

I. capable of  
reproducing by  
underground  
portions. v.



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i. Relative weeds-crops plants in a crop ii. Off type plants-rogue-local wheat variety, in Sonalika variety.

**Characteristics of Weeds:**

i.

Prolific seed producer ii. Prolonged viability iii. Dormancy iv. Capable of reproducing by underground portions.

v. Dispersed through various agents. vi. Inherent hardiness against heat, cold, soil abnormalities vii. Capable of escaping the destruction caused by man and animal viii. Capacity to self regenerate

**Propagation of Weeds:**

1. Asexual – Algae, Ferns 2.

Vegetative-Rhizomes, Runners, Stolons, Suckers, Offsets, Tubers, Bulbs, Bulbils, Stems and Roots.

**Dispersal/Dissemination of Weeds:**

i. Reproductive unit may fall near the mother plant ii.

A portion of mother plant may be carried away as contaminant with agricultural crop seeds iii. Dispersed to short/ long distances by dispersing agents 1. Wind: i. Weed seeds and fruits have specific organs to float in air ii. Pappus hairs (dandelion) iii.

Whole plant may be detached and rolled- wild safflower iv. Wind swings

entire plant and cause mature capsule to disperse the seeds. 2. Water: i.

May drift either as whole plant or plant fragments. 3. Birds and animals: i.

Fruits are eaten and seeds are dispersed ii. Lantana seeds by Myna, Chinese

turtle dove. iii. Farm animals carry seeds and fruits on their skin and hair. 4.

Man: i. Farm machinery, carts and automobiles 5. Manure: i.

Farm yard manure.

### **Classification of Weeds:**

1. Based on Duration: (a) Annuals: Weeds present along with annual crops.

Duration is short. i. Multiply by seeds and produce large number of seeds/plants. ii.

Prevention of flowering or removal of weeds before flowering is important. e.

g. Amaranthus, Argemone, Cenchrus. (b) Biennials: Alternanthera echinata,

Eichorium intybus. i. Life cycle two years ii.

I year- vegetative; II year – produce flowers and seeds. (c) Perennials:

Cyanodon dactylon and Cyperus rotundus i. Grow more than two years. ii.

Propagate vegetatively in addition to seeds.

2. Based on cotyledons: Monocots – Dalapon and Phrchetaralin Dicots – 2, 4

D, MCPA. 3. Morphological characters: Grasses: Echinochloa, Cyanodan.

Sedges: Cyperaceae – C. rotundus; C. deformis.

Broad leaf weeds: all dicot weeds

**Allelopathy:**

Definition: The phenomenon of one plant having detrimental effect on another through the production of chemical compounds. i. It depends upon a chemical compound being added to the environment by an allelopathic agent. ii. Differs from competition in that competition leads to removal or reduction of some factors (water, nutrients and light) from the environment that is required by some other plant sharing the habitat. Effect: i. May be direct or indirect harmful effect.

ii. Inhibit seed germination or reduce the growth of other plant species. iii. Phenolic acids, terpenoids, flavonoids. iv. Released as vapour, as leachings from the foliage, as exudates from the roots or decomposition of dead plant residues.

v. It is the mechanism through which weeds affect crop growth. vi.

Significant role in maintaining the balance. Types: True allelopathy: The direct or indirect harmful effect on the other crops through the release of toxic substance as such from the plant. Functional Allelopathy: When precursor is released which is converted into active substances by some microorganisms called functional allelopathy.

Based on Inhibition — Auto inhibitors: Toxic substances released from one species affect the other species. Allo inhibitors: Toxic substances released from one species affect the same species. I. Effect of weeds on crops: e. g. wheat. Seed exudates *Avena fatua* affect the germination and seedling growth of maize. Leaves and inflorescence, *Amaranthus spinosus* affect the vegetative growth.

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II. Crop plants on weeds: Wheat, oats and peas ñ. album affect biomass production and leaf Surface.

**Activity and Selectivity of Herbicides:**

Activity refers to the ability of herbicides to control weeds, where as selectivity is the ability of herbicide to control weed without affecting the economic plant in a mixed population. Herbicide activity is related to phytotoxic effects of a chemical on the plant growth and development. Herbicide selectivity refers to the phenomenon where in a chemical kills target plant species in a mixed population without harming or slightly affecting other plants. Factors affecting herbicide activity and selectivity: (a) Formulation, time, method and rate of application: Formulation affects solubility, volatility and specific gravity and phytotoxicity of a herbicide. Variation in the placement of a herbicide can affect its activity.

A herbicide is selective at a lower rate may become non selective when applied at higher rates. (b) Plant Morphology: Horizontally arranged leaves intercept more of the spray than upright leaves. Presence of leaf hairs, thick cuticle prevents the absorption. (c) Cultivation Practices: Tillage practices bring out the dormant weeds to the top soil exposing them to sun resulting in germination, thereby increasing the susceptibility to herbicides.

(d) Absorption: The differential absorption from one plant species to the other which determines herbicide activity and selectivity. (e) Translocation: Herbicide enters the plant must be transported to the site of action and disturb metabolic activities of plant. (f) Metabolism: Any herbicide which enters the plant undergoes metabolism. It is well known that tolerant plant

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inactivates a herbicide in one or many path ways. (g) Environmental Factors: The response of a plant to an applied herbicide depends upon the environmental stress occurs.

### **Crop-Weed Competition:**

Weed species absorb and accumulate nutrients faster than the crop plants. Application of high levels of fertilizers may increase the impact of the weed while weed growth is stimulated more than crop growth.

Competition for Light: Weeds grow faster and shade the crop plants if not checked. Weeds deplete photosynthetically active radiation resulting in reduction of photosynthesis and shortening the life of lower leaves. For e. g.

*Amarnathus hybridus* reduced the photon flux density reaching the cotton canopy by 90% at midday. Competition for Water: The amount of water required to produce an unit amount of dry matter is known as the transpiration ratio. The transpiration ratio of weeds is high as compared to crops. Critical Period of Crop-Weed Competition: The critical period of crop weed competition is the period from the time of sowing upto which the crop is to be maintained in a weed free environment to get higher yield.

Importance of critical period of crop-weed competition in weed management: Weeds generally germinate either before or at the same time as the crop, offer serious competition to the crop plants since they got opportunity to establish and accumulate dry matter faster than crop plant e. g. In maize the first 2-3 weeks of it emergence, weeds put forth 15-18% of their growth

while maize attained only 2-3%. Hence it is desirable to identify the critical period of crop-weed competition for all crops to get higher economic returns.

### **Integrated Weed Management (IWM):**

“ A weed population management system that uses all suitable techniques in a compatible manner to reduce weed population and maintain them at levels below those causing economic injury. Need for IWM: i.

No single control measure can be effective in all cropping situations. ii.

Usage of same control method leads to build up of tolerant weeds. iii. It is uneconomical to eradicate all weeds that some may provide food and shelter for insect predators and predators that reduce other pests. Cultural Methods:

(i) Field Sanitation – ploughing, burning (ii) Sowing/Planting Method – weed seed free (iii) Variety Selection – Selecting done (iv) Planting Density/Spacing – closer (v) Irrigation and Drainage – submergence alternate wet and dry (vi)

Cropping Systems – crop rotation, intercropping, mixed cropping Physical

Methods: (i) Hand weeding – rice, tomato (ii) Hand hoeing – onion, finger millet (iii) Mowing -cutting at ground level (iv) Dredging and chaining –

aquatic weeds (v) Burning (vi) Mulching (vi) Intercultivation Biological Control

Measures: Insects – zygogramma (parthenium sp.) Snails – Mariaga sp.

Fungi – Water hyacinth. Chemical Methods: Selective herbicides – Atrazine,

2, 4 – D, Butachlor. Non selective herbicides – Paraquat, Diquat.. Genetical

Methods: Manipulation of herbicide resistant gene in cultivated crop that

facilitate application of herbicides that are non selective. E. g.

tobacco, soyabean and maize etc. Advantages of IWM: i. All types of weeds can be controlled. ii. Yield reduction is prevented. iii. Evolution of tolerant weed is arrested. iv.

Ecologically sound and environment friendly. v. Avoiding herbicides reduces the pesticide load in the environment. vi. Prevent perennial weed shifts. vii. Economically feasible.

(a) Principles of Weed Control: 1. Prevention 2. Eradication 3. Control i.

Mechanical ii. Cultural iii. Biological iv. Chemical 1.

Prevention: i. All measures to deny the entry and establishment of new weeds in an area ii. Use of clean crop seeds iii. Care on the grains fed to cattle iv. Prevent movement of cattle v. Clean farm implements vi.

Quarantine 2.

Eradication: i. Complete elimination of particular weed species from an area. ii. Killing and destroying the viability of organs of reproduction. iii.

Eradication of perennial weeds cannot be accomplished in one season.

3. Control: (a) Mechanical or physical method: (i) Hand pulling: a. In home gardens where he cannot reach. b. Best for annuals and biennials weeds. c. Useful in lawns after irrigating it. d.

Time consuming and costlier. (ii) Hoeing: a. Used in wide row crops. b. Complete destruction of all top growth. c. Hand rotary weeder and wheel hoe. (iii) Tillage: a.



Weed control is one of the principles of the tillage. (iv) Mowing: a. The object is to prevent seed production and remove unsighted weed growth. b. Used along roadsides, waste places and pastures.

(v) Flooding: a. In rice fields. b.

Water is stagnated 6-10 inches for 3-8 weeks. (vi) Burning: a. To destroy top of weeds. b. Used in cotton to destroy weeds in rows. (vii) Smothering with non living materials: a.

Use of artificial Mulch- straw, hay, plastic film, etc. b. Main purpose -to cut the light supply. c. 2-4 inch thick mulch layer is required. (b) Cultural method: Not directly related to control weeds but helps to increase the yield.

(i) Crop stimulation: a. Modification of cropping conditions and soil leads to vigorous growth of crops which can compete better with weeds. b. Addition of sulphur, gypsum and altering the pH favourable to crops. c.

Banding or seed dressing of fertilizers and manures. d. Foliar spray of fertilizers. (ii) Crop rotation: a. Wild oat -using peas/gram as break crop for 2-3 years.

b. Fodder -planting grain crops instead of lucerne. (iii) Competitive or Smother cropping: (cowpea, millets, lucerne): a. They germinate quickly and form larger foliage and deep roots which exert their influence against weed seedlings. (iv) Summer fallowing: a.

Air temperature of 40-45°C. b. Not recommended for control of perennial weeds on light soils due to fear of erosion. (c) Biological control: a. Control by  
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living organisms called natural enemies which are encouraged or disseminated by man. b. Maintenance of balance between the target weed and its natural enemies. Criteria for selection of biological agents: a.

Host specific. b. Able to withstand new environment. c.

Should be free of its parasites and predators. d. High mobility. e. Faster reproduction. Kinds of bioagents: (a) Herbivorous fish-carp fish for aquatic weeds.

(b) Snails (c) Mites (d) Fungi-Cephalosporium sp. on *Acacia glauca* Merits: a. Self regulatory. b. No residue and environment is safe. c. Useful when larger area is infested by a single weed.

Demerits: i. Slow process and complete control is not possible. (d) Chemical control: Inorganic herbicide — Sodium chlorate, sodium arsenate, copper sulphate, copper nitrate. Organic herbicide — Organic acids, diesel oil and salts. Selectivity: Selective herbicide — Simazine, Atrazine and 2, 4 - D.

Non selective herbicide - Paraquat and Diquat Translocation: Systemic — Simazine, 2, 4 - D. Contact — Paraquat and Diquat. (b) Biological Weed Control: Use of living organisms viz. insects, disease organisms, herbivorous fish, snail or even competitive plants for the control of weed is called biological control. Merits: 1. Least harm to the environment 2. No residual effects 3. Relatively cheaper and comparatively long lasting effect 4.

Will not affect non-targeted plants and safer in usage. Demerits: 1.

Multiplication is costlier 2. Control is very slow 3. Success of controlling is very limited 4. Very few host specific bio-agents are available at present <https://assignbuster.com/i-capable-of-reproducing-by-underground-portions-v/>

Outstanding and feasible examples of biological weed control (A) Specific bio-agents: Weed Control by Bio-agents: Sl.

No. Weed species Agent  
 1. *Salvinia molesta* (water fern) Curculinoid weevil – *Cryptobagus singularis*  
 2. *Tribulus terrestris* Microlarinus lypriformis, *M. lareynii*  
 3. *Opuntia dilleni* Cochineal scale insect – *Dactylopius tomentosus*  
 4. *Lantana camara* *Crociosema lantana*, *Teleonemia scrupulosa*  
 5.

*Parthenium hysterophorus* *Zygrogramma bicolorata*  
 Bio-herbicides: The bio-herbicide approach involves spray of specific fungal spores or its fermentation products against the target weed. These preparations are called ' Mycoherbicides'. Non-specific agents: White amur feeds several weed species *Lemna*, *Hydrilla*, *Potamogeton*. Besides silver carp, common carp also feed large amount of algae.

Mycoherbicides and target weed: No. Product Content Target weed  
 1. *Devine* *Phytophthora palmivora* Strangle vine *Morrenia odorata* in citrus  
 3. *Bipolaris* *Bipolaris sorghicola* Johnson grass-*Sorghum halepense*  
 4. *Biophos* *hygroscopius* *Streptomyces* general vegetation  
 Non-specific Competitive plants:  
 The weed *parthenium* is suppressed by growing *Cassia sericea*. The plant leachates of *Cassia* have ' *Kolinei*' which accumulate in the soil and interfere with the germination of *parthenium*. Paragrass – *Brachiaria mutica* has been found highly competitive to *Typha* sp.

in ditches. Biological control of weeds in crop fields in India Eg. Control of *Ludwigia parviflora* in rice by steel blue beetle (*Haltica cynea*) Control of *Cyperus rotundus* by *Bactra verutana*.

**Recent Advances in Weed Science:**

Adoption of integrated weed management practices, appropriate cultivation technologies, sound crop rotation and crop diversification check the spread of weed seeds. However, crop weed interactions are complex and needs application of recent advancements for the development of future weed management strategies. Weeds of Wetland, Garden Land and Dryland: Wetland weeds Gardenland weeds Dryland weeds I.

Sedges: I. Sedges: I. Sedges: *Cyperus diformis* *Cyperus rotundus* *Cyperus rotundus* *Cyperus iria* *Cyperus rotundus* II.

Grasses: II. Grasses: *Cynodon dactylon* *Cynodon dactylon* *Echinochloa colonum* II. Grasses: *Panicum re pens* *Eleusine indica* *Echinochloa crusgalli* *Chloris barbata* *Panicum sp.* III. Broad leaved weeds: *Panicum sp.* III.

Broad leaved weeds: *Tridax procumbens* III. Broad leaved weeds: *Acalypha indica* *Striga lutea* *Ammania* *Amaranthus viridis* *baccifera* *Boerhaavia diffusa* A. Modelling crop-weed interactions: Competition between crop and weed for resources of growth (light, water and nutrients) is a critical process in agricultural ecosystems.

The mechanisms of competition are not simple. Models of weed invasion, population growth and control will be useful for organising biological information on weeds and for developing weed control strategies. B. Impact of Herbicide Use: The potential weed resistance to herbicides effect on non-target organisms and herbicide residues in the ecosystems needs to be monitored. Herbicide resistance in weeds: The weeds may develop partial

resistance, cross resistance and multiple resistance to the applied herbicide.

Herbicides in Agro-ecosystem: The persistence is very important factor because it determines the degree of weed control, the risk of carry over effect on the succeeding crop and the residue in soil and ground water.

Various management techniques, viz.

, use of optimum dose of herbicides, application of FYM, crop rotation, and leaching the soil have been developed to minimise the residue hazards in soils. C. Biological Control of Weeds: The idea of biological control originated for dealing with noxious weeds on non-crop lands, and later it was extended to water bodies. But now, some success has been achieved in biological control of weeds in crop fields. Biological control approach makes use of the invasive plant's naturally occurring enemies to help reduce the invasive plant's impact on agriculture and the environment. It simply aims to reunite weeds with their natural enemies and achieve sustainable weed control. These natural enemies of weeds are referred to as biological control agents.

D.

Biotechnological approaches: Bioherbicide which can be derived from fungi are Myco herbicides viz., ' Devine' containing a formulation of soil borne fungus *Phytophthora palmivora* and ' collego' containing spores of *Colletorichum gloeosporoides* are commercialised bioherbicides Use of Bioherbicides is another way of controlling weeds without environmental hazards posed by synthetic herbicides. These are made up of micro-organisms (e. g. bacteria, viruses and fungi) and certain insects (e. g. parasitic wasps, painted lady butterfly) that can target very specific weeds.

The microbes possess imasire agents that can attack the defensegenes of the weeds, thereby killing it.

The better understanding of the genes of both micro-organisms and plants allowed scientists to isolate microbes (pathogens) whose genes match particular weeds and are effective in causing a fatal disease in those weeds. Bioherbicides deliver more of these pathogens to the fields. They are sent when the weeds are more susceptible. The benefit of using bioherbicides is that it survive in the environment long enough for the next growing season where these will be more weeds to infect.

It is cheaper compared to syntheticpesticides. i. Molecular markers in weed science ii. Herbicide resistant crops E. Allelopathy in weed management: Although the allelopathic suppression of crops by weeds has been well documented, the research on allelopathic effect of crops on weed has been very limited release of phytotoxic ferulic acid from wheat crop residues suppressed Ipomeapurpurea and Sida spinosa.