Factor affecting cultivation of medicinal plant

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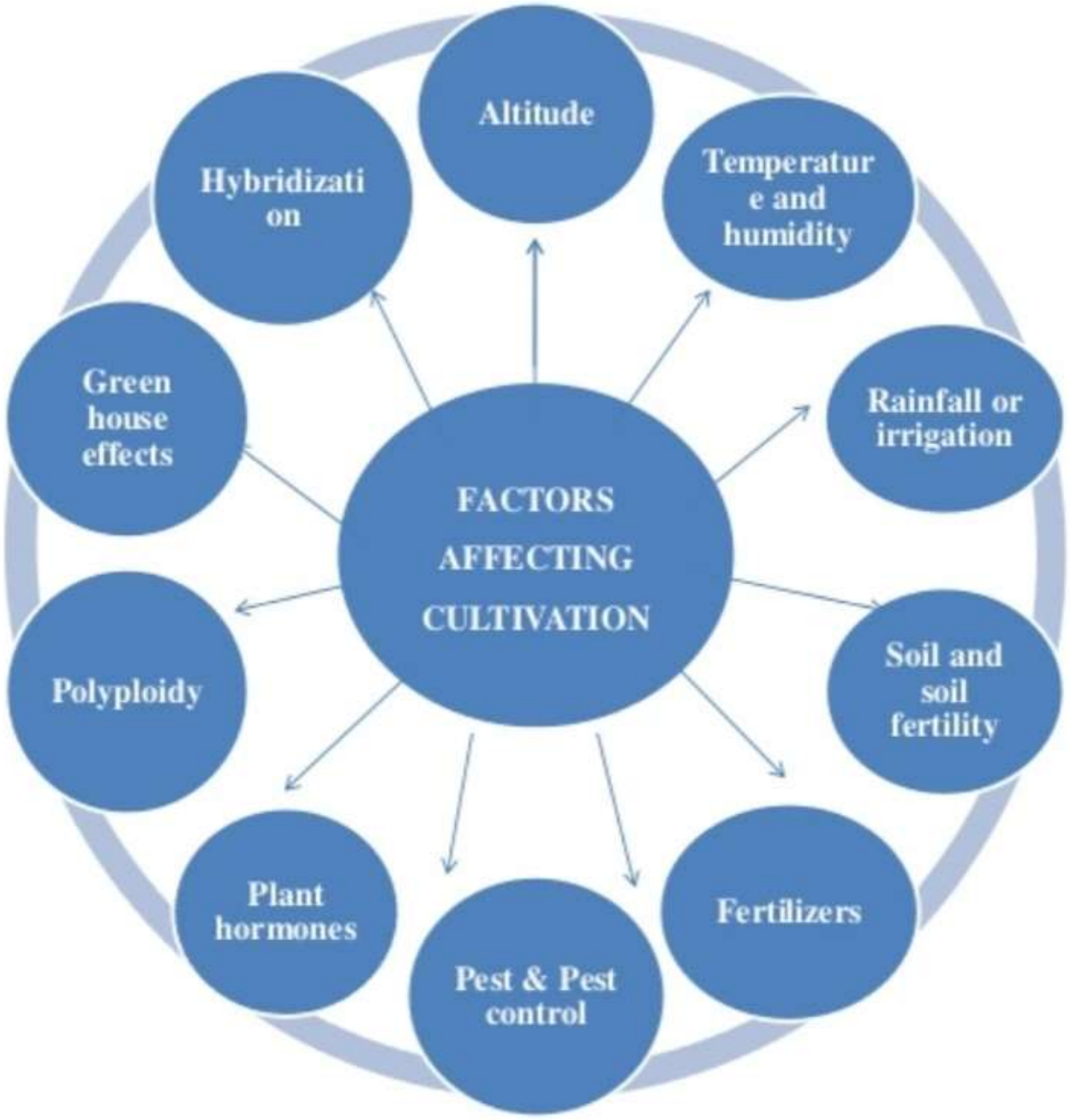
THE FACTORS WHICH ARE SPECIAL ATTENTION FOR CULTIVATORS

- Altitude
- Temperature and humidity
- Rainfall or irrigation
- Soil and soil fertility
- Fertilizers
- Pest & Pest control
- Plant hormones
- Polyploidy
- Hybridization
- Green house effects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ALTITUDE

➢The altitude is the most important factor influencing of cultivation of medicinal plants.

➢The increase the altitude, the temperature and atmospheric pressure decreases while the wind velocity, relative humidity and light intensity increases.

➢Thus as the climatic conditions change with height, they also produce change in the vegetation pattern.

➢Tea, Cinchona and Eucalypts are cultivated favorer at on altitude of 1000-2000 meters.

➢Cinnamon and Cardamom are grown at a height 1000 meters while Senna can be cultivated at sea level.

Examples 1.Clove up to 900

2. Camphor 1500-2000

3. Cinchona 1000-2000

TEMPERATURE AND HUMIDITY

- Temperature and humidity are the another major factors for the cultivation of the medicinal plant.
- Sudden decreases in temperature caused the formation of the ice crystals in intercellular spaces of the plants as a result water comes out of the cells and ultimately plants die due to drought and desiccation.
- The rate of photosynthesis is affected by change in temperature.
- The rate of respiration increases with increase in temperature.
- Humidity is present in the form of water vapours.This is called atmospheric humidity. Clouds and fog are the visible forms of humidity.humidity affects structure, form and transpiration in plants.

Examples 1. Cinchona 60-75 ^{0} F

2. Coffee 55-70 ^{0} F

3. Tea 70-90 ^{0} F

RAINFALL OR IRRIGATION

- Except the xerophytes most of other plants need water and proper irrigation and sufficient rain fall for there development.
- The rainfalls are most important factor influencing of cultivation of medicinal plants. The main source of water for the soil is rain water.
- Rainfall and snowfall have a large effect the climate condition.
- The water from rainfall flows into the rivers and lakes percolates into the soil to form ground water and remaining is evaporated.
- The minerals in the soil get dissolved in water and are then absorbed by plants. Water influences morphological and physiology of plant.

Examples: continuous rain can lead to a loss of water- soluble substance from leaves and root by leaching.

SOIL AND SOIL FERTILITY

- Soil is the most important natural resource as it supports growth of all plants.
- Soil provide mechanical strength , anchorage as well as the essential plant food elements for plant.
- The capacity of soil to supply plant nutrient quantities and proportion required and to provide suitable medium for plant growth is known **"soil fertility".**
- The soil is formed as a result of combined action of climate factors like plants and microorganisms.
- The soil should contain appropriate amounts of nutrients, organic matter and other elements to ensure optimal medicinal plant growth and quality.
- Optimal soil conditions : soil type, drainage, moisture retention, fertility and pH range of 6.5-7.5. acidic soils can be limed or alkaline soils can reclaimed by gypsum
- Acidic soils are not suitable for leguminous plants due to poor development of nodule bacteria.

The soil made of five components

1. Mineral matter
2. Soil air
3. Soil water
4. Organic matter or humus
5. Soil organisms

Types of soil

a)Clay – Clay particle are very small. (sizes of Coarse Clay 0.002 to 0.02 mm)

b)Loamy – The mixture of clay silt & sand is known as loamy.30-50% with clay

c)Silt loamy- Most textile as it contain more amount of organic substance than others. (Silt 0.02 to 0.2 mm with 20-30 % clay)

d)Sandy loamy – The amount of sand particles are more (sand 0.2 mm to 200 mm with 10-20 %clay.

e)Calcareous soil – Rich with nutrient elements.more than 20 % loam.

a)**Clay soil:**Clay particle are very small. These fit together very closely and therefore, leave very less pore space. These spaces get filled up with water very easily. Hence, the clay soil becomes quickly waterlogged. This soil known as physiologically dry soil because plants growing in these soil are not able to absorb water.

b.**Loam soil:**The mixture of clay, silt and sand is known as loam. Loam is very useful for growth. It is fertile soil because it contains available nutrient elements in sufficient amounts.

c.**Silt loam:** **Silt loam is considered to be the most fertile as it contains more amount of organic substances than others.

d. **Sandy loam:** The amount of sand particles is more than other types of loam.

e).**Calcareous soil** – Rich with nutrient elements.more than 20 % loam.

Sandy soil: Sand particles are large sized. These leave large pore spaces which do not have capillary action and therefore, water is not retained by them. Most of the water is quickly drained off and reaches deep into the soil. the sandy soil is poor in nutrient elements; it is less fertile .

Any type of soil containing less than 0.5 % organic matter is described as **Poor soil**

Any type of soil containing 1.5-5 % organic matter is described as **Rich soil**

Any type of soil containing 0.5-1.5% organic matter described as **Intermediate soil**

SOIL FERTILITY:

It is the capacity of soil to provide nutrients in adequate amounts and in balanced proportion to plants.

If cropping is done without fortification of soil with plant nutrients, soil fertility gets losts.soil fertility can be maintained by addition of animal manures, nitrogen-fixing bacteria or by application of chemicals of chemical fertilizers.

FERTILIZERS

➢A Fertilizer or Fertiliser is any material of natural or synthetic origin(other than liming materials that is applied to soils or to plant tissues (usually leaves) to supply one or more plant nutrients essential to the growth of plants.

➢Fertilizer is nutrients which are necessary for development & growth of the plant.

➢The second mode by some fertilizers act is to enhance the effectiveness of the soil by modifying its water retention and aeration.

➢**Fertilizers** are either applied to the soil, directly on the plant (foliage) or added to aqueous solutions, in order to maintain soil fertility, improve crop development, yield and/or crop quality.

Biological origin fertilizer

Mannures: Manure is materials which are mixed with soil. Thses supply almost all the nutrients required by the crop plants. This results in the increases in crop productivity.

Munnures are three types:

1.Farmyard manure –**FYM** (Cow dung manure , Poultry manure.)

2.Composited Manure-(Organic nitrogen supplements, Bone meal , Fish meal.)

3.Green manure- Neem seed cake , Vermi compost, Oil cake.

Bio fertilizer: Can be defined as biologically active products or bacteria, algae and fungi, which useful in bringing about soil nutrient enrichment.e.g :*Rhizobium,Azobactor*

Major Nutrients: Nitrogen (N), Phosphorus (P), and Potassium (K)

Secondary Nutrients: Calcium (Ca), Magnesium (Mg), and Sulfur (S)

Micronutrients or Trace Elements: Boron (B), Chlorine (CI), Copper (Cu), Iron (Fe), Manganese (Mn), Molybdenum (Mo), and Zinc (Zn)

16 Elements Necessary for Plants growth and developments.

Major Nutrients

Nitrogen (N) is the main nutrient for strong, vigorous growth, good leaf color, and photosynthesis. Plants that are almost all leaf (such as lawn grasses) need plenty of nitrogen, so the first number in fertilizers for lawns is especially high because grass must continuously renew itself after mowing. The higher the number, the more nitrogen the fertilizer provides.

Phosphorous (P) promotes root development which helps strengthen plants. It also increases blooms on flowers and the ripening of seeds and fruit. Lots of phosphorous is great for bulbs, perennials, and newly planted trees and shrubs. They depend on strong roots, so fertilizers meant for these plants often have high middle numbers.

Potassium (K) improves the overall health of plants. It helps them withstand very hot or cold weather, defend against diseases, helps fruit formation, photosynthesis, and the uptake of other nutrients. Potassium works along with Nitrogen so if you add nitrogen to the soil, it is important to add potassium at the same time.

PEST & PEST CONTROL

A pest is on organism that causes on epidemic disease associated with high mortality.

Types of pest- The different types of pests infecting medicinal plant are.

Fungi and Viruses Insects Flying (adult moths / flies & larvae) Crawling (beetles / weevils / cockroaches) Rodents Mice (field / house) Rats (roof / Norway) Birds Pigeons / crows / starling Other mammals Snakes / cats & dogs.

Methods of pest control

Mechanical Methods: It employs manual labour along with different devices for collection and destruction of pest.

Examples include:

1. Hand picking to remove insects
2. Pruning
3. Burning
4. Trapping of pests

Agricultural Methods

It covers advance plant breeding techniques capable of inducing genetic manipulation resulting in production hybrid varieties, which are resistant to fungal and bacterial attack.

Another aspect in agricultural control is ploughing which should be sufficiently deep so as to eradicate weeds, as well as early stages of insects.

Chemical Methods: Pests are controlled by using chemical pesticides.

1. Insecticides: DDT, gammaxine, parathione, malathione

2. Fungicides: Bordeaux mixture, chlorophenols, antibiotics

3. Herbicides: to control weeds (2, 4-di chlorophenoxy acetic acid, Sulphuric acid)

4.Rodenticides: Warfarin, Strychnine, Red squill

Biological Control methods:

This method is practiced by combating the pests, mostly the insects, which other living organisms.

If this method is properly designed, it may emerge as an effective, safe and economical method of pest control.

The chemical substances produced and released by some female insects are capable to eliciting (reaction) a sexual response from the opposite sex, which could be exploited for biological control of pests called sex pheromones.

Example:

7, 8-epoxy 2- methyloctadecane from gypsm moth.

Natural pest control agents: Tobacco, Nux-vomica, Neem

PLANT HORMONES

It is a hormone like synthetic organic compound. In small amounts, it modifies the growth and development either by promoting or inhibiting the growth.

General plant hormones:

The phyto-hormones are broadly grouped under five major classes namely

(1) Auxins (cell elongation)

(2) Gibberellins (cell elongation + cell division - translated into growth)

(3) Cytokinins (cell division + inhibits senescence)

(4) Abscisic acid (abscission of leaves and fruits)

(5) Ethylene (promotes senescence, epinasty , and fruit ripening)

POLYPLOIDY

The term euploidy is a type of ploidy in which genome contain whole set of chromosomes and euploidy includes monoploidy , diploidy and polyploidy .

When some plants contain more than two genomes it is called as polyploidy .

Polyploidy is caused by artificially induced methods/physical agents

(a) Colchicine (b) Veratrine (C) Sulphanilamide (d) Mercuric chloride.

Significant Effects of polyploidy: Greater significance to medicinal plants. It may cause formation of new species.

Mutation: Sudden change in genotype causing qualitative or quantitative alteration of genetic material called mutation.

Mutation can artificially produced by certain agents called mutagenes

Types of mutagenes:

(A) Physical Mutagenes: Ionizing radiations: x-rays, gamma radiation and cosmic rays. Non Ionizing radiations: UV radiation

(B) Chemical Mutagenes: Alkylating agents: Nitrogen and sulphur mustard. Acridines: Acridines and proflavins. Nitrous acid.

HYBRIDIZATION

➢Hybridization is the process of crossing two genetically different individuals to result in a third individual with a different, often preferred, set of traits. Plants of the same species cross easily and produce fertile progeny.

➢Wide crosses are difficult to make and generally produce sterile progeny because of chromosome-pairing difficulties during meiosis.

➢Hybridization of plants occurs in nature through various mechanisms. Some plants (such as the oil palm) are insect-pollinated, and others (such as maize, or corn) are wind-pollinated. Such plants are referred to as cross-pollinated plants.

➢Natural hybridization has played a significant role in producing new genetic combinations and is the norm in cross-pollinated plants. It is a common way of generating genetic variability.

Charles Darwin reported the results of his experiments with maize. He indicated that in twenty-four crosses, there was an increase in plant height, which was attributed to hybridization, and that decrease in plant height was associated with self-pollination.

Hybrids are immensely variable. Qualitatively, hybrids may express all of the secondary chemicals of the parental taxa, may fail to express certain parental chemicals, or may express novel chemicals that are absent in each parent.