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HERBAL DRUG TECHNOLOGY

UNIT 1

TOPIC :

- **Biodynamic Agriculture**

Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Pharmacy
Learn and Educate

Biodynamic Agriculture, Good Agricultural Practices, Organic Farming, Pest Management & Biopesticides

Biodynamic Agriculture

- Biodynamic agriculture is a natural and scientific farming system in which the farm is treated as a living organism. It uses natural manures, composts, biological methods, and cosmic energies (sun, moon, planets) for healthy crop production.
- It was developed by Rudolf Steiner in 1924.

Main Features of Biodynamic Agriculture

1. Uses natural fertilizers
2. Avoids chemical fertilizers and pesticides
3. Maintains soil fertility naturally
4. Uses special biodynamic preparations
5. Encourages ecological balance
6. Uses lunar and seasonal cycles in farming

Principles of Biodynamic Agriculture

1. Farm as a Living System

The farm is considered a complete living organism where:

- Soil
- Plants
- Animals
- Humans

all work together in balance.

2. Soil Fertility

Healthy soil produces healthy medicinal plants.

Methods used:

- Composting
- Crop rotation
- Green manure

3. Biodynamic Preparations

Special preparations made from herbs, cow dung, and minerals are used to improve:

- Soil fertility

- Plant growth
- Disease resistance

Examples

Preparation	Use
BD-500 (Cow manure)	Improves soil
BD-501 (Silica)	Enhances plant growth

4. Cosmic Rhythms

Planting and harvesting are done according to:

- Moon cycles
- Planetary movements
- Seasons

This is believed to improve crop quality.

Advantages of Biodynamic Agriculture

- Improves soil fertility
- Eco-friendly
- Produces high-quality medicinal plants
- Reduces pollution
- Increases biodiversity

Disadvantages

- Requires skilled workers
- Time consuming
- Lower yield initially

Importance in Medicinal Plants

Used for cultivation of:

- Tulsi
- Ashwagandha
- Aloe vera
- Neem
- Turmeric

It helps maintain:

- Purity
- Potency
- Medicinal value

Good Agricultural Practices (GAP)

- Good Agricultural Practices (GAP) are proper guidelines and procedures followed during cultivation, harvesting, processing, and storage of medicinal plants to produce safe and high-quality herbal materials.
- The World Health Organization recommends GAP for medicinal plants.

Objectives of GAP

1. Produce safe herbal drugs
2. Maintain quality and purity
3. Prevent contamination
4. Improve medicinal value
5. Protect environment
6. Ensure proper cultivation methods



Components of GAP

1. Selection of Site

Land should be:

- Fertile
- Pollution-free
- Well drained
- Away from industries

Importance

Prevents contamination of medicinal plants.

2. Soil Management

Healthy soil is essential.

Methods used:

- Organic manure
- Compost
- Crop rotation

Importance

Maintains nutrient balance.

3. Selection of Planting Material

Use:

- Genuine seeds

- Disease-free plants
- High-quality varieties

Importance

Produces healthy medicinal plants.

4. Irrigation

Plants should receive:

- Clean water
- Proper amount of water

Avoid:

- Waterlogging
- Contaminated water

5. Nutrient Management

Use natural fertilizers such as:

- Compost
- Vermicompost
- Green manure

Avoid excessive chemical fertilizers.

6. Weed Control

Weeds are unwanted plants.

Control methods:

- Manual removal
- Mulching
- Biological control

7. Pest and Disease Control

Use:

- Biopesticides
- Biological methods
- Integrated pest management

Avoid harmful chemical pesticides.

8. Harvesting

Harvest plants:

- At proper maturity
- In dry weather
- Carefully without damage

9. Post-Harvest Processing

Includes:

- Cleaning
- Drying
- Packaging
- Storage

Importance

Maintains active constituents.

10. Storage

Store herbs:

- In dry places
- Away from insects
- Away from moisture and sunlight

Advantages of GAP

- Better quality herbs
- Safe medicinal plants
- Reduced contamination
- Improved export quality
- Standardized herbal products

Organic Farming

- Organic farming is a natural farming system in which crops are grown without synthetic fertilizers, pesticides, or harmful chemicals.
- It uses natural methods to maintain soil fertility and plant growth.

Principles of Organic Farming

1. Use natural fertilizers
2. Maintain soil health
3. Protect environment
4. Avoid chemical pesticides
5. Encourage biodiversity



Methods Used in Organic Farming

1. Composting

Preparation of manure from:

- Plant waste
- Animal waste

Importance

Improves soil fertility naturally.

2. Green Manuring

Green plants are mixed into soil to increase nutrients.

Example

Leguminous plants

3. Crop Rotation

Different crops are grown alternately.

Importance

- Prevents soil nutrient loss
- Reduces pests

4. Vermicomposting

Earthworms convert organic waste into nutrient-rich manure.

Advantages

- Improves soil structure
- Increases nutrients

5. Biological Pest Control

Use of natural enemies of pests.

Examples

- Predatory insects
- Beneficial microorganisms

Advantages of Organic Farming

- Eco-friendly
- Safe medicinal plants
- Improves soil fertility

Disadvantages

- Lower yield initially
- More labor required
- Slow nutrient release

Pest in Medicinal Plants

- A pest is any organism that damages medicinal plants and reduces their growth, quality, or yield.

Types of Pests

Type	Examples
Insects	Aphids, caterpillars
Fungi	Rust, mildew
Bacteria	Leaf spot bacteria
Nematodes	Root-knot nematodes
Rodents	Rats
Weeds	Unwanted plants

Harmful Effects of Pests

- Reduced crop yield
- Destruction of medicinal plants
- Loss of active constituents
- Poor quality herbs
- Economic loss

Pest Management

- Pest management is the process of controlling pests to protect medicinal plants and improve crop quality.

Objectives of Pest Management

1. Protect crops
2. Reduce plant damage
3. Improve yield
4. Prevent economic loss
5. Reduce environmental pollution

Methods of Pest Management

1. Cultural Methods

Methods related to farming practices.

Examples

- Crop rotation
- Proper irrigation
- Field sanitation

2. Mechanical Methods

Physical removal of pests.

Examples

- Hand picking
- Traps
- Nets

3. Biological Methods

Use of living organisms to destroy pests.

Examples

- Predatory insects
- Microorganisms

4. Chemical Methods

Use of pesticides.

Disadvantages

- Toxic residues
- Environmental pollution

5. Integrated Pest Management (IPM)

Combination of:

- Biological methods
- Cultural methods
- Mechanical methods
- Limited chemicals

Advantages

- Eco-friendly
- Effective pest control
- Safe medicinal plants

Biopesticides

- Biopesticides are natural pesticides obtained from plants, microorganisms, or natural substances used to control pests.
- They are eco-friendly alternatives to chemical pesticides.

Types of Biopesticides

1. Microbial Biopesticides

Contain microorganisms.

Examples

Microorganism	Action
<i>Bacillus thuringiensis</i>	Kills insect larvae
Trichoderma	Controls fungi

2. Botanical Biopesticides

Obtained from plants.

Examples

Plant	Active Constituent
Neem	Azadirachtin
Pyrethrum	Pyrethrin

3. Biochemical Biopesticides

Natural substances affecting pest growth.

Examples

- Pheromones
- Insect growth regulators

Advantages of Biopesticides

- Safe to humans
- Eco-friendly
- Biodegradable
- Less toxic
- Specific action on pests

Disadvantages

- Slow action
- Short shelf life
- Sensitive to environmental conditions

Bioinsecticides

- Bioinsecticides are biological substances used specifically to kill or control insect pests.

Examples of Bioinsecticides

Bioinsecticide	Source	Action
Neem extract	Neem plant	Repels insects
Bt toxin	<i>Bacillus thuringiensis</i>	Kills larvae
Beauveria bassiana	Fungus	Infects insects

Neem as Bioinsecticide

Active Constituent

Azadirachtin

Actions

- Prevents feeding
- Stops insect growth
- Repels insects

Advantages

- Safe
- Biodegradable
- Widely used in medicinal plants

Importance of Biopesticides in Medicinal Plants

- Prevents chemical contamination
- Maintains purity of herbs
- Safe for herbal medicines
- Environmentally safe