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FACULTY OF AGRICULTURAL SCIENCES & ALLIED INDUSTRIES

Weeds- importance, classification

Weeds are plants that are unwanted in a given situation and may be harmful, dangerous or economically detrimental. Weeds are a serious threat to primary production and biodiversity. They reduce farm and forest productivity, displace native species and contribute significantly to land and water degradation. The costs of weeds to the natural environment are also high, with weed invasion being ranked second only to habitat loss in causing biodiversity decline.

Characteristics of weeds

Weeds are also like other plants but have special characteristics that tend to put them in the category of unwanted plants.

• Most of the weeds especially annuals produce enormous quantity of seeds, e.g. wild oats (Avena fatua), produces 250 seeds per plant, whereas wild amaranth (Amaranthus viridis) produces nearly 11 million seeds. It has been observed that among 61 perennial weeds, the average seed-production capacity was 26,500 per plant. • Weeds have the capacity to withstand adverse conditions in the field, because they can modify their seed production and growth according to the availability of moisture and temperature. They can germinate under adverse soil-moisture conditions, have short period of plant growth, generally grow faster rate and produce seed earlier than most of the crops growing in association.

• Weed seeds remain viable for longer period without losing their viability, e.g. annual meadow grass (Poa annua) and scarlet pimpernel (Anagallis arvensis) remain viable foe about 8 years; creeping thistle (Cirsium arvense) for 20 years and field bind weed (Convolvulus arvensis) for about 50 years.

• Weed seeds have a tremendous capacity to disperse from one place to another through wind, water and animals including man. Many of times, weed seeds mimic with the crop seeds due to their size and get transported from one place to another along with them.

Harmful effects

• Weeds have serious impacts on agricultural production. It is estimated that in general weeds cause 5% loss in agricultural production in most of developed countries, 10% loss in less developed countries and 25% loss in least developed countries.

In India, yield losses due to weeds are more than those from pest and diseases. Yield losses due to weeds vary with the crops. Every crop is exposed to severe competition from weeds. Most of these weeds are self-sown and they provide competition caused by their faster rate of growth in the initial stages of crop growth. In some crops, the yields are reduced by more than 50% due to weed infestation.

These losses caused by weeds in some of the important crops are given:-

Loss in crop yields due to weeds(%)

Rice -41.6

Groundnut- 33.8

Wheat -16.0

Sugarcane- 34.2

Maize -39.8

Sugar beet- 70.3

Millets- 29.5

Carrot- 47.5

Soybean- 30.5

Cotton- 72.5

Gram -11.6

Onion- 68.0

Pea- 32.9

Potato- 20.1

• Weeds compete with crops for water soil, nutrients, light, and space, and thus reduce the crop yields. An estimate shows that weeds can deprive the crops 47% N, 42% P, 50% K, 39% Ca and 24% Mg of their nutrient uptake

• Weeds are also act as alternate hosts that harbor insects, pests and diseases and other micro-organisms. Alternate hosts of some of the pest and diseases

Crop	**Pest**	**Alternate host**
Red gram	Gram caterpillar	Amaranthus
Castor	Hairy caterpillar	Crotolaris sp.
Rice	Stem borer	Echinochloa
Wheat	Black rust	Agropyron repens
Pearl millet	Ergot	Cenchrus ciliaris

• Some weeds release into the soil inhibitors of poisonous substances that may be harmful to the crop plants, human beings and livestock. Health problems caused by weeds to humans

Health problem	**Weed**
Hay fever and asthma	Pollen of Ambrosia and Franseria
Dermatitis	Parthenium
Itching and inflammation	Utrica sp.
African sleeping sickness	Brush weeds
Malaria, encephalitis	Aquatic weeds like Pistia lanceolate

• Weeds reduce the quality of marketable agricultural produce. Cotamination of weed seeds of Datura, Argemone, Brassica etc., is harmful to human health and weed seeds present in the produce cause odd odour sometimes.

• Weeds not only reduce yield but also interfere with agricultural operations. Weeds make mechanical sowing a difficult process and render harvesting difficult, leading to increased expenditure on labour, equipment and chemicals for their removal.

• In aquatic environment, weeds block the flow of water in canals, water-transport system and drainage system, rendering navigation difficult. The dense growth of aquatic weeds pollutes water by deoxygenating it and killing the fishes.

• Weeds are also a nuisance and a fire hazard along railway lines, roads, right-of- ways, airports, forest and industrial sites.

Beneficial effects

In spite of all the difficulties caused by weeds, they can offer some beneficial properties, particularly when occurring at low densities. These aspects should be utilised in the farming system, although this may make organic management more complicated than chemical based systems

Some of the potential benefits of weeds are listed below:

• Helping to conserve soil moisture and prevent erosion. A ground cover of weeds will reduce the amount of bare soil exposed helping to conserve nutrients, particularly nitrogen which could otherwise be leached away, especially on light soils.

• Food and shelter can be provided for natural enemies of pests and even alternative food sources for crop pests. The actual presence of weed cover may be a factor in increasing effectiveness of biological control of pests and reducing pest damage.

• Weeds can also be valuable indicators of growing conditions in a field, for example of water levels, compaction and pH.

• Weeds can be an important source of food for wildlife, especially birds. Bird populations have been declining on farmland over the last few decades and leaving weeds as a resource has been shown to help revive bird populations.

Classification of weeds

Out of 2, 50,000 plant species, weeds constitute about 250 species, which are prominent in agricultural and non-agricultural system. Under world conditions about 30000 species is grouped as weeds.

I. Based on life span

Based on life span (Ontogeny), weeds are classified as Annual weeds, Biennial weeds and Perennial weeds.

a. Annual Weeds

Weeds that live only for a season or a year and complete their life cycle in that season or year are called as annual weeds. These are small herbs with shallow roots and weak stem. Produces seeds in profusion and the mode of propagation is commonly through seeds. After seeding the annuals die away and the seeds germinate and start the next generation in the next season or year following. Most common field weeds are annuals.

The examples are

*Monsoon annual

Commelina benghalensis, Boerhavia erecta

*Winter annual

Chenopodium album

b.Biennials

It completes the vegetative growth in the first season, flower and set seeds in the succeeding season and then dies. These are found mainly in non-cropped areas.

Eg. Alternanthera echinata, Daucus carota

(a) Perennials

Perennials live for more than two years and may live almost indefinitely. They adapted to withstand adverse conditions. They propagate not only through seeds but also by underground stem, root, rhizomes, tubers etc. And hence they are further classified into

i. Simple perennials: Plants propagated only by seeds. Eg. Sonchus arvensis

ii. Bulbous perennials: Plants which possess a modified stem with scales and reproduce mainly from bulbs and seeds. Eg. Allium sp.

iii. Corm perennialsb Plants that possess a modified shoot and fleshy stem and reproduce through corm and seeds. Eg. Timothy (Phleum pratense)

iv. Creeping perennials: Reproduced through seeds as well as with one of the following.

a. Rhizome: Plants having underground stem – Sorghum halapense

b. Stolon: Plants having horizontal creeping stem above the ground – Cynodon dactylon

c. Roots: Plants having enlarged root system with numerous buds – Convolvulus arvensis d. Tubers: Plants having modified rhizomes adapted for storage of food – Cyperus rotundus

II**. Based on ecological affinities**

a. Wetland weeds

They are tender annuals with semi-aquatic habit. They can thrive as well under waterlogged and in partially dry condition. Propagation is chiefly by seed. Eg. Ammania baccifera, Eclipta alba

b. Garden land weeds (Irrigated lands)

These weeds neither require large quantities of water like wetland weeds nor can they successfully withstand extreme drought as dryland weeds. Eg.Trianthema portulacastrum, Digera arvensis

c. Dry lands weeds

These are usually hardy plants with deep root system. They are adapted to withstand drought on account of mucilaginous nature of the stem and hairiness. Eg. Tribulus terrestris, Argemone mexicana.

III. **Based on soil type (Edaphic**)

(a) Weeds of black cotton soil: These are often closely allied to those that grow in dry condition. Eg., Aristolochia bracteata

(b) Weeds of red soils: They are like the weeds of garden lands consisting of various classes of plants. Eg. Commelina benghalensis

(c) Weeds of light, sandy or loamy soils: Weeds that occur in soils having good drainage. Eg. Leucas aspera

(b) Weeds of laterite soils: Eg. Lantana camara, Spergula arvensis

IV**. Based on place of occurrence**

(a) Weeds of crop lands: The majority of weeds infests the cultivated lands and cause hindrance to the farmers for successful crop production. Eg. Phalaris minor in wheat

(b) Weeds of pasture lands: Weeds found in pasture / grazing grounds. Eg. Indigofera enneaphylla

(c) Weeds of waste places: Corners of fields, margins of channels etc., where weeds grow in profusion. Eg. Gynandropsis pentaphylla, Calotropis gigantea

(d) Weeds of playgrounds, road-sides: They are usually hardy, prostrate perennials, capable of withstanding any amount of trampling. Eg. Alternanthera echinata, Tribulus terestris

V**. Based on Origin**

(a) Indigenous weeds: All the native weeds of the country are coming under this group and most of the weeds are indigenous. Eg. Acalypha indica, Abutilon indicum

(b) Introduced or Exotic weeds: These are the weeds introduced from other countries. These weeds are normally troublesome and control becomes difficult. Eg. Parthenium hysterophorus, Phalaris minor, Acanthospermum hispidum

VI. **Based on cotyledon number**

Based on number of cotyledons it possess it can be classified as dicots and monocots.

(a**) Monocots** Eg. Panicum flavidum, Echinochloa colona

(b**) Dicots** Eg. Crotalaria verucosa, Indigofera viscosa

VII. **Based on soil pH**

Based on pH of the soil the weeds can be classified into three categories.

(a) Acidophile – Acid soil weeds eg. Rumex acetosella

(b) Basophile – Saline & alkaline soil weeds eg. Taraxacum sp.

(c) Neutrophile – Weeds of neutral soils eg Acalypha indica

VIII. **Based on morphology**

Based on the morphology of the plant, the weeds are also classified in to three categories.

This is the most widely used classification by the weed scientists.

(a**) Grasses**: All the weeds come under the family Poaceae are called as grasses which are characteristically having long narrow spiny leaves. The examples are Echinocloa colonum, Cynodon dactylon.

(b**) Sedges**: The weeds belonging to the family Cyperaceae come under this group. The leaves are mostly from the base having modified stem with or without tubers. The examples are Cyperus rotundus, Fimbrystylis miliaceae.

(c) **Broad leaved weeds**: This is the major group of weeds as all other family weeds come under this except that is discussed earlier. All dicotyledon weeds are broad leaved weeds. The examples are Flavaria australacica, Digera arvensis, Tridax procumbens

IX. **Based on nature of stem**

Based on development of bark tissues on their stems and branches, weeds are classified as woody, semi-woody and herbaceous species.

(a) Woody weeds: Weeds include shrubs and undershrubs and are collectively called brush weeds. Eg. Lantana camera, Prosopis juliflora

(b) Semi-woody weeds: eg.Croton sparsiflorus

(c) Herbaceous weeds: Weeds have green, succulent stems are of most common occurrence around us. Eg. Amaranthus viridis

X**. Based on specificity**

Besides the various classes of weeds, a few others deserve special attention due to their specificity. They are,

a. Poisonous weeds,

b. Parasitic weeds and

c. Aquatic weeds.

a. Poisonous weeds

The poisonous weeds cause ailment on livestock resulting in death and cause great loss. These weeds are harvested along with fodder or grass and fed to cattle or while grazing the cattle consume these poisonous plants. Eg. Datura fastuosa, D. stramonium and D. metal are poisonous to animals and human beings. The berries of Withania somnifera and seeds of Abrus precatorius are poisonous.

b. Parasitic weeds

The parasite weeds are either total or partial which means, the weeds that depend completely on the host plant are termed as total parasites while the weeds that

partially depend on host plant for minerals and capable of preparing its food from the green leaves are called as partial parasites. Those parasites which attack roots are termed as root parasites and those which attack shoot of other plants are called as stem parasites. The typical examples are;

1. **Total root parasite – Orabanche cernua on Tobacco**
2. **Partial root parasite - Striga lutea on sugarcane and sorghum**
3. **Total stem parasite - Cuscuta chinensis on leucerne and onion**
4. **Partial stem parasite - Loranthus longiflorus on mango and other trees.**

c. Aquatic weeds:

Unwanted plants, which grow in water and complete at least a part of their life cycle in water are called as aquatic weeds. They are further grouped into four categories as submersed, emersed, marginal and floating weeds.

1. Submersed weeds:

These weeds are mostly vascular plants that produce all or most of their vegetative growth beneath the water surface, having true roots, stems and leaves. Eg. Utricularia stellaris, Ceratophyllum demersum.

2. Emersed weeds:

These plants are rooted in the bottom mud, with aerial stems and leaves at or above the water surface. The leaves are broad in many plants and sometimes like grasses. These leaves do not rise and fall with water level as in the case of floating weeds. Eg. Nelumbium speciosum, Jussieua repens.

3. Marginal weeds:

Most of these plants are emersed weeds that can grow in moist shoreline areas with a depth of 60 to 90 cm water. These weeds vary in size, shape and habitat. The important genera that comes under this group are; Typha, Polygonum, Cephalanthus, Scirpus, etc.

4. Floating weeds:

These weeds have leaves that float on the water surface either singly or in cluster. Some weeds are free floating and some rooted at the mud bottom and the leaves rise and fall as the water level increases or decreases. Eg. Eichhornia crassipes, Pistia stratiotes, Salvinia, Nymphaea pubescens.