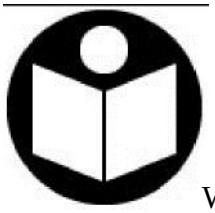
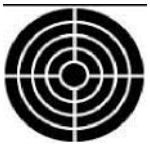
LESSON 11: WEEDS AND WEED MANAGEMENT

11.1 Introduction



Weeds are undesirable plants that may grow naturally along with crops. They affect the growth of plants, products desirability, decreased production efficiency and the yields. Weeds usually grow very fast, compete for the some resources and hinder plants growth by producing alellochemical. Weeding is necessary since weeds compete with the crop plants for water, nutrients, space and light. Farmers adopt many ways to remove weeds and control their growth. Tilling before sowing of crops helps in uprooting and removing of weeds, which may then dry up and get mixed up with soil. The best time for removal of weeds is before they produce flowers and seeds. The manual removal includes physical removal of weeds by uprooting or cutting them close to the ground, from time to time. Weeds are also controlled by using certain herbicides; these are sprayed in the fields to kill the weeds. They do not damage the crops.

11.2 Lesson Objectives



At the end of the lesson, you will able to

Define the term weed

Describe the economic importance of weeds

State the role of weeds in the farm

Describe the types of weeds

Describe the weed management and control strategies

Enumerate the effect of herbicides

11.3 What is a weed?

Weed is a plant considered undesirable, unattractive, or troublesome, especially one growing where it is not wanted as in a garden, lawn or agricultural areas where it competes with the crop plants for soil nutrients and water. More specifically, the term is often used to describe native or non native plants grow and produce aggressively. A Weed is any plant growing where it is not wanted.

Weeds are classified according to their life cycle into

Annual weeds. Weeds grow and mature within as year of their germination, more commonly in one season itself. New plants of such weeds regenerate in the next season from additional weeds present in the soil. Short lived annuals are called ephemerals.

Figure 24. Different species of annual weeds

Biennial weeds. The weeds complete their life cycle in two years in the first year they remain vegetative and in the second year they produce flowers and set seeds.

Figure 25. Different species of biennial weeds

Perennial weeds. Perennial weeds often have underground stems that spread out under the soil surface or, like ground creeping stems that root and spread out over the ground. They grow for more than three years before they wither. They live for more than two seasons. They survive harsh unfavorable conditions as dormant underground structures (roots, rhizomes, bulbs, tubers etc), the group has either evergreen or deciduous perennials.

Figure 26. Different species of perennial weeds

Weeds can be classified according to cotyledon character

- Monocotyledon- narrow leaves or grass weeds characterized by parallel veins and fibrous roots.
- Dicotyledon- broad-leafed weeds characterized by net venation, tap root system.

Differences between monocots and dicots		
Seeds	One seed leaf(monocotyledon)	Dicots
Leaf	Oblong Parallel veins Have a sheath at the base No leaf petiole	Broad leaf Net veined Have no sheath Has a leaf petiole
Stem	No cambium Vascular bundles scattered No secondary thickening	Cambium present Vascular bundle in a ring form (xylem and phloem) around the stem Secondary thickenings
Root	Tap root No pith Vascular bundles in the form of a ring Mostly herbs, few woody No separation into cortex and stele	Fibrous roots/Adventitious roots Pith is present Vascular bundle are star shaped Mostly woody Secondary growth in stem: and stem is Differentiated into cortex and stele
Flowers	Floral parts are in multiples of 3 and 4	

Weeds can be classified according to nature of stem

Depending on the Semi development of the bark tissue on their stem and their branches, weeds are classified as;

- Woody shrubs and under shrubs
- Semi woody
- Herbaceous have green, succulent stems and are of most common occurrence.

Weeds can be classified on the basis of growth habits

They can be classified in two groups;

- Free living weeds that live as independent organism and manufacture their own food through photosynthesis are known as autotrophic.
- Parasitic weeds that grow on living tissues of other plants deriving part or all of their food, water and mineral needs. Parasitic weeds can be classified into;

Roots parasites: Those which are obligate parasites because they need chemical stimulant from host plant to initiate seed germination. Root Parasitic weeds include *striga* spp (witch weed). Parasitic weeds cause serious economic losses to cultivated host crops. Chemical exudates from the host plant stimulate germination of the seed and as soon as it germinates the seedlings will attack itself to the root of plants host (such as maize) deriving assimilates, water and mineral from the host. After some days when green tissue are established they begin to synthesis their assimilates but still depend on the host root for water and water minerals, causing severe loss to the crop.

Stem parasites: attach themselves to the stem of the host plant through historian. They synthesize their own food but depend on the host for water and minerals.

11.4 Roles of weeds

- In crop production weeds can reduce yields, lessened products desirability and decreased production efficiency.
- Wild flowers and herbs not only provide beauty but also function in many useful ways, e.g. as a source of food for insects and animals, enrich the earth, loosen the hard-packed soil, and help prevent erosion.
- Dried weeds along roadsides are often the starting point for bush and forest fire. Their habits of growing and of propagation must be considered in attempting to eradicate them.
- Weeds compete with crops for water, light and nutrients. On rangelands and pastures weeds are those plants that grazing animals dislike or that are poisonous.
- Many weeds are host to plant disease organisms (pathogens) or of insect pests. They also harbor and spread plant pathogens that can infest and degrade the quality of crops of horticultural plants.
- Weeds limit the growth of other plants by blocking light or using up nutrients from the soil.
- Weeds may be a nuisance because they have thorns or prickles, cause skin irritation when contacted, or parts of the plant might come off and attach to fur or clothes.
- A number of weedy species have developed alellopathy, chemical means to prevent the germination or growth of neighboring plants.
- Some have been classified as noxious weeds because if left unchecked, they often dominate the environment where crop plants are to be grown. They are often foreign species mistakenly or accidentally imported into a region where there are few natural controls to limit their spread and population.
- “Beneficial weeds” may have other beneficial effect, such as drawing away the attacks of crop destroying insects but often are breeding grounds for insects and pathogens that attack other plants.

- Dandelions besides being a weed in lawns are one of the several species which break up hardpan in overly cultivated fields, helping crops grow deeper root systems.
- Some modern species of domesticated flower actually originated as weeds in cultivated field and have been breed by people into garden plants for their flower or foliage.

11.5 Impact of weeds

Losses due to weeds;

+ Reduced yield are directly related to weed population +
Reduced value of agricultural products and land value
+ Added production cost in weed control practices, health problems or harboring other pests

Competitive characteristics of weeds include

- Rapid development of tall canopy
- Large leaves or rapid leaf development
- Rapid stem elongation due to competition from other plants
- High nutrients and water uptake due to early/rapid root growth
- Effective photosynthesis
- Root secretion of allelopathic substances
- Highly prolific (many seeds under stressful circumstances)

Other competitive weed survival characteristics

- Seed/plant dormancy can cause problem for years
- Resistance to injury by having spines, thorns, or unpalatable leaves make plants survive grazing. Some weed are resistant to herbicides
- Adaptive growth leads to low growth and seed production despite mowing

11.6 Beneficial effect of weeds includes:

- Controlling soil erosion
- Provide wildlife habitat
- They are a source of germplasm
- Assist in nitrogen fixation

- They are host for biological organisms where they either assist in maintaining desirable organism or attract pests away from crops.
- Weeds are a source of food and livestock feed.

Name five major species of weeds that infest crop fields in Africa

- Thorn apple, *Datura stramonium*
- Green Beries, *Latana camara*
- Black jack, *Pidens pilosa*
- Striga, *Striga asiatica*
- Misteletoe *Phorandendron species*
- Couch grass, *Digitaria solonum*
- Oxalis, *Oxalis latifolia*
- Nutsedge, *Cyperus rotundas*
- Macdonald weed ,*Galinsonga parviflora*

11.7 Weed management and control

Weeds in the farm should be controlled to avoid or reduce yield losses. This can be done using a number of strategies. Weeds should be controlled before planting the crops, during crop production to reduce weed competition. The management strategies include;

Cultural control methods

This strategy involves manipulation of crop management to prevent infestation and growth. This can be done through;

- Varietal selection when one grows more vigorous or adapted varieties and hybrids that compete with weeds
- Farmers can practice crop rotation where different crop are grown to disrupt weed's life cycle.
- Selection of weed-free crop seed during planting.
- Practice different planting/harvest dates this gives crop an advantage over weeds while harvest may weaken and destroy over-wintering/perennial weeds
- Use narrow row spacing and population management. Narrow rows and high population lets the crop compete with weeds. For example narrow rows soybeans attain canopy 10-14 days before wide row (30" to 40")
- Soil fertility and pH management. This is essential since many weeds have very different needs.
- Mulching

Biological cost methods

Biological control relies on the use of biological relationships to control pests. This is done through usage of insect, diseases causing organism, animals and plant organisms.

- Disease causing organisms infect the weeds with disease which could be bacterial,viral or fungal diseases.
- Insects destroy weeds by feeding on them. Most of them are defoliators while others are the sap sucking insects.
- Some certain animals control weeds by feeding on them
- Some plants are allelophathic crop plants restrict growth of weeds by emitting chemicals into the soils. Allelopathy refers to the beneficial or harmful effect of one plant on another plant, both crop and weed species, by the release of chemicals from plant part by leaching, root exudation, volatilization, residue decomposition and other processes in

both natural and agricultural system. The effects of allelopathy include reduced seed germination and seedling growth

Mechanical control methods

This method involves direct physical injury to weeds. It can be done though

- Primary and secondary tillage to destroy weeds.
- Practicing row cultivation which reduces herbicide requirements
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- Clipping weeds depletes reserve carbohydrates and prevents seed production

Chemical control methods

Farmers use different types of herbicides to prevent or damage growth. Herbicides is any chemical used to destroy or inhibit plant growth, especially of weeds or other undesirable vegetation. There are over a hundred chemicals in common usage as herbicides. Many of these are available in several formulations (liquid, granular, and wettable powder) or under several trade names. The herbicides are applied through by broadcasting, banding, directing, non-directing, foliar, or soil-applied. Herbicides have either general or specific mode of action. This is based on how chemical interferes with normal processes. It acts as plant growth regulators, enzyme inhibitors or photosynthetic inhibitors.

Herbicides can also be grouped by activity use, chemical family, mode of action, or type of vegetation controlled

By activity

- Control herbicides destroy only the plant tissue in contact with the chemical. These are the fastest acting herbicides. They are less effective on perennial plants, which are able to re-grow from roots or tubers.
- Systemic herbicides are translocated through the plant, either from foliar application down to the roots, or from soil application up to the leaves. They can destroy a greater amount of plant tissue than contact herbicides.

By use:

- Soil-applied herbicides are applied to the soil and taken up by the roots of the target plant.
- Pre-emergent herbicides are applied to the soil before the crop emerges and prevent germination or early growth of weed seeds.
- Post-emergent herbicides are applied after the crop has emerged.

Type of formulation depends on the nature of herbicides, mode of action, ecology of the pest to be controlled and where to be used. Formulations include

- Dry or solid forms chemicals (dust or granules)

- Wettable powders
- Emulsifiable concentrate
- Gas form=fumigants
- Encapsulated form
- Water soluble
- Flowable formulation
- Water dispersible granules
- Salts
- Pellets

Why herbicides are formulated

- to reduce the concentration of the active ingredient through dilution in appropriate solvent.
- To make the pure chemicals available in a form that will permit uniform distribution of target
- To reduce the levels of contamination and hazard during handling and application.
- Better protection from degradation
- Greater uptake by weed.
- To reduce cost of weed control with that particular herbicide. For example, the choice of wettable powder over emulsifable concentrate and vice-verse may be, based to a large extent on which of the formulation is easy to produce and market

Methods of application

Broadcast application

Where the entire area is treated, the herbicide may be broadcast without fear or damaging other plants. Liquids and granules may be broadcast. Aerial application by aircraft is a form of broadcasting.

Band application

In orchards and vineyards, the path between rows may be readily cultivated, but the plant canopy may not permit the equipment to get close enough to all weeds from round the stem. Herbicides may be applied by band application to control the narrow strips of weeds around the plants.

Spot application

Weeds that break through gaps in the drive or walkway and masses of weeds concentrated in a small or hard to reach area are often spot treated.

Factor that favour chemical control of weeds

- Less drudgery in chemical control than in cultural method of weed control.
- Pre-emergence application of herbicides protects crop from the adverse effects of early weed competition
- Field labour demand is lower than in manual and mechanical control.
- Faster than manual and cultural weed control
- More effective against perennial weeds than other methods of weed control.
- Less likely to be adversely affected by erratic weather condition than other methods of weeding.

Limitations of chemical weed control

- Weeds become resistant due to prolonged and constant use of a given herbicide.
- Sudden dry spell may cause failure of pre-emergence herbicides
- Crop injury as a result of poor sprayer calibration or wrong dosage calculation, faulty equipment or failure to follow label directions.
- There could be side effects on the applicator
- Special skills are needed for effective herbicide use.
- Herbicide use is limited under multiple cropping
- Chemical weed control requires special equipment which may not be useful for other operation on the farm.

Health effects on herbicides

- Certain herbicides cause a variety of healthy effects ranging from skin rashes to death. The pathway of attack can arise from improper application resulting in direct contact with field worked inhalation of aerial sprays, food consumption and from contract with residual soil contamination.
- Herbicides can also be transported via surface runoff to contaminate distant surface water and hence another pathway of ingestion through extraction of that surface water for drinking.
- Some herbicides decompose rapidly in soils and other type have more persistent characteristics with longer environmental half-lives
- Other alleged health effects can include chest pain, headaches, nausea and fatigue.
- Some of the herbicides in use are known to be carcinogenic or teratogenic in nature
- However, some herbicides may also have a therapeutic use.

Summary

Weeds are plants growing where they aren't wanted. In general, plants are considered weeds when they interfere with the utilization of the plant and water resources or otherwise adversely intrude upon human welfare.

Activities

Collect different types of weed that appear in your environment, identify them and classify them using the classifiication you have learnt.