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Classification of Crops

(A) Taxonomic Classification of Crops :

1. Poaceae (Graminae) or Grass family : Cereals, **Sugarcane, Napier, Paragrass.**
2. Papilionaceae (Leguminosae) or Pea family : Pulses, Legumes, **Groundnut, Sunnhemp.**
3. Cruciferae/Mustard Family : Mustard, Radish, Cabbage, Cauliflower, Knolkhol.
4. Cucurbitaceae/Gourd family : All gourds (e.g. bottle gourd, bitter-gourd), Cucumber, Pumpkin.
5. Malvaceae/Cotton Family : **Cotton, Bhindi, Roselle.**
6. Solanaceae/Brinjal family : Brinjal, Potato, Tomato, tobacco, Chillies.
7. Tiliaceae : **Jute, Phalsa.**
8. Asteraceae (Compositae) : Sunflower, Safflower, Niger.
9. Chenopodiaceae : Spinach, Beet, Sugarbeet.
10. Pedaliaceae : **Seasame**(Sesamum)
11. Euphorbiaceae : Castor, tapioca.
12. Convolvulaceae : Sweet potato
13. Umbelliferae : Coriander, Cumin, Carrot
14. Alliaceae : **Onion, Garlic**
15. Zingiberaceae : Ginger, turmeric.

(B) Special Classification :

1. **Arable Crops** : Which require preparatory tillage e.g. potato, tobacco, rice, sugarcane, maize etc.

2. **Alley Crops** : Such arable crops which are grown in alleys/passages formed by trees or shrubs, established mainly to hasten soil fertility restoration, enhance soil productivity and reduce soil erosion. Slight shade tolerance and non-trailing habit are the prerequisites of Alley crops e.g. Arable crops like sweet potato, urd, turmeric & ginger are grown in the passages formed by the rows of Eucalyptus, subabool and cassia.
3. **Augmenting Crops** : Such crops are sown to supplement the yield of the main crops e.g. Japanese mustard with Berseem, Chinese Cabbage with mustard. Here Japanese mustard and Chinese cabbage help in getting higher yield in the first cutting.
4. **Avenue crops** : Such crops are grown along farm road and fences e.g. Arhar, Glyricidia, Sisal-etc.
5. **Border crops/Barrier/Guard Crops** : Such crops help to protect another crops from trespassing of animals or restrict the speed of wind and are mainly grown as border e.g. safflower (thorny oilseed crops) is planted around the field of chickpea.
6. **Brake crops** :
 - to break the continuity of agro-ecological situation of the field under multiple cropping systems.
 - to reduce the inoculum of soil-borne harmful biotic agents such as weeds, pest and improves soil condition for crop growth e.g. Legume in rice-wheat system.
 - are also used to designate guard crops — particularly those which help to break (retard) the wind speed and protect crops from wind hazards.
7. **Cash crops** : Such crops are grown for sale to earn hard cash e.g. Jute, Cotton, Tobacco, Sugarcane.
8. **Catch/contingent/Emergency crops** : Such crops are cultivated to catch the forthcoming season when main crop is failed. They are of very short duration, quick growing, fast bulking, harvestable or usable at any time e.g. greengram, urd, cowpea, onion radish etc.
9. **Cleaning crop** : Whose agronomical practices makes the field clean e.g. potato, maize etc.

10. **Cole crops** : 'Cole' is derived from colewort. Colewort is the ancestor of wild cabbage. Therefore, cole crops are essentially cold weather crops belonging to the cruciferae capable for withstanding considerable frost e.g. cabbage, cauliflower and Brussels sprouts.
11. **Contour Crops** : Grown on or along the contour lines to protect the land from erosion e.g. marvel grass etc.
12. **Commercial crops** : Such crops are grown to earn money e.g. Jute, Cotton, tobacco, Sugarcane etc. Cash crops are certainly commercial crops.
13. **Cover crops** : Able to protect the soil surface from erosion through their ground covering foliage and/or root mats e.g. lobia, groundnut, urd, paragrass, sweet potato.
14. **Complementary crops** : Each other crop is benefited in intercropping e.g. Jowar+Lobia. Jowar receives nitrogen from lobia and lobia requires support from jowar.
15. **Competitive crops** : Such crops compete to each other and are not suitable for intercropping e.g. two cereals.
16. **Supplementary crops** : Such crops are neither competitive nor complementary e.g. maize+cucurbits.
17. **Exhaustive crops** : Such crops leave the field exhaustive after growing e.g. cereals.
18. **Energy crops** : To obtain liquid energy such as ethanol and alcohol e.g. sugarcane, potato, maize, topioca.
19. **Fouling crops** : Whose cultural practices allow the infestation of weeds intensively e.g. direct seeded upland rice.
20. **Ley crops** : Any crop or combination of crops is grown for grazing or harvesting for immediate or future feeding to livestock e.g. Berseem+mustard. Such cropping is called ley cropping.
21. **Mulch crops** : to conserve soil moisture, such crops are grown e.g. cowpea.
22. **Nurse crops** : Such crops help in the nourishment of other crops by providing shade and acting as climbing sticks e.g. rai in peas, jowar in cowpea.

23. **Paira/Utera Crops** : Growing of such crops sown a few days or weeks before harvesting of standing mature crops is called paira/utera cropping and the sown crop is called paira/utera crop e.g. Lathyrus in rice, paira cropping in succession may constitute relay cropping.
24. **Paired row cropping** : Each third row is removed or growing of crops in paired row is called paired row cropping. It is suitable for dryland and objective is to conserve soil moisture.
25. **Restorative crops** : Such crops provide a good harvest along with enrichment or restoration or amelioration of soil e.g. Legumes.
26. **Riparian crops** : Grown along irrigation and drainage channels or waterbodies e.g. waterbind weed (kalmi sak), para grass. They help to protect the soil from erosion.
27. **Skip Cropping** : A line is left unsown in the regular row series of sowing is called skip cropping.
28. **Silage crops** : Such crops are grown to preserve in pits in a succulent condition by a process of natural fermentation or acidification for feeding livestock during lean months or offseason e.g. cowpea, jowar etc.
29. **Smother crops** : Able to smother (suppress) the population and growth of weeds by providing dense foliage and quick growing ability e.g. cowpea, mustard.
30. **Soiling crops** : Grown to harvest while they are still green and fed fresh to livestock in stalls e.g. barseem, napier etc.
31. **Trap/Decoy Crops** : Grown to trap insect-pests and soil-borne harmful biotic agents such as parasitic weeds e.g. cotton red bug is trapped by growing Bhindi around the cotton and **orobanche (weed)** is trapped by **solanaceous plants** and **striga** by **sorghum**.
32. **Truck crops** : Grown to market fresh e.g. Bhindi, spinach.
33. **Ware Crops** : Such crops are grown for temporary storing as intact in warehouse for future use or sale e.g. potato.



Weeds -

origin of weeds - It is considered that many weeds principally originated from two important and major arbitrarily defined groups -

- 1) By man's conscious effort.
- 2) By invasion of plants into man created habits.

→ In world there are 30,000 weed species, out of which 18,000 species cause damage to crops.

→ Weeds are competitive and adaptable to all the adverse environments.

→ Weeds cause 5% loss to agri production in most developed countries.

10% loss in less developed countries.

25% loss in least developed countries.

* Weed word, Tillage, zero tillage, Horse Hoeing Husbandry (MHH Book).
~ By - Jethro Toll.
1931 in book horse hoeing husbandry.

* Zero Tillage concept → Triplet.

* 1st time zero tillage use by → USA in 1950.

* zero tillage first time discovered by → Japan.

Weed Definition - Any unwanted, undesirable, and out of place (from its origin) plant which ~~is called as weed~~ which interferes with the land & water resource & adversely effect human welfare is called as weed.

→ "The obnoxious plants are known as weeds"
~ W.W. Robbins et al. 1942.

• weeds snatches major parts of nutrients, water, light, place, and CO₂ available to the crop.

• Due to tough competition ^{crop} suffers adversely & production is reduced.

→ weeds are → 1) unwanted plant

2) a plant out of place (growing where not required)

3) extremely noxious, useless, poisonous

4) Any plant or vegetation including fungi interferes with the objectives or requirements of people.

Criteria to be a weed & whether a plant is weed or not depends on :-

- 1) characteristics & habit of plant.
 - 2) Relative position.
 - 3) Time of occurrence of plant.
- ↳ In some situations all plants become a weed.

Characteristics of weeds :-

- 1) Produce enormous no. of seeds. eg - wild oats (*Avena fatua*) produces 250 seeds/plant.
- 2) Thrive well even in adverse conditions. because they can modify their seed production & growth according to availability of moisture & temp. ?
- 3) seeds remain viable for many years without losing its viability. eg - field bind weed (*Convolvulus arvensis*) for about 50 yrs.
- 4) ^{weed} seeds have tremendous capacity to disperse through wind from one place to another by wind, water, animals & man.
- 5) weed seeds mimic with the crop seeds due to their size & get transported with them.
- 6) Able to regenerate lost parts
- 7) compete with cultivated plants
- 8) all seeds of weed mature simultaneously.
- 9) weeds have allelopathic effect on crops
- 10) produces seeds in flushes
- 11) seed production through apomixis, spore etc.
- 12) weed seeds have dormancy either inherited or induced.
- 13) have short period of plant growth.
- 14) generally grow at faster rate and produce seeds earlier than most of crops in growing in association.

Harmful effects of weeds

Of the total annual loss of agricultural produce from various parts in India, weeds ^{accounts for} 45%.

insects → 30%
diseases → 20%
other → 5%

The loss due to weeds depends on:-

- 1) Type of weed
- 2) Severity of infestation
- 3) Duration of infestation
- 4) Competitive ability of crop plants with weed.
- 5) Climate conditions which effect the growth of crop and weeds.

Harmful effects are:-

① Weed menace in agriculture

- By reduction of crop yield has direct correlation with weed competition. for water, light, nutrient, space.
- Besides direct relation, reduction in crop yield, there are many indirect ways, by which weeds may be troublesome eg- hairy vetch become troublesome when field bind weed (*Convolvulus arvensis*) and morning glory (*Ipomoea sp.*) bind the crop plants together.
- It reduces the quality of farm produce.
eg- quality of sugarcane crop reduce due to presence of parasitic weed (*Striga litoria*)
- Land unsuitable for economic crop production when land infested with *Cynodon dactylon*, *Cyperus rotundus*.
- In rice crop *Echinochloa* and *Panicum* act as alternate host for stem borer.

② Diseases - wild mustard act as alternate host for stem club root / black leg along with cabbage, cauliflower.

③ Weed menace in animal husbandry :-

- Milk gives odd smell when animal fodder crops are mixed with wild onion, wild garlic, Cichorium intybus, Argemone mexicana.
- Certain weeds cause sickness & death of animals due to high levels of alkaloids, tannins, oxalates, glucosides or nitrates.
- Leaves of lantana cause acute photosensitivity & jaundice in animals due to toxic principle of lauradene.
- Crotalaria spp. is fatal to chick.
- whereas Sweet clover contains (Melilotus alba) contains dicoumarin which act as anti blood coagulant.

④ Weed menace to human health :-

- Parthenium hysterophorus, common rag weed are responsible for respiratory problems & skin allergies (dermatitis).
- Aquatic weeds like water lettuce (Pistia lanceolata) act as alternate host & vector for malaria, yellow fever, dengue, filariasis.
- When Mexican poppy seeds (Argemone mexicana) crushed with mustard seeds cause death & blindness of people.

⑤ Weed menace to aquatic ecosystem :-

- weeds make the appearance of water bodies repulsive & decline their recreational value.
- weeds hinder navigation, fishing, slow down irrigation channels.
- upon decomposition emit offensive odour & pollute drinking water bodies.

⑥ Weed menace to forest & pasture lands :-

- In Karnataka & Andhra Pradesh large forest area come under the grip of Parthenium hysterophorus.
- In West Bengal 11% of high forest area & 38% of plantation population forest have been affected by Mikania micrantha (mile-a-minute weed).

Beneficial effects of weeds / Economic uses of weeds :-

Several weeds have economic uses since ages.

- 1) Cichorium intybus roots are used for adding flavour to coffee powder.
- 2) Chenopodium album, Amaranthus viridis used as leafy vegetables.
- 3) In north India, Saccharum spontaneum used in breeding programme for developing noble canes.
- 4) Crotalaria, Panthemum, Calotropis, Eichornia reduces root knot nematode population in soil as they exhibit nematocidal properties.
- 5) Kariyali grass (Cynodon dactylon), Dicanthium annulatum weeds of grain serves as food for animals.
- 6) People in China, Japan consume Chlorella pyrenoides (algae) as protein supplement.
- 7) Eichornia crassipes (Cu, Zn, Pb, Cd) identify metals in water bodies through satellite images.
- 8) Eichornia crassipes use for composting.
- 9) NO₂ air pollution determined by wild mustard.
- 10) SO₂ " " " " chick weed.
- 11) Aquatic weeds useful in paper, pulp & fibre industry.
- 12) Chenopodium album use as mulch to reduce evaporation loss.
- 13) Agropyron repens (quack grass) control soil erosion due to its prolific root system.
- 14) Lantana camara, Amaranthus viridis, Chenopodium alba, Eichornia crassipes use for beautification.
- 15) use to cure snake bite → Leucas aspera
gastic troubles → Calotropis procera
skin disorders → Argemone mexicana
control diabetes → Stigma orbanchooides
- 16) preparation of agarbathis → Cyperus rotundus
aromatic oils → Simbopogon sp., andropogon sp.

Classification of weeds :-

1) On the basis of site of Predominance :-

Obligate weeds

- grown only in association with man & his agriculture.
- It is never found in wild form.
eg - Chenopodium album
• Anagallis arvensis.

Facultative weeds

- grown both as wild and in cultivated habitats.
eg - Argemone mexicana
• Euphorbia hirta.

2) On the basis of dependence of host plants :-

Total root / Holo root parasite

eg - Orobanche
[Solanaceae, mustard]
tobacco.

Parasite depends totally on other plants roots & obtain nourishment from them. (host)

Total stem / Holo stem parasite

eg - Cuscuta
[legume, lucerne, kuseem, linseed]

Semi-root parasite

eg - Stigma
(witchweed)
[Poaceae, sunflower]

Parasite which photosynthesize their own food but tap the roots of other species for water & inorganic nutrients.

Semi-stem parasite

eg - Loranthus
(birdvine)
[mango, citrus, tea
(flowering stage)]

3) On the basis of botanical / Morphological characters :-

Grasses

eg - All graminae family
+
monocot seeds.
- Echinochloa, Phalaris
etc.

- most weeds belong to this group
- cylindrical & hollow stem having nodes & internodes.

Sedges

eg - Cyperaceae
family
- Cyperus (Motha).

- triangular stem
- no node
- very large internode
- leaf at top.
- Cyperaceae family - no branch, usually 3 leaves at top, pith present.

Broad leaf

eg - all dicot weeds like Camellina, Chenopodium album (~~thota~~)
(Bathwa)

- broad leaf alternately arranged on stem
- cylindrical stem
- usually tap root.
- legume family.

4) On the basis of Season :-

Kharif weeds
eg - Cyperus rotundus
(Motha)

- Amaranthus viridis
(jungle chaulai)

June to October.

Rabi weeds

eg - Argemone mexicana
Anapallis arvensis
Chenopodium album

Oct to March.

Zaid weeds

eg. include both
kharif & rabi.

- b/w Rabi & kharif
is grown.

• March to June

5) On the basis of Importance :-

1) Relative weed - eg - rice in wheat field.
barley in wheat field.

These are undesirable crop plants grown in main field of same family.

2) Absolute weed - eg - Cyperus rotundus such weeds are due to its characteristics.

3) Rogue weed - eg - plants of C-306 variety grown in Raj-4037 variety of wheat crop.
same crop but different variety.

4) Mimicry weed - eg - Phalaris in wheat field & wild rice in rice field.
similar in external morphology as main crop.

5) Volunteer weeds - eg - green gram in wheat field on the present season crop.

weeds grown from the fallen seeds of previous or preceding crop in field.

6) Noxious weed - eg - Parthenium, Orobanché
toxic to humans & animals.

7) Objectible weed - eg - wild oat and oat.
which produce seeds that are difficult to separate since mixed with crop seeds due to its resemblance.

8) Satellite weed - eg - Avena fatua in barley. } Same
weeds mature at same time & height along with crop and seeds are similar to main crop.

9) Exotic / Alien weed - origin out of native place.

eg - Lantana camera - from USA
- Parthenium from USA

- Phalaris minor → Mediterranean region
- Orobanché from Europe

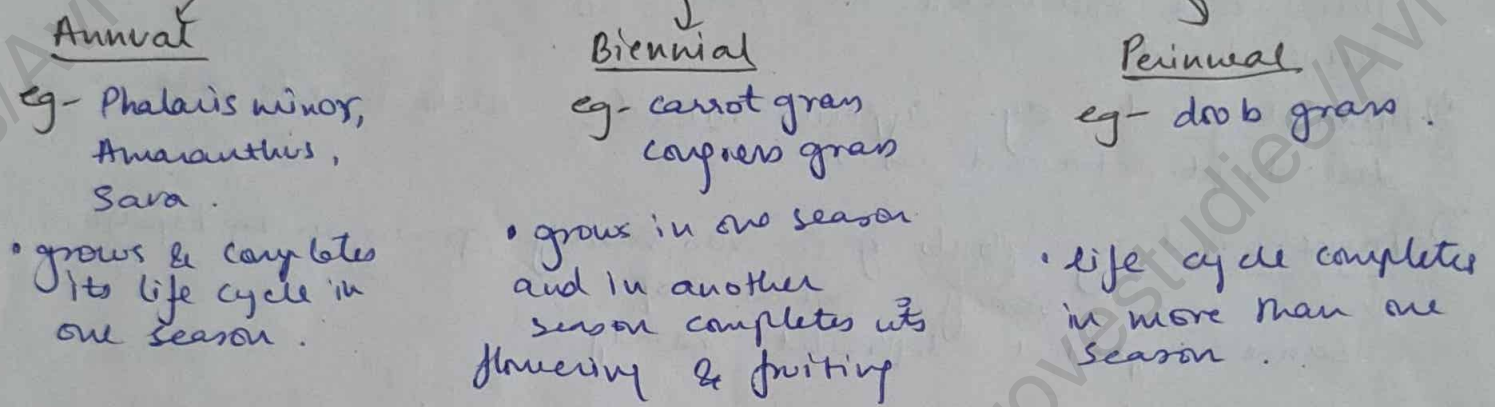
- Opuntia - Brazil

- Cyperus, Convolvulus arvensis
from Eurasia.

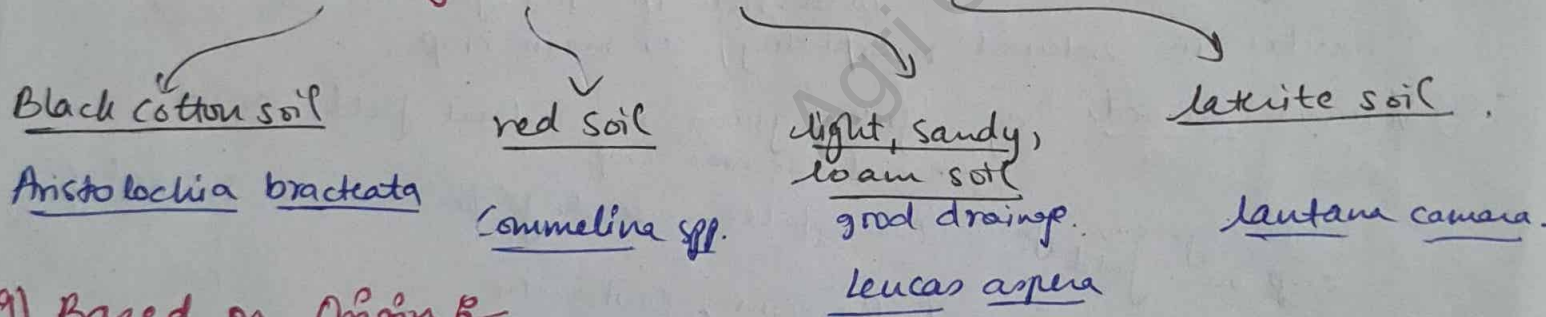
6) On the basis of common name :-

- 1) Tiger grass - Saccharum spontaneum
- 2) Guinea grass - Panicum millicerum
- 3) Soil worst weed - Cyperus
- 4) Devil grass - Cynodon dactylon
- 5) Pig weed - Amaranthus viridis
- 6) Hog weed - Cannabis sativus
- 7) Cocklebar - Ranuncium spp.

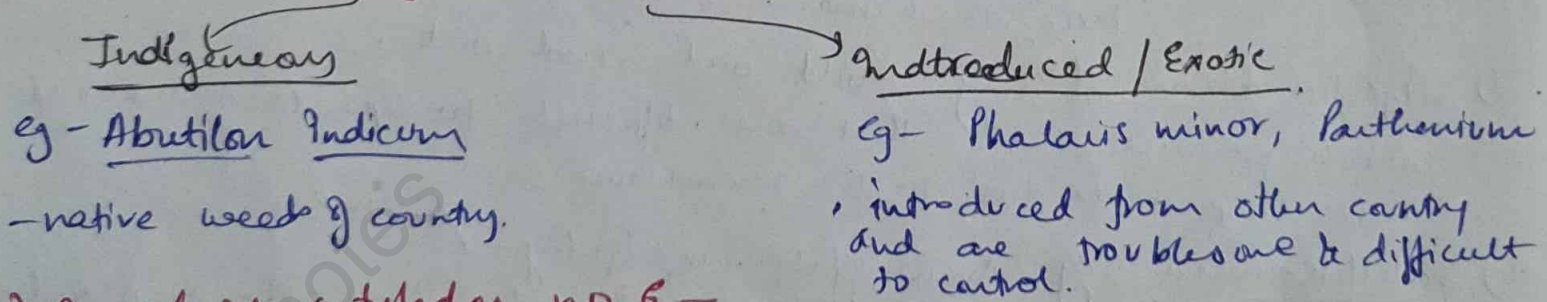
7) On the basis of life cycle :- (Ontogeny)



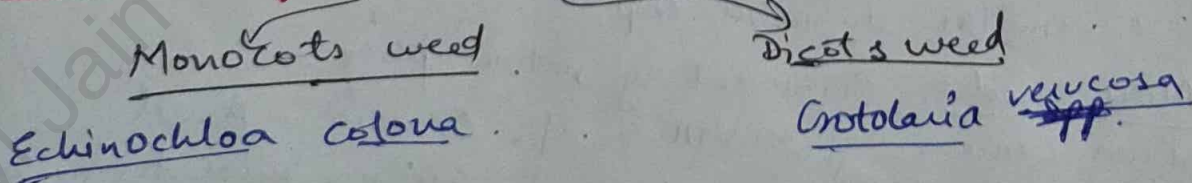
8) Based on soil type :- (Edaphic) :-



9) Based on Origin :-



10) Based on cotyledon no. :-



① Based on soil pH :-

Acidophile

acid soil weeds

eg - Rumex acetosella

Basophile

alkaline soil weeds

eg - Taraxacum sp.

Neutrophile

weeds of neutral soils

eg - Acalypha indica

② Based on nature of stem :-

Woody

eg - Lantana camara

• include shrubs & undershrubs collectively called as brush weeds.

Sem-woody

eg - Croton spp.

Herbaceous

eg - Amaranthus viridis

• green, succulent stems

③ Based on specificity :-

Poisonous weed

eg - Datura fastuosa

cause ailment in livestock and resulting in death and cause great loss.

Parasitic weed

→ Total root, semi root, total stem, semi stem.

④ Aquatic weeds :-

Submerged

eg - Utricularia stellata

- mostly vascular
- produce most or all vegetative growth beneath water surface
- have true root, stem, leaves.

Emersed

eg - Jussiaea repens

- rooted in bottom mud.
- aerial stem, leaves at or above water surface
- do not rise or fall with water level.

Marginal

eg - Typha

- grow in moist shoreline areas at 60 to 90 cm water depth.
- vary in size, shape and habitat.

Floating

eg - Eichornia crassipes

- weeds have leaves which float on water surface either singly or in cluster
- some are free floating
- some rooted at mud bottom & leaves rise and fall as water increase or decrease.

15. On the basis of place of occurrence:-

Crop lands

eg- Phalaris minor
in wheat.

pasture lands

eg- Indigofera
enneaphylla

• found in pastures or
grazing grounds.

waste places

eg- Calotropis
gigantea

• corners of field,
margins of channels.

playgrounds, road sides

eg- Tribulus
terrestris

• usually hardy.
• withstand
trampling.

16. Based on ecological affinities:-

Wetland

eg- Eclipta alba

• thrive in waterlogged
as well as in
partially dry condition.
• tender annuals &
semi-aquatic.

Garden land/ Irrigated land

eg- Digera
arvensis

• neither require large quantities
of water like wetland
• nor can withstand extreme
drought, as dryland weeds.

Dry land

eg- Argemone
americana

• hardy plants
• deep root system
• withstand drought.

→ Perennials :-

(i) Simple - plants propagate only by seeds - eg - Sonchus
arvensis

(ii) Bulbous - plants with modified stem with scales & reproduce mainly
from bulbs. & seeds - eg - Allium sp.

(iii) Corm perennials - plants with modified shoot & ~~fruit~~ fleshy stem
& reproduce through corm & seed eg - Timothy (Phleum
pratense)

(iv) Creeping perennials - reproduce through seeds as well as with :-

a) Rhizome - eg - Sorghum
halapense
Plants have underground stem.

b) Stolon - eg - Cynodon
dactylon
Plants have horizontal creeping stem above the ground.

c) Roots - eg - Convolvulus
arvensis
enlarged root system with buds.

d) Tubers - eg - Cyperus
rotundus
modified rhizomes for storage of food

Herbicides :-

Herbicide :- derived from latin word, Herba (plant) and ~~caed~~ Caedere (to kill). means, chemicals that kill or suppress the unwanted vegetations.

Weedicide :- It's a restricted term, chemicals that kill weeds only.

On basis of chemical structure

→ Inorganic herbicides -

before 1940, like ashes, salts, copper sulphate, Sodium arsenate, sodium nitrate, NaCl etc.

→ Organic herbicides

• era of this started with discovery of 2,4-D (2,4-dichlorophenoxyacetic acid) in 1940. (used as plant hormone).
→ 1st selective herbicide used in world.

* Herbicides in India are registered under the Insecticides Act, 1968.

* CIBRC - Central Insecticide Board & Registration Committee. regulates & manages the use of herbicides & insecticides.

* major crops use herbicide are → rice, wheat & plantation crops.

* most used herbicides in India are →

- Isoproturon
- Butachlor.
- 2,4-D.
- glyphosphate
- atrazine.

* Bioremediation :- some weeds remove or accumulate heavy metals from soil or aquatic systems.
eg- Eichornia crassipes and Hydrilla serve for bioremediation of Pb, Hg, and Cd.

Classification of Herbicides :-

1) On the basis of selectivity :-

Selective herbicide

eg - atrazine, 2,4-D, Butachlor, pendamethalin, Fluchloralin, Isoprotruron, Simazine, MCPA.
(all pre & post emergence herbicide)

- Kills only target weeds.

Non-selective herbicide

eg - Diquat, ~~Diquat~~ ^{Paraquat}, glyphosate, etc.

- Kills all vegetation (crop + weed both) when comes in contact.

2) Based on type of weed control :-

herbicide of broad leaf weed

eg - 2,4-D.
• applied in mixed plant population mainly control broad leaf weed.

(graminicide) narrow leaf weed

eg - Phenoxyprop-chloridifop.

Narrow spectrum

eg - difenzoquat, metaxuron

- upon application to a mixed population of weeds proves active in one or very limited no. of species.

Broad spectrum

eg - atrazine, butachlor, pendamethalin, alachlor.

- control wide range of weeds at a time.

3) Based on Translocation / movement of herbicide in plant :-

Contact

eg - Paraquat, diquat, propanil, H_2SO_4 acid.

- kills either weed or crops when it comes in contact with plant tissue.
- kills part of plant that is in contact
- less mobile

Systemic / translocated

eg - 2,4-D, atrazine, pendamethalin, glyphosate, dalapon.

- moves within the weed either through xylem or phloem this affect whole system of respiration, and photosynthesis.

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4) On the basis of time of application :-

Pre-plant applied (PPI) / incorporation

eg - Fluchloralin, Alachlor

- before planting of crop in tilled soil.

Pre-emergence

eg - only selective herbicides

like Atrazine, Pendimethalin.

- before emergence of weeds but post emergence of crops.

Post emergence

eg - Dalapon, 2,4-D, Diquat, Paraquat

- applied after the emergence of weed and crop both (15-30 DAS) generally.

5) Lay-by-herbicide - application after the last cultivation in crops, such as after ridging in sugarcane & cotton

5) Based on residual action :-

Residual

eg - 2,4-D (3-4 weeks),
Triazines (1-2 yr)

- more resistant to degradation & maintain their effect in soil for a considerable period of time after application.

Non-residual / zero persistence

eg - Paraquat, Diquat, glyphosate
(their use in zero/minimum tillage)

- easily degraded or metabolized after application
- leaves no or less residue in applied soil.

6) On the basis of duration of weed control :-

Temporary soil sterilants / fumigants

- basically fumigant.
- sterilize the soil for a relatively short period (15-16 weeks).
- volatile compounds which leave soil in vapour form. In this period they kill all the live plants parts in soil.

eg - methyl-bromide, metham.

Permanent Soil Sterilant

- remain active for 2 or more years.
- use in non-crop areas

eg - Sodium chlorate,
Triazines, phenyl urea

7.) On the basis of methods of application :-

1) Soil active / Soil applied herbicide :- applied to soil rather than vegetation.

- prevent weed-crop competition.
- eg - all pre-emergence herbicide, → Simazine, Alachlor.
- On non-crop lands → soil sterilants & fumigants are used.
- control perennial weeds like → Cyperus rotundus, Convolvulus arvensis.

- | | | | | |
|---|--|--|--|--|
| (i) <u>Surface application</u> | (ii) <u>Sub-surface layering</u> | (iii) <u>Band application</u> | (iv) <u>Soil fumigation</u> | (v) <u>Herbigation</u> |
| eg - Urea, Triazines.
• applied uniformly on surface of soil either by spraying or broadcasting. | • application in a concentrated band about 7-10 cm below soil surface. | • application to a restricted band along the crop rows.
• leaving untreated band in inter-rows.
• Cost saving. | 1) by soil injection (Chloropicrin)
2) by direct soil surface (Metham)
3) releasing under sealed, plastic covers. (methyl bromide) | • application with irrigation water both by surface & sprinkler system.
eg - Fluchloralin in chillies & tomato. |

2) Foliage applied / foliage active :-

- applied to weeds after their emergence from soil.
- they are absorbed by the plant foliage & translocated to other parts.
- eg - Paraquat, Diquat etc

* both soil active & foliage active herbicides are → 2,4-D, atrazine.

- | | | | |
|---|---|---|--|
| <u>Blanket application</u> | <u>Direct spraying</u> | <u>Spot treatment</u> | <u>Protected spraying</u> |
| • uniform application to standing crops.
• only highly selective herbicide
eg - 2,4-D in wheat, rice. | • application to inter-rows of crop avoiding crop foliage.
• partially selective herbicides. | • application to small patches of weeds.
• leaving weed free gaps untreated. | • Non selective herbicide to obtain selective weed control in distant planted vegetables & ornamentals either by covering the non-target plants before application with plastic or metallic covers.
eg - Bermuda grass reinfesting row middles controlled by glyphosate products. |

methods of treating brush weeds & trees

- | | | |
|---|---|--|
| 1) <u>Foliage treatment</u>
ground sprayers can cover up to 2.5 m high brush when the brush leaves are fully expanded. | (2) <u>Basal bark treatment</u>
• basal 30 cm of stem is peeled off then spraying is done to the point of liberal run-off. | (3) <u>Cut stump treatment</u>
• Sawing of trees above the ground.
• liberal application on cut surface. |
|---|---|--|

3) Direct Contact Application (DCA) :- includes all techniques

- involving wiping, rubbing & smearing of herbicide onto the target plant surface.
- herbicide cloth wulches - are dragged against weeds growing much taller to crop plants.
- herbicide laden wax bars - are spread in the crop inter-rows.
- roving gloves - carry arrangement to smear herbicide onto the weed gripped by workers.
- Soil injection - like ethylene are applied by soil injections at prescribed spacing before planting of crops.

Allelopathy / Teletony & their application

Definition & concept of allelopathy

The term allelopathy ^{introduced} Molisch (1937)

- Plants growing in a community produce & release numerous secondary metabolites, many of which are capable of initiating chemical among the neighboring plants.
- * The phenomenon of one plant having a detrimental effect on another through the production and release of toxic chemicals is called as **allelopathy**.
These chemicals are called as **allelo-chemicals**.
 - * Parthenium daughter plants exhibit allelopathy/teletony to its parent plants is called as **autotony**. (effect of weed on another weed)
 - * **Allelopathic chemicals** :- are derivatives of benzoic acid, phenolic acids, cinnamic acid, hydroquinones, benzoquinones, coumarins.
 - * The word allelopathy is derived from greek - allelo (each other) and patho (an expression of suffering of disease)
 - * These chemicals inhibit the seed germination of small grains with Cyperus rotundus extracts.
 - * growth of wheat plants by Avena fatua & Phalaris minor extracts.
 - * Reduction of germination of cabbage & egg plant by **Amaranthus retroflexus**.
 - * Inhibition of growth of many agronomic plants by Parthenium spp. extracts.

Chemicals released in form of :-

- ① Vapour - some weeds release volatile compounds from their leaves. eg - Compositae family weeds.
- ② Leachates - chemicals released from foliage.
eg - Eucalyptus allelochemicals are leached out as water toxins from the above ground parts by action of rain, dew or fog.
- ③ Exudates from roots - metabolites are released from Cirsium arvense roots in surrounding rhizosphere.
- ④ Decomposition products - of dead plant tissues and worn out tissues. The production of allelochemicals is influenced by the intensity, quality and duration of light.
• Greater quantity produced under ultra violet light and long days, conditions of mineral deficiency, drought stress and cool temperature.
• Under crop situation low allelo-chemicals.

Allelopathic control of certain weeds using botanicals.

- eg - 1) dry dodder powder has been found to inhibit the growth of water hyacinth & eventually kill the weed.
- 2) The presence of marigold (Tagetes erecta) plants exerted adverse allelopathic effect on Parthenium.
 - 3) The Eucalyptus tree leaf leachates suppress the growth of nut sedge & Bermuda grass.

Effect of crop on weed :- root exudates of wheat, oats, peas suppresses Chenopodium album. It increases catalase and peroxidase activity of weeds & inhibit their growth.

Effect of Stimulatory effect :- root exudates of corn promoted the germination of Ombanthe minor.

Allelopathy effect of weed on crop plants :-

- 1) seeds of Datura affect germination & growth of Sunflower
- 2) seeds of wild oat affect germination & early seedling growth of Wheat
- 3) leaves & inflorescence of Parthenium affect germination & seedling growth of Sorghum
- 4) " " " " " " " " " " Maize
- 5) Tubers of Cyperus rotundus affect the dry matter production of Wheat & Maize

On the basis of family

- 1) Gramineae / Poaceae :- wheat, barley, rice, sorghum, maize, pearl millet, all millets, all grasses, sugarcane.
- 2) Leguminosae / Fabaceae :- gram, green gram, black gram, red gram, soyabean, groundnut, beans, lucerne, lentil.
- 3) Cruciferae / Brassicaceae :- mustard, broccoli, rai, radish, ~~that~~ knotknot, cabbage, cauliflower
↳ cole crop.
- 4) Asteraceae / Compositae :- sunflower, safflower, niger.
- 5) Malvaceae :- cotton, okra, mistha, ~~fine~~ crop.
- 6) Umbelliferae :- carrot, cummin, celery, coriander, fennel.
- 7) Cucurbitaceae :- all gourds, pumpkin.
- 8) Chinopodeaceae :- sugarbeet, bathua, spinach, quinoa.
- 9) Aliaceae :- onion, garlic.
- 10) Singchaceae :- ginger, turmeric.
- 11) Paddytiaceae :- sesame.
- 12) Tiliaceae :- jute.
- 13) Liliaceae :- linseed.
- 4) Euphorbiaceae :- tapioca, castor, amla.

Weed Management

Date _____
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Objective - To study about the identification of weed in the crop research farm.

Weed name -

1) Prickly chaff - (लट्जीरा / *Clirchita*)

bot name - *Achyranthus aspera*

2) Thorny amaranth - (कटैली यो लार)

Bot. name - *Amaranthus spinosus*

3) Wild amaranth - (जंगली यो रार)

Bot. name - *Amaranthus viridis*

4) Red chick weed - (कृष्ण नील)

Bot. name - *Anagallis arvensis*

5) Mexican poppy - (सत्यानारी)

Bot. name - *Argemone mexicana*

6) wild onion - (ल्योनी)

bot. name - Asphodelus tenuifolius

7) wild oat - (जंगली जई)

bot. name - Avena fatua

8) goose foot - बघुआ

bot. name - Chenopodium album

9) ~~Nettle~~ Nettle leave - goose foot
(खर बघुआ)

bot. name - Chenopodium murale

10) common chicory - कांसरी

bot. name - Cichorium intybus

11) spider weed - डोल डोल

bot. name - Cleome icosandra

12) field bind weed - धिरन पुरी

bot. name - Convolvulus arvensis

13) wild fig - जंगली सूट

bot. name - *Corchorus fascicularis*

14) ~~tuosa~~ *Cuscuta* - अमरबेल - medicinal value
- for hair

bot name - *Cuscuta reflexa*

15) Bermuda grass - हब घास

bot. name - *Cynodon dactylon*

16) nut grass / - मौव्या - *Cyperus rotundus*
java grass

17) thorn apple - धतूरा - *Datura fastuosa*

18) Hyacinth - जल कुंभी - *Echornia crassipes*

19) *Lathyrus* - जंगली मटर - *Lathyrus aphaca*

20) honey ~~weed~~ clover - पीली सेंजी - *Medicago alba*

21) Indian sweet clover - सफेद सेंजी - *Medicago indica*

22) ~~Cactus~~ *Cuscuta* - नागाफनी - *Opuntia dillenii*

23) Canary grass - गिहिसंडा /
गोट्टेसा - *Phalaris minor*
(गोट्टे का मामा)

24) Storm breaker - (इलायदा) - Phyllanthus niruri

25) Pig weed - जंगली पालक - Portulaca oleracea

26) Jabe cane - ~~चौंस~~ चौंस - Saccharum spontaneum

27) Yellow foxtail millet - बंदरा बंदरी - Setaria glauca

28) Black night shade - मकोरा - Solanum nigrum

29) Johnson grass - ~~बेरक~~ बेरक - Sorghum halepense

30) Striga - - - Striga spp.

31) Bull ~~head~~ head - गोखर - Trivulus terrestris

32) ~~वेर~~ - - - z

33) जंगली ~~वेर~~ वेर - - - z

34) wild rice -

35) Kainy tar - गुरमुना

36)

On the basis

1) Gramineae / Poaceae

wheat, barley, rice, pearl millet, all sugarcane

2) Leguminosae / fab

gram, green gram, red gram, soybean, kidney, lucerne,

3) Cruciferae / Brassicaceae

mustard, cabbage, cauliflower, radish, turnip,

4) Asteraceae / Compositae

sunflower, safflower,