**WEED-CROP INTERACTION**

- When plants grow close to each other, they interact in various in ways.

- ***Interference:*** It is the detrimental effects of one species on another resulting from their interactions with each other. When plants are far apart they have no effect on each other. Interaction generally involves competition and amensalism**.**

- ***Commensalism:*** This is the relationship between unrelated organism (different species) in which one derives food or benefit from the association while the other remains unaffected.

***Competition*** (**allelospoly)**: It is the relationship between two plants (weed/crop, crop/crop, weed/weed) in which the supply of a growth factor falls below their combined demand for normal growth and development. The growth factor competed for include water, nutrients, light, space and air/gasses (oxygen, carbon dioxide

**Types of competition**

- Above-ground (Aerial) competition : Takes place in the leaves and the growth factors involve are light and carbon dioxide.

- Below-ground(Subterranean) competition: Takes place mainly in the roots while the growth factors involve are water, nutrients and oxygen.

The perceived consequence of competition with crop is reduction in the economic yield of affected crop plants.

**Forms of competition**:

*Intraspecific competition*: competition for growth factors among individuals of a plant species

*Interspecific competition*: competition for growth factors between two different plant species i.e crop/weed, weed/weed,or crop/crop

**Critical Period of Weed competition/interference:**

This is the minimum period of time during which the crop must be free of weeds in order to prevent loss in yield .

it represents the overlap of two separate components (a) the length of time weeds can remain in a crop before interference begins

(b) the length of time that weed emergence must be prevented so that subsequent weed growth does not reduce crop yield.

**Factors affecting weed-crop competition**

**Weed factors**

- Competitiveness of weed species
- Weed density and weight
- Onset and duration of weed-crop association
- Growth factors

**Crop factors**

- Type of crop and seeding rate
- Spatial arrangement of crops
- Plant architecture
- Growth factors availability
- Cropping patterns

- Crop type (C3 or C4 plants)
- Crop variety ( tolerance, resistance, aggressiveness)

**Environmental factors**

- Climatic factors e.g. rainfall, temperature, wind, light etc
- Tillage
- Ground water management
- Soil (Edaphic)

***Amensalism*** (**Allelopathy**)

**Allelopathy i**s 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.

**There are two types of allelopathy**:(***True and Functional*** )

*True allelopathy* involves the release into the environment compounds that are toxic in the form they are produced. *Functional allelpathy* involves the release into the environment substances that are toxic as a result of transformation by microorganism.

Allelochemical complex commonly encountered in plants include:

coumaric acid, terpenoids, - syringic acid, butyric acid, flavonoids, phenolic compounds.

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, glnut, olera, cowpea, pepper.

7. *Cyperus esculentus*– is allelopathic on rice, maize

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

**Parasitism**

- ***Parasitism:*** It is a relationship between organisms in which one lives as a parasite in or on another organism.

- ***Parasitic* weeds** are plants that grow on living tissues of other plants and derive part or all of their food, water and mineral needs from the plant they grow on (host plants)

*Hemi parasite* (*Semi parasite*) is a plant which is only partially parasitic, possessing its own chlorophyll (green colour) and photosynthetic ability (may be facultative or obligate). E.g *Striga hermonthica*

*Holo parasite* – a plant which is totally parasitic, lacking chlorophyll thus unable to synthesize organic carbon. E.g *Orobanche spp*

*Obligate parasite* – a plant which cannot establish and develop without a host

*Facultative parasite* – a plant which can grow independently but which normally behaves as a parasite to obtain some of its nutrition.

- ***Predation***: It is the capture and consumption of organisms by other organisms to sustain life.

- **Mutualism**: It is an advantageous relationship between two organisms of different species that benefits both of them. It is obligatory and the partners are mutually dependent. Both partners are stimulated when the interaction is on. Example is the case between fungus and algae. The fungus protects the algae while the algae provide carbohydrate for the fungus.

- **Neutralism:** This is the situation where plant exerts no influence on one another.

- **Protocooperation:** This is a condition whereby two plants interact and affect each other reciprocally. Both organisms are stimulated by the association but unaffected by its absence.

**Weed Biology**

- Definition: Weed biology is the study of the science of physical life of weeds. It is also defined as the study of the establishment, growth and reproduction of weeds as well as environmental influences on these processes.

- Weed identification

- Periodicity of weed emergence

- Dormancy characteristics

**Distribution of weeds**

Global distribution of weeds divides weeds into three climatic regions as follows:

- Tropical weeds

- Sub-tropical weeds

- Temperate weeds.

Temperature is the most important factor of climate which governs the global distribution of weeds.

**Local distribution of weeds**

**Factors affecting distribution of weeds:**

- Land use
- Soil characteristics
- Cropping practices
- Frequency of weeding

**Terrestrial weeds:**

- are weeds that grow on land and consist of
- 69% are broadleaves, 23% grasses, 6% sedges and 2% ferns.

Aquatic weeds:

- are those that grow on water or are submerged in water.
- 60% account for grasses, 30% for broadleaves and 10% for ferns.

**REPRODUCTION IN WEEDS**

Four processes are involved in weed reproduction:

- Seed production
- Seed dissemination (Dispersal)
- Seed germination
- Vegetative propagation

**Roles of seed in a weed's life cycle**

- Survivability and adaptability to environment
- Perpetuation of species
- Dispersability
- Food Storage
- Protection during adverse conditions that are favourable for germination (dormancy)

**Seed Rain**

- This is a periodic weed seed supply whereby weed seeds are shed by mature weeds and added to the population of weed seeds in or on the soil.

Factors that affect the quantity of weed seeds in the seed rain include:

- Damage by animals
- Damage by adverse weather conditions

**Fate of weed seeds shed on the soil**

- Such seeds can move unto the soil profile :
  - Cracks and fissures in the soil
  - Cultivation
  - Harvesting of root and tuber crops
- Transportation by water.
- Such seeds can remain dormant for years and germinate during land preparation.
- May be killed by heat during burning or mulching

- May be killed by pre-emergence herbicide
- May germinate (if not-dormant) and seedling killed by adverse weather condition; herbicides (post and pre-emergence) mechanical and hoe weeding.
- The weeds seedlings that escape these actions and grow into maturity and produce mature seeds add to the seed rain.

**Seed Bank**

- This is the reservoir of seed in the soil . It consists of seeds produced on a given area plus weed seeds that have migrated to the area as a result of the actions of agents of seed dissemination/dispersal.
- Distribution of weed seeds in a soil profile is affected by: Tillage practices and action of natural forces
- Top 10cm of soil contains higher seed density than the lower soil depth.

**SEED DISPERSAL (Dissemination)**

- Weed seeds are dispersed in time and space
- Weed seeds dispersal in time means the capacity of many weed seeds to remain dormant for a period of time.
- Seed dispersal in space refers to the physical movement of seeds from one place to another

**Dispersal in time**

- weeds show periodicity in germination whereby the weed seeds have the tendency to have germination flushes at certain times in the growing season
- some weed species have one germination while others have more than one germination

- All weed species will show peak germination between March and June

- So most broadleaf weeds are predominate in the early season while grasses are more serious in the late (dry) season due to the low soil moisture, high soil temperature, land use patterns and cropping practices

**Dispersal in Space**

- The quantity of weed seeds falling on a unit area of land is affected by:

(i) Height and distance of the source of seed

(ii) The concentration at the seed source

- Dispersability of the seed (seed, size, presence of pappus), bouyancy in water and other morphological and anatomical features that may facilitate transportation to far distances.

Activities of the dispersing agents.

**Agents of weed seed dispersal**

Natural agents for weed seed dispersal are:

- Water - through surface run-off, drainage, streams and irrigation water.

- Wind e.g. seeds of Asteraceae family

- Animals - clinging to animal fur, feathers or eaten by animals or birds and passing out of their droppings without loss of viability

- Humans - clinging to clothing, as impurities in crop seeds and clinging to muddy tillage implement or harvesters.

- The farther the distance from the source (e.g. wind dispersed seeds) the lower the density of dispersed seeds.

Regardless of the agents of dispersal, distribution of seeds in space is uneven.

**Seed Germination**

- Germination is the resumption of vegetative growth by a seed resulting in theproduction of seedling.

**Process of Germination**:

- Inception of rapid metabolic activities within the seed.
- Appearance of radicle and its emergence.
- Radicle emergence is the evidence that germination has begun.
- The best indicator of seed germination is the emergence of plumule (broadleaf plants) or the coleoptiles (monocots).

**STAGES OF SEED GERMINATION**

- **Germination**- It involves water inbibition and all the biochemical and physiological processes that culminate in the emergence of radicle and plumule.
- **Underground Elongation** : Elongation of radicle and plumule takes place at the expense of food stored in the endosperm.
- **Emergence**- The aerial parts of the seedlings emerge above ground.
- Seedling emergence could be Hypogeal (Cotyledons remain below the soil surface), or Epigeal (Cotyledons are forced above ground by elongation of the epicotyl.
- **Independent growth**- Process starts with the onset of photosynthetic activity by the seedling plant.

**SAFE SITE**

- A site that provides favourable conditions for the weed seed to germinate is called a SAFE SITE.

This site provides the following:

- Stimuli required for the breaking of dormancy
- Conditions required for the germination process to proceed.
- The resources (water, and oxygen) which are consumed in the course of germination etc.

**Factors Affecting Weed Seed Germination**

- **Temperature**: It is specific for a given non-dormant weed species.
- **Soil moisture**: Adequate moisture at the safe site.
- **Alternative wetting and drying of soil:** relates to the removal of inhibitory substances associated with seed dormancy e.g *Digitaria* and *Striga species* germinate better when subjected to such changes in soil moisture.
- **Depth of seed burial**: Tillage affects depth of weed seed burial. Seedlings of small seeded weeds (< 2mm) cannot germinate from soil depth > 5cm
- **Disturbance of the soil surface**
- **Aeration**
- **Light**:
- **Soil nutrient level**

**Dormancy characteristics of weed seeds**

- Dormancy is the situation whereby the viable seeds, spores or buds fail to germinate under conditions of moisture, temperature and oxygen favourable for vegetative growth.
- Seed dormancy is a survival mechanism.
- Buds of rhizomes, stolons and other specialized stems also exhibit dormancy.

**Types of dormancy**

- Innate dormancy
- Induced dormancy
- Enforced dormancy