**Why Weeds are Successful?**

In spite of repeated efforts to manage weeds over long period of time, weeds are still successful invader. There are certain characteristics adopted by the weeds that ensure their persistence. Some of important characters adopted by the weeds are:

1. Better competitive ability of the weeds. Weeds being wild plant are better competitors compared to crop plants. The crop plants will be affected more adversely compared with crop plants under unfavourable conditions.
2. Time of maturity of weeds is earlier than that of crop plants. They shed their seeds before the crop adding up in soil seed bank.
3. Mimicry of weeds with crop plants make it difficult to control at early growth stages e.g. *Phalaris minor* and *Avena fatua* plants are morphologically similar to wheat and difficult to identify at early growth stages.
4. The seeds of some weeds are similar to the seed of certain crop. Theweed seed alongwith crop seed enter in the field e.g. the seed of  *Cichorium intybus* are similar to those of berseem.
5. The weeds produce a large number of seed e.g. one plant of *Chenopodium album* can produce seeds up to1,50,000 and *Trianthema portulacastrum* up to 35,000.
6. Many weeds progate both sexually and asexualy. They have developed various structures like rhizomes (*Sorghum halepense*), stolon (*Cynodon dactylon*), bulbs (*Asphodelus tenuifolius*), corm (*Cyperus rotundas*), tubers (*Cyperus rotundas*) and fragmentation (*Portulaca oleracea*), which, help in their persistence.
7. Weed Allelopathy



**CLASSIFICATION OF WEEDS**

On the basis of similarities and dissimilarities weeds are classified in different groups.

1. **Classification based on leaf morphology**

Based on leaf morphology, weeds are classified into following groups

1. **Broad leaved weeds**:

These weeds have leaves characterized with a network of veins, simple or compound leaves, tap root system and stiff stem. The stem is well branched having primary, secondary and tertiary branches. e.g. *Chenopodium album, Convulvulus arvensis, tranthema portulacastrim* etc.

1. **Narrow leaved/grass weeds**

The weeds having long, tapering, narrow leaved with parallel veins are termed as narrow leaved or grasses. The leaf of a grass plant is composed of three basic parts: 

1. **Leaf** **blade** (flattened portion of the leaf)
2. The **collar** (Junction between leaf blade and leaf sheath)
3. **LEAF** **sheath** (portion of the leaf surrounding the stem)

1. **Sedges**

A plant of the Cyperaceae family,

having solid three-sided stems and

three ranked leaves arranged in three

rows with out ligule or auricle. They

superficially resemble grasses. e.g.

Cyperus rotundas (Purple nutsedge),

cyperus difformus (small umbrella

sedge) etc.

**RUSHES**

1. **CLASSIFICATION BASED ON LIFE CYCLE**

It is important to study the life cycle of weeds as it helps to understand the seedling establishment, growth and reproduction of weeds. This knowledge is necessary for finalizing weed control plan to get economic and effective control of specific weed.

* 1. Annual: the weeds that complete their life cycle within one year or one season. Based on seasons they are further classified into following groups
		1. **Kharif Annuals**: These weeds appear in the field with the onset of rainy season (Moonsoon) and complete their life cycle before the onset of winter season (Oct.-Nov.) e.g.
		2. **Rabi Annuals**: These weeds complete their life cycle in winter season i.e. starting from Oct-Nov. and maturing in Feb-March e.g.
		3. **Summer annuals**: These weeds complete their life cycle in summer season. The weeds appear in the field in Feb.-March and complete life cycle upto May-June. e.g.
		4. **Ephemerals**: These weeds complete their life cycle in a short duration i.e. with in 2-4 weeks e.g.
	2. **Biennial:** These weeds complete their life cycle in two years or seasons. They complete their vegetative growth in first year/season, undergo dormancy period forming rosette and in next season stem elongates (bolts) to produce flower. e.g. wild carrot and wild onion. As these weeds require undisturbed soil for two consecutive years, therefore mostly found in fields which have been under no-tilled conditions for many years.
	3. **Perennial:** These weeds grow for more than two years. They can produce seeds many times during their life cycle. Perennials can be differentiated from annuals by thick and strong roots and dormant underground buds at the base of the stem. The perennials can be further classified into following groups
		1. Simple perennials

These weeds have tap root system without buds. They usually propagate through seeds. They however, can propogate through stem fragments e.g. *Sonchus arvensis*

* + 1. Creeping perennials

These weeds not only reproduce through seeds but also through vegetative parts like bulbets, rhizomes, bulbs, tubers and stolons. These weeds are usually difficult to control because even if the above ground part of these weeds is destroyed, they have the ability to reemerge from underground parts. Repeated application of herbicides may be used for effective control of these weeds.

1. Classification based on CO2 assimilation
2. C3 weeds: These weeds during photosynthesis produce a three carbon compound (3-phosphoglyceric acid) as first product through Calvin-Bensen cycle). These weeds exhibit photorespiration and therefore, are less efficienct compared with C4 weeds. These weeds consume18 molecules of ATP and 12 molecules of water water to synthesize one molecule of glucose. Most of the temperate region weeds are C3 in nature e.g. *Avena fatua*, *Chenopodium album*, *Convolvulus arvensis* etc.
3. C4 weeds: These weeds that produce a four carbon compound (oxaloacetic acid) as first step during photosynthesis through Hatch-Slack pathway. They consme 30 molecules of ATP and 24 molecules of water to synthesize a molecule of glucose. They continue the process of photosynthesis at very high light intensities and very low CO2 concentrations. Photorespiration does not take place in C4 plants e.g. *Trianthema portulacastrum*, *Cynodon dactylon*, *Amaranthus viridus* etc.
4. CAM weeds: These weed employ crasulacean acid metabolism for CO2 fixation. The stomata in these weeds remains closed during day time to minimize the evapo-transpiration process and open at night to store CO2. At night CO2 is stored in vacule in the form of malate, during day time this malate is transported to chloroplast and converted back to CO2. The fixation of carbon dioxide is done through Calvin cycle like C4 plants.
5. Classification based on host dependence

 Some weeds depend upon host plants, partially or fully, to complete their life cycle. These parasitic weeds develop an organ for attachment and penetration to host plants called haustorium. The hypae of haustorium is attached to xylem and/or phloem of host plant for absorption of minerals, water and food and also believed to be involved transfer of hormones between the two organisms. The parasitic weeds may be divided into two groups.

1. **Total parasite**: Weeds which lacks chlorophyll and cannot prepare their own food, therefore totally depend upon their host for food are called total parasities e.g. Orobanche spp (root parasite) in cotton, tobacco, sunflower etc. The seeds of these weeds germinate when they receive root exudates of host plant.
2. **Semi parasite**

These weeds depend upon host plants for the part of their life cycle e.g. cuscuta (stem parasite) and striga (root parasite). The seeds of cuscuta are large in size with large food reserves which allow the radical to grow extensively while searching for host stem. The seeds of striga germinate only when they receive stimulant strigol screted by the host plants (Sorghum, maize, sugarcane etc). The radical of the striga weed get attached with the roots of host plants soon after germination but weed takes several weeks to emerge out of the soil. During this period it acts as total parasite, but after emergence, it produces chlorophyll and start producing its own food. It will act as partial parasite as it will get nutrient and water from the roots of host plant.

1. **Classification based of habitat**

Depending upon the place of occurance weeds can be classified as

1. **Terrestrial weeds**

Weeds growing in plains or upland areas are termed as terrestrial weeds. They can be further divided into following groups

1. **Woody weeds**

These are perennial weed having hard stem srounded by woody bark. Trees and shrubs are included n this group. It is difficult to control such weed once these are established e.g. *Acacia Arabica*, *Lantana camara*, *Zizyphus rotundifolius* etc.

1. **Herbaceous weeds**

The weeds having green succulent stem are called herbaceous weeds. These are the most common weeds e.g. *Avena fatua*, *Chenopodium album*, *Phalaris minor* etc.

1. **Weeds of crop plant**

The weeds that cause infestation in crop plants. All the winter and summer season herbaceous weeds are included in this group.

1. **Weeds of lawn and parks**

The weeds that are found in lawns, parks and play grounds are included in this group e.g. *Cynodon dactylon*, *Imperata cylindrical*, *Medicago denticulate* etc.

1. **Weeds of gardens**

These are the weeds that are found in the gardens e.g. *Cynodon dactylon*, *Stellaria media* etc.

1. **Weeds of pastures**

The weeds found in pasture lands are included in this groups e.g. *Cyperus rotundus*, *Cynodon dactylon*, *Digitaria sanguinlis*, *Medicago denticulate* etc.

1. **Weeds of waste places.**

The weeds that are found on uncultivated areas or wastelands e.g. *Rumex dentatuts*, *Amaranthus viridus, alva neglecta* etc.

1. **Road side weeds**

The weeds that are found on the road sides e.g. *Pathenium hirstorium*, *Amaranthus viridus*, *Cannabis sativa*, *Saccharum benghalensis* etc.

1. **Aquatic weeds**

These are the weeds that grow in water. These can be dividedinto following subgroups.

1. **Floating weeds**

Free floating or anchored weed aquatic weeds that grow with most of its vegetative parts above the water and lowering and rising with water level e.g. *Eichhornia crassipes*(Marts) Solms also called water hyacinth.

1. **Submerged weeds**

These are the grow beneath the surface of the water and are attached to the bottom of ditch e.g. *Hydrilla verticillata* also called hydrilla.

1. **Emersed weeds**

The anchored aquatc weed adopted to grow with most of the leaf stem tissue above the water surface but not lowering or rising with water level e.g. *Typha domingensis* Pers also called cattail.

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Broad leaved weeds