VEGETATIVE PROPAGATION

Types of Vegetative Organs

- Stolons or Runners
- Rhizomes
- Tubers
- Bulbs
- Bulbils
- Stems

Advantages and Disadvantages of vegetative propagation

Advantages:

- Uniformity
- High yield
- Fast establishment

Disadvantages:

- Limited adaptable qualities
- Few individuals are produced from vegetative organs.

regenerated vegetative plants cannot survive continuous soil disturbance of the environment

WEED MANAGEMENT

Weed Management refers to how weeds are manipulated so that do not interfere with the growth, development and economic yield of crops and animals. It encompasses all aspects of weed control, prevention and modification in the crop habitat that interfere with weed ability to adapt to its environment.

Weed control: Refers to those actions that seek to restrict the spread of weeds and destroy or reduce their population in a given location. The effectiveness of weed control is affected by

i Type of crop grown

ii Timing of weeding operation

iii Nature of the weed problem

iv Methods of weed control available to the farmer

v Type of weeds to be controlled

vi Cost of the operation

vii Available labour or cash resources

viii Environmental condition before during and after the time of operation.

Weed prevention: This refers to the exclusion of a particular weed problem from the system that has not experienced that weed problem. It involves 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.

It includes the following:

- *Fallowing*

- *Preventing weeds from setting seeds*
- *Use of clean crop seed for planting*
- *Use of clean machinery*
- *Controlling the movement of livestock*
- *Quarantine laws services*

Weed eradication:

This involves complete removal of all weeds and their propagules from a habitat. Eradication is difficult to achieve in crop production and uneconomical. However in situations where weed problem becomes so overwhelming, eradiation may be desirable in long term goal. E.g. *Striga asiatical, S. hermonthica*.

Eradication may be considered if

i other weed control method s are ineffective

ii Weeds have many buried seeds that can not be controlled by convectional pratice

iii The infested field is small

iv Benefits from eradication outweigh those of the alternate methods for copping with weeds.

Methods of weed control

i Cultural

ii Biological

iii Chemical

iv Integrated

CULTURAL WEED MANAGEMENT

Cultural weed management is defined as any practice or effort adopted by the farmer in crop production which minimizes weed interference problem but such methods are not necessarily directed or aimed at weed control

Cultural weed methods include:

Hand weeding

Mechanical weeding (animal-drawn weeders & machine-power weeder.

- Mulching
- Crop Rotation
- Tillage
- Burning
- Flooding
- Sowing/planting time and crop spatial management
- Crop genotype choice
- Cover crop (used as Living mulches)
- Intercropping
- Fertilization

BIOLOGICAL WEED MANAGEMENT

- Biological weed management refers to the use of biological agent – pest, predators, pathogen and parasites to control weeds.

- It involves the control or suppression of weeds through the action of one or more organisms by natural means, or by manipulation of the weeds, organism or environment. It involves:

- ***Control of weeds with vertebrates & invertebrates (Macrobial weed control)***

- ***Use of micro organism such as plant pathogen (Microbial weed control)***

- ***Live mulch:***Live mulch is the crop production system in which a food crop in planted directly in the living cover of an established cover without destruction of the fallow (cover crop vegetation).

Perennial legumes such as *Psophocarpus palustris* have been evaluated and found suitable as live mulch.

- ***Allelopathy:*** Allelopathy is the production of chemical(s) or exudates by living and decaying plant species which interfere with the germination, growth or development of another plant species or microorganism sharing the same habitat.

Examples of allelopathic plants:

1. Black walnut (*Juglans nigra*)
2. *Gmelina arborea*
3. *Sorghum bicolor*
4. Casuarina
5. *Lantana camara*
6. *Imperata cylindrica* is allelopathic on tomato, cucumber, maize rice, ground nut, cowpea, pepper.
7. *Cyperus esculentus*– is allelopathic on rice, maize

8. *C. rotundus* – is allelopathic on barley

Plant canopy: Major effect of plant canopy is to shade the understorey plants and limit their ability to synthesize carbohydrates.

A competitive crop should be able to establish complete ground cover.

Some low grow crops which can provide early ground cover and shade out weeds when intercropped with other crops are egusi melon (*Colocynthis citrillus*) and sweat potato

CHEMICAL WEED CONTROL

Chemicals that are used for killing weeds or suppress the plant growth are called herbicides. The practice of killing the undersirable vegetation (that is weeds) with herbicide is called chemical weed control.

History of herbicides/chemical weed control

- The use of chemical weed control started with inorganic copper salts e.g $CuSO_4$ for broadleaf weed control in cereals in Europe in 1896.

- Other inorganic salts that were tested between 1900-1930 included nitrates and borates.

- In 1912, sulphuric acid (H_2SO_4) was used for selective weed control in onions and cereals. In 1932, the first organic herbicide, Dinitro-ortho Cresol (DNOC) was introduced.

- In the 1950s triazine was introduced. In 1974, Glyphosate , (frequently sold under brand name Roundup) for non-selective weed control was introduced.

- Agriculture witnessed tremendous changes through the production of organic herbicides, which came at a time when field workers were reducing, high cost labour and productive cost of production. Thus, farmers in advance countries almost depended on herbicide because it met their production challenges in agriculture and relatively ignored other methods of weed control.

There are various factors that made chemical weed control popular than manual and mechanical weeding.

- Less drudgery in chemical control than in cultural method of weed control.
- Preemergence application of herbicides protects crops 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 weeds control

- Weeds become resistant due to prolonged and constant use of a given herbicide .
- Sudden dry spell may cause failure of preemergence 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 effect on the applicator
- Special skills are needed for effective herbicide use.
- Herbicide use is limited under multiple cropping

- Chemical weed control require special equipment which may not be useful for other operations on the farm.

Herbicide classification

Herbicides are classified based on the following:

- Based on time of application (when applied)
- Based on point of application (where applied)
- Based on Herbicide movements in plants (how they move in plants) (Site of primary action)
- Based on type of plants killed (Selectivity)
- Based on chemical structure (Chemistry)
- Based on Physiological action

INTEGRATED WEED MANAGEMENT

Integrated weed management (IWM) refers to the system of combining 2 or more weed management systems at low input level to keep weed interference in a given cropping system below economic threshold level. It combines 2 or more weed management systems at low inputs to obtain a level of weed suppression superior to that ordinarily obtained when one weed management system is used.

IWM may involve combinations of cultural plus chemical, cultural plus biological, cultural plus preventive, biological plus chemical or combinations of three or more of these systems.

- ***Factors that made IWM desirable.***

- Inability of any one method of weed control to completely solve the weed problem
- tendency of weeds to adapt to a given cropping system and thus escape control
- ability of weeds to develop resistance to a frequently used herbicide
- tendency of certain cropping systems to favour the dominance of specific weeds
- Seasonal fluctuation in labour availability
- Reduction in environmental degradation/hazards

HERBICIDES

Herbicide use in weed control has been the most important in world agriculture because it destroys weeds on a large scale either before or at emergence of crop without disturbing the crop or soil and farmers don't depend heavily on human labour. Weed killers consist of inorganic, organic, and biological herbicides. ***Types of Inorganic herbicides***

- Ammonium sulfate
- Ammonium thiocyanate
- Sodium borate
- Sulfuric acid
- Sodium chlorate

Types of organic herbicides

Over 200 organic herbicides are in use in the world agriculture today. Some of the herbicides are either selective or non- selective while some are also contact or systemic in their actions.

i. Oil: the petroleum oils used in agriculture consists of phytotoxic and phytobland (non-phytotoxic) oils.

Phytotoxic oils: kill plant by solubilizing cell walls, thus causing cells to disintegrate. Phytotoxic oils can be selective or non selective. They have high content of unsaturated fatty acids. Example of selective phytotoxic oils include: diesel oils, while non-selective phytotoxic oils include Stoddard solvent.

Phytobland / Non pyhtotoxic oils: these are light non herbicidal oils which are added to herbicide to enhance their activity. They are used both as toxicant and adjuvants. Examples of nonphytotoxic oils include sun 11 or corn oils.

ii. Organic arsenicals or methane arsonate herbicides eg. Cacodylic acid, MSMA, DSMA.

iii Aliphatic acids e.g TCA, Dalapon

iv. Nitrophenols or substituted Phenol herbicides e.g dinoseb, DNOC and PCP

v.Phenoxycarboxylic acid derivative

(a) Phenoxyaceticacid herbicide; 2,4-D, MCPA.

(b) Phenoxypropionic acid herbicide; dichlorprop, mecopropane, fenoprop.

(c) Phenoxybutyric acid herbicide; 2,4-DB, MCPB.

(d) Phenoxy-Phenoxypropionic acid; dichlofop-methyl

vi. Amide derivatives

a. α-Chloroacetamide herbicides; acetochlor, alachlor,CDA A (callidochlor), butachlor, diphenamid metolachlor, propachlor.

b. Carboxyanilide herbicides; propanil

vii. Benzonitriles; Bromoxynil, dichlobenil and ioxynil.

viii. Carbamic acid derivates (carbamates)

a. Carbanilic acid derivatives; asalam, chlorpropham.

b. Thiocarbamate herbicides; butylate, EPTC, molinate, thiobencarb.

c. Dithiocarbamate herbicides; CDEC, metham

ix. Dinitroaniline herbicide; Benefin, (benfluralin), dinitramine, pendimethalin, trifluralin, isopropalin.

x. Diphenyl ethers: acifluorfen, bifenox, lactofen, oxyfluofen.

xi. Substituted benzoic acids e.g chloramben, dicamba, DCPA

xii. Symmetrical triazines:

a. Chlorodiamino-s-triazine: atrazine, cyanazine, propazine, simazine

b. Methoxydiamino-s-triazine: atraton ana prometon

c. Methythiomino-s-triazines: ametryn, prometryne and terbutryn

xiii. Triazinones: e.g. hezazinone, metribuzin

ix. Substituted ureas e.g chlorbromuron,chloroxuron, diuron, linuron, metobromuron, monuron

x. Sulfonylurea herbicides: chlorsulfuron, sulfometuron-methyl, classic, lindax

xi. Uracils herbicides: e.g bromacil and terbacil

xii. Miscellaneous herbicides:

- Amitrole

- Bentazone
- Bipyridilium herbicides e.g difenzoquat, diquat and paraquat
- Cinethylin
- Fosamine
- Glufosinate- ammonium
- Glyphosate
- The imidazolinone herbicides

e.g. Buthidazole, Imazaquin, arsenal, Imazapyr

- The picolinic acid derivatives: Picloram, Triclopyr
- Oxadiazon
- Sethoxydim (Akobundu, 1987)

Effectiveness of herbicide can be modified by: environment, stage of maturity of target plant, type of plant, plant part sprayed, how herbicide moves within the plant, concentration of herbicides, method of application and tissue of application.

Herbicides are named in three major ways:

- **Common name**
- **Trade name**
- **Chemical name of the active ingredient (chemical formulae)**

Structural formulae (Chemical Structure)