Herbicide:

Defined as any chemical agent that kills or greatly inhibits plant growth. They were made to specifically and mainly kill plants.

Literally means "plant killer"

History of Herbicides:

- 1890 to 1900 sodium arsenite to control aquatic plants in waterways in the USA.
- 1925 sodium chlorate (direct soil application) was first used for killing weeds.
- 1934 sodium nitrocresylate, as the first selective weed killer in France.
- 1940s first organic herbicide 2,4-D was commercialized providing selective control of certain broadleaf weeds in grass crops.
- 1960's pre-emergence herbicides trifluralin and atrazine introduced.
- 1974 glyphosate (Roundup) available among the world's most important herbicides -S.B.Powles. Control broad-spectrum of weed spp.
- As in 2010, more than 200 herbicides from 22 mode-of-actions available in the market.

Herbicide Nomenclature:

- 1. Active ingredient the chemical in the herbicide formulation primarily responsible for its phytotoxicity.
- 2. Trade name a trademark or other designation by which a commercial product is identified.
- 3. Common name each herbicidal chemical has one common name assigned to it. In many cases, the common name is a simplified version of the chemical name.
- 4. Chemical name the systematic name of a chemical compound according to the rules of nomenclature of the International Union of Pure and Applied Chemistry (IUPAC), Chemical Abstracts Service (CAS) or other organization.

Herbicide Toxicity:

Toxicity: danger/poison level

LD₅₀ (lethal dose): An LD₅₀ represents the individual dose required to kill 50 percent of a population of test animals.

The lower the LD_{50} value, the less chemical that is required to reach lethality.($LD_{50}10$ is more toxic than $LD_{50}100$).

Herbicide Classification: herbicides can be classified based on:

A- Selectivity:

1. Selective:

Toxic to some species and much less toxic to others at a given dosage. A selective herbicide kills weeds but not the crop.

2. Non-selective:

Kills or severely damages all or most species. A non-selective herbicide kills weeds and potentially crops.

Selectivity may be due to differential absorption, translocation or physical (morphological) differences between species.

Examples: 2,4-D, mecoprop, dicamba control many broadleaf weeds but many turf grasses are tolerant.

A selective herbicide can be made non-selective by applying improperly or by applying high rates. Selectivity is usually rate dependent.

Nonselective herbicides control plants regardless of species.

Examples: Glyphosate, glufosinate and paraquat are nonselective, foliar absorbed herbicides.

(Note – glyphosate is selective to certain turf species at low rates)

B. Activity:

1- Contact herbicides:

Kill only the portion of green tissue that is contacted.

- Effective only on tissue contacted by application of herbicide.
- Very little movement (translocation) within the plant.
- Full spray coverage essential (because no translocation must get spray deposited on most of plant).
- Usually exhibit acute effects kill rapidly
- Effective for annuals, usually ineffective for perennials (because no translocation to underground reproductive organs)
- Can be selective or non-selective.

Contact herbicides do not kill perennial underground structures such as rhizomes, tubers and bulbs. Repeat applications to regrowth may eventually drain the plants' underground resources, but it is better to try to control perennial weeds with systemic herbicides. Use contact herbicides on annual weeds.

2- Systemic herbicide:

Are extensively translocated in a plant's vascular system from point of absorption (leaf or root) to sites of action.

- Absorbed by roots or above-ground parts (depends upon particular herbicide and application method), translocate within plant.
- Good spray coverage is necessary with all herbicides, but less critical than contact herbicides because of systemic herbicides can be translocated.
- Usually exhibit chronic effects slow acting.
- Effective on annuals, some are effective on perennials; effective on perennials because of translocation to underground organs.
- Can be selective or non-selective.

Systemic herbicides are transported throughout the vascular system along with nutrients, water and organic materials necessary for plant growth.

Systemic herbicides require days to weeks for total control. (Herbicide must travel throughout plant).

Systemic herbicides are more effective on perennial weeds than contact herbicides.

C. Residual activity:

1. Residual: Herbicide retains activity on susceptible weeds for some time following application. Length of residual depends upon the particular herbicide and the application rate.

2. Non-residual: Herbicide has activity only on weeds present at time of application. Does not provide control of weeds that emerge after application.

D. Type/time of application:

- 1. Pre-plant: applied to soil, prior to planting the crop. They are nonselective herbicides that kill desirable and undesirable plants.
- 2. Pre-emergence: applied to the soil prior to emergence of the crop or weed
- 3. Post-emergence: applied after emergence of the crop or weed.
- 4. POST herbicides are applied directly to the emerged weed, and are usually more effective on seedlings.

Example: 2, 4-D is a POST, selective, systemic, foliar absorbed herbicide.

POST herbicides usually should be avoided in high temperatures degrees. The weeds could be drought-stressed and also the herbicide could become volatile and drift to non-targeted sensitive plants.

E. Methods of application:

Refer to the ways herbicides can be applied:

1. Broadcast: applied over the entire field.

2. Band: applied to a narrow strip over the crop row.

3. Direct: applied between the rows of crop plants with little or no herbicide applied to the crop foliage.

4. Spot treatment: applied to small, weed-infested areas within a field.