

8th Science Lesson 7 Notes in English

7] Plant Kingdom

Introduction:

The living organisms found on the earth differ in their structures, habit, habitat, mode of nutrition and physiology. The estimated number of plant species on the earth is 8.7 million (1 million = 10 lakhs). Among them 6.5 million species are living on land and 2.2 million species are living in the ocean. Out of them 4,00,000 species are flowering plants. The living organisms show lot of similarities and differences so that they can be arranged into many groups systematically. In traditional system of classification, plant kingdom is divided into two sub-kingdoms called non flowering plants (Cryptogams) and flowering plants (Phanerogams). Thalophyta, bryophyte and pteridophyt are non flowering plants. In this lesson, we will study about algae, fungi, bryophytes, pteridophytes and classification of plants.

Algae:

Algae is a latin word (Algae - Sea weeds). They are chlorophyll bearing, simple and primitive plants. These plants are autotrophs. Algae belongs to thallophyta and the plant body of algae is called thallus. i.e. the plant body is not differentiated into root, stem and leaf.

Most of the algae are living in aquatic region. It may be fresh water or marine water. Very few algae can survive in wet soil. Some algae are very minute and float on the surface of the water. These algae are called phytoplankton. Some of the algae are symbionts (Algae living with fungi and they both are mutually benefitted). E.g. Lichen. A few species of algae are epiphytes. The branch of study of algae is called phycology or algology. Algae reproduces by three methods. They are:

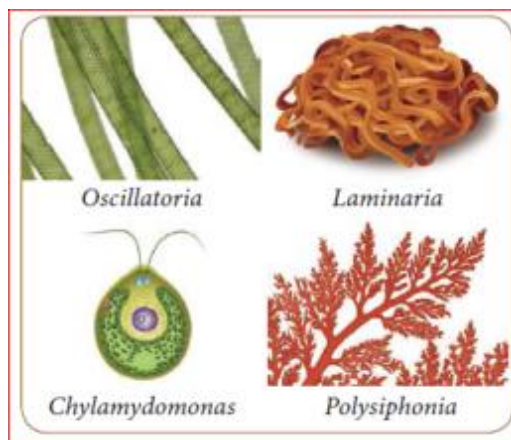
- Vegetative reproduction takes place by fragmentation. E.g. Spirogyra.
- Asexual reproduction takes place by spore formation. E.g. Chlamydomonas.
- Sexual reproduction takes place by means of fusion of gametes. E.g. Spirogyra, Chara.

Clarification of Algae:

Algae are classified into different classes based on the pigments. They are given in table.

Classification of algae based on pigments

Class	Example	Types of Pigments	Reserve food material
Bluegreen algae (Cyanophyceae)	Ocillatoria	Phycocyanin	Cyanophycean Starch
Green algae (Chlorophyceae)	Chlamydomonas	Chlorophyll	Starch
Brown algae (Phaeophyceae)	Laminaria	Fucoxanthin	Laminarian starch and Manitol
Red algae (Rhodophyceae)	Polysiphonia	Phycocerythrin	Floridian Starch



Algae

Economic importance:

Food:

Algae are consumed as food by people in Japan, England and also in India. E.g. Ulva, Spirulina, Chlorella etc. Some algae are used as food for domestic animals. E.g. Laminaria, Ascophyllum.

Agriculture:

Some of the blue green algae are essential for the fixing of atmospheric nitrogen into the soil, which increases the fertility of the soil. E.g. Nostoc, Anabaena

Agar Agar:

Agar agar is extracted from some red algae, namely Gelidium and Gracillaria. It is used to prepare growth medium in laboratories.

Iodine:

Iodine is obtained from brown algae like Laminaria.

Space travel:

Chlorella pyrenoidosa is used in space travel to get rid of CO₂ and to decompose human wastes.

Single Cell Protein (SCP):

Some of the single cell algae and blue green algae are used to produce protein. E.g. Chlorella, Spirulina.

Fungi:

Fungi (Singular – Fungus) belongs to thallophyta. Its plant body is not differentiated into root, stem, and leaves. The plant body of fungus consists of filament like structures called hyphae.

Several hyphae are arranged in the form of network called mycelium. The cells of fungi are multicellular and eukaryotic. Some species of fungi like yeast are unicellular and eukaryotic. Cell wall of fungi is made up of a chemical substance called chitin.

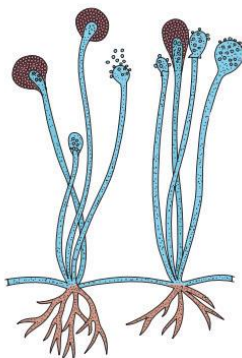
The reserve food materials of fungi are glycogen and oil. They have no starch because they have no chlorophyll pigments. So, they are heterotrophs. Heterotrophs are of three types namely, parasites, saprophytes and symbionts.

Some species of fungus live as parasites. They absorb food from the living organisms with the help of special root called haustoria. E.g. *Cercospora personata*. It affects groundnut plants and cause Tikka disease.



Tikka disease in groundnut leaves

Some species of fungi live as saprophytes. They grow upon the dead and decaying organic matters and get food from them. E.g. *Rhizopus*

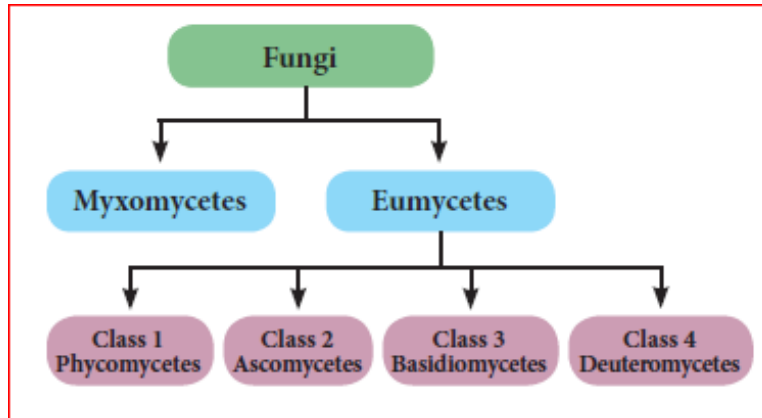


Rhizopus

Some species of fungi are living with algae and mutually benefitted. E.g. Lichen. Some of them live symbiotically with higher plants in their roots called Mycorrhizae

Classification of Fungi:

Fungi are classified into different classes as given below.

**Economic importance of Fungi:**

Fungi are useful to us in many ways. The importance of fungi are given below.

Antibiotic:

Penicillin (*Penicillium notatum*) and Cephalosporin which cure different diseases are obtained from fungi.



Penicillium notatum

Food:

Mushroom contains rich protein and minerals. The most common edible mushroom is Agaricus (Button mushroom).



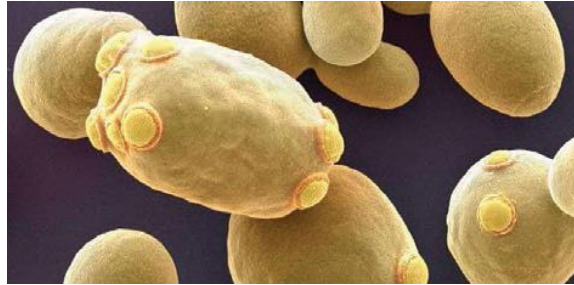
Agaricus

Vitamins:

Fungus like *Ashbya gossypii* and *Eremothecium gossypii* are used to produce vitamin B₂ (riboflavin).

Alcohol:

Fungus like yeast contain enzymes invertase and zymase, which ferment the sugar molasses into alcohol.



Yeast

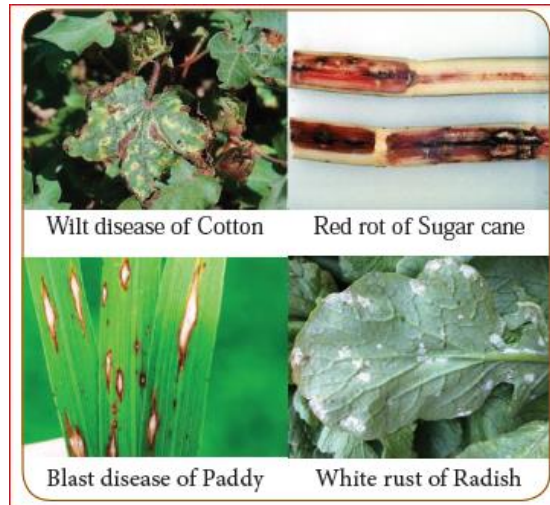
Harmful effects of Fungi:

Fungi cause various diseases in plants and animals. They are given in the tables below.

Diseases caused by fungi in plants

Pathogen	Name of the Disease
Fusarium oxysporum	Wilt disease in cotton
Cercospora personata	Tikka disease in ground nut
Colletotrichum falcatum	Red rot in sugar cane
Pyricularia oryzae	Blast disease in paddy
Albugo candida	White rust in radish

Diseases caused by fungi in plants



Diseases caused by fungi in human

Name of the Fungi	Name of the Disease
Trichophyton sp.	Ring worm (Circular rash on the skin)
Microsporum furfur	Dandruff
Tinea pedis	Athletes foot

Difference between algae and fungi

Algae	Fungi
Algae are autotrophs.	Fungi are heterotrophs.
They have pigments.	They have no pigments
Reserve food material is starch.	Reserve food materials are glycogen and oil.
Some algae are prokaryotic in nature E.g: Cyanobacteria (Nostoc, Anabaena)	All are eukaryotic nature. E.g: Agaricus



Diseases caused by Fungi in human

Bryophytes:

Bryophytes are the primitive and simplest group of plants. These are terrestrial and nonvascular cryptogams (They have no vascular tissues like xylem and phloem). Bryophytes live on land and in water. Therefore, they are named as amphibians of plant kingdom. Water is essential to complete their life cycle.

Bryophytes have distinct alternation of generation. Gametophyte generation is dominant and sporophytic generation is small. Sporophytic generation depends on the gametophytic generation. The gametophytic plant can be either thalloid (liverworts) or leafy (mosses). The plant remains fixed to the substratum with the help of root like structure called rhizoid.

Sexual reproduction is oogamous type. They have well developed sex organs like antheridia and archegonia. The male sex organ is antheridium, which produces antherozoid. The female sex organ is archegonium which contains an egg. Antherozoid swims with the help of water and reaches the archegonium. It fertilizes the egg and forms zygote ($2n$). Zygote is the first cell which develops into sporophytic generation and produces haploid spore (n) by meiosis. Spore is the first cell of the gametophytic generation.



Bryophytes

Classification of Bryophytes:

Bryophytes are classified into three classes. They are:

1. Hepaticae (Liverworts)
2. Anthoceratae (Hornworts)
3. Musci (Mosses)

Hepaticae (E.g. Riccia):

- These are lower forms of bryophytes. They are simple in structure than moss.
- Sporophyte is very simple and short lived.

Anthocerotae (E.g. Anthoceros):

- Gametophyte is undifferentiated thallus. Rhizoids are unicellular and unbranched.
- Protonemal stage is absent. Sporophyte is differentiated into foot and capsule only.

Musci (E.g. Funaria):

- These are higher forms in which the gametophyte is differentiated into stem, leaf and root like parts.
- Protonemal stage is present.
- Sporophytes are differentiated into foot, seta, and capsule.

Economic importance:

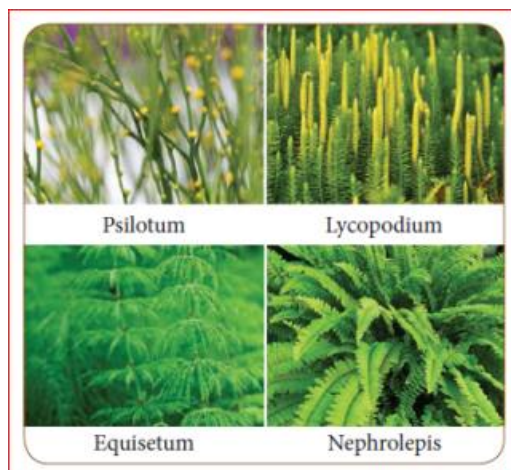
- Bryophytes prevent soil erosion.
- Sphagnum can absorb large amount of water. Hence, it is used by the gardeners in nursery.
- Peat which is a valuable fuel like coal is obtained from Sphagnum.

Pteridophytes:

Pteridophytes are the first true land plants with xylem and phloem. Hence, they are called vascular cryptogams. The main plant body is differentiated into true root, stem and leaves.

Pteridophytes also exhibit alternation of generation. The diploid sporophytic phase alternates with the haploid gametophytic phase. Sporophyte is the dominant phase. Sporophytes reproduce by means of spores. Spores are produced in sporangium. The sporangia bearing leaves are called sporophyll. Most of the plants produce only one type of spore either microspore or megaspore (homosporous). In some plants both microspore and megaspore are produced (heterosporous).

Spores give rise to gametophytic generation called prothallus, which is short lived and independent. The gametophytes produce the multicellular sex organs, antheridium which produces antherozoid (male gamete) and archegonium which contains an egg (female gamete). The antherozoid fertilizes with egg and form diploid zygote. It develops into an embryo which is differentiated into sporophyte.



Pteridophytes

Classification of Pteridophytes:

Pteridophytes are classified into four classes. They are:

1. Psilopsida (Eg. Psilotum)
2. Lycopsidea (Eg. Lycopodium)
3. Sphenopsida (Eg. Equisetum)
4. Pteropsida (Eg. Nephrolepis)

Economic importance of Pteridophytes:

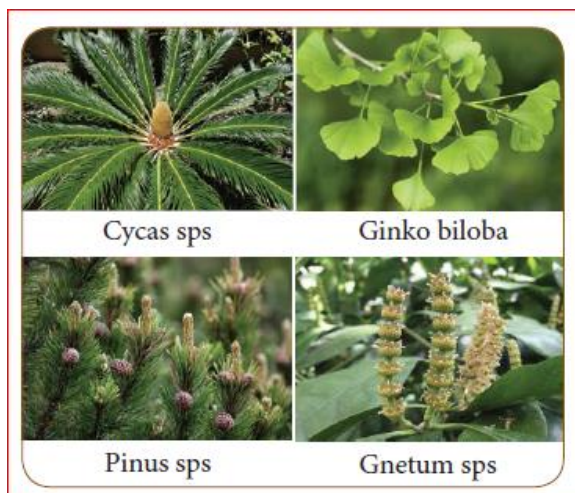
- Ferns are used as ornamental plants.
- The rhizome and petioles of Dryopteris yield the vermifuge drug.
- The sporocarp of Marsilea (Water fern) is used as food by some people.

Difference between Bryophytes and Pteridophytes

Bryophytes	Pteridophytes
Plant body cannot be differentiated into root, stem and leaf.	Plant body can be differentiated into root, stem and leaf.
Bryophytes are amphibians.	Pteridophytes are true land plants.
Vascular tissues are absent.	Vascular tissues are present.
The dominant phase of the plant body is gametophyte.	The dominant phase of the plant body is sporophyte.
Sporophytic generation depends on the gametophytic generation. E.g. Riccia	Gametophytic generation does not depend on sporophytic generation. Eg. Selaginella

Gymnosperms:

Gymnosperm are naked seed plant, i.e. the ovule is not enclosed by ovary. Gymnosperms have two phases in its life cycle (Gametophytic and Sporophytic). Sporophytic plant body is dominant and it is differentiated into root, stem and leaf. They have well developed vascular tissues (xylem and phloem). The water conducting tissue is tracheid and the food conducting tissue is sieve cell. They have cone in which sporangia and spores are produced.



Gymnosperms

Classification of Gymnosperms:

Gymnosperm are classified into four different types. They are:

1. Cycadales
2. Ginkgoales
3. Coniferales
4. Gnetales

Cycadales:

These are palm like small plants (erect and unbranched). Leaves are pinnately compound forming a crown. They have tap root system and coralloid root. E.g. Cycas sps.

Ginkgoales:

These are large trees with fan shaped leaves. Ginkgo biloba is the only living species in the group. They produce unpleasant smell.

Coniferales:

These are evergreen trees with cone like appearance. They have needle like leaves or scale leaves. Seeds are winged and produced in female cone. E.g. Pinus sps

Gnetales:

Gnetales are small group of plants. They possess advanced characters like angiosperm. Ovules are naked but, developed on flower like shoot. E.g. Gnetum sps

Economic importance of Gymnosperms:

- Woods of many conifers are used in the paper industries. E.g. Pinus, Agathis
- Conifers are the sources of soft wood for construction, packing and plywood industry. E.g. Cedrus, Agathis
- Turpentine, an essential oil, extracted from the resin of Pinus is used for paint preparation. It is also used medicinally to get relief from pain, bronchitis etc.,
- Seeds of Pinus gerardiana are edible.
- Ephedrine is an alkaloid extracted from Ephedra. It cures asthma and respiratory problems.
- Araucaria bidwillii is an ornamental plant.

Angiosperms:

The term 'Angiosperm' is derived from two Greek words, i.e. 'angio' which means box or closed and 'sperma' which means seed. Habit of the plants may be herb (Solanaum melongena), shrub (Hibiscus rosasinensis) and tree (Mangifera indica - Mango). They have well developed vascular tissues called xylem and

phloem. Xylem contains vessel, tracheid, xylem parenchyma and xylem fibre. Phloem contains sieve tubes, phloem parenchyma, companion cells and phloem fibres.

Classification of Angiosperms:

Angiosperms are divided into two classes. They are:

- Dicotyledons
- Monocotyledons

Characteristic features of Dicotyledons:

- Seed has two cotyledons.
- Plants have tap root system and leaves are with reticulate venation.
- Flowers are tetramerous or pentamerous. Calyx and corolla are well differentiated.
- Pollination occurs mostly by insects.
- Examples are: Bean, Mango, Neem

Characteristic features of Monocotyledons:

- Seed has only one cotyledon.
- Plants have fibrous root system, and leaves are with parallel venation.
- Flowers are trimerous and not differentiated into calyx and corolla.
- Pollination occurs mostly by wind.
- Examples are: Grass, Paddy, Banana.

Taxonomy:

Taxonomy is the branch of biology that deals with the study of identification, classification, description and nomenclature of living organisms. The word taxonomy is derived from two Greek words (Taxis means arrangement and Nomos means laws). The word 'taxonomy' was first coined by Augustin-Pyramus de Candolle.

Classification:

Plants are arranged into different groups and categories on the basis of similarities and differences. It is called classification. There are four types of classification.

1. Artificial system of classification
2. Natural system of classification
3. Phylogenetic system of classification
4. Modern system of classification

1. Artificial system of classification:

This is the earliest system of classification in plants. Plants are classified on the basis of one or few morphological characters. The most famous artificial system of classification is Linnaeus classification which was proposed by Carolus Linnaeus in his book Species plantarum.

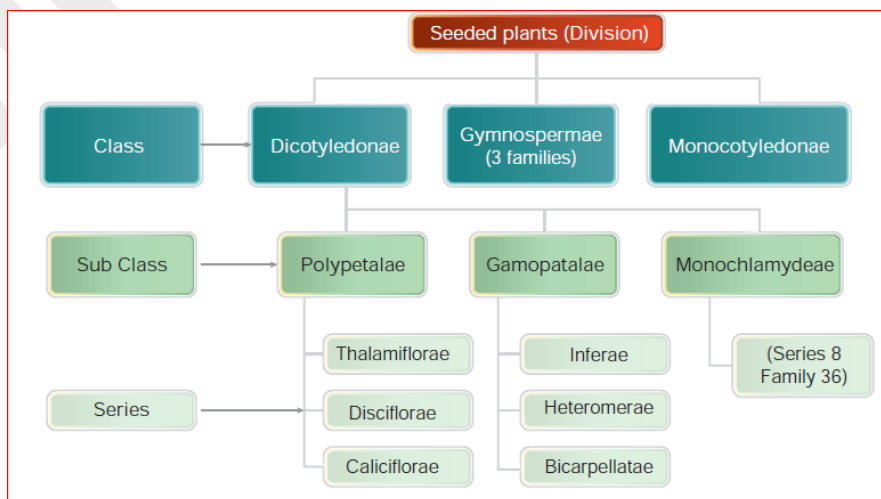
2. Natural system of classification:

In this system, plants are classified on the basis of several characters. Bentham and Hooker's classification is an example of natural system of classification. This system of classification is based on morphological and reproductive characters of the seeded plants. Bentham and Hooker published their natural system of classification in their book named General Plantarum in three volumes. This classification is widely used in many herbaria and botanical gardens all over the world.

Binomial Nomenclature:

The naming of an organisms with two words is known as Binomial Nomenclature. For example, the binomial name of mango is *Mangifera indica*. Here the first word *Mangifera* refers to the genus name and the second word *indica* refers to the species name.

Binomial name was first introduced by Gaspard Bauhin in the year of 1623. Binomial system was implemented by Linnaeus in his book, Species Plantarum. The system of naming the plants on scientific basis is known as Botanical nomenclature.

Outline of Bentham and Hooker's System of Classification

Uses of medicinal plants:

Plants are useful to us in many ways. Some plants along with their parts are used as medicines. Uses of some medicinal plants are given below.

Acalypha indica (Kuppaimeni):

- It belongs to the family Euphorbiaceae.
- The paste obtained from the leaves of this plant is used to cure the burns on the skin.
- The juice of this plant leaves is mixed with lemon juice to cure ringworm.



Acalypha indica

Aegle marmelos (Vilvam):

- It belongs to the family Rutaceae.
- The unripe fruit of this tree is used to treat indigestion.
- It is used to cure chronic diarrhoea and dysentery.



Aegle marmelos

Solanum trilobatum (Thoodhuvalai):

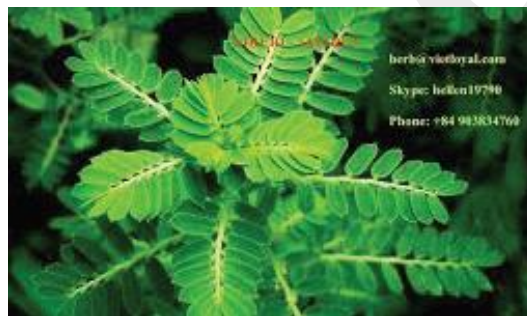
- It belongs to the family Solanaceae.
- The leaves and fruits of this plant cure cough and cold.
- It is widely used in the treatment of tuberculosis and bronchial asthma.



Solanum trilobatum

Phyllanthus amarus (Keezhanelli):

- It belongs to the family Euphorbiaceae.
- The entire plant is used for the treatment of jaundice.
- It gives additional strength to human liver and it is used to treat other liver disorders.



Phyllanthus amarus

Aloe vera (Sothu Katrazhai):

- It belongs to the family Liliaceae.
- Leaves of this plant is used to cure piles and inflammations on the skin.
- It cures peptic ulcer.



Aloe vera

Points to Remember:

- Algae are chlorophyll bearing, simple, primitive plants and they are autotrophs.
- Gametophytic thallus is dominant phase in Bryophytes.
- Parasites have special roots called haustoria.

- Pteridophytes are the first true land plants. They are vascular cryptogams. $\frac{3}{4}$ Gymnosperms are the naked seeded plants.
- Angiosperms are the closed seeded plants (Ovules are enclosed by the ovary).
- Angiosperms are divided into two classes, namely dicotyledons and monocotyledons.
- Scientific method of naming the plants with two words is known as Binomial Nomenclature.
- The paste obtained from the leaves of *Acalypha indica* cures burns on the skin.
- The leaves, flowers and fruits of *Solanum trilobatum* cure cough and cold.

Glossary:

Haustoria - Special roots present in parasites.

Mycorrhiza - Symbiotic association of fungi with higher plant roots.

Epiphytes - Plants growing upon other plants.

Autotrophs - Organisms which prepare their own food.

Heterotrophs - Organisms which depend on other organisms for their nutrition.

Vascular tissues - Tissues which conduct water and minerals.

Polypetalae - Petals which are many but not united.

Gamopetalae - United petal

Monochlamydeae - Flower with single whorl of perianth which can not be differentiated into calyx and corolla.

Do You Know?

The branch of study of fungus is called mycology.

Claviceps purpurea is the hallucinogenic fungi which causes greatest damages to the frustrated youth by giving unreal, extraordinary lightness and hovering sensations.

Aspergillus species cause allergy to children while *Cladosporium* protects against allergy.

Fungi are placed as third kingdom in R.H. Whittaker's five kingdom of classification because of absence of chlorophyll and starch.

Penicillin is known as Queen of Medicine. It was discovered by Sir Alexander Fleming in 1928.

Lycopodium, is known as club moss. *Equisetum* is known as horse tail.

Herbarium is the collection of pressed, dried plants pasted on a sheet and arranged according to any one of the accepted systems of classification.

Largest Herbarium of India is in Kolkata, which has more than 10,00,000 (one million) species of herbarium specimens.

The rules and recommendations regarding binomial nomenclature were found in ICBN (International Code of Botanical Nomenclature). Now it is known as ICN (International Code of Nomenclature).