the level of understanding and drive of a sample of organizations to comply with CSR.

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Article by
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Blue Eyes - A technology that understands emotions

Have you ever thought about what will happen if our smartphones, tablets, and computers acquired the ability to sense our emotions? Imagine a world where machines can identify us, feel our presence, and interact with us the way we interact with each other. A world where machines can judge what we are feeling based on our facial expressions, hand gestures, eye movement, and our voice tone while speaking. All these things will soon be a part of the world we are living in and will be achieved with the help of **Blue Eyes technology.**

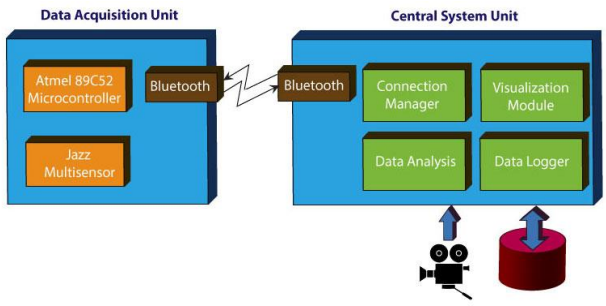
Blue eyes technology has been conducted by the research team of IBM at Almaden Research Center (ARC) in San Jose, California since 1997. It is an amalgamation of both hardware and software technologies with the help of which we can build machines having human-like sensory and perceptual abilities. In Blue eyes technology, Blue stands for Bluetooth which depicts a wireless and reliable mode of communication and helps in creating a PAN (Personal Area Network) for linking various components of the Blue Eyes devices, and Eyes that help us perceive the world and obtain interesting information. The idea of Blue Eyes technology is similar to Affective Computing. Affective Computing was coined in 1995 in a research paper by Rosalind Picard. It can be described as a modern branch of computer science with a combination of psychology and cognitive science.

Hardware used in Blue Eyes Technology

The Blue Eyes technology has two main hardware components - **Data Acquisition Unit (DAU) and Central System Unit (CSU).**

Data Acquisition Unit's main objective is to acquire data with the aid of numerous sensors such as beepers, LCD screens, LED indicators, etc., and to transfer all that data to CSU with the help of Bluetooth. It uses Atmel 89C52 as its principal component. The Central System Unit's task is to analyze and process the data sent by DAU. It also performs access verification and system maintenance.

The interaction between DAU and CSU is depicted in the diagram below:



Software used in Blue Eyes Technology

The software present in a Blue-Eyes device continuously monitors the conditions of the surroundings. When the conditions change, the software performs real-time analysis of the incoming data and triggers several operations based on the captured data.

The connection manager manages wireless communication between Data Acquisition Unit and Central System Unit.

The physiological conditions of the user received by the sensors are analysed by the Data Analysis module.

The Visualization module acts as a UI for the superiors and helps them to watch the physiological condition of the user with a preview of the audio and video streams.

Blue Eyes Devices

The devices used for collecting the information in this technology are as unique as the technology itself. These are specially designed to obtain a plethora of data through touch, perception, hearing, etc.

Some of the devices used in this technology are:

Emotion Mouse (For Hand)

Emotion mouse is an input device that looks like a conventional mouse but it serves the purpose of evaluating the emotions of the user. It has pressure, photo, temperature, and GSR sensors that can classify a user's emotions into different categories like - fear, surprise, anger, sadness, happiness, disgust, etc. while the user is interacting with the computer.

Sentic Mouse

Sentic mouse is also an extension to computer mouse having directional pressure sensors giving conventional mouse the ability to measure emotional valence i.e to sense attraction or avoidance for objects present on the computer screen.

Expression glass (For Eyes)

Expression glasses are wearable devices that help in determining what the

User is interested in at a particular time by analyzing the interaction between user and computer. These glasses remember what the user is watching and also catch the facial expressions of the user at that time. Combining that visualization with the emotion of the user gives the level of interest a user has for that thing. One of its prototypes used piezoelectric sensors.

The Artificial Intelligence Speech Recognition technique is also being used in combination with Blue Eyes Technology to provide a better user experience.

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https://insights.daffodilsw.com/

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India Must Scale Up Wastewater Analysis For Health Surveillance

Wastewater testing helped identify COVID-19 hotspots almost a couple of weeks before clinical data could The COVID-19 pandemic illustrated the value of wastewater-based epidemiology (WBE) — also known as wastewater or environmental surveillance — as an effective population-wide monitoring technique. Such mapping captured viral shedding by people with or without symptoms of the coronavirus disease.

Countries have used WBE for more than 40 years for retrospective indication of poliovirus, norovirus, and influenza, hepatitis and measles outbreaks. In India, environmental surveillance played a crucial role in poliovirus eradication in 2012. It continues to confirm the absence of poliovirus and provides active surveillance of acute flaccid paralysis (AFP) cases.

A single case of AFP indicates substantial underlying polio transmission in a population. Systematic environmental sampling has been estimated to detect one case of wild poliovirus among 10,000 inhabitants 1. In India, a handful of cities such as Hyderabad, Pune, Surat and Bengaluru used WBE to track SARS-CoV-2, recognizing it as an economical and effective surveillance tool.

Bengaluru's environmental surveillance platform sampled 1,140 million liters of wastewater daily, covering almost 11 million people. . It monitored a hybrid network of 46 open drain sites between March 2021 and March 2022, and 28 sewage treatment plants (STPs) since August 2021, representing nearly 92% population of the city.

This data was normalized to average daily flow of sewage and population size of catchment area, which essentially represent viral load copies per person per day. Normalized viral data from the STPs was used to estimate the number of infected individuals in a given catchment area (or sewer shed site).

WBE allowed comparison of viral load in various parts of the city, correlating it with number of COVID-19 cases helped identify infection hotspots. The real-time genomic surveillance from wastewater representing pooled samples from community is key to understanding the variants that cause the emerging viral load patterns in wastewater.

In places, with or without sewage networks, where WBE can be applied with or without sewage network, it is key to remember the following:

(i) When and where to sample: Once or twice a week, sampling is required for accuracy in trend analysis. For identification of hotspots, it is important to have granular information of catchment areas and sanitation mapping for site selection. This can be scaled up with rise in infection.

ii) Complementary tool: Wastewater surveillance should be used as a complementary surveillance approach to identify disease hotspots.

(iii) Building capacity: A smart surveillance tool needs localized capacity

building of sewer shed staff with protocols for easy onsite processing, which can help maintain sample quality in low-resource settings.

(iv)Communication: Regular communication among WBE practitioners, epidemiologists, public health authorities is essential to inform policy. Wastewater sequencing reveals emerging variants which might not have been recorded in clinical data.

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Article by -
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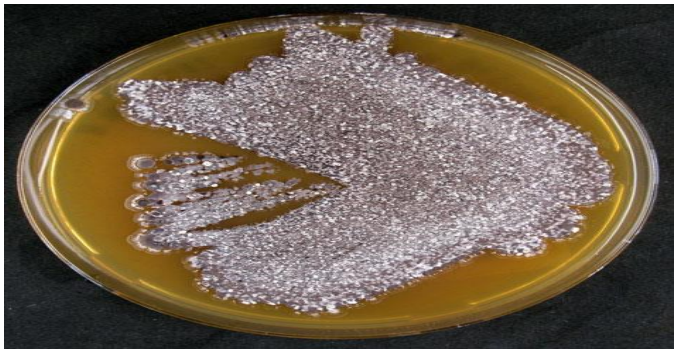
Geldamycin produced by bacteria *Streptomyces hygroscopicus*



Introduction:-

Geldanamycin was originally discovered in the organism streptomyces hygroscopicus. It is a macrocyclic polyketide that is synthesized by a Type I Polyketides synthase. The genes gelA, gelB, and gelC encode for the polyketide synthase. The PKS is first loaded with 3-amino-5-hydroxybenzoic acid (AHBA). It then utilizes and methoxymalonyl-CoA to synthesize the precursor molecule Progeldanamycin. This precursor is subjected to several enzymatic and non-enzymatic tailoring steps to produce the active molecule Geldanamycin, which include hydroxylation, o-methylation, carbamoylation, and oxidation.

Geldanamycin is antitumour antibiotics that inhibits the function of HsP90 (Heat Shock Protein 90) by binding to the unusual ADP/ATP-binding pocket of the protein. HSP90 client proteins play important roles in the regulation of the cell cycle, cell growth, cell survival, apoptosis, angiogenesus and oncogenesis.

Production of Geldanamycin:-

The biosyntheses of geldanamycin analogues were reported to be involved in the assembly of 3-amino-5-hydroxybenzoic acid (AHBA) as a starter unit, following elongation with the acyl-Coenzyme A substrates malonyl-CoA, methylmalonyl-CoA, and 2-methoxymalonyl-ACP, the polyketide intermediate undergoes intra-molecular lactamization gdmF to form progeldanamycin. The compound isolated in this study and previously reported herbimycin A, proposed that an O-methylation step exist after the formation of polyketide backbone which may lead to identify a new O-methyltransferase. To prove this hypothesis, mutant lines could be established for screening of this 11-O-methyltransferase.

Uses:-

Geldanamycin inhibits the ATPase activity of chaperone heat shock protein 90 (Hsp90), which maintains conformation, stability, and function of oncogenic protein kinases involved in signal transduction cascades leading to proliferation and progression of cell cycle and apoptosis

Geldanamycin (GA), a benzoquinone ansamycin antibiotic has been shown in vitro to possess anti-plasmodial activity. Pharmacological activity of this drug is attributed to its ability to inhibit PfHSP90. The parasite growth arrest has been shown to be due to drug-induced blockage of the transition from ring to trophozoite stage. To further evaluate the consequences of this pharmacodynamics feature, the anti-malarial activity of GA analogs with enhanced drug properties in a Plasmodium-infected animal model have been evaluated for their capacity to induce clearance of the parasite.

Geldanamycin, a benzoquinone ansamycin, protected against neuronal injury induced by oxygen-glucose deprivation (OGD)/zVAD treatment in cultured primary neurons. More importantly, Geldanamycin decreases RIP1 protein level in a time and concentration-dependent manner. Geldanamycin also decreases the Hsp90 protein level, which causes instability of RIP1 protein, resulting in decreased RIP1 protein level but not RIP1 mRNA level after Geldanamycin treatment.

Geldanamycin is identified as the first natural product inhibitor of Hsp90 that binds to the N-terminal ATPase domain of Hsp90 to inhibit its chaperone function, and significantly induces tumour cell death via an apoptotic mechanism.

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Article by:
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HISTORY

Vikram Ambalal Sarabhai was an Indian physicist and astronomer who initiated space research and helped to develop nuclear power in India. He was honoured with Padma Bhushan in 1966 and the Padma Vibhushan in 1972.

The Indian Space Research Organisation (ISRO) was established on August 15, 1969. It was previously known as the Indian National Committee for Space Research (INCOSPAR), which was established in 1962 by the Government of India. Dr. Vikram Sarabhai envisioned INCOSPAR.

ISRO's main goal was to develop and use space technology for national development, while also pursuing space science research and planetary exploration. In 1972, ISRO was brought under the Department of Space (DoS).

ISRO's headquarters are located at Antariksh Bhavan in Bangalore. The chief executive of ISRO is also the chairman of the Indian government's space commission and the Secretary of the Department of Space.

ISRO was previously the Indian National Committee for Space Research (INCOSPAR), set up by the Government of India in 1962, as envisioned by Dr. VikramA Sarabhai. ISRO was formed on August 15, 1969 and superseded INCOSPAR with an expanded role to harness space technology.

The ISRO - Indian Space Research Organization logo was designed by Shri Bhargava V. S., an Ahmedabad-based calligrapher and artist. It was officially adopted on August 15, 1969. The design of the logo underwent slight modifications in 2002 when ISRO celebrated its thirty-third anniversary

Department of Space and ISRO

The Department of Space (DOS) has the primary objective of promoting development and application of space science and technology to assist in all-round development of the nation.Towards this, DOS has evolved the following programmes :

•Launch Vehicle programme having indigenous capability for launching spacecrafts.

•INSAT Programme for telecommunications, broadcasting, meteorology, development of education etc.

•Remote Sensing Programme for application of satellite imagery for various developmental purposes.

•Research and Development in Space Sciences and Technology for serving the end of applying them for national development.

Organization With the setting up of Indian National Committee for Space Research (INCOSPAR) in 1962, the space activities in the country were initiated. In the same year, the work on Thumba Equatorial Rocket Launching Station (TERLS) near Thiruvananthapuram was also started. Indian Space Research Organisation (ISRO) was established in August 1969. The Government of India constituted the Space Commission and established the Department of Space (DOS) in June 1972 and brought ISRO under DOS in September 1972. The Space Commission formulates the policies and oversees the implementation of the Indian space programme to promote the development and application of space science and technology for the socio-economic benefit of the country. DOS implements these programmes through, mainly, Indian Space Research Organisation (ISRO), Physical Research Laboratory (PRL), National

Atmospheric Research Laboratory (NARL), North Eastern-Space Applications Centre (NE-SAC) and Semi-Conductor Laboratory (SCL). The Antrix Corporation, established in 1992 as a government owned company, markets the space products and services.

The establishment of space systems and their applications are coordinated by the national level committees, namely, INSAT Coordination Committee (ICC), Planning Committee on National Natural Resources Management System (PC-NNRMS) and Advisory Committee of on Space Sciences (ADCOS).

The Secretariat of DOS and ISRO Headquarters are located at Antariksh Bhavan in Bangalore. Programme offices at ISRO Headquarters coordinate the programmes like satellite communication, earth observation, launch vehicle, space science, disaster management support, sponsored research scheme, contracts management,international cooperation, safety, reliability, publications and public relations, budget & economic analysis, civil engineering and human resources development.

Missions accomplished

Department of Space (DOS) is Government of India department mandated with the execution of Indian Space Programme. The Department of Space has evolved the following programmes with the objective of promoting & developing application of space science and space technology:

- Launch Vehicle programme having indigenous capability for launching satellites.
- INSAT Programme for telecommunications, broadcasting, meteorology, development of education etc.
- Remote Sensing Programme for application of satellite imagery for various developmental purposes.
- Research and Development in Space Sciences and Technology for serving the end of applying them for national development.

Conclusion

ISRO is India's pride in space. It is the national space agency of India that operates as the primary research and development arm of the Department of Space. ISRO has demonstrated its excellence, innovation and leadership in various domains of space technology and exploration, such as satellite technology, launch vehicle technology, lunar missions, interplanetary missions and human spaceflight programme. ISRO has also contributed to India's socio-economic development, national security and international cooperation through its space endeavours.

ISRO's achievements are remarkable for their low cost, high quality and indigenous capability. ISRO has also fostered a culture of scientific excellence, collaboration and innovation among its scientists, institutions and industries. ISRO has also addressed its social and environmental challenges and opportunities through its space endeavours.

ISRO's achievements are a source of inspiration and aspiration for its people, especially its students who are the future of science and technology. ISRO's achievements are also a source of cooperation and partnership for other countries who share its vision of science for peace and prosperity. ISRO's achievements are a testament to its spirit of curiosity and creativity that drives its quest for knowledge and discovery.

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Apiculture (Bee keeping)

Introduction to Apiculture

Apiculture involves the care of honeybee colonies for honey production, pollination, or personal interest. Over time, insights into bee behavior evolved from recognizing honey production and stinging to revolutionary discoveries in the 17th-19th centuries. These include understanding the queen bee's role, her unique mating, movable hives, and controlled swarming. Modern practices like wax-comb foundation, honey extraction, disease control, and artificial insemination transformed beekeeping into a commercial venture. Honeybees, part of Hymenoptera are crucial pollinators and honey makers. Some common species domesticated are five important species of honeybees are:

- The rock bee, Apis dorsata (Apidae).
- The Indian hive bee, Apis cerana indica (Apidae).
- The little bee, Apis florea (Apidae).
- The European or Italian bee, Apis mellifera (Apidae).

Colonies operate as unified entities, with specialized roles for the queen, worker bees, and drones.

Honeybee colonies

Inside a beehive, a structured caste system operates, comprising three key groups: queens, workers, and drones. The queen bee mates with multiple drones to maintain genetic diversity. She then focuses on egg laying, potentially living up to five years. Workers handle tasks like foraging, guarding, and tending to the hive, living around six weeks to few months. Drones are male bees with the sole duty of mating with a queen before being expelled. This hierarchical system showcases the specialized roles that enable the hive's survival and prosperity.

Life cycle

Honeybees exhibit a complex life cycle that revolves around the queen's reproductive abilities. The queen's mating flights ensure genetic diversity within the colony, as she mates with multiple drones during these airborne encounters. Once mated, the queen's primary role becomes egg-laying, ensuring the colony's growth and sustainability. Drones, on the other hand, serve a singular purpose: mating with the queen. After mating, drones perish.

Swarming

When a colony becomes overcrowded, honeybees initiate swarming as a natural means of propagation. During this process, a portion of the worker bees, along with the old queen, leave the hive in search of a new home. This instinctual behaviour safeguards the species' genetic diversity and allows the colony to thrive in a new location.

Foraging and hive activities

Honeybees engage in a variety of tasks to sustain their colony. They collect nectar from blossoms, which they transform into honey through a meticulous process. Bees also gather pollen, a crucial protein source for raising young bees. In the process of gathering nectar and pollen, bees inadvertently pollinate the plants they visit, facilitating plant reproduction. Additionally, honeybees collect water for temperature control within the hive, as well as propolis, a resinous material from tree buds, which they use to seal cracks or cover foreign objects. The efficient collection and transportation of nectar, water, and pollen can result in an impressive accumulation of up to 500 Kg per year in a robust colony.

Products of apiculture

Bee venom – It contains compounds like melittin and apamin with potential anti-inflammatory and pain-relieving effects. Used in

apitherapy, it's suggested to offer benefits such as arthritis relief, improved skin health, and immune support. However, research is limited, and its high doses can cause irritation and inflammation. Further study is needed to fully understand its effects and optimal applications.

Honey – It is the prized product of beekeeping, available in various forms. Liquid honey is extracted from the comb, while comb honey is harvested in its natural comb structure. The production of comb honey requires careful management to prevent swarming. Comb honey is produced by placing extra-thin foundation wax frames directly above the brood nest and ensuring timely removal. Creamed honey, a smooth and creamy variant, can be achieved through proper blending and granulation control.

Beeswax – It is a valuable by-product of beekeeping, serves multiple purposes. Salvaged from uncapped or unusable combs, beeswax is melted and refined for reuse in comb foundation. Beeswax is also utilized in candles, cosmetics, art, agriculture, and industry. Some beekeepers focus primarily on wax production, as it is a stable commodity with diverse applications.

Pollination

Bees play a crucial role as pollinators. Their value in crop pollination far outweighs their honey production, with an average bee colony being worth 20 to 40 times more for pollination. Bees are also important for pollinating ornamental plants and various forest and range plants that contribute to the diets of birds and wildlife. Beekeepers strategically place colonies near or within fields for crop pollination, especially in Brassica fields, almond, cucumbers, sunflower, cherries, pear, and apple orchards.

Apiculture equipment and basic techniques

Beekeepers rely on various tools to manage their colonies effectively. The smoker is used to calm bees during hive inspections. A veil protects the beekeeper's face, while gloves provide protection from stings, especially for newcomers. The hive tool is a versatile instrument for separating frames and hive parts, and the uncapping knife helps open honey cells for extraction. The extractor is a centrifuge used to remove honey from the combs, and it plays a central role in honey production.

The beekeeper's annual cycle begins in early autumn, involving requeening colonies with inadequate queens and ensuring each colony has enough stores, typically 23 Kg of honey and frames filled with pollen. Some beekeepers use fumagillin to counter nosema disease. Colonies require sunny exposure and protection from cold winds; in colder areas, some beekeepers insulate hives. In spring, colonies are examined to prevent starvation before abundant flowers bloom. Syrup, sugar water, or honey-filled combs are used to save starving colonies. As spring advances, colonies expand, and more supers (comb-filled boxes) are added. Manipulating combs helps prevent swarming. Capturing swarms involves placing a hive beneath and encouraging bees inside. Regulations often mandate movable-frame hives. Requeening entails introducing a new queen gradually to the colony through a screen cage. Queen cages with attendant bees and sugar candy are used.

Summary of Apiculture

Beekeeping involves caring for honeybee colonies for honey and pollination. The evolution of beekeeping knowledge spans centuries, from basic honey production to advanced practices. The structured caste system of queens, workers, and drones drives hive functionality. Bee life cycles, swarming, foraging, and hive activities contribute to colony survival. Beekeeping produces various products like honey, beeswax, and bee venom. Bees serve as vital pollinators for crops and plants. Beekeepers use equipment and techniques for hive management, focusing on seasonal cycles.

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Mumbai, 26th January, 2018