WEEDS AND THEIR CONTROL

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Definition of a Weed:

A weed is a plant out of place or a plant growing where it is not wanted. A plant is regarded as a weed either because it interferes with human activity / welfare or because it occurs spontaneously in human-disturbed habitats. Weeds are generally undesirable and may be prolific, persistent, competitive, harmful or even poisonous.

Characteristics of Weeds

1. *It is harmful to humans, animals and crops.* It may contain poisonous alkaloids e.g leaves of stinging nettle (*Fleurya aestuans*), pods of M*ucuna pruriens*, high level of nitrates in A*maranthus* is poisonous to animal, parasitic crop (*Striga spp)*
2. *Wild and rank (too thickly) growth*. It is wild and rank in growth habitat. E.g *Chromolaena odorata, Andropogon spp*. They grow rapidly, branch or tiller profusely and cover extensive areas.
3. *They are persistent and resistant to control or eradication* e.g purple and yellow nutsedge (*Cyperus rotundus), C. esculentus* have well developed tubers and viable seeds, I*mperata cylindrica* has extensive rhizome systems and seeds, *Bryophyllum pinnatum* spreads by seed and leaf bulbil (It is resistant to dessication)
4. *They have high reproductive capacity*. Some weeds produce large quantities of seeds e.g *Amaranthus spinosus* (235,00 seeds per plant)
5. *Ability to exhibit seed dormancy*. A condition in which a seed fails to germinate in the presence of environmental condition that are normally optimal or seed germination. The forms of dormancy so exhibited by weed species include induced dormancy, enforced dormancy and innate dormancy.

   Induced dormancy = inability of a mature viable seed to germinate because of an after ripening experience(exposure to high CO_2 level, hard seed coat or allelochemicals)

   Enforced dormancy= result of exposure of mature viable seeds to adverse environmental condition e.g low moisture or high temperature and poor aeration.

   Innate dormancy= occurs if a viable mature seed fails to germinate when exposed to environmental conditions that are favorable to vegetative growth because of immature embryo or the presence of inhibitor chemicals either in the seed coat in the fruit.
6. *Weeds may grow in an undesirable location*. They can be found in cultivated fields, tennis courts or recreational sites and cracks of concrete.
7. *Weeds have large populations*. E. g *Euphorbia heterophylla, Ageratum conyzoides, Aspilia africana.* They are able to compete better with crops because of this numerical superiority.
8. *Humans often find them useless, unwanted, undesirable*. Many weeds have some morphological features such as thorns, prickles etc which make them objectionable e.g *Amaranthus spinosus*.

9. *Spontaneous growth, appearing without being sown*. Such weeds have small, obscured seeds that are buried in soil e.g *Amaranthus spinosus, Talinum triangulare.*
10. *Aggresiveness*: Many weeds rapid seedling growth and wide tolerance to edaphic and environmental factors. Some are very competitive and deep roots and have the ability to form canopy over associated crops e.g *Euphorbia heterophylla*.
11. *Unsightly.* Many weeds have unattractive flowers and foliage and tend to disfigure the landscape e.g *Panicum spp,Aandropogon spp and Pennisetum spp.*

Economic Importance of Weeds

Direct Losses by weeds

1. Weeds cause reduction in crop yield through competition for light, nutrient, water and space. They can also reduce the yield of crop through the release of toxic substances or exudates which inhibit crop growth. This is called **allelopathy**. Uncontrolled weed infestation can lead to 95% yield loss in cassava, 40% in maize, 53% in cowpea, soyabean and pigeon pea.
2. Weeds can reduce the quality of harvested agricultural products.
3. Weeds interfere with harvest operations and increase the cost of harvesting in both small holder and large scale farms.
4. Weeds may poison animals e.g *Amaranthus spp* can adversely affect livestock because of the high nitrate content of the shoots.
5. The cost of controlling weeds is high.
6. The presence of weeds can impede water flow in irrigation canals.
7. The presence of weeds in lakes and reservoir can increase loss of water by transpiration.

Indirect Losses caused by weeds

1. Weeds serve as alternate hosts to many plant diseases and animal pests e.g insects, rodents, birds etc that attack crops.
2. The presence of weeds imposes a limit on farm size.
3. The presence of weeds can also reduce the economic value of lakes by preventing or limiting fishing activities.
4. Weeds such as Imperata *cylindrica* become fire hazards in the dry season throughout the savanna vegetation zone.

Non Agricultural Losses

1. Weeds affect health of humans, stinging nettle can cause skin rashes and the flowers of some other weeds can be associated with allergies in humans
2. Weeds impair visibility along roads and railway lines.
3. Uncontrolled weed growth reduces the value of real estates.
4. In situations where farmers depend on human labour for weeding, children have to miss school at peak of weeding periods. This reduces the quality of education that these children can get during their early years.

Beneficial Effects of Weeds

1. Weeds provide a vegetative cover that protects the soil surface against erosive action of rain and wind.
2. Weeds play an important part in nutrient recycling. Roots of weeds tap nutrients from the lower soil depths and return these to the soil surface as litter when the weeds shed their leaves or when the entire plant plants die and decay.
3. Weeds add organic matter to the soil both from the roots and from the above ground parts.
4. Many plants that are designated weeds are used as potherbs e.g *Talinum triangulare*.
5. Weeds are sources of pesticides e.g *Chrysanthemum cinerariifolium* which provide insecticide pyrethrum.
6. Weeds provide food and cover for animal. Wildlife generally depend on weeds for survival as food and shelter.
7. Weeds serve as an important source of genetic materials for crop improvement such as breeding for resistance to pests and diseases which are made possible by genetic materials provided by wild species of the crop plants.
8. Weeds serve as host for beneficial insects, and at the same time provide nectar for bees.
9. Many weeds help to beautify the landscape. E.g a good ground cover of *Cynodon dactylon* beautifies the home.

Classification of Weeds

Weeds can be classified based on:

1. *Morphology*
2. *Life cycle(ontogeny)*
3. *Growth habit*
4. *Botanical consideration*
5. *Habitat*

Classification Based on Morphology of weeds

The criterion defines classification on the basis of leaf shape.

(a) **Grasses**: the leaf lamina in relation to the breadth is very high e.g *Panicum maximum, Andropogon gayanus, Eleusine indica*

(b) **Broadleaves**: the ratio of leaf lamina to the breadth is smaller e.g *Sida acuta, Talinum triangulare, Euphorbia heterophylla, Ageratum conyzoides*

(c) **Sedges** : all the leaves tend to arise from the same point e.g *Cyperus rotundus, Cyperus esculentus, Mariscus alternifolius.*

Classification based on Life cycle

- Ephemerals e.g *Euphorbia, Digitaria, Eluesine, Spigelia anthelmia*.
- Annuals e.g. *Pennisettum spp, Rottboelia cochinchinensis*,

- Biennial e.g *Taraxacum officinale*
- Perennials e.g *Imperata cylindrica, Sida acuta.*

Classification based on Growth habit

- Free living weeds e.g Siam weed
- Parasitic weeds e.g *Sriga spp*

Classification based on Habitat

- Terrestrial weeds or upland weeds e.g *Imperata cylindrica, Euphorbia heterophylla.*
- Aquatic weeds e.g. water hyacinth, water lily.

Weed Control Methods

Weed control involves any action that seeks to restrict the spread of weeds and destroys or reduce their population in a given location.

Generally weeds can be controlled using the following methods:

1. *Preventive Weed control*
2. *Cultural Weed control*
3. *Biological Weed control*
4. *Chemical Weed control*
5. *Integrated Weed control*

Preventive Weed control

Preventive weed control refers those measures necessary to prevent the introduction of new weed species into a given geographical area as well as the multiplication and spread of existing weed species.

Preventive weed control includes the following:

- Use of clean crop seeds for planting
- Fallowing
- Preventing weeds from setting seeds
- Use of clean machinery
- Controlled movement of livestock
- Screening of irrigated canals to prevent weeds from being transported from infested field to clean areas
- Quarantine laws and services to prevent accidental introduction of exotic plants or their propagules.

Cultural Weed Control

This involves all aspects of good crop husbandry used by farmer to minimize weed interference with crop or any practice adopted by the farmers which aid in weed suppression.

This method includes:

- Hand weeding. This can be done by using hand pulling, hand hoeing, handslashing or push type weeders.
- Mechanical weeding: This can be done with animal drawn weeders or machine-powered weeders.
- Tillage
- Burning
- Flooding
- Mulching
- Crop rotation

Biological Weed Control

This refers to the control or suppression of weeds by the action of one or more organisms through natural means or by manipulation of the weed, organism or environment. This involves the use of the following:

- **Live mulch**: This is a crop production system in which a food crop is planted directly in the living cover of an established cover crop without destruction of the fallow vegetation.
- **Biological control with invetebrate animals** e.g the use of insects to control weeds; use of *cactoblastis* moth on *Opuntia* (Prickly pear) in India; the use of grasshoppers(*Paulina acuminata*) to control *Salvinia molesta* in Zambia.
- **Biological control with vertebrate animal** e.g. goats to graze down woody weeds; ducks and fish for control of aquatic weeds.
- **Microbial weed control** . This involves the use of microorganisms such as fungi, bacterial, bacteria, nematodes and viruses. E.g. of microbial weed control is the use of soil borne fungi (*Phytophthora palmivora*) now sold as mycoherbicides – sevine to control strangler vine (*Morrenia odorata).* **Mycoherbicides** is the use of plant pathogens to control weeds. The use of aerial fungus *Collectotrichum gloeosporoides* (sold as mycoherbicides- collego) for the control northernjointvetch in paddy rice.
- **Allelopathy**; This is the detrimental effect of chemical or exudates produced by one living plant species on the germination, growth or development of another plant species, or microorganisms sharing the same habitat.
- **Plant canopy**: The major effect of plant canopy is to shade the understorey plants and limit their ability to synthesize carbohydrates.

Chemical Weed Control

The practice whereby undesirable vegetation (weeds) is killed with herbicide is called chemical weed control

A chemical used to control, suppress or kill plants or to severely interrupt their normal growth process is called **herbicides**.

Herbicides can be *selective or non-selective*

Selective herbicides are those that have the ability to suppress certain member of weeds species and leave others unhurt. Eg. Atrazine, propanil, dalapon etc

Non selective herbicides are those that are generally toxic to all plants (they destroy any weeds that come their way) e.g glyphosate, paraquat.

Integrated Weed Management

This is a form of weed management that involves the combination of two or more weed control methods at low inputs to obtain a level of weed suppression superior to the ordinarily obtained when one weed management system is used. e.g.

Chemical +cultural method

Herbicide + organic mulch

Biological +Chemical +Cultural method

PESTS OF CROP PLANTS

Meaning of crop Pests: A pest can be described as any organism capable of causing damage to crop plants.

Types of Crop Pests

1. Insects
2. Birds
3. Rodents
4. Monkeys
5. Man
6. Nematode

Classification of Insect Pests

Insect pests can be classified into various groups based on their mode of feeding (feeding habits) as follows:

a. Bitting and chewing insects

b. Piercing and sucking insects

c. Boring insects

a. Biting and chewing insects

These possess strong mandible and maxillae (mouth parts) which enable them to bite and chew. Examples are: termites, grasshoppers, leaf worms, army worms, mantids, locusts, crickets and beetles

b. Piercing and sucking insects

The insects possess strong mouth parts called proboscis which enable them to pierce through plants and suck liquid materials from plant tissues. Examples are: aphids, cotton stainers, mealy bugs, scale insects, white flies, mirids and capsids.

c. Boring insects

These bore into plant parts and destroy the tissues of the plants or fruit or seeds. Examples include: bean beetle, stem borers, maize weevils, rice weevils.

ECONOMIC IMPORTANCE OF INSECTS PESTS

1. Insects pests destroy crops in the field through their biting, chewing, boring sucking and defoliation activities.
2. They cause reduction in viability of stored produce.
3. Spot of injuries by insects may predispose crops to disease attack.
4. They increase the cost of production during the cause of controlling them.
5. They render vegetables and fruits unattractive and unmarketable.
6. Some are carriers or vectors of diseases.
7. The profits of farmers are reduced .
8. They reduce the quantity of produce either in store or in the field
9. They generally reduce the yield of crops.
10. They can also cause total death of crop plants.

Prevention and control of Pests

Pests of crops can be prevented or controlled through the following methods

1. ***Physical control***
2. ***Cultural control***
3. ***Biological control***
4. ***Chemical control***

1. Physical control

This involves the physical removal of pests by

i. Handpicking of insects and larva
ii. Setting of traps to catch rodents
iii. Shooting rodents with guns
iv. Fencing round the farm with wire nets

2. **Cultural control** : This involves the use of farm practices to prevent or control pests especially on the field. Examples of cultural control

i. Practice of crop rotation.
ii. Use of pest resistant varieties of crops.
iii. Appropriate tillage operation
iv. Use of insect traps
v. Hand-picking and destruction of insects
vi. Burning crop residues
vii. Timely planting of crops
viii. Proper weeding or sanitation
ix. Timely harvesting
x. Close season practices especially in cotton

3. **Biological control**: This involves the introduction of the natural enemies of pest to control or keep the pests population under control. Such enemies eat up or feed on these pests e.g *Epidinocarsis lopezi*

4. **Chemical control**: This involves the use of chemicals called pesticides to control pests of crop plants. Examples of chemicals used to control pests:

i. Pesticides- chemicals to control pests
ii. Insecticides- chemicals to control insects
iii. Rodenticides- chemicals to control rodents
iv. Avicides- chemicals to control birds
v. Nematicides- chemicals to control nematodes

5. **Integrated control**: This involves use of two or more of the above methods. This type pest control is more economical and more effective.

Side effects of chemical method of control

i. Some beneficial insects and soil organisms may be destroyed
ii. The chemical used may be toxic to man and domestic animals
iii. It may leave undesirable residue in the environment.
iv. Pests and diseases may develop resistance to chemicals.
v. Some are washed out of soil to rivers and streams where they can endanger aquatic life and cause pollution.
vi. Empty containers may be a source of poisoning when used as containers for consumables.

Side effects of biological method of pest control

i. The new organism introduced may start attacking crops which were originally free from attack.
ii. The predators expected to control others may rather feed on beneficial insects
iii. The activities of the new organism introduced may cause serious imbalance in the ecosystem

Side effects of cultural method

i. The use of fire to kill harmful pests may also result in detruction of other beneficial organisms.
ii. Resistant varieties may become adapted to the environment so that the resistance is short-lived where is used.
iii. If care is not taken fire may spread to other unintended places and farms.
iv. The use of fire may cause the destruction and loss of organic matter from the soil.
v. It may lead to destruction of soil structure and cause soli erosion.