

08.04.2019

Genetics - மரபாய்வு

பார்மிப்ரியம்

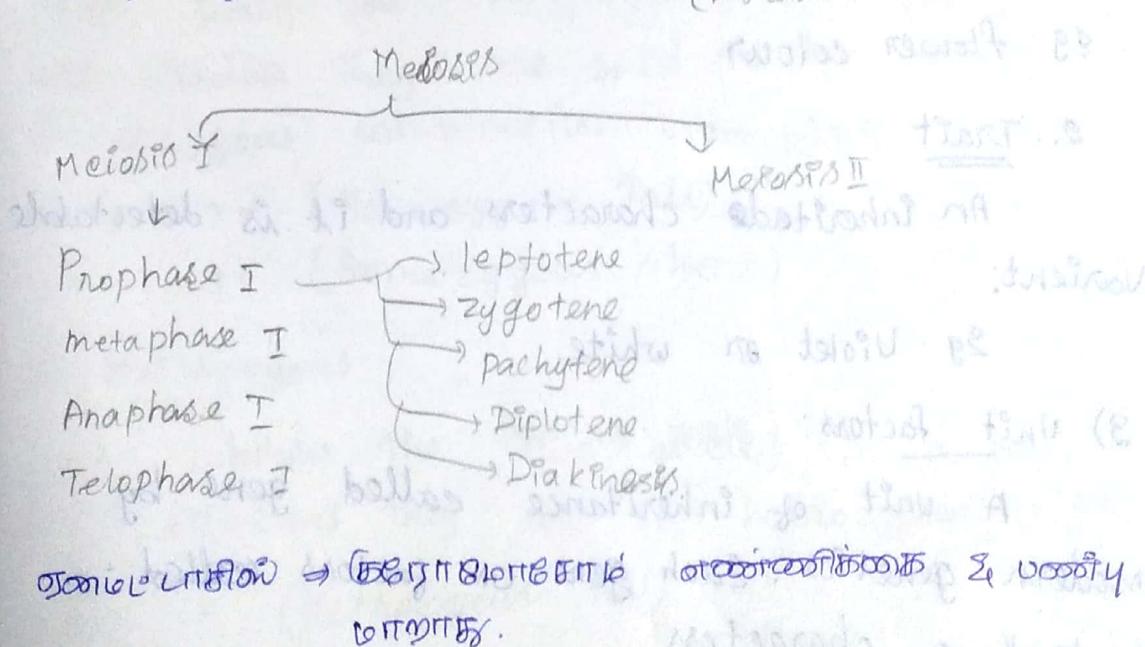
வெற்றிகளானின் பொருத்தம் அடுத்த நிலைகளுக்கு
கடத்தப்பட்டதலே.

The transfer of characters from parents
to offsprings is known as inheritance.

Genetics - மரபாய்வு

It deals with the inheritance as well as
the variations of characters from parents to
offspring.

* எப்ப்ரோடியூநின் குழாய்மாலில் குறைந்த சுலத்துல்
நிறுத்திச் சுட்டு நிலைகளைக் கடத்தப்பட்டுள்ளது
பண்புகள் ஒவ்வொன்றிற்கு கூட மொத்தம் நிலையாக
ஏற்கின்றது. (ஏந்திலை)



நிறுத்துதல் \Rightarrow குழாய்மாலில் நிலைகளின்றை கூட்டுப்
படுத்தல்.

நிறுத்துதல் \Rightarrow நிலைகளின்றை கூட்டுப் படுத்தல்.

நிறுத்துதல் \Rightarrow நிலைகளின்றை கூட்டுப் படுத்தல்.

Variations: கால்வீசி

Variation is the degree by which progeny
differs from parents.

* Variation is common in sexually reproducing
organisms.

- * Asexually reproducing organisms are monoparental, hence they exhibit no genetic variation.
- * Variation in the transmission of genetic characters from parents to offspring.

- * It deals with phenomenon of like begets like.

Eg: Human babies are like human being in overall characters.

Genetic terms & Symbol.

1) Character

It is the feature of the individual.

Eg: flower colour.

2) Trait

An Inherited characters and it is detectable variant.

Eg: violet or white.

3) Unit factors: (genes)

A unit of inheritance called gene by modern genetics. Each gene or factors control a character.

Eg: R or r.

4) Allele

gene which code for a pair of contrasting traits are known allele.

It represents atleast two alternative form a gene or unit factor.

Eg: RR, rr, Rr, rr

3) Phenotype:

- * It is a observable morphological appearance.
 - * The phenotype of an individuals is determined by different combination of alleles.
- Eg: Tallness or dwarfness.

4) Genotype:

It is representation of an individual genetic constituent with respect to a single character/s or a set of characters.

Eg: TT, tt, Tt

5) Homozygous:

When the two alleles of a gene are similar. They are said to be in homozygous combination.

Eg: TT (Homozygous Tall)

tt (Homozygous short)

6) Heterozygous:

When the two alleles in a pair are different they are in heterozygous state.

Eg: Tt (Heterozygous tall)

7) Dominant:

An allele that influence the apperence of the phenotype even in the presence of alternate allele.

* It expresses as complete unmodified product.

Eg: T

10) Recessive: By birth death

An allele that influence the appearance of the phenotype only in the presence of another identical allele.

Eg : t

Mendel's law of Inheritance:

- * Mendel was born on July 20 1822.
- * He worked on pisum sativum (Garden pea or edible pea) for 7 years.
- * He taking 4 pairs of contrasting traits.
- * Mendel was first to apply statistical analysis and mathematical logic.
- * He selected 14 true breeding pea plant varieties.
- * A true breeding line is one that having undergone continuous self pollination.
- * He died due to kidney disorder in 1884.

Mendel selected following contrasting characters in pea plant and chromosome's

S.No	characters	Contrasting trait		Location of trait (On the chromosome) No:
		Dominant trait	Recessive trait	
1.	seed shape	Round	wrinkled	7
2.	seed colour	Yellow	green	1
3.	flower colour	Violet	white	1
4.	Pod shape bean	Full	constricted	4
5.	Pod colour	Green	Yellow	5

6.	Flower position	Axile (at node)	Terminal (at tip)	4
7.	Stem height	Tall	dwarf	4

Mendel's fails:

Mendel's fails no produce same results in

- * Hawk weed (*Hieracium*)

- * Beans (lab lab)

- * Detailed Investigation

Detailed investigation by S. Blunt on pea plant led to locate mendel's seven characters on 4 different chromosome on 1, 4, 5, 7.

Mendel's work did not receive any recognition. It deserved till 1900.

Mendel's work remained unnoticed and unappreciated for several years due to following reason:

1) Communication was not easy in those days and his work could not be widely published.

2) His concept is stable, unblending discrete unit or factors for various trait did not find acceptance from the contemporaries.

3) His approaches of mathematical and statistical analysis to explain biological phenomena was totally new and unacceptable to many of the biologists of that time.

4) He could not provide any physical proofs for existence of factors.

Rediscovery of Mendel's work.

independently (1900)

Mendel's work was rediscovered by

- * Dutch → Hygo de Vries
- * German → Carl Correns
- * Austrian Botanist → Erich Von Tschermak
- * Correns raised "status of mendel's generalisation law"

Reason for mendel select the pea plant:

- * Pea has many distinct alternative traits
(clear contrasting character) → வெளிவரப்பு கூடிய உணர்வு
- * Life span of pea plant short.
- * flowers shows self (bud) pollination so are true breeding. R. Sathiyapriya
- * It is easy to artificially cross-pollinating the pea flowers.
- * The ^{F₁ generation} hybrid thus produced were fertile. → ஒன்றேயாக விளையாத பிள்ளை

Mendel's work & result

- * He first made monohybrid cross.
- * second made Dihybrid cross.
- * Third " Trihybrid cross.

Monohybrid cross:
Cross between parents differing from each other in one character. Eg: stem height.
Dihybrid.

Cross between parents differing from each other in two characters. Seed shape etc.

& F₁ hybrid were self crossed to give rise to F₂ generation.

Reciprocal cross

Mendel also carried out reciprocal cross & found that reciprocal cross gave the same result. Reciprocal means opposite cross.

* The parent which provide male gametes in one cross in second experiment it provide the female gametes and vice versa.

Results of Reciprocal cross:

To proves that both gametes produce the same effect.

Inheritance of one gene:

Mendel studied only one characters at a time & gave three postulates.

Postulate-I

Characters are controlled by a pair of unit factors.

* The unit factors are now called

→ Allele

→ Allelomorphs.

Postulate-II

If two dissimilar unit factors are present in an individual only one expresses it self

→ The one which expresses itself is known as dominant factors.

→ Second which does not express at all is known as recessive factors.

Postulate - III

According to postulating allele responsible for contrasting traits present in an individual do not get mixed & get separated from each other at the time of gamete formation by F₁ hybrid. due to their recombination four combination can be obtained in equal frequency.

Above three postulate Based on

- i) Mendel's Monohybrid cross on one gene interaction.
- ii) Law of Dominance
- iii) Law of Segregation.
- iv) Law of Dominance:
 - When two ^{contrasting} alleles for characters come together in an organism.
 - Only one is expressed completely & shows visible effects.
 - Other alleles of the pair does not express & remain hidden in called recessive.
 - This law is universally applicable.

Monohybrid cross:

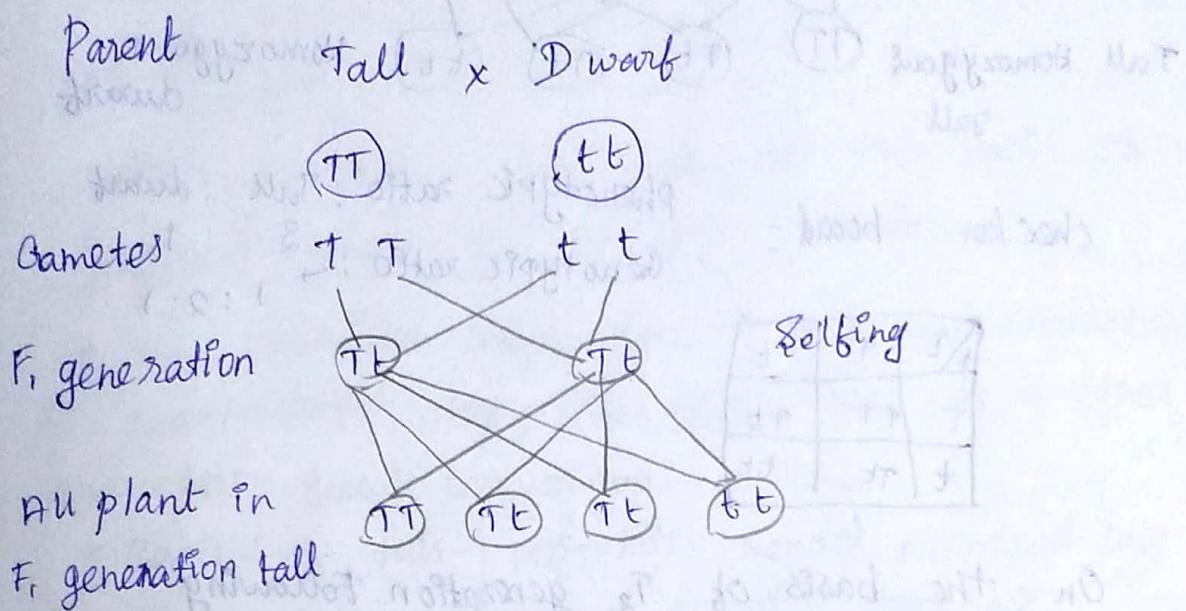
- * Plant height = tall / dwarf.
- * Plant height controlled by two allele.
 - Dominant allele (T)
 - Recessive allele (t)

* The two allele can be present in three forms.

* i) TT - Dominant allele expressed

- ii) tt - recessive allele expressed } Homozygous

iii) Tt - Dominant allele expressed \rightarrow Heterozygous.
(Characters of hybrid)



He observed that all the F₁ progeny plants were tall. Like of one of the plants

i) Law of Segregation or Law of pairing of gametes.

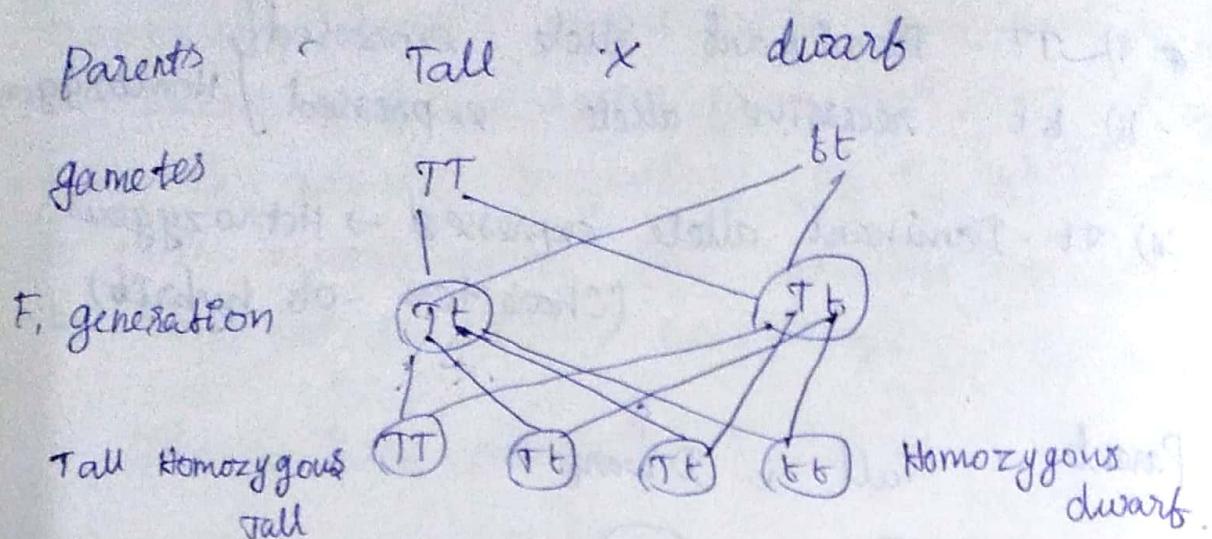
* This law state that presented parental allele.
(Recessive & dominant)

* F₁ separate & are expressed phenotypically in F₂ generation.

This law is universally applicable.

* F₂ generation was produced by allowing F₁ hybrid to self pollinate. To find out segregation or separation.

* It was observed that both dominant & recessive plants appeared in 3:1



checker board: phenotypic ratio: Tall : dwarf

Genotypic ratio: $\frac{3}{1}$

$1:2:1$

T	T	t
T	TT	Tt
t	Tt	tt

Homozygous tall

Heterozygous tall

Homozygous dwarf

On the basis of F₂ generation following observation can be made:

* These allele may either similar or dissimilar.

* Organisms with similar allele of a pair is called pure or true breeding.

* If the organisms contains a dissimilar allele of a pair is called impure or ~~true~~ hybrid

* In monohybrid cross

The plant is obtained in F₂ generation shows 3:1

3. Tall, 1-dwarf [Phenotypic ratio 8:1]

* of these three tall plants one is pure or homozygous dominant (TT)

Rest two Heterozygous Tall (Tt)

* Only one plant that shows recessive characters (dwarf)

Inheritance of two genes:

Postulate:

* This postulate was made on the basis of dihybrid cross or two gene interaction.

* He postulate that inheritance of one characters is independent of the inheritable of another characters.

* Basis of this postulate mendel proposed law of independent assortment.

Dihybrid cross:

Mendel selected two characters

seed shape & seed colour

seed shape Round & wrinkled

* Round is dominant

* wrinkled is recessive

In other words

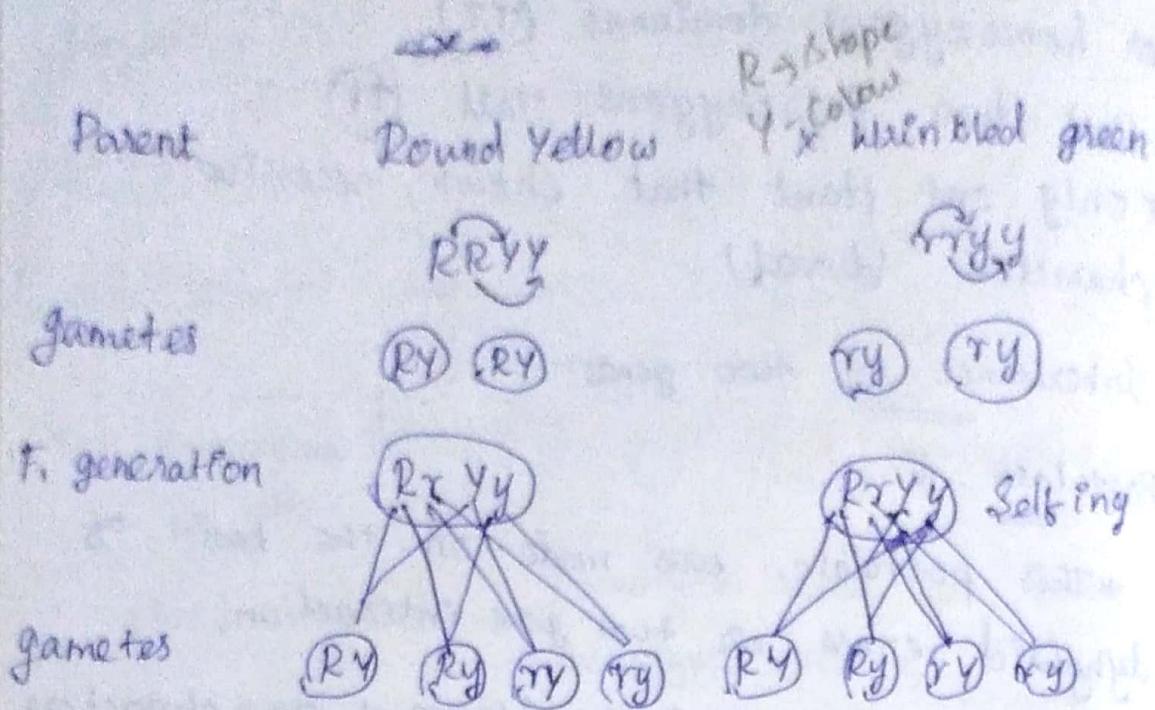
seed colour yellow green. Here yellow is dominant, green is recessive.

Therefore two diff character parents crossed

He got a F₁ hybrid are Round & yellow coloured plants.

Then F_1 hybrid are selfing we get

F_2 generation 9:3:3:1



♀	♂	RY	Ry	rY	ry	Phenotypic ratio
RY	RRYY 2 बोडिंग लिंब	RRYy 2 बोडिंग लिंब	R _r YY 2 बोडिंग लिंब	R _r Yy 2 बोडिंग लिंब	R _r Yy 2 बोडिंग लिंब	Round Yellow : 9
Ry	R _r YY 2 बोडिंग लिंब	Round green : 3				
rY	R _r YY 2 बोडिंग लिंब	R _r Yy 2 बोडिंग लिंब	rrYY सर्कारी लिंब	rrYy सर्कारी लिंब	rrYy सर्कारी लिंब	wrinkled Yellow : 3
ry	R _r Yy 2 बोडिंग लिंब	R _r Yy 2 बोडिंग लिंब	rrYy सर्कारी लिंब	rrYY सर्कारी लिंब	rrYY सर्कारी लिंब	wrinkled green : 1

Genotypic ratio :

RRYY → 1

R_rYy → 2

RRYy → 2

rrYy → 2

R_rYY → 2

rrYY → 1

R_rYy → 4

rrYY → 1

RRYy → 1

it has two kinds of flower so it is called diadiploid

Experiment No.	Phenotypic ratio	Example
1. Complementary gene	9:7	flower colour in Sweet pea
2. Duplicate gene	15:1	capsule shape in Shepherd Purse (capsule)
3. Recessive epistasis	9:3:4	Mice coat colour
4. Dominant epistasis	15:3:1	fruit colour in summer squash (<i>Cucurbita Pepo</i>)
5. Polymeric / additive gene	9:6:1	Fruit shape in summer squash
6. Inhibitory gene	13:3	leaf pigmentation in rice
7. Supplementary gene	9:3:4	seed coat colour in lablab (Bean)
8. Collaborative gene action	9:3:3:1	Comb shape in poultry

~~Collaborative gene action~~

F10419
Date

Microbes in human Welfare:

- * Microbes belongs to diverse group of organisms.
- * They include
 - * viruses + bacteria + fungi + protozoae.
- * Viroids and Prions are included amongst microbes.
- * Viruses or Viroids cannot be cultured in cell free extract.
- * Microbes are act as a causal agent of most of the infections diseases But,
Some are also use by human & nature in many important process in
 - * home * industries * Agriculture
 - * sewage treatment.
- * Microbes used in many ways some are
- i) * Microbes used in house hold products
 - * n n Industrial products.
- * n n Sewage treatment
- * n n production of biogas
- * n n bio control agent
- * n n Biofertility.
- * n n Soil fertility etc.

D) Microbes used in household products:

i) Dairy products:

- * Lactic acid bacteria is also known as LAB
- * Lactobacillus is one of the lactic acid bacteria
- * It is added to the milk & it convert lactose Sugar of milk into lactic acid than milk is charged curd, Yoghurt, cheese.

i) Curd

- * *Lactobacillus acidophilus*
- * temperature about 40°C or less
- * Curd contain more nutritious than milk because It contains a number of vitamin especially Vitamin B₁₂.

ii) Yoghurt

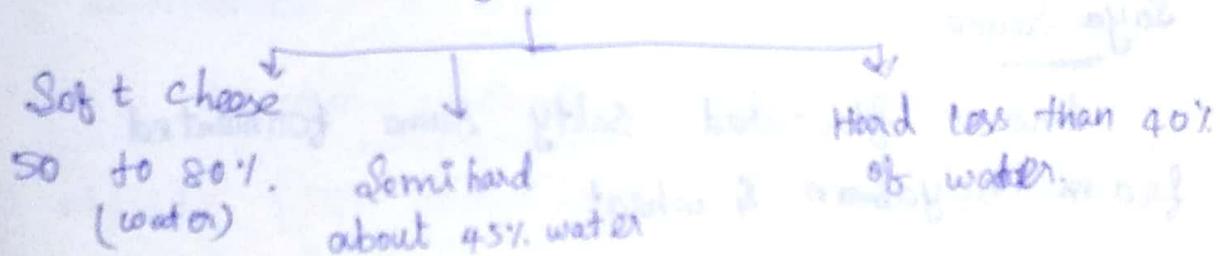
- * ~~*Streptococcus*~~ *thermophilus*
- * *Lactobacillus bulgaricus*.

iii) Buttermilk

- * *Streptococcus cremoris*
- * *Streptococcus lactis*
- * *Lactobacillus acidophilus*
- * Lauterostreptococcus species at 22°C for 18 hours.

iv) Cheese:

Three types of cheese



* Large wheel swiss cheese is produced by *Propionibacterium shermanii*. This cheese is ripened with the help of CO_2 produced by this bacterium.

* Roquefort cheese was produced by *Penicillium roquefortii*.

* Comembert cheese employed by *Penicillium comemberti* for ripening.

2) Bread :

Saccharomyces Cerevisiae (Yeast) grown on molasses are used as Baker's Yeast.
(திரும்புவது)

3) Dosa, Idli & Uppma:

They are fermented preparation of rice & gram. They are allowed to ferment 3-12 hrs with *Lactobacillus* & *Streptococcus* bacteria.

4) other food:

* Temph:

fermented food for Indonesia

* Tofa " " " Japanese

* Sufu " " " Chinese.

Soya Sauce:

brown flavoured, salty same fermented from soyabean & wheat.

* Tender bamboo:

Tender bamboo shoots are used as vegetable directly as well as fermentation.

* Several type of sauce are prepared by fermentation.

* Curing of fish & meat used in microbes.

*

5) Toddy

* Toddy palm (*Cocos nucifera*)

The unopened spadices of coconut are topped to obtain toddy which is a refreshing drink. It contains 6% alcohol content.

II] Microbes used in industrial products:

i) Alcoholic fermentation:

Yeast used in alcohol fermentation are

* *Saccharomyces cerevisiae* (Brewer's Yeast)

* *Saccharomyces ellipsoideus* (Wine Yeast)

* *Saccharomyces sake* (Sake Yeast)

* *Saccharomyces pastorianus* (Ginger beer / Ale Yeast)

* Wine & beer are produced without distillation.

Alcohol content in beverages:

* Whisky [50% alcohol]

* Rum [40% alcohol]

* Brandy [65-70% alcohol]

* Rum [40% alcohol]

They are produced by distillation of fermented broth.

Antibiotic

Antibiotic means against life

* First antibiotic generally associated generally with the name of Alexander Fleming (1928)

- * When he discovered penicillin from *Penicillium notatum*.
- * Penicillin is a first antibiotic it is otherwise called Queen of medicine.
- * Antibiotic was commercially extracted by Chain & Florey.
- * These chemical was extensively used in treating wounded American soldiers in world war II.
- * Fleming, Chain, Florey were awarded nobel prize in 1945.
- * Antibiotics have generally improved our capacity to treat deadly disease like, plague, Whooping cough, diphtheria, leprosy etc.

Streptomycin:

Waksman & Albert (1943) discovered streptomycin.

Streptomycin is extracted from *streptomyces griseus*.

Uses:

- * It is used to urinary infection.
- * tuberculosis
- * Meningitis
- * pneumonia

Auromycin:

streptomyces aurofaciens.

Used in:

used as medicine to treat whooping cough & eye infection.

Chloromycin:

extracted from *streptomyces venezuelae*

Use: It is used to treat typhoid fever.

Bacitracin:

Bacillus licheniformis.

It is used to treat syphilis.

Polymyxin:

extracted from *Bacillus polymyxa* pt cure some bacterial disease.

Fungi:

cephalosporin
Acne monium chrysogenum.

Griseofulvin:

Penicillium griseofulvum.

Ergotamine (ergot alkaloid)

Claviceps purpurea.

chemical, enzymes, other bioactive molecule.

Bioactive molecule:

It is a molecule which are functional in living system or interact with their components.

a number of them are obtained from microbes.

Organic acid:

* Acetic acid (Vinegar)

It is prepared from fermented alcohol with the help of acetic acid bacteria *Acetobacter aceti*.

oxalic acid, citric acid are produced by the fungus *Aspergillus niger*

* Yeast are rich source of Vitamin B complex.

Citric acid:

* It is obtained through fermentation carried out by fungi *Aspergillus niger* & *Mucor* species on sugary syrups.

* Citric acid is employed in dyeing, engraving, (are a design on hard surface) medicine, ink, flavouring & preservation of food.

Gluconic acid:

The acid prepared by the activity of *Aspergillus niger* & *Penicillium chrysogenum*. *Calcium bacterium* *Acetobacter aceti*.

Butyric acid:

Butyric acid is extracted by *Clostridium butylicum*.

b) Enzymes:

1) Proteases:

It is obtained from *Mucor*, *Mucorella*, *Zygospora*, *Aspergillus*, *Bacillus* sps.

2) Amylases:

It is obtained from *Aspergillus*, *Rhizopus*, *Bacillus* sps.

Amylases, gluco amylases, gluco isomerase are employed in conversion of corn starch into fructose rich corn syrup.

3) Streptokinases:

It is an enzyme obtained from culture of some haemolytic streptococci
It has fibrinolytic effect.

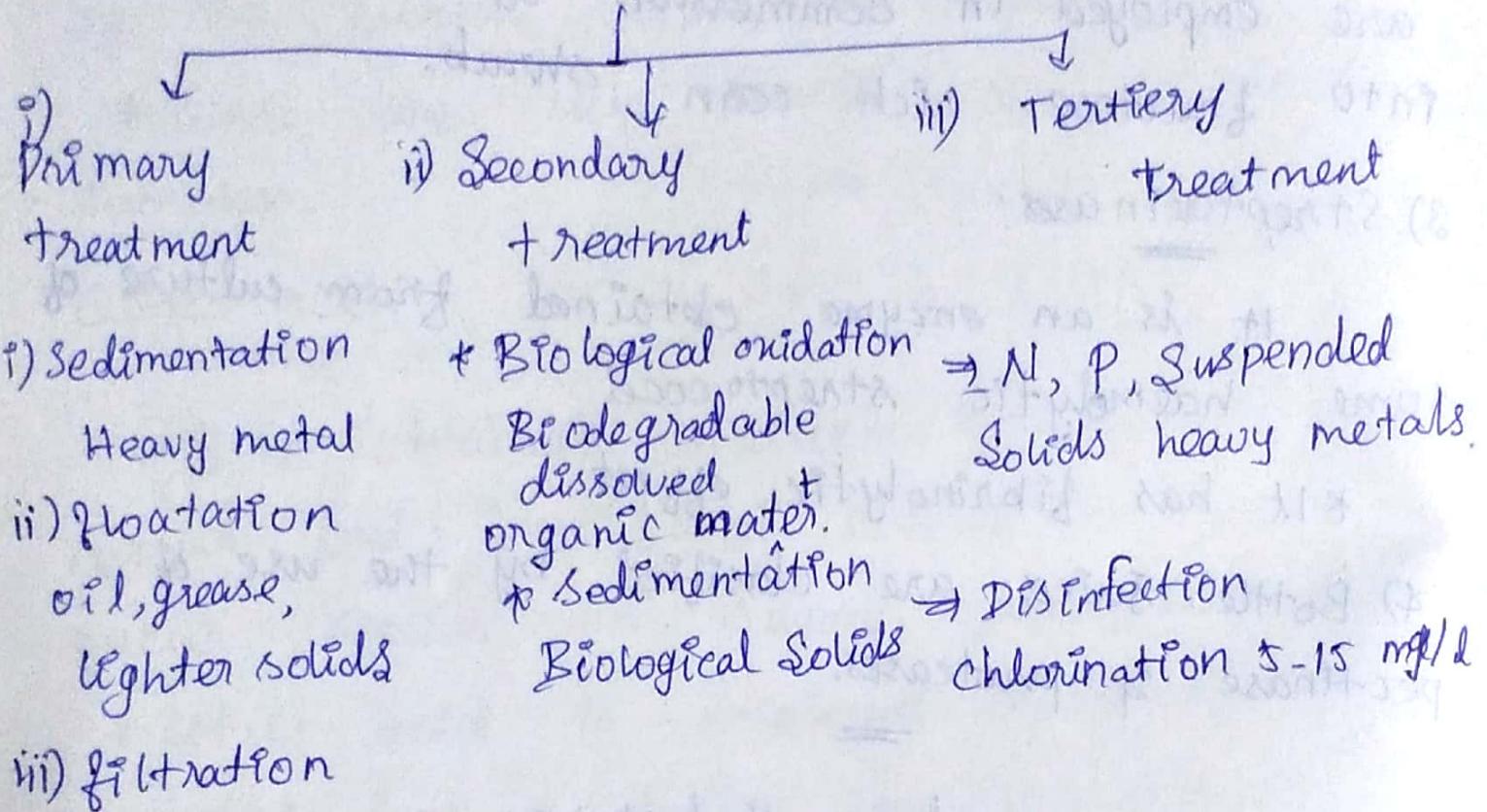
4) Bottled juices are classified by the use of pectinase & proteases.

III) Microbes used in Industries:

Curing of coffee bean, tea leaves, tobacco leaves are fermented by the bacteria *Bacillus megaterium*.

- * It is generated largely in cities and towns
- * Sewage contain large amount of domestic water & waste including.
- * Human & animal excreta
- * Microbes & everything
- * It is passed to river streams, & others water bodies.

There are three type of sewage treatment



→ Sewage treatment is the physiochemical process in which chlorine gas, zirconium, ozone gas, per chlorate salts, UV rays or reverse osmosis are used to remove DDT, pesticide,

River action plant:

* prior to 1985 very few cities & towns had sewage treatment plant.

* The municipal waste water was discharged directly into rivers resulting in the pollution & high incidence of water borne disease such as

* Typhoid & dysentery & cholera & diarrhoea

* In order to protect the major rivers of India from sewage pollution.

* The ministry of environment & forest has initiated development of sewage treatment plants, under the National river conservation authority

Ex: * Ganga Action plan (GAP)

* Yamuna Action plan

* Sutlej Action plan & Gomti Action plan.

23/04/19

* The plant cells have eukarytic structure with prominent chloroplast & cell wall mainly made up of cellulose.

* life cycle of plants two distinct phases.

i) diploid sporophytic * ii) Haploid gametophytic

which are either alternation with each other.

* The length of the haploid & diploid phase vary among different group in plants.

* Alternation of generation:

The haploid & diploid phases are free living or dependent on others.

System of classification:

There are three type of classification

i) Artificial classification

ii) Natural classification

iii) phyto genetic classification.

Other important one APG classification:

i) Artificial classification

a) Basis of classification.

* Based on one or few superficial or morphological characters.

* They were mainly based vegetative characters or androecium structure.

b) Contributors:

Theophratus:

* father of Botany.

* He classified the plants basis of habit.

* herb & under shrubs & shrubs.

* Trees.

Carolus Linnaeus:

* Swedish botanist * father of taxonomy

* book species plants 1753.

* describe 7,300 species.

* divided 24 classes.

24 classes:

1) Monandria → Only one stamen.

2) Diandria → Stamen 2

3) Triandria → Stamen 3

4) Tetrandria → Stamen 4

5) Pentandria → Stamen 5

6) Hexandria → Stamen 6

7) Heptandria → Stamen 7

8) Octandria → Stamen 8

9) Enneandria → Stamen 9

10) Decandria → Stamen 10

11) Dodecandria → 11 to 19 Stamen

12) Icosandria

Stamen 20 to more attached to the

Calyx.

13) Polyandria

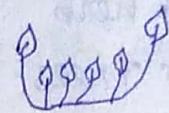
Stamen 20 or more attached to the
~~receptacle~~ receptacle.

14) Didynamia

Stamen Didynamous.

15) Tetradynamia

Stamen tetradynamous.



16) Monoadelpbia (மொந்தோப்பு)

Stamen mono adelphous.

17) Diadelphus: இருப்பு ஏக் கங்கு

Stamen diadelphous.

18) Polyadelpbia:

Stamen polyadelpbus.

19) Syngenesia (ஒத்தந்தலைப் பொன்றது, ஒத்தந்தந்துமிழு
துறவுடையது)

Syngenesious stamen.

20) Gynandria (stamen ~~badnats~~ to the gynoecium,

21) Monoecia (ஒந்தோப்பு)

plant monoecious

22) Dioecia (ஒந்தோப்பு)

plants dioecious.

23) Polygemia (ஒன்றின்மொலைப்பு)

plant polygamous.

34) Cryptogamin

flowerless plants

include

algae & fungi & mosses & ferns.

monodonta

monocot - zingiberaceae

Dicot - Anacardiaceae

* *Prunus* was classified along with cactus.
Because the same no. of stamen.

Drawbacks:

* It is based ^{on} one or few characters.
Hence,

The diverse animals or plants placed
in limited no. of groups.

* Natural affinities & phylogenetic characters
were not considered.

* The artificial system gave equal
weightage to vegetative & sexual.

* This is not acceptable & since we knew
that the vegetative characters are most
easily by environment.

Natural System:

Basis of classification

to be conceded

* Morphological & cytological & Anatomical.

* Physiological etc.

Contributors:

Bentham & Hooker.

Plantae

↓
Cryphogamia
Seedless plants
↳ Thallophytes
Bryophytes
Pteridophytes

↓
Phenogamous
(Seeded plants)

Based on no. of cotyledones

Dicotyledonae

Based on petals

Polypetalae

Thalamiflorae
6 order
34 families

Disciflora
4 - or, 23 - fam

Calycoflora
5 - or, 22 - fam

Gamopetalae

Inferae
3 - or, 9 fam

Heteromerae
3 - or, 19 fam

Bicarpellate
3 or, 24 fam

Monochlamyd.

8 series
36 families

Phylogenetic classification:

Basis of classification:

Evolutionary relationship

Genetic affinity

Fossil record.

Contributor:

Adolf Engler & Carl Prandl

Cronquist

Stimulus for classification of phylogenetic classification:

concept of Charles Darwin origin of species.

Engler & Prantl's book is

Die natürlichen Pflanzen

which is a classification for plants

and for Kingdoms

History of evolution

(Aboriginal tribes) +

changes +

survival +

changes +

(a) natural (b) man-made (c) hybrid

for studies of plant systematics

together with associated morphological & anatomical

features as evidence for specific relationships

Branches of Taxonomy:

i) Morphology:

On the basis of external characters

ii) Cytotaxonomy or karyotaxonomy

On the basis of number, structure & behaviour of chromosome during cell division.

iii) Chemotaxonomy.

Basis of classification in Biomolecules like.

* Sequencing of DNA

* Cheminature of proteins

*

* Calcium oxalate (Glycals)

* Crystals

* Calcium carbonate

Crystals

iv) Numerical taxonomy (or) phenetics (or) Taximetrics.

Numerical method for the evolute of similarities & differences between the species with the help of calculator or computer.

* Number & code are assigned to all characters.

dendrogram:

Family tree of organisms on the basis of phenetics or numerical taxonomy. So let us start with detailed study of different plant group.

Total Number of plant groups in the world

E India

Rank	plant group	World	India
1.	Algae	40,000	7,357
2.	Bryophytes	16,236	2,748
3.	Pteridophytes	12,000	1,289
4.	Gymnosperms	1,012	79
5.	Angiosperms	2,68,000	18,386

Algae

Another division

* The study of algae is called Algology or

Phycology.

* Father of Indian phycology M. O. Parthasarathy.

* He conducted the research on structure, cytology, reproduction & taxonomy of algae

* He published monograph on Valvocales.

* New found new algal forms.

Fucuschella

Sabalocystopsis

Solient feature of algae:

* Algae are autotrophic & grow wide range of habitats.

* Majority of the aquatic.

i) Marine

- *Gracilaria*

* *Sargassum*.

ii) Fresh water
+ *Oedogonium* + *Vlothrix*

iii) Soil
+ *Frischella* + *Vaucheria*

iv) Endophytic life (Hydra & Sponges)

+ *Chlorella*

v) Ectophytic life:
Cladophora aristata grow on the
shells on *Molasea*.

Salt pans:

Dunaliella Salina

+ Snow covered mountains

+ *Chlamydomonas nevatis*

+ It imported the red colour to the
snow the snow is called red snow:

Epiphytic algae

grow on surface of aquatic plant

+ *Coleochaete* + *Rhodis menia*

1) Alcology (or) phycology → Study of algae

2) Mycology → Study of fungi

3) Bactriology → Study of Bacteria

4) Virology → Study of Virus

5) Histology → Study of Tissue

6) Acanthology → to study of spined things
in particular sea