

Weed Science

1. Overview of weeds

- 1.1 Definition, characteristics, classification, economic importance of weeds
- 1.2 Causes of weed presence and perpetuation in a crop field
- 1.3 Identifying vulnerabilities in the weed life cycle
- 1.4 Weed thresholds, weed shift, and weed seed bank
- 1.5 Crop-weed interference, allelopathy and allelochemicals (definition, concept and example)
- 1.6 Critical period of crop weed competition
- 1.7 Weed and the soil environment: temperature management, water management, fertility management, crop residue management
- 1.8 Weed adaptations to various agro-ecological zones of Nepal

2. History, concept, and method of weed control

- 2.1 History and concept of weed control- prevention, eradication, control and management
- 2.2 Principles and practices of cultural/ecological, physical, mechanical, chemical, biological and biotechnological approach of weed management, their uses in different situations, advantages and disadvantages, economics of weed management practices
- 2.3 Organic weed management
- 2.4 Chemical weed management: History of herbicide development, characteristics of ideal herbicide, use, and its limitation
- 2.5 Integrated weed management (definition, rationale, approach, need, components, importance and social dimensions)
- 2.6 Examples of integration of various techniques in different situations: Organic farming, conservation agriculture, agro-forestry, forestry, traditional agriculture, modern agriculture, terraces, hill slopes, flatlands, rangelands
- 2.7 Status, Scope, relevance, advantages, and disadvantages of different weed control approach

3. Herbicide and herbicidal weed control

- 3.1 Classification of herbicide (time of application, selectivity, spectrum, site of application, mode of action, residual action), difference between herbicide mode of action and site of action
- 3.2 Selectivity of herbicide (concept, mechanism, and factor affecting)
- 3.3 Classification systems based on Herbicide Resistance Action Committee (HRAC), common examples of herbicides belonging to each group, their chemical structure,

how these herbicides work, damage symptoms they cause in plants, and equivalence with WSSA system (ACCase inhibitors, ALS inhibitors, photosystem II inhibitors, photosystem I electron diverters, EPSP synthase inhibitors, mitosis inhibitor, Nucleic acid inhibitors)

- 3.4 Herbicide application technology
- 3.5 Relationship of herbicide with tillage, fertilizer, and irrigation
- 3.6 Environmental and health concern about the herbicidal use
- 3.7 Bio-herbicide
- 3.8 Social dimensions, regulation, and economics of herbicide use
- 3.9 The present trend of herbicide uses and availability in Nepal, the economic importance of herbicide

4. Uptake absorption and the fate of herbicide

- 4.1 Mechanism and factor affecting absorption, uptake, and translocation of herbicide
- 4.2 The action of herbicide on physiological process of plant
- 4.3 The fate of herbicide in plants
- 4.4 Environmental fate of herbicide (the fate of herbicide in the soil, herbicide drift, runoff, volatilization, adsorption, absorption, degradation, and movement)
- 4.5 Herbicide residue in soil and crops

5. Herbicide-tolerant crops (development, history and current trends)

6. Herbicide-resistant weeds (type, mechanism, and prevention)

7. Weed management in different crop and cropping system

- 7.1 Weed management in cereals, pseudo-cereals, grain legumes, oilseed, commercial crops, vegetables, floriculture, and orchard
- 7.2 Aquatic, parasitic weeds – their control
- 7.3 Weed competition and critical period of weed control in agricultural fields

8. Biology and ecology of weeds of Nepal.

- 8.1 Germination ecology, seed longevity, and weed seed dormancy
- 8.2 Spatial and temporal disturbance and weed adaptations
- 8.3 Interactions with neighboring plants - competition, interference, antagonism, mutualism, co-existence, herbivory, parasitism, allelopathy
- 8.4 Resource limitations and weed adaptations: Light, Water, Mineral nutrients

- 8.5 Biological and ecology of agricultural weeds (*Echinochloa*, *Phalaris*, *Cyperus*, *Cynodon*, *Amaranthus*),
- 8.6 Biological and ecology of forest weeds (*Lantana*, *Parthenium*, *Eupatorium*, *Mikania*),
- 8.7 Biological and ecology of aquatic weeds (*Eichhornia*, *Hydrilla*, *Pistia*)

9. Invasive weeds

- 9.1 Definition, difference between native and invasive plants
- 9.2 Seed dormancy and dispersible mechanism of invasive species
- 9.3 Principles of weed ecology and weed invasions
- 9.4 Dispersal mechanism; evolution and genetics; seed dormancy; temporal and spatial demographics of Invasive Plants
- 9.5 Examples of plant invasions globally, and in Nepal
- 9.6 Biology of major invasive weeds of Nepal (*Parthenium*, *Phalaris*, *Mikania*, *Eupatorium*, *Lantana*, *Imperata*)
- 9.7 Effect of invasive species on the ecosystem (Bioiversity, wildlife, land value, tourism, humans, landscape, road, highways, lakes, protection area, urban area, historical site, and other human inhabited area of Nepal);
- 9.8 Management of invasive weeds (concept, types, and tools)
- 9.9 Climate change and its effect on invasive weeds

10. Experimental design and statistics

- 10.1 Fundamental principles of field experimentation,
- 10.2 Assumptions of ANOVA and data Transformation
- 10.3 Experimental design: CRD, RCBD, factorial experiment, Split plot and strip plot
- 10.4 Mean comparison, correlation and regression analysis.