

History of Plant --- Pathology



Ancient period

A literature of European and vedic eras will give us some information on the plant diseases and their control measures. Greek philosopher **Theophrastus** recorded some observations on the plant diseases in his book enquiry into plants. His experiences were mostly based on imagination and observation but not on experimentation. He had mentioned that plants of different groups have different diseases which were autonomous or **spontaneous**, i.e., no external cause was associated.

In India, the information on plant diseases is available in ancient literature such as **rigveda, atharveda (1500-500BC), arthasashtra of Kautilya (321-186 BC), Sushruta sanhita (200-500AD), Vishnupuran (500AD), Agnipuran (500-700AD), Vishnu dharmottar (500-700AD)**, etc. In Rigveda, not only the classification of plant diseases has been given but the germ theory of disease was also advocated.

Vriksha ayurveda by Surpal in ancient India is the first book in which lot of information on plant diseases is available. In this book, plant diseases were categorized into two groups, **internal** (probably physiological diseases) and **external** (probably infectious diseases). External diseases were supposed to be **due to attack of microorganisms and insects**. In this book, a mention of treatments for different diseases caused by different agencies was prescribed which were based on superstition as well as scientific observation. Hygiene, tree surgery, protective covering with pastes and special culture of plants are practices which are still recommended. In chemical treatments, use of honey, ghee, milk, barley flour, pastes made from herbs, plant extracts, etc., were recommended. For the control of root diseases, oilcakes of mahuva, mustard, sesame, castor, etc., were used.

Symptoms of plant diseases such as rust, downy mildew, powdery mildew and blight are often mentioned in the **bible, Shakespeare's poems and dramas** of other Christian literature. In **Jataka of Buddhism, Raghuvansh of Kalidas** there was also a mention about different symptoms of plant diseases. In Europe and other western countries, after the time of Theophrastus (about 286 BC) no definite opinion could be formed about plant disease for the next 2000 years. In ancient period, the plant diseases were attributed to many causes which include divine power, religious belief, superstition, effect of stars and moon, bad wind and wrath of god, etc.

PRE-MODERN PERIOD

PIER ANTONIO MICHELLI (Italian)

- ❑ He was the **founder and father of Mycology**.
- ❑ He was the first person who observed fungal spores for the first time and conducted many spore germination studies (by growing fungus organisms on freshly cut pieces of melons and pears).
- ❑ In 1729 he published a book “**Nova Plantarum Genera**” in which he gave descriptions about 1900 species in Latin out of which 900 were fungi.



TILLET (French)

- ❑ In 1755, he published a **paper on bunt or stinking smut** of wheat.
- ❑ By well planned experiments he proved that wheat seeds that contained black powder on their surface produced more diseased plants than clean seeds.
- ❑ He emphasized that bunt was an infectious disease and it was closely related with fungus. However, he believed that the disease was caused by some toxin produced by the black powder. He did not know that the black powder contained the spore mass of the fungus.
- ❑ He reported that the chemical treatment of seeds with common salt and lime inhibited the contagious activity.

Modern period

BENEDICT PREVOST (French)

- ❑ He proved that diseases are caused by micro-organisms .
- ❑ He studied wheat bunt disease for about 10 years and in 1807, he published his findings in the paper “**memoir on the immediate cause of bunt or smut of wheat and of several other diseases of plants and on preventives of bunt**”.
- ❑ He proved that the bunt of wheat was caused by the fungus *Tilletia caries*.
- ❑ Discovered the life cycle of bunt fungus
- ❑ He showed that the solution containing copper sulphate prevented the germination of bunt spores and can be used for control of bunt diseases.



CHRISTIAN HENDRICK PERSOON (1761-1831)

- ❑ Persoon first published **observations Mycologicae**.
- ❑ In 1801, he published “**Synopsis methodica fungorum**” for nomenclature of *Ustilaginales, Uredinales and Gasteromycetes*.
- ❑ He also published **Mycologica Europica** in 1822.
- ❑ He gave the name to rust pathogen of wheat as *Puccinia graminis*.

ELIAS MAGNUS FRIES (1821)

- ❑ He published three volumes of “**Systema Mycologium**” for nomenclature of hymenomycetes.
- ❑ Person and fries first time introduced binomial system of nomenclature to classify the fungal organisms.

ANTON DE BARY (Germany)

- ❑ He was the **father and founder of modern Mycology**.
- ❑ In 1863, he studied the epidemics of late blight and renamed the casual organism as *Phytophthora infestans*.
- ❑ He discovered heteroecious nature of rust fungi (1865).
- ❑ He gave detailed account on life cycles of downy mildew genera.
- ❑ He studied about vegetable rotting fungi and damping off fungi.
- ❑ He wrote a book named **“Morphology and Physiology of fungi, lichens and Myxomycetes”** (1866).
- ❑ He reported the role of enzymes and toxins in tissue disintegration caused by *Sclerotinia sclerotiorum*



E. J. Butler (Edwin John Butler)

- ❑ He was **the father of modern plant pathology and father of Indian Mycology.**
- ❑ Monograph: Pythiaceae and allied fungi.
- ❑ Books: a) Fungi and Disease in Plants (1918)
b) Fungi in India (with B.R.Bisby) and
c) Plant Pathology (with S.G.Jones).



E.C. STAKMAN

- ❑ He studies the variability in rust fungus. Contributed valuable information on physiological races of pathogen
- ❑ He concluded that due to continuous evolution of races and biotypes in the species of the rust fungus its pathogenic capability goes on changing and as a result the resistant capability of the host also changes.

T. J. BURRUILL (USA)

- ❑ He proved for the first time that fire blight of apple and pear was caused by a bacterium (now known as *Erwinia amylovora*)

E.F.SMITH (U.S.A)

- ❑ He gave the final proof of the fact that bacteria could be incitants of plant diseases.
- ❑ He also worked on the bacterial wilt of cucurbits and crown gall disease.
- ❑ He is also called as "Father of Phytobacteriology".
- ❑ In 1981, he demonstrated for the first time that budding or grafting could be another method of transmission of plant viruses.
- ❑ He showed the contagious nature of peach yellows.

DOI AND ISHIE (JAPANESE)

- ❑ They found that mycoplasma like organisms (MLO) could be responsible for the disease of the yellows type.
- ❑ Doi observed that MLO's are constantly present in phloem while Ishie observed MLO's temporarily disappeared when the plants are treated with tetracycline antibodies.

BEIJERINCK (Dutch)

- ❑ **Founder of virology.**
- ❑ He proved that the virus inciting tobacco mosaic is not a living microorganism.



W.H.STANLEY

- ❑ In 1935, he proved that viruses can be crystallised. He got Nobel Prize.
- ❑ He treated the sap from diseased leaves of tobacco with ammonium sulphate and obtained a crystalline protein which, when placed on healthy tobacco leaves, could reproduce the disease.
- ❑ He finally proved that viruses are not living microorganisms because no living form can be chemically treated and crystallized and still remain viable.



INDIAN SCIENTISTS

1) B.B. MUNDKUR: He worked on the **control of cotton wilt** diseases. He is responsible for the identification and classification of large number of Indian smut fungi. He started Indian Phytopathological Society in 1948 and published a journal Indian Phytopathology. His book – Fungi and Plant diseases.

2) J.F. DASTUR: First Indian plant pathologist who was credited for his detailed studies on fungi and plant diseases. He studied the characters of *Phytophthora* and *Phytophthora* diseases of potato and castor. He established *Phytophthora parasitica* from castor.

3) K.C. MEHTA – Life cycle of cereal rusts in India

4) T.S. SADASIVAN - Started the studies on bio-chemistry of host-parasite relationship at University of Madras. Contributed to the concept of vivotoxins. Studied on mechanism of wilting in cotton by *Fusarium vasinfectum*. The production of fusaric acid by this fungus outside the host was demonstrated.

5)M.K PATEL: started plant bacterial research at pune. – 1948. Reported about 40 bacterial plant diseases. Introduced post of “ plant bacteriologist “ at IARI, in 1955

6)N.J. Nayulu- rice viral disease

7)Srinibasan- reported on BLB for the first time in India

8)Y.Y.Neni- book fungicide in plant disease control

9)G.Rangaswami- worked on bacteriology and mycology and book “Disease of crop plant in India”

Socio-economic significant of plant disease

Late blight of potato

Cereal rust

Bengal famine

Coffee rust

Thank you..