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PLANT OF THE MONTH

Vitexnegundo– "Sarvaroginivarini"

सिन्दुवारःश्वेतपुष्पःसिन्दुकःसिन्दुवारकः
नीलपुष्पीतुनिर्गुण्डीशेफालीसुबहा च सा ||
(भ. नि. गुडूच्यादिवर्ग)

This quote says that a man cannot die of disease in an area where*Vitexnegundo, Adathodavasika,* and*Acoruscalamus* are found(provided he knows how to use them).

V.negundo commonly called as "Nirgudi" is a large shrub belonging to the family Verbenaceae. It is a medicinal plant with great medicinal importance from the ancient times and hence its medicinal aspects are broadly mentioned in 'CharakaSamhita'.

Distribution:-The species is naturally distributed in Indo-Malaysia and cultivated in America, Europe, and West Indies. It is found in many parts of India, uptothe height of 1500 m in outer Himalayas.

Plant Parts Used:-Leaves, Roots, Flowers, Fruits and Seeds.

Chemical Constituents:-Leavescontain **Alkaloids** like**Nishidine**, **Casticine**;**Flavanoids**like Flavones, Uteolin-7-glucoside, and**Irioid glycosides**.

Seeds contain **hydrocarbons**,**β-sitosterol**, benzoic acid, pthalicacid(Hussain et al, 1992), **flavonoids** and **triterpenoids** (Chawlaet al 1991,1992).

Stem bark yields **vanilic acid**, **leuco-anthocyanidine**, **p-hydroxybenzoic acid**, **luetoin**, and **β-sitosterol**.

Medicinal importance:-

Traditional importance:- The plant is traditionaly used in Ayurvedic formulations like *Nirgunaditailum*, *Dashmularistha*, *Vatavyadhi*. Ayurveda describes it as an anthelminthic and vermifuge.Also suggested against arthritis.

In Unani medicine, seeds of Nirgudiare used for their aphrodisiac property when they are dispersed with *Zingiberofficinalis* and milk.Decoction of leaves is used externally for clearing ulcers and is also useful in fever, toothache, and asthama. If mixed with long pepper, it is used for catarrhal fever associated with head congestion.

Leaf poultice is applied on sprained limbs and leech bites. Plaster of leaves is applied on enlarged spleen.

Roots are used against dyspepsia, colic, rheumatism, boils and leprosy.

Seeds are boiled in water and eaten and theboiled water is drunk to prevent thespread of toxins after poisonous snake bites.

Fresh fruits are used in headaches while dried fruitsare used as vermifuge.

Flowers are used in treatment of cholera, fever and diseases of liver and also as cardiac tonic.

<u>Recommended Doses(Adults)</u>:- Juice 10-20ml, Decoction 50-100ml, Leaves powder 1.5-3 gm, dry leaves extract 300-600mg. (Chaudhary 1996)

<u>Pharmacological activity</u>:- The ethanolic extracts of *V.negundo* showed antitumour activity against Dalton's asctic lymphoma(DAL) in Swiss albino mice at a dose of 250-500mg/kg of body weight (Dewade 2010)

Immuno-stimulant activity from extract of *V.negundo* was seen in oxyburst phagocytic assay using human polymorph nuclear cells(Singh et al. 2005).

The ethanolicextracts of aerial parts of *V.negundo* is reported to have HIV type 1 reverse transcriptase (RT) inhibitory activity.92.8% activity wasdetected against RT at 200µg/ml due to presence of**Flavanoids** (Kannan2005).

Methanolic extracts of *V.negundo* showed anti-snake venom activity against snakes such as*Viperaruselli andNajakaouthia*(Vishwanathan&Basavaraju2010)

As this plant holds such a great capacity to cure all disorders the plants from its traditional aspect is known as "Sarvaroginivarini" i.e. remedy for all diseases.

DrushtantBuch

MSc-I

SCIENTIST OF THE MONTH

Heinrich Anton de Barywas born in Frankfurt on 26th January 1831.He wasa German suegeon,botanist,microbiologist and mycologist.He received his degree in medicine at Berlin in 1853.In the same year he published a book on the fungi that caused rusts and smuts in plants.

He is considered as a **founding father of plant pathology**(**phytopathology**)as well as founder of **modern mycology**.His extensive and careful studies on life history of fungi and contribution to the understanding of algae and higher plants were landmarks of biology.

ACHIEVEMENTS

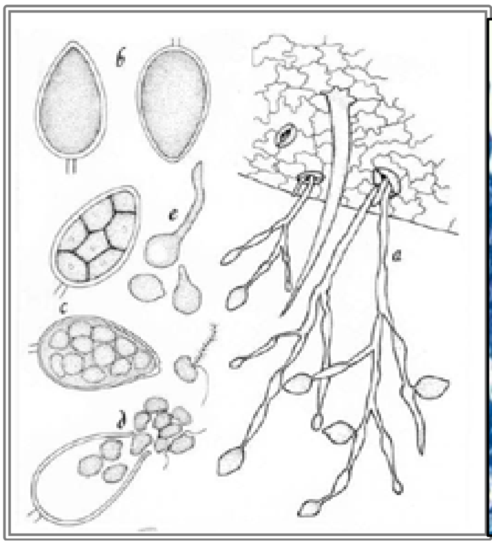
In earlier days, various fungi were considered to arise through spontaneous generation.Heinrich Anton de Bary was the one who proved that pathogenic fungi were not products of cell contents of affected plants and did not arise from secretion of sick cells. He showed that they had an independent existence and attacked plants.

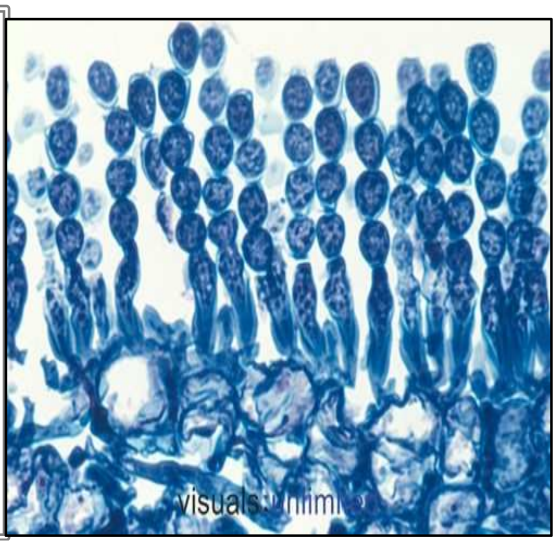
In those days, late blight of potato had caused sweeping crop devastation and economic loss.He studied the pathogen-*Phytophthora infestans* (formerly *Peronospora infestans)* and elucidated its life cycle.

- He declared that the rust and smut Fungi were the causes of pathological changes in diseased plants.
- He concluded that members belonging to Uredinales and Ustilaginales were parasites.
- He studied the developmental history of Myxomycetes(slime moulds)and thought it was necessary to re-classify lower animals.He pointed out that at one stage of their life cycle(**plasmodial stage)**they were little more than formless,motile masses of substances called sarcode(protoplasm).This is the fundamental basis of **protoplasmic theory of life**.
- He first coined the term **Mycetozoa** to include lower animals and slime moulds.
- He was also the first to demonstrate sexuality in fungi.He described sexual reproduction in the fungus *Perenospora sp*. (1861) and then spent more than 15 years studying the

family Perenosporaeae particularly(*Perenospora infestans)* and Cyopus(*Albugo)*parasites of potato.

- He studied formation of lichens which result due to an association between a fungus and an alga.
- He coined the word **'symbiosis'** in his monograph."**Die Ersceinung der Symbiose"**(Strasbourg)1879 as "living together of unlike organisms".



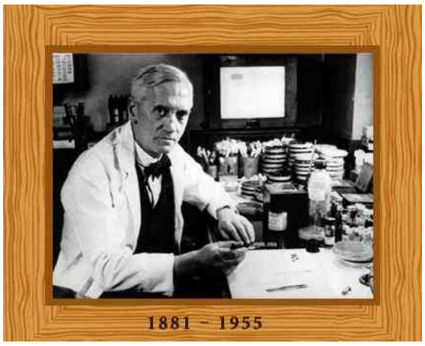


PhytophthorainfestnsAlbugo

<u>CONCLUSIONS</u>

His concept and methods had great impact on growing fields of Bacteriology and Botany.He published more than 100 research papers and influenced many others. Such dedicated work has made him the mostinfluential bio-scientists of the 19th century.

Raveena Ray
M.Sc.1



Sir Alexander Fleming

born August. 6, 1881 , Darvel, Scotland

Died March 11, 1955 , London, England

In 1928, Sir Alexander Fleming observed that colonies of the bacterium Staphylococcus aureus could be destroyed by the mold Penicillium notatum, proving that there was an antibacterial agent there in principle. This principle later lead to medicines that could kill certain types of disease-causing bacteria inside the body. At the time, however, the importance of Alexander Fleming's discovery was not known. Use of penicillin did not begin until the 1940s when Howard Florey and Ernst Chain isolated the active ingredient and developed a powdery form of the medicine.

History of Penicillin

Originally noticed by a French medical student, Ernest Duchesne, in 1896. Penicillin was re-discovered by bacteriologist Alexander Fleming working at St. Mary's Hospital in London in 1928. He observed that a plate culture of Staphylococcus had been contaminated by a blue-green mold and that colonies of bacteria adjacent to the mold were being dissolved. Curious, Alexander Fleming grew the mold in a pure culture and found that it produced a substance that killed a number of disease-causing bacteria. Naming the substance penicillin, Dr. Fleming in 1929 published the results of his investigations, noting that his discovery might have therapeutic value if it could be produced in quantity.

Dorothy Crowfoot Hodgkin

Hodgkin used x-rays to find the structural layouts of atoms and the overall molecular shape of over 100 molecules including penicillin. Dorothy's discovery of the molecular layout of penicillin helped lead scientists to develop other antibiotics.

Dr. Howard Florey

It was not until 1939 that Dr. Howard Florey, a future Nobel Laureate, and three colleagues at Oxford University began intensive research and were able to demonstrate penicillin's ability to kill infectious bacteria. As the war with Germany continued to drain industrial and government resources, the British scientists could not produce the quantities of penicillin needed for clinical trials on humans and turned to the United States for help. They were quickly referred to the Peoria Lab where scientists were already working on fermentation methods to increase the growth rate of fungal cultures. One July 9, 1941, Howard Florey and Norman Heatley, Oxford University Scientists came to the U.S. with a small but valuable package containing a small amount of penicillin to begin work. Pumping air into deep vats containing corn steep liquor (a non-alcoholic by-product of the wet milling process) and the addition of other key ingredients was shown to produce faster growth and larger amounts of penicillin than the previous surface-growth method. Ironically, after a worldwide search, it was a strain of penicillin from a moldy cantaloupe in a Peoria market that was found and improved to produce the largest amount of penicillin when grown in the deep vat, submerged conditions.

Andrew J. Moyer

By November 26, 1941, Andrew J. Moyer, the lab's expert on the nutrition of molds, had succeeded, with the assistance of Dr. Heatley, in increasing the yields of penicillin 10 times. In 1943, the required clinical trials were performed and penicillin was shown to be the most effective antibacterial agent to date. Penicillin production was quickly scaled up and available in quantity to treat Allied soldiers wounded on D-Day. As production was increased, the price dropped from nearly priceless in 1940, to $20 per dose in July 1943, to $0.55 per dose by 1946.

As a result of their work, two members of the British group were awarded the Nobel Prize. Dr. Andrew J. Moyer from the Peoria Lab was inducted into the Inventors Hall of Fame and both the British and Peoria Laboratories were designated as International Historic Chemical Landmarks.

Dr. Mahesh Borde
Assistant Professor

Game Theory and why survival of the fittest is not always true….

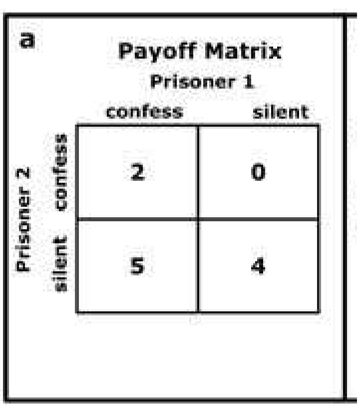
-Sourav Adhikari, MSc II

Survival of the fittest, an idea proposed by Sir Charles Darwin in his book On the Origin of Species, published way back in 1859, revolutionised the way naturalists perceived the notion of evolution.

The idea proposed by Darwin (Darwinism) suggests that evolution resulted from a process that he called as natural selection, in which different organisms fight for the limited resources in their 'struggle for existence', and 'survival of the fittest' that are much more favoured to the existing environment. But this is not the case all the time as complex behavioural interactions can be seen between certain organisms; like mutualism, commensalism, parasitism, helotism, or basic prey-predator relationships in which one organism (or a group) is always much more suited for survival than another organism (or a group) in that given spatial and temporal environment. The question arises why does then organisms actually form complex behavioural interactions?

To explain this we will explore a very different concept of Game Theory, a branch of mathematics which sheds much light on evolutionary relationships, by taking into account multi-individual interactions, in which the outcome of one individual's outcomes (Payoff) not only depends on its own strategy but also on the strategies of the other individuals involved.

The Prisoners' Dilemma: A Classic Cooperation matrix



The conditions of the prisoners' dilemma are as such that, two prisoners are captured for, and guilty of the same crime, and each prisoner has the choice to confess or remain silent. The largest mutual benefit occurs when both prisoners remain silent but the highest possible benefit for one of them occurs when he confesses, implicates the other and the other prisoner remains silent. If both confess, both of them gets a reduced punishment.

In fig. a the payoff matrix is depicted from the perspective of Prisoner 1.

Thus we see the only evolutionary stable strategy is always to confess and implicate the other prisoner.

How does this example lead to cooperation in biological systems??

For biological interactions it is assumed that the same two individuals will interact more than once. In the population level, this game will be repeated over evolutionary time scales (100 or thousand generations). We can recall that cooperation results in the highest mutual benefit for both players. Thus with repeated games cooperation can evolve through a simple strategy of 'Tit for Tat'. In this strategy if individual 1 begins the game with cooperating, in subsequent iterations individual 2 will also cooperate. If individual 1 confesses in round one, individual 2 will definitely confess in round two. Thus cooperation can evolve in small populations through strategies based on simple reciprocity.

Case study: A matrix involving Bacterium vs. Legume in a symbiotic relationship

Consider a symmetric matrix in which two organisms are involved in symbiotic relationship in trade for resources. Consider a legume that associates with bacteria and can provide it with nitrogen that it can use. These bacteria live in the root nodules of the plants and acquire energy from the plant in the form of sugar. Thus an investment by both partners is involved. In the payoff matrix a modification value ***m*** increase the payoff if both the organism cooperates with each other. If cheating occurs that is one partner cooperates and the other doesn't then the payoff is reduced by a value of ***m***. if a bacterium receives more sugar, it is able to provide more nitrogen to the plant which the plant utilizes to produce more sugar. Thus positive feedback cooperation exists between them. So long as the partners are true to themselves cooperation emerges as an Evolutionary Stable Strategy (ESS).

Outcomes of the matrix from the perspective of the legume :

a) If both defect, none of them is helped and they get a cooperative value of 2.
b) If the legume cooperates but the bacterium defects then the payoff is 0
c) If the legume defects and the bacterium cooperates the payoff of 5 is reduced by a value of m (modification value)
d) If the legume and the bacterium both cooperate with each other, the payoff of 4 is increase by a value of m

a **Payoff Matrix**

Bacterium \ Legume	defect	cooperate
defect	2	0
cooperate	5-*m*	4+*m*

Thus ESS suggests that cooperating with each other is the best possible outcome.

Conclusion

The principles of Game Theory provide a theoretical framework for understanding the evolution of biological interactions. It applies to organisms that interact repeatedly, both within a generation and over evolutionarily relevant time scales. In special cases Evolutionary Stable Strategies(ESS) arise in which a particular strategy is adopted by all members of the population, and alternative strategies cannot invade or displace the ESS. The flexibility of game theory allows for the testing of complex mixed strategies and incorporating rewards and punishment in evolutionary strategies. Importantly game theory demonstrates the evolution through cooperation is consistent with evolution through natural selection.

Examination!!!

It's the time of **EXAMINATION**!

All parents are in **TENSION**

Some get admitted due to **HYPERTENSION**

And students are all in **CONFUSION**

All of us have lots of **AMBITION**

Wanting to head towards new **INVENTION**

Trying to find out chemical's **CONCENTRATION**

Studying under arrows of electric **INDUCTION**

Getting confused in English **PRONUNCIATION**

Messed up in sentences **CONVERSION**

Thinking of what to write in **COMPOSITION**

No importance remained of **MEMORISATION**

Our health depends on **NUTRITION**

E.V.S. talks about increasing **DEFORESTATION**

Exams to spread message of **AFFORESTATION**

Learning in life for energy **CONSERVATION**

Finding out continuity of an **EQUATION**

Life seems to be a **DERIVATION**

Still have to live in **INTEGRATION**

Choosing between permutation and **COMBINATION**

Heart is full of **CIRCULATION**

Lungs engaged in **RESPIRATION**

Brain programming of **CANCELLATION**

Life continues with its **MISSION**….

Phoebe Borde

MSc-I

Amanita muscaria (fly agaric)

Scientific name: *Amanita muscaria* (L.) Lam.
Common name(s): fly agaric, fly mushroom
Synonym(s): *Agaricus imperialis*, *Agaricus nobilis*, *Amanitaria muscaria*

About this species

Fly agaric was first described by Carl Linnaeus (Swedish botanist and the father of modern taxonomy) in 1753, as *Agaricus muscarius*, the epithet deriving from the Latin '*musca*', or 'fly', apparently referring to its use in parts of Europe as an insecticide, crushed in milk for attracting and killing flies. It is amongst the most iconic of the toadstools, commonly depicted in children's books and on Christmas cards around the world. It is highly distinctive and, at least when fresh and in good condition, can hardly be confused with any other species. Its hallucinogenic properties have been well-known for centuries and the species has a long history of use in religious and shamanistic rituals, especially in Siberia. It is a common and widespread fungus, native to much of the north-temperate world, and an important ectomycorrhizal associate of various broadleaved and coniferous trees. Its fruitbodies are also utilised by a wide variety of flies (Diptera) and by some beetles (Coleoptera) as breeding sites.

Geography and distribution

Widespread in north-temperate regions, throughout Europe, Iceland, northern Asia - including Siberia and Korea - North Africa, and western North America. Inadvertently introduced with forestry into South Africa, Australia and New Zealand. In some places where introduced it is considered a pest species in native forests where it forms

mycorrhizas with native trees, including species of *Nothofagus*, and adversely affects native fungi.

Uses:

Fly agaric is well known to contain psychoactive alkaloids, and has a long history of use in Asia and parts of northern Europe for religious and recreational purposes. It has also been identified with 'Soma', a sacred and hallucinogenic ritual drink used for religious purposes in India and Iran from as early as 2000 B.C., and the subject of a Hindu religious hymn, the Rig Veda. The identity of Soma is controversial but is thought by the American author Robert Wasson to be made from *A. muscaria*. Since medieval times, fly agaric has also reportedly been used to attract and kill flies, and the ibotenic acid it contains is indeed a weak insecticide. According to the British mycologist John Ramsbottom, it was also used in England and Sweden for getting rid of insects. Other anecdotal uses of fly agaric include its use as a treatment for sore throats, and arthritis, and as an analgesic. Fruitbodies also provide an important food source for invertebrates, especially for the larval stages of a range of Diptera (flies), particularly in the families Anthomyiidae, Cecidomyiidae, Heleomyzidae, Mycetophilidae, and some Syrphidae.

Toxicity of Fly Agaric:

Fly agaric is psychoactive and hallucinogenic, containing the alkaloids muscimol, ibotenic acid and muscazone, which react with neurotransmitter receptors in the central nervous system. These cause psychotropic poisoning which may be severe in some cases although deaths are very rare. It also contains small amounts of muscarine, the first toxin to be isolated from a mushroom, and first isolated from this species. This causes sweat-inducing poisoning, stimulating the secretory glands and inducing symptoms which include profuse salivation and sweating. These symptoms can be treated by using atropine but this should not be used in cases of *Amanita muscaria* poisoning because it increases the activity of muscimol.

Flowers around you

Carrisa congesta L. (Apocynaceae)

Moullava spicata (Caesalpiniaceae)

Woodfordia fruticosa L. (Lythraceae)

Memecylon umbellatum Burm. (Melastomiaceae)

Melastoma malabathricum L. (Melastomaceae)

Strobilanthus callosus L. (Acanthaceae)

Urena lobata L. (Malvaceae)

Hibiscus hirtus L. (Malvaceae)

Ipomoea pes-caprae Roth. (Convolulaceae)