1. Establishment of herbal garden for medicinal and aromatic plants. (In botanical garden of college campus).

- **Introduction:** Plants are a very important source of many products considered as useful for human bodies. Many plant species are used as a source of treatment of various disorders, so these plants are also known as Medicinal and Aromatic plants. Plants have been used since ancient times of all civilizations and cultures, mostly as home remedies for treating seasonal flu viruses, cough, cold, stomachache, sore throat and headaches. Besides, the aromatic plants are still used in making perfumes, because of their pleasant smelling flowers, in cooking because of their strong flavors, and liquor industries. At the present there are used many herbal treatments that are becoming very popular in the society because of their efficiency and less side effects. Of course the medicinal and aromatic plants are less expensive, more available and have potential to control disorders. The use of these plants is also a potential material for maintaining good health and conditions, not only for a remedy for specific diseases. Of course, the role of medicinal and aromatic plants in national economy is also enormous.

PLANTS STUDIED :

I) Tulsi:

Kingdom : Plantae
Division: Magnoliophyta
Class: Magnoliopsida
Order: Lamiales
Family: Lamiaceae

Tulsi is known as the queen of all the herbs and is used in the ayurvedic and naturopathic medicine. Tulsi can help you get rid of many health problems ranging from fever to **kidney stones**. Ayurvedic texts have also categorized in Hindu religion, holy basil is both a religious symbol as well as a good medical remedy. Religiously speaking, holy basil is worshipped in the mornings and evenings by Hindus throughout India and medically speaking it is used to treat common ailments in the ancient Ayurvedic healthcare system. The wonder herb act as a stimulant, antipyretic and aromatic in nature.

Benefits of Tulsi

- **Tulsi for skin**

It is used to treat acne, skin infections, lighten dark spots and improve skin texture.
Tulsi helps in skin brightening
Tulsi helps in curing acne face marks
Tulsi mixed with eggs and mixed can help in tightening skin pores
Tulsi helps in curing skin infections and any sort of skin allergies.

- **Tulsi for hair**

Tulsi can prevent hair fall
Tulsi can stop graying of hair and keep it thick and black
Tulsi can stop dandruff; and

Tulsi can prevent dry scalp

- **Tulsi for weight loss**

Tulsi tea controls your metabolism and helps your body absorb essential nutrients.
Tulsi tea helps boost your digestive system which is important for losing weight quickly.
Tulsi tea has zero calories that boost your stamina.

- **Tulsi for the eyes**

Your eyes are prone to a lot of dust and pollution every day. Thus most people develop eye-related problems and Tulsi acts as an immediate cure for eye-related problems such as:
Tulsi soothes the eye
Tulsi leaves left in boiled water overnight can be used to wash your eyes.
Tulsi eyewash can also reduce strain on your eyes

- **Tulsi in medicinal uses**

Tulsi can cure fever
Tulsi leaves are used to treat skin problems like acne, blackheads and premature ageing.
Tulsi is used to treat insect bites
Tulsi is also used to treat **heart disease** and fever
Tulsi is also used to treat respiratory problems
Tulsi is used to cure fever, common cold and sore throat, headaches and kidney stones
Tulsi helps in treating **Asthma**
In simple terms, Tulsi is the best natural painkiller and solution to many of your health problems.

- **Shocking thing in eating tulsi leaves**

Eating Tulsi leaves can have these 5 side effects!
Not suitable for pregnant women.
May not be good for diabetic patients.
May impact male and female fertility.
May interfere with blood thinning medicines.
It may cause damage to the liver.
May stain your teeth.

II) MINT

Kingdom: Plantae
Division: Magnoliophyta
Class: Magnoliopsida
Order: Lamiales
Family: Lamiaceae
Genus: *Mentha L*.

Using fresh mint and other herbs and spices in cooking can help a person add flavor while reducing their sodium and sugar intake.

Throughout history, people have used different species of mint plants in medicine. Different types of mint plants offer a range of antioxidant qualities and potential health benefits, especially for people who have irritable bowel syndrome (IBS).

- **BENEFITS OF MINT**

Rich in Nutrients.
May Improve Irritable Bowel Syndrome. Irritable bowel syndrome (IBS) is a common digestive tract disorder. ...
May Help Relieve Indigestion. ...
Could Improve Brain Function. ...

May Decrease Breastfeeding Pain. ...
Subjectively Improves Cold Symptoms. ...
May Mask Bad Breath. ...
Easy to Add to Your Diet.

- **BENEFIT FOR SKIN**

Brightens Your Complexion. Mint has an extremely refreshing and soothing effect on your skin. ...
Treats Acne.
Soothes Mosquito Bites And Other Irritations.
Hydrates Your Skin.
Tones Your Skin.

Gets Rid Of Blackheads.
Rejuvenates Your Skin.
Slows Aging.

- **BENEFIT FOR HAIR**

Mint also works well on your hair. One of the highest sources of carotene and antioxidants, mint offers natural antimicrobial and antifungal properties, which helps quash dandruff and other scalp issues. For at-home dandruff treatment, simply blend crushed mint leaves and lemon juice to form a paste.

- **BENEFIT OF MINT OIL**

May Ease Digestive Upsets.
May Help Relieve Tension Headaches and Migraines.
May Freshen Your Breath.
May Relieve Clogged Sinuses. May Improve Energy.
May Help Relieve Menstrual Cramps.
May Fight Bacterial Infections.

III) AJWAIN

Kingdom: Plantae
Subkingdom: Traceobionta
Division: Magnoliophyta
Class: Magnoliopsida
Order: Apiales
Family: Apiaceae
Genus: *Trachyspermum Spp.*

BENEFITS OF AJWAIN

- Active enzymes in ajwain improve the flow of stomach acids, which can help to relieve indigestion, bloating, and gas.
- The plant can also help to treat peptic ulcers as well as sores in the oesophagus, stomach, and intestines.
- Fight bacteria and fungi. Carom seeds have powerful antibacterial and antifungal properties.
- Improve cholesterol levels.
- May lower blood pressure.
- Combats peptic ulcers and relieves indigestion.
- May prevent coughing and improve airflow.
- Has anti-inflammatory effects.

IV) Citrus lemon

Kingdom – Plantae
Phylum- Spermatophyta
Class – Dicotyledonae
Order – Sapindales
Family – Rutaceae
Genus – *Citrus*
Species -- *limon*

Benefit of *Citrus limon*

- Antioxidant. Lemon juice naturally contains vitamin C, an antioxidant that may help reduce skin damage and premature aging.
- Astringent qualities. Due to its high pH levels, lemon can decrease oil on the skin and reduce inflammation.
- Antifungal.
- Skin lightening.
- Drinking a warm glass of lemon water in the morning can detoxify the body and the presence of pectin helps in improving the metabolism and gut health, which helps in improving digestion. This drink also helps in accelerating the fat burning process in the body

V) Aloe vera

Aloe vera is a popular medicinal plant that people have used for thousands of years. Aloe vera, or Aloe barbadensis, is a thick, short stemmed plant that stores water in its leaves. It is best known for treating skin injuries, but it also has several other uses that could potentially benefit health.

Advantages of Aloe vera

It contains healthful plant compounds.
It has antioxidant and antibacterial properties.
It accelerates wound **healing**.
It reduces dental plaque.
It helps treat canker sores.
It reduces constipation.
It may improve skin and prevent wrinkles.
It lowers blood sugar levels.

COMMON SIDE EFFECTS OF ALOE VERA

Blood sugar (hypoglycemia)
Burning and itching of the skin (infrequent)
Stomach pain and **cramps** (high doses)
Diarrhea, **kidney problems**, blood in the urine, low potassium, muscle weakness, weight loss, and heart disturbances (long-term use at high doses)
Liver problems (rare).

2.Establishment of Kitchen Garden.

- The traditional **kitchen garden**, is a space around a dwelling place where vegetables are grown. The plants are grown for domestic use. It is regarded as a good and fresh source of vegetables. In India the concept of kitchen garden is very old. People use small areas around their dwelling place for cultivation of vegetables. Different plants like tomatoes, potatoes, broccoli, capsicum, coriander, fennel, beet root, methi etc. are grown in kitchen garden.
- Since kitchen gardens are often on the smaller side, it's important to continually plant new crops as others are harvested. It's a practice known as succession planting.

The four components required to establish a kitchen garden are:

- Size
- Location
- Tending
- Purpose

SIZE:-A kitchen garden is relatively small, ranging from 25 to 250 square feet in size.
LOCATION:-Because you'll be harvesting from the kitchen garden often—just before meals, as you pack lunches in the early morning, or while making an herb topping for dinner—you'll want the kitchen garden close by. In fact, right outside your backdoor is ideal.
TENDING;-Because you're picking from it regularly, you're also tending it too. The kitchen garden is designed to be lightly tended on a daily or weekly basis. This isn't heavy lifting, just a little pruning here, a little planting there, again and again throughout the growing season.
PURPOSE:-The kitchen garden exists to feed you, to help you relax, and to give you a constant source of discovery. It's a place to go to unwind from the day and awaken all your senses. You'll hear bees buzzing and birds flying overhead; you'll feel the wind, the soft leaves, and the tender flowers; you'll smell the sweet marigolds and peppery arugula and summery basil. And of course, you'll taste the incomparable flavor of just-harvested greens and tomatoes and all things vegetabl.

3.To study phenology of citrus plant.

Citrus aurantium (orange)

Classification

Division : Spermatophyta
Class : Dicotyledonae
Sub class : Polypetalae
Series : Disciflorae
Order : Geraniales
Family : Rutaceae
Genus : *Citrus*
Species : *aurantium*

Introduction: India ranks 3rd in world production of Citrus with an area of 10.55 million hectares (14.9% of total fruit area) and production of 12.74 million tonnes (12.5% of total fruit production) with a productivity of 10.30 tonnes/ha. The total production of oranges in India is 3431.4 thousand MT (3.9% of total fruit production) from an area of 330.0 thousand hectares (4.6% of total fruit area) with a productivity of 10.4 MT/ha.(Jhade et.al.2018)

Citrus Phenology "Phenology refers to "the study of the timing of recurrent biological events, the causes of their timing with regard to biotic and abiotic forces, and the interrelationship among phases of the same or different species" Badeck et al., (2004)

Methodology: Field trials were conducted in local orchard in Jalandhar. Plant was observed from August to September. Flowering is usually evaluated when the morphological differentiation of flower organs is clearly recognizable. However, the whole phenomenon of flowering starts with flower induction, followed by the initiation of flower primordia and the development of these primordia into mature flowers.

Observations:

Day1 **Day 2**

Day

Da

4.To survey distribution pattern of plants in local area.

A survey was conducted in local area to find pattern of distribution of Plants in that area.

Rose: *Rosa indica*

A rose is either a woody perennial flowering plant of the genus Rosa , in the family Rosaceae .There are over three hundred species and tens of thousands of cultivars. They form a group of plants that can be erect shrubs, climbing, or trailing, with stems that are often armed with sharp prickles.

Catharanthus is a genus of flowering plants in the family Apocynaceae. There are eight known species. Seven are endemic to Madagascar, though one, C. roseus, is widely available around the world. The eighth species, C. pusillus, is native to India and Sri Lanka. The name Catharanthus comes from the Greek for "pure flower".

These are perennial herbs with oppositely or almost oppositely arranged leaves. Flowers are usually solitary in the leaf axils. Each has a calyx with five long, narrow lobes and a corolla with a tubular throat and five lobes.

Money Plant : pothos, (*Epipremnum aureum*), also called **golden pothos, money plant**, or **devil's ivy**, hardy indoor foliage plant of the arum family (Araceae) native to southeastern Asia. Pothos is an evergreen plant with thick, waxy, green, heart-shaped leaves with splashes of yellow. As a houseplant, it is commonly grown as a hanging plant. Pothos can climb by means of aerial roots, and wild or cultivated plants grown outdoors can reach enormous heights using tall trees as support. In addition, the leaves of outdoor plants grow many times larger than indoor plants.

Mango: *Mangifera indica*

It is a species of flowering plant in the family Anacardiaceae. It is a large fruit tree, capable of growing to a height of 30 metres (100 feet). There are two distinct genetic populations in modern mangoes – the "Indian type" and the "Southeast Asian type". It is a large green tree, valued mainly for its fruits, both green and ripe. Approximately 500 varieties have been reported in India. It can grow up to 15–30 metres (50–100 feet) tall with a similar crown width and a trunk circumference of more than 3.7 m (12 ft). The leaves are simple, shiny and dark green.

Guava : *Psidium guajava*

The guava is an evergreen shrub or small tree native to the Caribbean, Central America and South America. It is easily pollinated by insects; when cultivated, it is pollinated mainly by the common honey bee, Apis mellifera. Widely cultivated in tropical and subtropical regions around the world, guava fruits can range in size from as small as an apricot to as large as a grapefruit. Various cultivars have white, pink, or red flesh; a few varieties feature red skin.

When cultivated from seed, guavas are notable for their extremely slow growth rate for several months, before a very rapid acceleration in growth rate takes over. From seed, common guavas may bloom and set fruit in as few as two years or as many as eight. Cuttings, grafting, and air layering are more commonly used as a propagation method in commercial groves.

Walnut : *Juglans regia*
A walnut is the edible seed of a drupe of any tree of the genus Juglans (family Juglandaceae), particularly the Persian or English walnut, .
Although culinarily considered a "nut" and used as such, it is not a true botanical nut. After full ripening, the shell is discarded and the kernel is eaten.

Papaya : *Carica papaya.*
Papayas grow in tropical climates. Their sweet taste, vibrant color, and the wide variety of healthbenefits they provide make them a popular fruit. The papaya, a previously exotic and rare fruit, is now available at most times of the year.

Pinus: *Pinus sylvestris* -- pine is conifer in the genus Pinus of the family Pinaceae. Pinus is the solegenus in the subfamily Pinoideae. Many pines are cultivated as ornamentals, including black, white, Himalayan, and stone pines, and some are planted in reforestation projects or for windbreaks. Pine-leaf oil, used medicinally, is a distillation product of the leaves; charcoal, lampblack, and fuel gases are distillation by-products.

5. To Study Fungicidal and Insecticidal properties of sour buttermilk spray.

Insecticides: are substances used to kill insects. They include ovicides and larvicides used insect eggs and larvae, respectively. Insecticides are used in agriculture, medicine, industry and by consumers. Nearly all insecticides have potential to significantly alter ecosystems; many are toxic to humans and animals; some become concentrated as they spread along the food chain.

Fungicides: is a specific type of pesticide that controls fungal disease by specifically inhibiting or killing the fungus causing the disease.

BUTTERMILK SPRAY AS FUNGICIDE AND INSECTICIDE

1. Sour buttermilk work both as an insecticide and fungicide. The older the buttermilk is, the more beneficial it is for the crops. It is very beneficial for the control of stem borer caterpillar, twig caterpillar, and other juice sucking pests. Buttermilk, popularly known as "Lassi", has proved to be one of the most effective fungicides and can be used to treat plants afflicted with fungal infections.
2. Found to effectively colonize rhizosphere and phylloplane of cotton plant and produce anti-microbial peptides and fatty acids, which cubed the virus.
3.The formulations of plant growth promoting rhizobacteria suspended in buttermilk not only reduced the disease incidence but also promoted plant growth and yield.
4.The formulation, prepared in buttermilk, was tested against the plant virus and found effective. The use of buttermilk for its antimicrobial activity in humans and plants has been a traditional practice. Many milk proteins are known to have shown antiviral activity, by inhibiting reverse transcriptase enzyme of viruses. Buttermilk could prevent fungus-borne diseases like Yellow Rust and White Rust in wheat crop.
5. After filtering the five-day-old buttermilk, a little quantity of it mixed with water could be sprayed on plants within ten days. The buttermilk should not be stored in aluminium or bronze utensils. The buttermilk should be tested on a few plants before spraying in the whole field.

Uses of Buttermilk spray:

Buttermilk spray is a very good mixture for fighting the danger of sucking pests and insects. This mixture can be easily prepared at home by farmers.

Essential ingredients for buttermilk spray:

1. Clay pot
2. Buttermilk spray (5 liters)
3. Small piece of copper
4. Polyethylene

Methodology:

1. Take a plastic or clay pot and put 5 liters of buttermilk and a small piece of copper metal. A small piece of copper metal acts like fungicide and rotting buttermilk.
2. Cover the opening of clay pot with polythene. Clay pot should be kept in the shade and also should not be in contact with rain water. Leave the mixture to fermentation for 15 days.
3. Filter the mixture of rotten buttermilk after 15 days.
4. After 15 days use this mixture on the crops and vegetables.

Observation:

It was observed that when Buttermilk was sprayed on the plant it save them from diseases such as damping off and powdery mildew.

6.To study shape and canopy of various plants of local area.

Study Area For Survey: Himachal Pradesh (Kangra) and Punjab (Jalandhar)

Introduction: There are many reasons why tree shapes differ. A tree growing in poor soil may be stunted due to lack of nutrients, and a tree growing right next to an apartment building may have more leaves on the side facing the sun. Different kinds of trees have their own unique form, but the form that any tree has is also affected by the environment where it grows.
Sunshine and water are both essential for a tree to survive, and both influence tree height, crown shape (for example, a round treetop or the cone shape of a pine tree), and the form of leaves.
Some tree species grow quite tall and receive much sunlight. But what about those trees left in the shadows? Many trees collect sunlight that is filtered through the leaves of taller trees. These shaded understory trees survive by gathering indirect sunlight or sun flecks that break through openings in the canopy. A rounded crown seems to work best for gathering filtered, understory sunlight, which comes from many different directions
The shape of the tree's crown also has a lot to do with where it lives. Nearer to the equator, the noontime sun is almost directly overhead all year. Tall trees with flat treetops (or crowns) are very common in this part of the world because the flat shape helps expose more of their leaves to the direct, overhead light.
Canopy is the above-ground portion of vegetation in forests consisting of the tops of trees forming a kind of ceiling.
Following are the plants we have studied during our project

1.MULBERRY
COMMON NAME:-MULBERRY
BOTANICAL NAME:- *Morus rubra*
Features *:*-leaves are arranged side by side on the branch at regular intervals.
Juvenile leaves are light green,which at maturity turn to dark green.
Branching pattern :- sympodial
Canopy:-Round and bushy canopy.
Location:- Himachal Pradesh

2.MANGO
Common Name :- Mango
Botanical Name:- *Mangifera Indica*
Features :-Mango Trees Have Simple Alternate Lanceolate Leaves. Mature Leaves Are Leathery Glossy And Deep Green In Colour.
Branching Pattern:- Sympodial Branching
Branches Are Spirally Arranged
Canopy:- Round And Bushy Canopy
Location:-Himachal Pradesh (Kangra)

3.LOQUAT JAPANESE PLUM
Common Name: Loquat Or Japanese Plum
Botanical Name :-*Eriobotrya japonica*
Features:-These Trees Are Large Evergreen Shrub Or Tree.

It Is A Subtropical Tree
Loquat’s Have Alternate Simple Leaves

Branching Pattern:-Dichotomous Branching
Canopy:-Flat Crown Top Canopy
Location :- Himachal Pradesh (Kangra)

4.EUCALYPTUS
Common Name:-Safeda (Eucalyptus)
Botanical Name:-*Eucalyptus Globulus*
Features:-When Only One Leaf Develops At Each Node Eg.,Brassica Campestris
When A Pair Of Leaves Are Present Just Opposite To Each Other At Each Node Eg.,Calotrpis
Branching Pattern:- Monopodial Branching
Alternating Lateral Branches
Canopy:- Conical Canopy.
Location:-Jalandhar(Punjab)

5.JAMUN
Common Name :- Jamun
Botanical Name:- *Syzigium Cumin*
Features:-Fruits Of Jamun Tree Are Edible
Fruit Is Generally Fleshy And Having A Hard Seed Inside .
Jamun Is Having Higher Amount Of Antioxidants.
Branching Pattern:-Sympodial (Cymose)Branching
Canopy:-It Is Dome Shaped
Location :- Himachal Pradesh (Kangra)

6.BAHEDA
Common Name:- Baheda
Botanical Name:-*Terminalia Bellirica*
Features:-Leaves Are Alternately Arranged Or Fascicled At The End Of Branches .
Leaf Tip Is Narrow –Pointed Or Rounded
Branching Pattern :- Horizontal Alternating Branches Occur In Acropetal Manner-Monopodial
Location:-Himachal Pradesh (Kangra)

7.KHAIR
Common Name :- Khair
Botanical Name :-*Mimosa Pigra*
Features:- Khair Tree Is Very Useful In Dental Problems. It's Timber Is Very Hard,Very Steady And Moerately Tough.
Branching Pattern :-Sympodial Branching
Canopy:- Round And Bushy Canopy
Location :-Himachal Pradesh (Kangra)

8.TUNI
Common Name :- Tuni
Botanical Name :- *Cedreala Fissilis*

Features :-The Tree Has Long Compound Leaves. It Is A Fast Growing Decidious Tree With Large Branches
Branching Pattern :-Sympodial Branching
Canopy:- Round And Bushy Canopy
Location:-Himachal Pradesh (Kangra)

9.ASHOKA
Common Name :- Ashoka
Botanical Name:- *Polyalthia Longifolia*
Features:-Ashoka Tree Has Beautiful Foliage And Fragrant Flowers. It Is Small ,Erect Evergreen Tree. Ashoka Tree Has Ample Of Medicinal Properties
Branching Pattern :-Racemose Branching, Stem Is Monopodial
Canopy:- Conical Canopy
Location :- Himachal Pradesh (Kangra)

10.ARAUCARIA
Common Name :-Araucaria
Botanical Name :- *Araucaria Araucana*
Featues:-Needle Like Leaves. The Trees Are Evergreen. Araucaria Are Mainly Large Trees With A Massive Erect Stem
Branching Pattern :- Plagiotropic Branches. Main Axis Is Monopodial
Canopy:-Conical Canopy Appearance
Location :-Himachal Pradesh (Kangra)

7.Identification and description of annuals, herbaceous perennials, creepers and flowering plants.

Introduction: Herbaceous plants are plants that have no persistent woody stem above ground. They are classified following life-cycle classification as annuals, biennials or perennials. Annual plants are those plants that complete their life cycle from germination to the production of seeds within one growing season. Creepers, as the name suggests, are plants that creep on the ground. They have very fragile, long, thin stems that can neither stand erect nor support all their weight.

Following are the example of annual plants we have studied during our project:

WHEAT:- ***Triticum aestivum***
Order-Poales
Family- Poaceae
Clade-Monocot
Wheat is mainly a rabi[winter] season crop in India. It is grown in a variety of soils in India.
Area of collection- Himachal [kangra]
TOMATO:- ***Solanum lycopersicum***
Order-Solanales
Family- Solanaceae
Tomatoes are a summer-season vegetable and are usually grown as summer annuals.

Area of collection- Himachal Pradesh [kangra]

Mustard:- ***Brassica nigra***
Order- Brassicales
Family- Brassicaceae
Genus- Brassica
Time for sowing mustard crop is from September-October month.
Area of collection- Himachal pardesh [kangra]

MAIZE:- ***Zea mays***
Order- Cyperales
Family- Poaceae
Genus-Zea
Maize is sown in June-July in india to achieve higher yield.
Area of collection –
Himachal pardesh[kangra]
Following are the example of annual creeper plants:

PEA :- P*isum sativum*
Group- Dicot
Family- Fabaceae
Area of collection- Himachal Pradesh [kangra]
Pea is annual herb seeds can be sown in either march-April or
August-September.

FAVA BEANS:- ***Vicia faba***
Order-Fabales
Family- fabaceae
Area of collection- himachal pardesh [kangra]
Fava beans are cool season legume usually planted in feburary-march.

Some annual plants act as biennials in colder areas
Biennial plants:- a biennial plant is a flowering plant that takes two seasons to complete its biological life cycle. At first season plant undergoes primary growth and in the second season plant produces flower and seeds.
Raddish :-
Order-Brasssicales
Family-Brassicaceae
Genus-*Raphanus*
Species-*raphanistrum*
Sub-species-*sativus*
Area of collection- himachal[kangra]
Radish is cool season crop,its cultivation is prepared in winter season in plains.

Broccoli:- ***Brassica oleracea***
Order-Brassicales
Family-Brassicaceae

Genus- *Brassica*
Species- *oleracea*
Area of collection-himachal pardesh [kangra]
It is planted in summer once heat subsides for harvesting in winter and planted in spring for harvesting in summer.

Turnip:- ***Brassica rapa***
Order- Brassicales
Family- Brassicaceae
Genus- *Brassica*
Species-rapa
Area of collection- himachal Pradesh[kangra]
August –September is best time for sowing desi varieties, whereas October-November month is ideal for European varieties.
Herbaceous perennials:- herbaceous prennials are those herbaceous plants that lives more than two years.
Bamboo:- ***Bambusa vulgaris***
Order- Poales
Family- Poaceae
Area of collection- himachal pardesh [kangra]
Bamboo is monocarpic perennial herb that can grow in poor soil conditions but not in wet and soggy soil. It reproduce through rhizomes.

Tulsi:- ***Ocimum tenuiflorum***
Order- Lamiales
Family- Lamiaciae
Genus- *Ocimum*
Species- *tenuiflorum*
Area of collection- himachal pardesh[kangra]
Tulsi grow as a perennial plant in frost free areas with mild winter and as an annual in cold climates.

8. Identification and collection of ethanomedical plants used by local people

Introduction: Medicinal plants, also called medicinal herbs, have been discovered and used in traditional medicine practices since prehistoric times. Plants synthesize hundreds of chemical compounds for various functions, including defense and protection against insects, fungi, diseases, and herbivorous mammals.

ALOE VERA
Common name : Aloe
Family: Asphodelaceae

Plant part used : leaves of aloe
Area of collection: village-thanger, tehsil-jawali, distt-kangra (Himachal pradesh)
Uses : It contain healthful plant compounds.
It accelerate wound healing.
It reduces dental plaque.
It helps to treat canker sores.
It reduces constipation.
It improves skin and prevent wrinkles.
It lowers blood sugar levels.

TRIGONELLA FOENUM-GRAECUM
Common name: Methi
Family: Fabaceae
Plant part used: leaves and seeds
Area of collection: village- thanger, tehsil – jawali, distt –kangra (Himachal pradesh)
Uses: Lowering blood sugar levels.
Boosting testosterone.
Production of milk in breastfeeding mothers increases.
Reduces cholesterol level.
Help with appetite control.

FOENICULUM VULGARE
Common name: Saunf
Family: umbelliferaceae
Plant part used: roots and seeds
Area of collection: village – thanger, tehsil- Jawali, distt-kangra (Himachal pradesh)
Uses: Improves digestive health.
Helps to regulate blood pressure.
Reduces asthma and other respiratory ailments.
Promotes lactation. Improves skin appearance.

CORIANDRUM SATIVUM
Common name: dhaniya
Family: Umbelliferaceae
Plant part used: seeds and leaves
Area of collection: village- thanger, tehsil- jawali, distt-kangra (Himachal pradesh)
Uses: Help in lowering blood sugar levels.
Rich in immune boosting antioxidant.
May benefit heart health.
May protect brain health.
May promote digestion and gut health.
May fight with infections.
May protect your skin.

ALLIUM SATIVUM
Common name: Garlic
Family: Liliaceae
Plant part used: bulb (cloves)

Area of location: Village – thanger, tehsil- jawali, distt-kangra (Himachal pradesh)
Uses: Lowers blood pressure.
Lowers cholesterol level.
Hardening of arteries.
Reduces the risk of Alzheimer's disease.
To treat bronchitis.

ZINGIBER OFFICINALIS

Common name: Ginger
Family: Zingiberaceae
Plant part used: rhizomes of plant
Collection : village- thanger, tehsil- jawali, distt-kangra (Himachal pradesh)
Uses: Reducing gas and improving digestion.
Relieving nausea.
Easing a cold or the flu.
Relieving pain.
Reducing inflammation.
Supporting cardiovascular health.
Lowering cancer risk.

HELIANTHUS

Common name: sunflower (suraj mukhi)
Family:Asteraceae
Plant part used: leaves, seeds flowers
Collection:village- amela,tehsil- jawali, distt-kangra (Himachal pradesh)
Uses: Treat malarial fever.
Arthritis.
Gastroenteritis.
Pulmonary pneumonia.
Respiratory Tract.
Snake bites.
Antioxidant against cancer.

HOLY BASIL

Common name: Tulsi
Family: Lamiaceae
Plant part used: leaves
Area of collection: village-thanger, tehsil-jawali, distt-kangra (Himachal pradesh)
Uses: Promote healthy heart.
Anti-aging.
Treats kidney stones.
Relieves headache.
Fights acne.
Cures asthma.
Rich source of vitamin-K

CALOTROPIS

Common name: Akk plant
Family: Apocynaceae
Plant part used: bark and roots
Area of collection: village-thanger, tehsil-jawali, distt- Kangra (Himachal Pradesh)
Uses: Digestive disorder including diarrhoea.
Constipation and stomach ulcers.
Painful conditions including toothache.
Joint pains.
For parasitic infection including elephantiasis and worms.

DATURA STRAMONIUM
Common name: thorn apple, Stinkweed
Family: Nightshade
Plant part used: seeds
Area of collection: village-thanger, tehsil-jawali, distt-kangra (Himachal pradesh)
Uses: Analgesic
Anthelmintic.
Anti- inflammatory.
Worm infestation.
Toothache.
Fever from inflammation.
Fruit applied to scalp to treat dandruff.

TAGETES
Common name: marigold
Family:Asteraceae
Plant part used: oil, flowers, leaves
Area of collection: village-thanger, tehsil-jawali, distt-kangra (Himachal pradesh)
Uses: Heals skin wounds, burns, rashes.
Lowers inflammation.
Natural antiseptic properties.
Reduces hemorrhoid pain.
Reduces eye inflammation.
Reduces menstrual pain

9.To study the medicinal properties and biochemistry behind some common plants.

- ***Nyctanthes arbortristis***

Introduction:

Nyctanthes arbor-tristis Linn.(NAT) is a small divine ornamental tree used to pray the God according to Indian mythology known across the country for its fragrant white flowers. NAT is commonly known as night flowering Jasmine or Parijata.

Medicinal properties:

It is well known Indian medicinal plant. The plant is used in Ayurveda for various pharmacological actions such as anti-arthritic, antispasmodic, antibacterial, anti-inflammatory, immunostimulant, antidiabetic, hepatoprotective, antiarthritic, antioxidant, antimicrobial, antihelmintic, antileishmanial, antiviral, CNS depressant. The present review discusses pharmacology of the herb, its pre-clinical and clinical studies, safety and herbal drug interaction which is a need of the hour.The leaves of NAT are used extensively in Ayurvedic medicine for the treatment of various diseases such as sciatica, pchronic pyrexia, rheumatism, and internal worm infections, and as a laxative, diaphoretic and diuretic

Plant Parts used:

Leaves are effective in cough. Leaf succulent is mixed in honey and given thrice daily for the treatment of cough. Paste of leaves is given with honey for the treatment of pyrexia, high blood pressure and diabetes. Succulent of the leaves is used as digestives, antidote to reptile venoms, mild bitter tonic, laxative, diaphoretic and diuretic. Leaves are also used in the enlargement of spleen.The bright orange corolla tubes of the flowers contain a colouring substance nyctanthin, which is identical with α-Crocetin ($C_{20}H_{24}O_4$) from Saffron.

Biochemistry behind its effectiveness in curing Arthritis:

Arthritis is a disease manifested by joint pain followed by bone and joint destruction. Cytokines play a major role in arthritis. In the previous study it was reported that the irregular expression of tumor necrosis factor-α (TNF-α) in experimental animals has been shown to cause destructive arthritis. The development of arthritis was markedly suppressed in interleukin-β (IL-1β) deficient collagen-induced arthritis (CIA). Interleukin-6 (IL-6) gene disrupted mice were resistant to antigen and collagen-induced arthritis. These studies indicated that pro-inflammatory cytokines (TNF-α, IL-1β, and IL-6) play a role in arthritis and are potential targets for therapy.

Adjuvant induced arthritic model was used to test the efficacy of seed, leaves and fruit extract of NAT. The results resolved that the mice receiving two doses of FCA (Freud's complete adjuvant): one on 0th day and other on 12th day. Daily treatment with extracts of leaves and fruit reduced TNF α, IL-1, IL-6 from 14th day; while the seed extract was found to

be pathetic. A shift in balance between pro-inflammatory and anti-inflammatory cytokines was observed in adjuvant-induced mice thus favouring inflammation. The extract of leaves and fruit was found to possess anti-arthritic properties.

- ***Syzygium aromaticum***

Introduction:

Cloves are the aromatic flower buds of a tree in the family **Myrtaceae**, *Syzygium aromaticum*. They are native to the Maluku Islands (or Moluccas) in Indonesia, and are commonly used as a spice. Cloves are available throughout the year owing to different harvest seasons in different countries.

Plant parts used:

Cloves are a spice that you may well have stowed away somewhere in the kitchen; originally from the Maluku Islands in Indonesia, the spice itself comes from the **flower buds of the clove tree.**

Uses:

It is used to **flavour food,** imparting a sweet, aromatic flavour, and also one of the common spices used in the making of **mulled wine.** As well as this, the oil of cloves is commonly recommended as a **traditional remedy** for **relieving toothache**, amongst other conditions.

Biochemistry behind its effectiveness in curing toothaches:

So, what are the chemicals that make this use possible?

To start with, let's consider the composition of clove oil. There are actually three types, depending on whether the oil is extracted from the buds, the leaves, or the stems of the clove tree; here, we'll focus mainly on the bud oil. This is composed of three main compounds, as well as a myriad of minor constituents: eugenol, which accounts for around 70-85%, eugenyl acetate, which accounts for around 15%, and ß-caryophyllene, which accounts for 5-10%.

Eugenol is the major compound that allows clove oil to be used as a remedy for toothache. It has an impressively wide variety of properties: it's an anaesthetic and antiseptic, and has anti-inflammatory, antifungal, antibacterial and insecticidal properties – quite the catalogue. In terms of toothache, we're mainly concerned with the anaesthetic properties. These come about due to eugenol's ability to affect nerves in areas to which the clove oil is applied. It inhibits the movement of sodium ions, lessening the nerves' ability to communicate with the brain and transmit the sensation of pain.

Despite this, the FDA (US Food & Drug Administration) has stated that there isn't currently enough evidence to rate eugenol as effective for the treatment of toothache. This isn't to say it has no effect, and there are studies that have shown that it performs more effectively

against toothache than a placebo, but that this effect has not been shown to be significant enough to be of major use.
Another odd use for cloves came across during the research for this graphic was in a topical cream, in combination with some other ingredients, targeted at preventing premature ejaculation. Presumably this must also have something to do with eugenol's effect on nerves. Slightly concerned about the spam emails & in-browser advertising I'm going to be getting after researching this effect.
Finally, the aroma of cloves is influenced by the presence of eugenol, but also by the presence of some minor compounds in the composition. One of these is methyl salicylate, an ester commonly referred to as oil of wintergreen; another is 2-heptanone, which has a fruity, spicy odour. 2-heptanone is particularly interesting; much like eugenol, it can act as an anaesthetic, and research has shown that it is also contained in the mandibles of honeybees. The compound is secreted when the honeybee bites intruders in its hive, paralysing the intruder and allowing it to be removed by the bee. This is a comparatively recent discovery, and the compound has been patented for potential use as an anaesthetic in humans in the future.

- ***Azadirachta indica***


Introduction: Neem (*Azadirachta indica*) is an evergreen tree that belongs to the Meliaceae family and is found throughout world. Its English name is neem, and its Arabic name is Al Shurisha. Neem is a large tree that is approximately 25 meters in height with a semi-straight trunk. It is a flowering plant and normally starts fruiting after 3–5 years. The tree becomes productive within 10 years. The bark of this tree is grey and rough. The leaves are up to 30 centimetres long. Each leaf has 10–12 serrated leaf lets that are 7 centimetres long by 2.5 centimetres wide. The neem tree grows well in minimum rainfall countries.

Plant part used: All parts of the selected plant are used as medicine for the treatment of many diseases and **illnesses**.

Uses:Traditionally, the leaves and their paste are used for **curing allergic skin reactions** and **antivirally** treating **smallpox** and **chicken pox**. Most urban Nepalese, Indian and Bangladeshi use neem twigs to clean their **teeth**. The juice from the leaves is used as a tonic to increase **appetite** and to **remove intestinal worms**. It is also used for its **hypoglycaemic**, **hypolipidemic**, **hepatoprotective** and **hypotensive activities** and to control **fever**.

Biochemistry behind its effectiveness: In India, there is much interesting, but anecdotal, information attributing antiviral activity to neem. Its efficacy-particularly against pox viruses—is strongly believed, even among those of advanced medical training. Smallpox,

chicken pox, and warts have traditionally been treated with a paste of neem leaves—usually rubbed directly onto the infected skin.Experiments with smallpox, chicken pox, and fowl pox suggest that there may be a true biological basis for this practice. Crude neem extracts absorbed the viruses, effectively preventing them from entering uninfected cells.Unfortunately, no antiviral effects were seen once the infection was established within the cell. Thus neem was effective prevention, but not cure.

Recent pharmacological studies have supported the belief that neem leaves possess some antiviral activity. So far these are only preliminary and unconfirmed results, but they are intriguing, nonetheless. In the United States, aqueous neem-leaf extracts have shown low to moderate inhibition of the viral DNA polymerase of hepatitis B virus.6 In Germany, an ethanolic neem-kernel extract has proved effective against herpes virus.And in horticultural studies, crude extracts also seemed to effectively bind certain plant viruses, and so limit infectionShould these early results prove to be soundly based, an array of extremely virulent and difficult diseases of people—not to mention of wildlife and livestock—might be treated.

- ***Kalanchoe pinnata***

Introduction:*Kalanchoe pinnata*, formerly known as *Bryophyllum pinnatum*, also known as the air plant, cathedral bells, life plant, miracle leaf, and Goethe plant is a succulent plant native to Madagascar, which is a popular houseplant and has become naturalized in tropical and subtropical areas. It is distinctive for the profusion of miniature plantlets that form on the margins of its leaves, a trait it has in common with some other members of Bryophyllum (now included in Kalanchoe.)

Plant part Used: Bryophyllum pinnatum has been recorded in Trinidad and Tobago as being used as a traditional treatment for hypertension.In traditional medicine, the juice of the leaves is also used for kidney stones, although there is ongoing research and some scientific evidence for this use but further research is required. In the French Antilles, Kalanchoe pinnata, called zeb maltet, is used in local application against headaches. For the people of the Amazon, kalanchoe has multiple uses: the Creoles use it roasted against inflammations and cancer and as an infusion, and as a popular remedy for fevers. The Palikur people of Brazil and French Guiana apply a preparation of the juice of Kalanchoe leaves mixed with coconut oil to their foreheads to treat headache.

Chemical constituents: Bufadienolide compounds isolated from Bryophyllum pinnatum include bryophillin A, bersaldegenin-3-acetate, and bryophillin C. Bryophillin C also showed insecticidal properties.Phytochemical studies of Kalanchoe pinnata have identified the presence of triterpenes, steroid, phenanthrene, flavonoid, flavones, chalcones, taraxasterol,

aurones, phenolic acid, caffeic acid, syringic acid, malic, oxalic, ferulic acid and organic acid. Bufadienolides and phenanthrene are toxic compounds. Two calves fed for 48 hours with K. pinnata have been reported to have died due to ataxia and severe cardiac arrhythmia.

- ***Cinnamomum zeylanicum***

Introduction
Cinnamon (*Cinnamomum zeylanicum*, and *Cinnamon cassia*), the eternal tree of tropical medicine, belongs to the Lauraceae family.

Plant part used:
The bark of various cinnamon species is one of the most important and popular spices used worldwide not only for cooking but also in traditional and modern medicines.
Uses:
Cinnamon is a coagulant and prevents bleeding. Cinnamon also increases the blood circulation in the uterus and advances tissue regeneration. This plant plays a vital role as a spice, but its essential oils and other constituents also have important activities, including antimicrobial, antifungal, antioxidant, and antidiabetic.
Cinnamon has been used as **anti-inflammatory**, **antitermitic**, **nematicidal**, **mosquito larvicidal**, **insecticidal**, **antimycotic**,and **anticancer agent**. Cinnamon has also been traditionally used as **tooth powder** and to **treat toothaches**, **dental problems**, **oral microbiota**, and **bad breath**.

Chemical components: Cinnamon consists of a variety of resinous compounds, including cinnamaldehyde, cinnamate, cinnamic acid, and numerous essential oils. Singh et al. reported that the spicy taste and fragrance are due to the **presence of cinnamaldehyde and occur due to the absorption of oxygen**. As cinnamon ages, it darkens in color, improving the resinous compounds. Sangal reported various physiochemical properties of cinnamon. The presence of a wide range of essential oils, such as trans-cinnamaldehyde, cinnamyl acetate, eugenol, L-borneol, caryophyllene oxide, b-caryophyllene, L-bornyl acetate, E-nerolidol, α-cubebene, α-terpineol, terpinolene, and α-thujene, has been reported.

Anti-Inflammatory Activities: Several studies on medicinal plants and their components have indicated the anti-inflammatory activities of cinnamon. Various studies reported the anti-inflammatory activity of cinnamon and its essential oils. To date, there are several flavonoid compounds (e.g., gossypin, gnaphalin, hesperidin, hibifolin, hypolaetin, oroxindin, and quercetin) that have been isolated and have anti-inflammatory activities.A recent study reported that 2′-hydroxycinnamaldehyde isolated from C. cassia bark exhibited an inhibitory effect on the production of nitric oxide by inhibiting the activation of the nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB), indicating that this substance can potentially be used as an anti-inflammatory agent. The ethanolic extract of C. cassia showed

significant anti-inflammatory effects by reducing the activation of Src/spleen-tyrosine-kinase-(Src/Syk-) mediated NF-κB. Various compounds contained in C. ramulus showed anti-inflammatory effects by suppressing the expression of inducible nitric oxide synthesis (iNOS), cyclooxygenase-2 (COX-2), and nitric oxide (NO) production in the central nervous system (CNS). By this mechanism, C. ramulus could be a potential source for the therapeutic treatment or prevention of inflammation-mediated neurodegenerative diseases [90]. Furthermore, the aqueous extract of cinnamon decreases the lipopolysaccharide-induced tumor necrosis factor-α levels in the serum.

10..To study the different types of grasses in specific area

Weed is defined as the unwanted, undesirable plant, growing out of their proper place, which interfere with

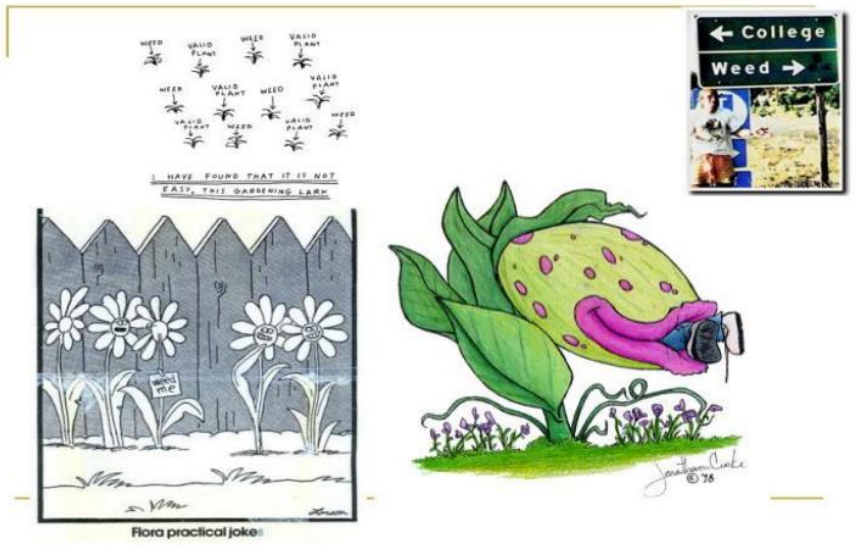
▪ the utilization of natural resources, prolific, persistent, competitive, harmful and even poisonous in nature

▪ and can grow in adverse climatic conditions. (Jethro Tull: father of weed Science)

Weed is a plant that originated under a natural environment and in response to imposed and natural
environments, evolved and continues to do so as an interfering associate with our desired plant and
activities.

Weed is a plant growing out of place and time. They are unwanted not useful, persistent and prolific,
effectively competing with the beneficial and desirable crop plants for space, nutrients, sunlight and water,
interfere with agricultural operations and thereby reducing the yield and quality of produce.

Out of 2,50,000 plant species, weeds constitute about 250



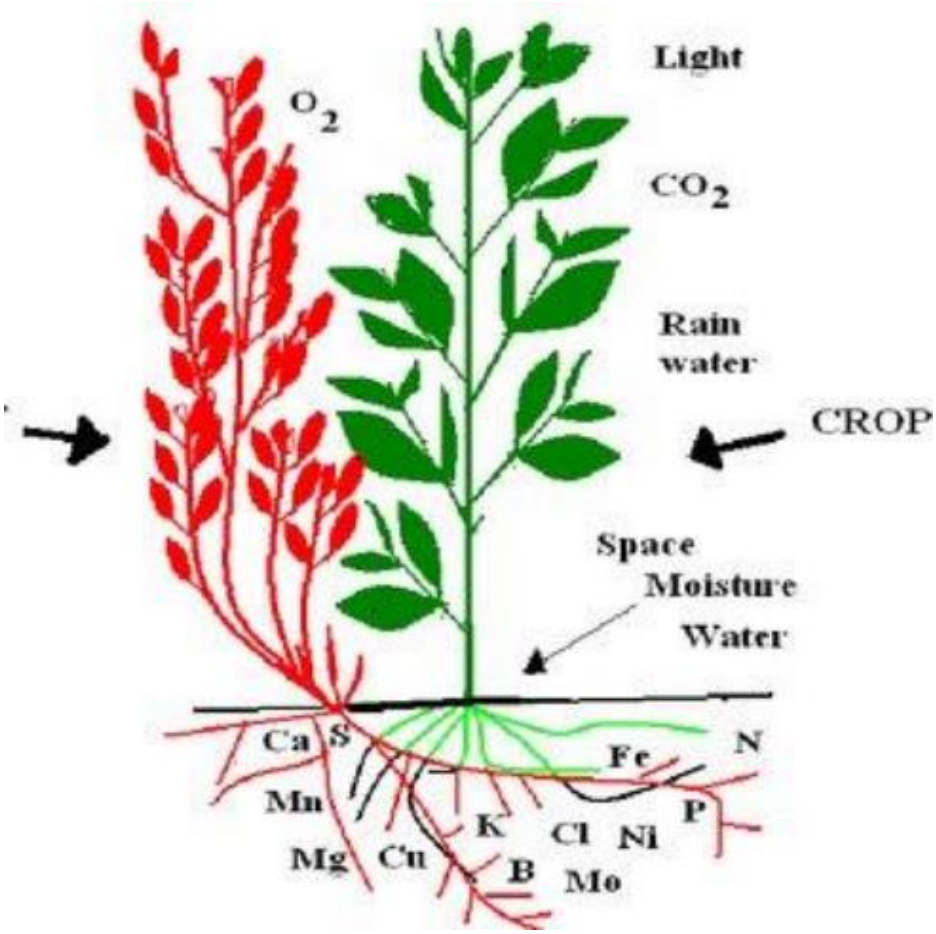
species, which are prominent in agricultural and non-agricultural system. Under world conditions about 30000 species are grouped as weeds which are classified as follows:

▪ Weeds have rapid seedling growth and ability to reproduce when young e.g. Redroot Pigweed can flower and reproduce when it is less than eight inches tall.

▪ Weeds have quick maturation period or take only a short time in the vegetative phase e.g. Canada thistle can produce mature seeds in two weeks after flowering and Russian thistle seeds can germinate very quickly between 280 -110 0 F in latte spring.
▪ Weeds may have dual mode of reproduction. Most weeds are angiosperms & reproduce by seeds and vegetatively too.
▪ Weeds have environmental plasticity. Many weeds are capable of tolerating and growing under a wide range of climatic and edaphic conditions.
▪ Weeds are often self-compatible but self-pollination is not obligatory.
▪ If a weed is cross pollinated, this is accomplished by non- specified flower visitors or by wind.

Crop	Reduction in yields due to weeds (%)	Crop	Reduction in yield due to weeds (%)
Rice	41.6	Groundnut	33.8
Wheat	16.0	Sugarcane	34.2
Maize	39.8	Sugar beet	70.3
Millets	29.5	Carrot	47.5
Soybean	30.5	Cotton	72.5
Gram	11.6	Onion	68.0
Pea	32.9	Potato	20.1

Weeds compete with crops for water soil, nutrients, light, and space, and thus reduce the crop yields. An estimate shows that weeds can deprive the crops 47% N, 42% P, 50% K, 39% Ca and 24% Mg of nutrient uptake. Weeds also act as alternate hosts that harbour insects, pests, diseases and other microorganismsBased on life span (Ontogeny), weeds are classified as Annual weeds, Biennial weeds and Perennial weeds.
(A)Annual Weeds :-Weeds that live only for a season or a year and complete their life cycle in that season or year are called as annual weeds. These are small herbs with shallow roots and weak stems. Produces seeds in profusion and the mode of propagation is commonly through seeds. After seeding, the annuals die away and the seeds germinate and start the next generation in the next season or year following.Most common field weeds are annuals. The examples are:
a. Monsoon annuals: Commelina benghalensis, Boerhavia erecta
b Winter annuals: Chenopodium album
c Biennials



They complete the vegetative growth in the first season, flower and set seeds in the succeeding season and then dies. These are found mainly in non-cropped areas.e.g. Alternanthera echinata, Daucus carota

d.Perennials :-live for more than two years and may live almost indefinitely. They adapt to withstand adverse environmental conditions. They propagate not only through seeds but also by underground stems, roots, rhizomes, tubers etc. and hence they are further classified into ▪ i. Simple perennials: Plants propagated only by seeds e.g. Sonchus arvensis

▪ ii. Bulbous perennials: Plants which possess a modified stem with scales and reproduce mainly from bulbs and seeds e.g. Allium sp.

▪ iii. Corm perennials: Plants that possess a modified shoot and fleshy stem and reproduce through corm and seeds e.g. Timothy (Phleum pratense)

▪ iv. Creeping perennials: They reproduce through seeds as well as with one of the followings: ▪ a. Rhizome: Plants having underground stem – Sorghum halepense

▪ b. Stolon: Plants having horizontal creeping stem above the ground – Cynodon dactylon ▪ c. Roots: Plants having enlarged root system with numerous buds – Convolvulus arvensis ▪ d. Tubers: Plants having modified rhizomes adapted for storage of food – Cyperus rotundus **II. Based on ecological affinities**

a. Wetland weeds

They are tender annuals with semi-aquatic habit. They can thrive well under waterlogged and in partially dry conditions. Propagation is chiefly by seed e.g. Ammania baccifera, Eclipta alba

b. Garden land weeds (Irrigated lands)
These weeds neither require large quantities of water like wetland weeds nor can they successfully withstand
extreme drought as dryland weeds e.g. Trianthema portulacastrum, Digera arvensis c. Dry lands weeds
These are usually hardy plants with deep root system. They are adapted to withstand drought on account of mucilaginous nature of the stem and hairiness e.g. Tribulus terrestris, Argemone mexicana.
(a) Weeds of black cotton soil: These are often closely allied to those that grow in dry condition e.g. Aristolochia bracteata
(b) Weeds of red soils: They are like the weeds of garden lands consisting of various classes of plants e.g. Commelina benghalensis
(c) Weeds of light, sandy or loamy soils: Weeds those occur in soils having good drainage e.g. Leucas aspera
(d) Weeds of laterite soils: e.g. Lantana camara, Spergula arvensis

IV. Based on place of occurrence

(a) Weeds of crop lands: The majority of weeds infests the cultivated lands and cause hindrance to the
farmers for successful crop production e.g. Phalaris minor in wheat
(b) Weeds of pasture lands: Weeds found in pasture / grazing grounds e.g. Indigofera enneaphylla
(c) Weeds of waste lands: Corners of fields, margins of channels etc., where weeds grow in profusion
e.g. Gynandropsis pentaphylla, Calotropis gigantean etc.
(d) Weeds of playgrounds, road-sides: They are usually hardy, prostrate perennials, capable of withstanding any amount of trampling.e.g. Alternanthera echinata, Tribulus terestris

V. Based on Origin

(a) Weeds of crop lands: The majority of weeds infests the cultivated lands and cause hindrance to the farmers for successful crop production e.g. Phalaris minor in wheat
(b) Weeds of pasture lands: Weeds found in pasture / grazing grounds e.g. Indigofera enneaphylla (c) Weeds of waste lands: Corners of fields, margins of channels etc., where weeds grow in profusion e.g. Gynandropsis pentaphylla, Calotropis gigantean etc.
(d) Weeds of playgrounds, road-sides: They are usually hardy, prostrate perennials, capable of withstanding any amount of trampling.e.g. Alternanthera echinata, Tribulus terestris

VI. Based on cotyledon number

Based on number of cotyledons they can be classified as dicots and monocots.
(a) Monocots e.g. Panicum flavidum, Echinochloa colona
(b) Dicots e.g. Crotalaria verucosa, Indigofera viscosa

VII. Based on soil pH

Based on pH of the soil the weeds can be classified into three categories.
(a) Acidophile – Acid soil weeds e.g. Rumex acetosella
(b) Basophile – Saline & alkaline soil weeds e.g. Taraxacum sp.
(c) Neutrophile –Weeds of neutral soils e.g. Acalypha indica

▪ VIII. Based on morphology

Based on the morphology of the plant, the weeds are also classified in to three categories. This is the most
widely used classification by the weed scientists.
(a)Grasses:-All the weeds which come under the family Poaceae are called as grasses which are characteristically having long narrow spiny leaves. The examples are Echinocloa colonum, Cynodon dactylon.

(b)Sedges:- The weeds belonging to the family Cypperaceae come under this group. The leaves are mostly from the base having modified stem with or without tubers. The examples are Cyperus rotundus, Fimbrystylis miliaceae.

(c) Broad leaved weeds:-This is the major group of weeds . All dicotyledon weeds are broad leaved weeds. The examples are Flavaria australacica, Digera arvensis, Tridax procumbens

IX. Based on nature of stem

Based on development of bark tissues on their stems and branches, weeds are classified as woody, semiwoody and herbaceous species.

(a). Woody weeds:-Weeds include shrubs and under shrubs and are collectively called brush weeds e.g. Lantana camera, Prosopis juliflora

(b). Semi-woody weeds:-e.g.Croton sparsiflorus

(c). Herbaceous weeds:-Weeds have green, succulent stems and are of most common occurrence around us e.g. Amaranthus viridis

X. Based on specificity

Besides the various classes of weeds, a few others deserve special attention due to their specificity. They are: a). Poisonous weeds, b). Parasitic weeds and c). Aquatic weeds.

a. Poisonous weeds

The poisonous weeds cause ailment to livestock resulting in death and cause great loss. These weeds are harvested along with fodder or grass and fed to cattle or while grazing the cattle consume these poisonous plants e.g. Datura fastuosa, D. stramonium and D. metel are poisonous to animals and human beings. The berries of Withania somnifera and seeds of Abrus precatorius are poisonous.

(b). Parasitic weeds:-

The parasite weeds are either total or partial which means, the weeds that depend completely on the host plant are termed as total parasites while the weeds that partially depend on host plant for minerals and capable of preparing its food from the green leaves are called as partial parasites. Those parasites which attack roots are termed as root parasites and those which attack shoot of other plants are called as stem parasites. The typical examples are;

Total root parasite – Orabanche cernua on Tobacco

Partial root parasite - Striga lutea on sugarcane and sorghum

Total stem parasite - Cuscuta chinensis on lucerne and onion

Partial stem parasite - Cassytha filiformis on orange trees and Loranthus longiflorus on mango and other trees.

(c). Aquatic weeds:-

Unwanted plants, which grow in water and complete at least a part of their life cycle in water are called as aquatic weeds. They are further grouped into four categories as submersed, emersed, marginal and floating weeds.

Submersed weeds: These weeds are mostly vascular plants that produce all or most of their vegetative growth beneath the water surface, having true roots, stems and leave
e.g. Utricularia stellaris, Ceratophyllum demersum.

Immersed weeds : These plants are rooted in the bottom mud, with aerial stems and leaves at or above the water surface. The leaves are broad in many plants and sometimes like grasses. These leaves do not rise and fall with water level as in the case of floating weeds e.g. Nelumbium speciosum, Jussieua repens.

Marginal weeds : Most of these plants are immersed weeds that can grow in moist shoreline areas with a depth of 60 to 90 cm water. These weeds vary in size, shape and habitat. The important genera that comes under this group are; Typha, Polygonum, Cephalanthus, Scirpus, etc.

Floating weeds: These weeds have leaves that float on the water surface either singly or in cluster. Some weeds are free floating and some rooted at the mud bottom and the

leaves rise and fall as the water level increases or decreases. e.g. Eichhornia crassipes, Pistia stratiotes, Salvinia sp., Nymphaea pubescens.

Potential yield loss due to weeds in different major crops of India

Crop	Yield loss (%)	Crop	Yield loss (%)
Chieckpea	10-50	Pea	10-50
Cotton	40-60	Pearlmillet	16-65
Fingermillet	50	Pigeonpea	20-30
Greengram	10-45	Potato	20-30
Groundnut	30-80	Rice	10-100
Horsegram	30	Sorghum	45-69
Jute	30-70	Soybean	10-100
Lentil	30-35	Sugarcane	25-50
Maize	30-40	Vegetables	30-40
Niger	20-30	Wheat	10-60

Major weeds associated with different crops vary with crops and locations . The Directorate of Weed Research (DWR), Jabalpur, has developed a Weed Atlas for major weeds in major crops in 435 districts spread across 19 states of the country and published a handbook on weed identification [Naidu 2012]. Its findings revealed that a) infestations of little mallow (.Malvaparviflora L.), jangli palak {Rumex retroflexus Lag. ex Schult. & Schult.f.), annualbluegrass {Po'a annuaL.), lesserswinecress {Coronopus didymus (L.) Sm.} andrabbitfoot polypogon {.Polypogon monspliensis (L.) Desf.} are increasing in the rice-wheat cropping zone; b) tiger foot morning glory (.Ipomoea pestigridis L.) has become a serious weed of sugarcane in Haryana and U.R; c) the intensity of submerged weeds is gradually increasing in the ricerice sequence in Assam; d) ragweed {Ambrosia artemisiifolia L.) and parthenium {Partheniumhysterophorus L.) are gradually spreading beyond the non-cropped area and entering cropped and plantation areas; and e) loranthus {Loranthus longiflorusDesr.) is likely to be a major problem for mango orchards in the southern part of the country. In addition, weedy rice {Oryzasativa L.) is emerging as a major problem in direct-seeded rice .

▪ **WEED CONTROL:-**

Weed control includes many techniques used to limit weed infestation and minimize competition. Weed control technique attempt to achieve a balance between cost of control and crop yield loss, but weed control is used only after the problem exist.

WEED MANAGEMENT:- Weed management is an approach in which weed prevention and weed control have companion roles. Weed management is the combination of the techniques of prevention, eradication and control to manage the weed in a cropping system or –environment. Or It is defined as a system of farming, using all available knowledge and tools to produce crops which are free from economically damaging competitive vegetation.

There are two broad methods of weed control:

▪**1. Preventive methods**

▪**2. Curative methods**

▪ **i) Eradication**

▪ **ii) Control measures**

1. Preventive Method:

Prevention of introduction and spread of weeds in an entirely new locality is termed as preventive method.It is essential to know that how weeds disseminate. By taking following measures weed spread can be prevented from entering into a new locality.

I) Sowing of weed free clean seed

The seed contaminated with weed seed is a good source of spread of weeds. It becomes hard to separate the weed-seed from the crop seed. For example, cruciferous crops like radish, cauliflower, cabbage, broccoli etc. are well mixed with the seed of Satyanashi (Argemone mexicana). Such impure seed should be discarded for sowing

II) Use of clean implements:

While operating agricultural implements like cultivator, harrow, and seed drill etc. in weed infested field, care must be taken that multiplication part of weed like rhizome, bulb, tubers, stem is not being carried along. The agricultural implements should be cleaned properly. Only then these should be used in other fields. This helps in controlling spread of the weeds.

▪ **III) Removal of weeds along canal and irrigation channel:**

Weed seed get transported through water and reach the field. Removal of weeds growing along the sides of canal or irrigation channel is necessary

IV) Care in transplanting of seedling/plantlets:

Many horticultural plants like all transplanted vegetables,flowers, and fruits are transplanted in the field with soil attached to their root. Infestation of soil with weed may contaminate a new field.

V) Use of well rotten manure:

Weed seeds have good viability. The seed of hirankhuri (Convolvulus arvensis) remain viable for as long as 50 years. Doob (Cynodon dactylon) and motha (Cyperus rotundus) seed viability lasts for two and five years, respectively. For making manure the cowdung is generally heaped. If the heaping period is short, the seed do not lose its viability and grows in the field wherever manure is applied. So only well rotten manure should be used.

VII) Crop management practices.

All such practices which favour the growth of main crop only disfavour the growth of weed. The following management practices have smothering effect on weed and must find place in crop land to prevent weed spread:

Proper crop rotation prevents establishment of weeds.

Higher plant population per unit area smothers the growth of weed.

Proper placement of fertilizer in the root zone of the seed favours the growth of crop only. The weeds deprive of nutrients and their growth is restricted.

Fast and vigorous growing varieties by virtue of their larger leaf canopy cause smothering effect on the growth of weed. Such crops should receive preference to prevent spread of the weed.

VIII) Enforcement of weed Laws:

In India, many noxious weeds grow in the fields and pose great economic and health hazard. Noxious weeds are those perennial weeds which are reproduced by seeds,stem,roots,and other reproductive parts as well and are very difficult to control.Parthenium hysterophorus, Striga sp.,Cyperus rotundus,Cynodon dactylon etc.are noxious weeds that grow in many horticultural crops.In India , no weed laws are in force except in Karnataka where Parthenium has been declared as a noxious weed.

IX) Quarantine Laws.

Quarantine laws impose legal restrictions on the movement of the agricultural material. If there were adequate quarantine laws, the Parthenium and Argemone which widely grows in vegetable and flower field may not have entered India.Creating isolation between widely weed infested area and new area is essential by enforcing and observing quarantine properly.

X) Use of pre-emergence herbicides:

Herbicides which are used before the emergence of weeds either before or after planting of crop, is a good preventive measure for preventing weed infestation. Such herbicides either inhibit seed germination or kill young seedlings before they get established.

CURATIVE METHODS

I) Eradication:-Eradication means elimination of weeds after they have become established in an area and control methods are adopted where prevention and eradication have failed, so control measure as a rule eradicate the weeds and make it possible to raise the crops in spite of their presence. Constant control measures applied for several years help in practical elimination of weeds. Eradication is however, impractical and if practiced in large scale it may be possible to eradicate certain weeds which are limiting in their spread.

ii) Methods of weed control:- weed control can be decided by the habits of weed which concern with life cycle and methods of propagation by the habitat which mean magnitude of the problem Habit- Concern its life cycle and methods of propagation
Habitat- Means place where it thrives best
Distribution- Means the magnitude of the problem

A) PHYSICAL /MECHANICAL METHODS OF WEED CONTROL

a) Prevention from spread

b) Destruction of top growth

c) Destruction of underground part

d) Destruction of weed seeds in the soil

a) Preventing from spread

Use of clear seeds:- Certified and pure seeds should be used for the sowing purpose. Most of the seeds are full of impurities which help in the spread of weeds year after year. There should be a rule to stop the sale of uncertified seeds.

- **b) Destruction of weed growth**

Hand pulling

Hand hoeing

Tillage

Blind tillage

Ploughing

Harrowing

Disking

Spudding

Burning

Pasturing and grazing

- **c) Destruction of underground parts**

Hand digging:- Removal of underground parts like roots and rhizomes by hand digging, but it is an expensive method. Applied in small patches where noxious weeds have been found to grow.

Summer fallow :- Continuous clearing of the land throughout summer without growing a crop. Effective if top growth of the weeds is removed at regular intervals to starve the roots. Fields may be ploughed, or disked. Employed in dry farming areas where crop depends on monsoon. It helps in the absorption of precipitation by the soil and in the retention of absorbed moisture.

d) Destruction of weed seeds in the soil:-

Some of the weed seeds remain buried in the soil for years without losing their viability and come up and produce new crops. Steps should be taken to destroy the weeds and to clean the fields.

Deep ploughing:- weed seeds which are buried below are exposed to the surface if deep ploughing is practised during summers. Such weed seeds are induced to germinate and once they come up, it is easy to control them.

Harrowing and shallow cultivation:- These methods induce many seeds to germinate and can be destroyed during the preparation of seed beds.

▪ Helping to conserve soil moisture and prevent erosion. A ground cover of weeds will reduce the amount of bare soil exposed helping to conserve nutrients, particularly nitrogen which could otherwise be leached away, especially on light soils.
▪ Food and shelter can be provided for natural enemies of pests and even alternative food sources for crop pests. The actual presence of weed cover may be a factor in increasing effectiveness of biological control of pests and reducing pest damage.
▪ Weeds can also be valuable indicators of growing conditions in a field, for example of water levels, compaction and pH.
▪ Weeds can be an important source of food for wildlife, especially birds. Bird populations have been declining on farmland over the last few decades and leaving weeds as a resource has been shown to help revive bird populations.
▪ Weeds have serious impacts on agricultural production. It is estimated that in general weeds cause 5% loss in agricultural production in most of the developed countries, 10% loss in less developed countries and 25% loss in least developed countries. In India, yield losses due to weeds are more than those from pest and diseases. Yield losses due to weeds vary with the crops. Every crop is exposed to severe competition from weeds. Most of these weeds are self-sown and they provide competition caused by their faster rate of growth in the initial stages of crop growth. In some crops, the yields are reduced by more than 50% due to weed infestation.

11.To study the hormonal action responsible for plant growth rate

Tulsi is a tropical plant, it requires warm temperature to germinate.
• It is sacred plant of Hindus.
• It is aromatic perennial plant of family Lamiaceae.
• It is commonly used in Ayurveda.

MORPHOLOGY OF THE PLANT: -

1. It is erect, many branched subshrubs with hairy stem.
2. Leaves are green or purple in color.
3. They are simple, petioled, with an ovate blade which have toothed margin.
4. Purplish flowers are placed in the closed whorls on elongated racemes.

SOWING TIME

❖ Tulsi seeds should be started indoors 6 to 12 weeks before the last frost.

❖ It should be kept in a place where the temperature is warmer.

❖ If the house in which we are growing the plant is colder than we can use a seedling mat to warm the temperature of the soil.

❖ The soil should be kept moist continuously, but not soggy.

DAYS ANALYSIS

❖ We should leave about an inch of space at the top of the pot.

❖ Tulsi seeds are so small sprinkle the seeds on top of the soil then gently press them downward with your fingers.

❖ Seed will germinate about 3 weeks after planting.

❖ Tulsi plants are very frost sensitive.

❖ It should not be moved outdoors until several weeks after the last frost date. ❖ Plant should have ample sunlight in a south facing window for at least 4-6 hours of direct sunlight per day.

❖ Organic compost or liquid fertilizer can be used to maintain the nutrients in the soil.

❖ We can also grow Tulsi plant from cuttings. ❖ Make sure seeds kept continually warm, and change water to avoid mold and stagnation.

❖ Once your Tulsi plant is established, it needs warm temperature to thrive.

❖ It can be grown as perennial houseplant or annual outdoors.

❖ You can begin to harvest Tulsi once the plant reaches about afoot in their height.

❖ Pinch back the growing tips of the plant to help encourage a bushy plant habit, which will increase yield.

❖ Tulsi Plants should be ready for harvesting about 40 days after the germination.

❖ Bushes of Tulsi plant can reach upto the height of 4-5 ft.

❖ In indoors it remains small and bushy till the height of 1-2 ft.

❖ Once you notice the roots grown out of drainage holes in the bottom of the pot. ❖ We need to transfer the plant into larger pot. ❖ We can safely transfer Tulsi outdoors about 6- 8 weeks after you planted it.

SUNLIGHT: - In ideal conditions, Tulsi requires at least 6 hrs of sunlight per day.

FERTILIZER: - The best fertilizer for Tulsi plants is balanced 10-10-10 liquid fertilizer and can be applied every few months for indoor plants. HARDINESS: -Tulsi is hardy to zone and cannot handle any frost.

(2) SOYABEAN {Glycine max}

CLASSIFICATION:

KINGDOM: Plantae

ORDER: Fabales

FAMILY: Fabaceae

GENUS: Glycine

SPECIES: max

INTRODUCTION

✓Soyabean is a species of legume.

✓Soyabean can fix atmospheric nitrogen due to symbiotic bacteria.

✓Soyabean provide us oil and proteins. ✓It is firstly discovered as fertilizer.

MORPHOLOGY OF THE PLANT: - ➢ Stem is branched, buds in the axils of the cotyledons.

➢ Root of soya plant is taproot. Roots ae swollen because of nodules in it.

➢ Leaves are trifoliate, alternate, petiolate, stipulate, cylindrical and have ovate leaflets. ➢ Inflorescence is short cluster axillary raceme.

SOWING TIME AND DAYS ANALYSIS:

• Plant seeds are mainly sown from late spring to early summer.

• They must have warm soil to germinate and grow.

• Poke holes into the cultivated bed or row to plant soyabean seeds about 2 inches apart and one-half inches deep.
• Soyabean crops can be used mainly to add nitrogen in the poor soil.

• Plant soyabean in full sun; soyabeans will tolerate the partial shade but its yield will be reduced.
• Soyabeans grow best in the loose well drained soil which is rich in the organic matter.
• Soyabeans prefer the pH of 6.0-6.8. • Soyabeans are tolerant of the poor soil.
• Sow soyabeans in the spring 2-3 weeks after the average last frost date when the soil warmed to at least 16° C.

• Plant soyabean in warm winter region. Soyabean are not frost tolerant.

Do not soak seeds before planting and do not overwater immediately after planting.

• Too most seeds may crack and germinate poorly.

• Keep planting beds evenly moist till the soyabean have pushed through the soil. • Water regularly during pod formation and flowering.

• Avoid overhead watering which can cause flowers and pods to fall off.

Avoid adding nitrogen rich fertilizer in planting beds.
• Soyabean set up mutual exchange with the nitrogen fixing bacteria to produce nitrogen compounds. • Avoid handling soyabean when they are wet or covered with heavy dew; this may spread fungal spores.
Mulch to conserve the soil moisture once the soil has warmed. • Soyabeans are rarely bothered by pests.
• Soyabeans are rarely attacked by any disease.

(3) CHILLI {*Capsicum annuum*}
• The chilli is a fruit of plant belongs to the family of "Solanaceae" and genus of "Capsicum".
• The chilli is one of the most valuable crops of India.
• The chilli is also being termed as "chilli pepper" I
The chilli is one of the most valuable crops of India.
• The chilli is also being termed as "chilli pepper" in many parts of world.
The crops grown largely for its fruits all over world.

SOWING TIME ;-Just put the seeds on the surface of the medium & cover it with more coco-peat on the top to cover the seed. Keep the seedling tray indoors till the seeds germinate. Covering: Keep the seed tray in a box or cover it with paper for first 4-5 days to encourage faster seed germination.

DAYS ANALYSIS

• Total duration of chilli crop is 120-150 days. Firstly, wet the seeds nicely and sow them in soil at a depth of about 2-3cm. the chilli seeds will germination in about 1 week. Water the everyday, keep the soil moist.

•The seeds will germinate and see two small leaves on the surface of the soil within 7-10 days of planting the seeds. Keep watering them every day and expose 4-6 hours of sunlight daily.

• The plant is about 8-10 inches in height, it'll bring out small buds which will blossom into cute little white flowers about 1- 1.5 month after planting them. The flower remains on the plant for about 7- 10 days, then falls off and then a cute chilli growing in its place.

PLANT STRUCTURE

The Chilli plant's body is divided into two main parts: Roots: They are the structures that anchor the plant to the ground whilst also absorbing water and minerals from the surrounding environment.
Shoots: These are the aboveground plant structures which includes the stem, which is the framework for the leaves, flowers, and fruits.
STEM
Nodes are the points at which the leaves are connected to the stem Internodes are stretched or distance of stem between the nodes.
Terminal buds can remain dormant or grow into a shoot at a later time depending upon undeveloped shoot located where a petiole or leaf stalk, meet the stem.
Apical dominance refers to a process in which growth of the main stem is primary and growth of side stem is inhibited.
Uses of chilli:
Chili pepper has preventive and herapeutic properties for many ailments such as different types of cancer, rheumatism, stiff joints, bronchitis and chest colds with cough and headache, arthritis, heart arrhythmias.

(4) MUSTARD PLANT (*Brassica Campestris*)

CLASSIFICATION:
Kingdom: Plantae
Division: Magnoliophyta
Class: Magnoliopsida
Order: Brassicales
Family: Brassicaceae
Genus: Brassica
INTRODUCTION
The mustard plant is a plant species in the genera Brassica and Sinapis in the family Brassicaceae. Mustard seed is used as a spice. Grinding and mixing the seeds with water, vinegar, or other liquids creates the yellow condiment known as prepared mustard. The seeds can also be pressed to make mustard oil.
PLANTED THE SEEDS :-Plant the seeds 1/2 an inch deep (1.25cm), and 15 inches (36cm) apart. Once the plants are up, thin the seeds to about 9-10 inches (24-26cm) apart from each other. Care: Needs constant moisture for optimal growth. Make sure that the pH of the soil is not more than 6.0

GERMINATION :-Favorable conditions for mustard germination include moist soil and a soil temperature of roughly 45 degrees Fahrenheit. Under these conditions, mustard will emerge from the soil in five to 10 days. Mustard planted when the soil is 40 degrees will germinate, but it will germinate more slowly be eaten as mustard greens.
LEAF DEVELOPMENT :-The leaf consists of a stalk (the petiole) and a blade— the

thin, flat, expanded portion (needle like in most conifers) that is normally green in color because of the presence of the pigment chlorophyll.
Leaves vary in size (up to 60 ft/18m long in some palms), shape, venation, color, and texture, and are classified as simple (one blade) or compound (divided into leaflets). e pinnate (with one central vein, the midrib, and smaller branching veins) or palmate (with several large veins).
STEM ELONGATION :-A stem develops from the plumule of a seed away from the soil upwards. The stem is hemoaceous and branched. It bears leaves and flowers.
The point on the stem or a branch from where leaf arises is called a node. The part of the stem between two adjacent nodes is called internode. The stem provides support to the leaves in such a way that they may receive maximum sunlight tor preparing me food during photosynthesis.
INFLORESCENCE :-The inflorescence of Brassica campestris is corymbose raceme inflorescence. The racemose inflorescence shows indefinite growth.
FLOWERING :-The flowers of mustard seed plant are generally yellow but some varieties have white flowers. As the mustard flower grows and matures, it will form pods. Watch for these pods to start to turn brown. Another sign that you are nearing harvest time will be that the leaves of the plant will start to yellow.
SEED :-The seeds are the ingredient in the common prepared mustard condiment. Mustard is easy to grow from seed at home, even in cooler climates, and often grows as a volunteer plant in gardens. Mustard seeds can be found in garden stores.
USES :-The seed and oil from the seed are used to make medicine. Black mustard oil is used for the common cold, painful joints and muscles (rheumatism), and arthritis. Black mustard seed is used for causing vomiting, relieving water retention by increasing urine production, and increasing appetite.
Plant Hormones:
Plant hormones are chemical messengers released in one part of the plant that cause a change in another part.

Auxins	Roots, shoots, and young leaves	Promote stem elongation and are involved in overall growth and the dropping, or abscission, of leaves, and in the differentiation of vascular tissue cells (xylem and phloem)
Gibberellins	Apical meristem, seeds, and young leaves	Promote stem elongation and the germination of seeds and are involved in the growth of fruit
Cytokinin	Roots	Stimulate cell division in plant growth and are involved in the differentiation of plant cells into tissues
Ethylene	Most plant tissues	Slows the lateral growth of buds, promotes leaf abscission, and induces fruit ripening

Abscisic acid	Leaves, roots, and fruit	Regulates leaf openings, or stomata, in times of drought; balances growth hormones; involved in seed dormancy

11.STUDY OF VARIATION IN GROWED OKRA SEEDS UNDER DIFFERENT LIGHT CONDITIONS.

REQUIREMENTS:– Two pot , okra seeds, organic manure, sufficient sunlight , water etc.

DESCRIPTION:–

- Take two pot add sufficient soil in both
- Sow okra seeds in both pot
- Give sufficient water to seeds
- Put one pot in the presence of light and other pot in the absence of light other pot in the absence of light
- Add organic manure time to time in soil of pot which present in absent of light .

OBSERVATION :–

- After sowing (18sep.2020) ,the seeds were germinate in 2-3 day (20sep.2020)
- The growth rate of seeds in the absence of sunlight is fast because addition of organic manure in it while in the presence of sunlight light growth rate of seeds slow (absence of organic manure)
- Plants grown well in different light conditions.
- Within 74 days (30 Nov.2020) flower was arises on plants which present in sunlight
- Within 74 days (30Nov.2020) some insects like ants, caterpillar attack on plants (which grown in absence of sunlight) cause damage to developing leaves and flowers.
- Pests or insects mostly attack on the okra plants when temperatures of environment fall down , so due to the absent of sunlight and temperature fall down plants got effected by pests or insects .
- (2dec.2020) pods were arises from the plant which present sunlight .
- Plants in the present of sunlight also affected by pests due to decrease in the temp. In the month of December.
- Plants present in the absent of sunlight effected by insects or pests in the month of November while the plants present in sunlight effected in the month of December.

PRECAUTIONS:-

- Grow okra seed in full, hot sun , because it require 6-8 hour daily sunlight .
- Use pesticides or insecticides for protecting plants from insects or pests .
- Watering plants when soil surface get dries
- Keep the soil moist and keep temperature near 75 degree until the okra sprouts .
- Okra plants grow well in hot season as compare to cold season.

sunlight present

sunlight absent

19sep.2020

sunlight present

sunlight absent

20sep.2020


30Nov.2020
2nov.2020
sunlight absent
30Nov.2020


1dec
2dec.
sunlight present
20dec.2020
sunlight absent

attack of pests

Lll

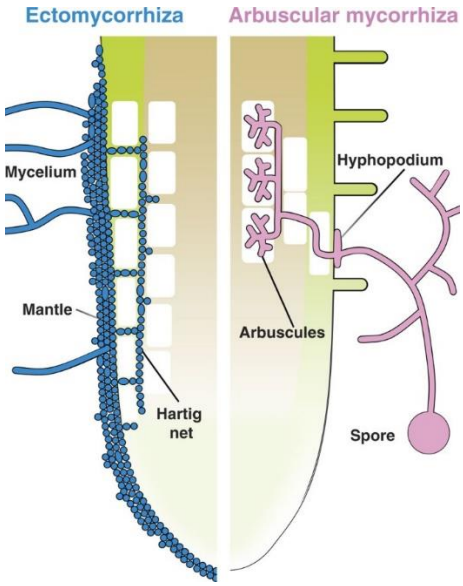
Okra plant in the presence of sunlight ***vs.*** ***okra plants in the absent of sunlight***

Growth of plants	***Okra plant in the present of sunlight***	***Okra plant in the absent of sunlight***
Number of Seeds germinate. ***Germination and growth rate.***	***Number of germinating seeds (1-4).*** ***Germination and growth rate was normal.***	***Number of germinating seeds (1-5). Germination and growth rate fast because of addition of organic manure.***
Length of stem	**Length of stem is about (9-10 inch)**	***Length of stem same as that in the presence of light (9-10 inch***
Developing of seed pod and flower buds	***Seed pod and flower bud well developed are 1-2 in numbers***	***Seed pod developed but flower buds are not developed because seed pods were eat by pests or insects.***
Development of okra pod	***2 okra pods are developed***	
Attack of pests or insects	**Pests or insects attack on the plant in the month of December**	***Attack of pest in the month of November***
Color and shape of flower	**Plant produces flowers with 5 white to yellow petals which are 4-8 cm in diameter.**	
Seed pod	***Seed pod is a capsule up to 25 cm long containing numerous seeds***	

12. To study different mycorrhizal species that form symbiotic association with plants.

Mycorrhizae are symbiotic relationships that form between fungi and plants. The fungi colonize the root system of a host plant, providing increased water and nutrient absorption capabilities while the plant provides the fungus with carbohydrates formed from photosynthesis. Mycorrhizae also offer the host plant increased protection against certain pathogens.

Approximately 90% of all vascular land plants live in some association with mycorrhizal fungi. Mycorrhizal fungi encompass many major groups of the fungus Kingdom and in the past were divided into two non-evolutionarily related groups: the ectotrophic and endotrophic based upon the position of the fungal hyphae in relation to the tissues of a plants roots. Ectomycorrhizal fungi ensheath the root cells but usually do not penetrate them (extracellular). Endomycorrhizal fungi penetrate and enter the cells of a plant root (intracellular). Modern research has lead to the recognition of seven types of mycorrhizal fungi, subdividing the old, traditional groups. The new nomenclature is often more precise and specific to the associated plant taxa. The relatively homogenous ectomycorrhizal group largely remains with only the addition of the subgroup ectendomycorrhizas. The endomycorrhizal group has been dismantled, but specific types are now recognized: Vescicular-Arbuscular Mycorrhizas, the Orchid mycorrihzas, and those which associate with the Ericaceae (Blueberry family): the Arbutoid, Monotropoid and Ericoid mycorrhizas.



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To colonize plant roots, these propagules must be present in the substrate and in close proximity to actively growing roots of a compatible plant. The growing root tips emit root exudates as they push through the substrate which signal the fungi to colonize the roots and establish the symbiosis. Once the roots are colonized, then the process is self-sustaining as the mycelia continue to grow with the plant's root system and additional spores and hyphae are produced.

Examples of Endomycorrhizal Fungi	**Examples of Ectomycorrhizal Fungi**
Glomus intraradices (AKA *Rhizophagus*	*Rhizopogon villosulus*

irregularis)	
Glomus mosseae	*Rhizopogon luteolus*
Glomus aggregatum	*Rhizopogon amylopogon*
Glomus etunicatum	*Rhizopogon fulvigleba*
Glomus deserticola	*Pisolithus tinctorius*
Glomus clarum	*Suillus granulatus*
Glomus monosporum	*Laccaria bicolor*
Paraglomus brasilianum	*Laccaria laccata*
Gigaspora margarita	*Scleroderma cepa*
	Scleroderma citrinum

13. To study role of plant hormones on plant-microbe relationships.

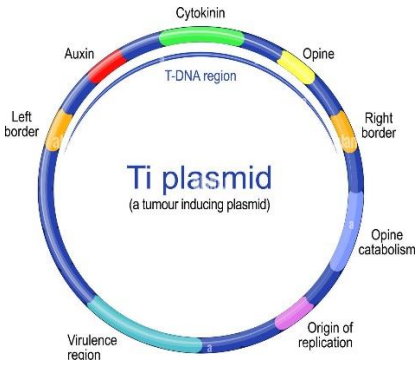
Plant hormones are regulators of almost all aspects of plant development and plant responses to their environment. Active at very low concentrations, with tight spatial regulation of synthesis and response, many plant hormones have key roles in the interactions between plants and beneficial microbes.

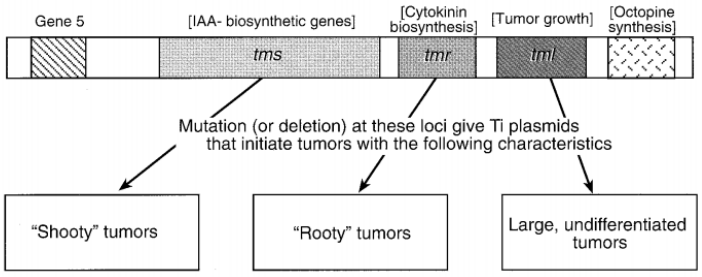
The plant hormone auxin regulates many processes central to plant growth and development. There is growing evidence that auxin also plays a role in several interactions between plant-associated microbes and their hosts, including pathogenic microorganisms that cause disease, endophytes, symbionts, and other beneficial microbes that promote plant growth or modulate plant stress responses. Auxin may also influence the development of microbial communities that live in association with plant hosts. It thus comes as no surprise that auxin is also produced or catabolized by diverse microbes to influence host signaling, physiology, and development. Recent studies have revealed that auxin (especially indole-3-acetic acid, IAA) can also act as a signaling molecule that directly impacts microbial gene expression. Thus, auxin appears to function in multiple ways to regulate plant-microbe interactions.

IAA is the most well-studied form of naturally occurring auxins. In addition to governing many aspects of normal plant development, IAA plays a role in several plant–microbe interactions. Many plant-associated microbes, including plant growth-promoting rhizobacteria (PGPR), nitrogen-fixing symbionts, and pathogens, produce IAA.

Given the well-established role of auxins in promoting plant cell division and expansion, it is not surprising that IAA plays an important role in diseases caused by tumorigenic plant pathogens such as *Agrobacterium tumefaciens, P. savastanoi (formerly P. syringae pv. savastanoi)* and *P. agglomerans.* In the case of A. tumefaciens, the main source of the IAA involved in disease development is not synthesized directly by the pathogen, but rather is produced by plant cells that have been genetically transformed by the A. tumefaciens T-DNA element. Integration of the T-DNA into the plant cell genome and subsequent expression of the

T-DNA-borne *iaaH* and *iaaM* genes by the plant cell ultimately results in IAA synthesis. Production of cytokinin occurs in these cells as well, as cytokinin biosynthetic genes are also located on the T-DNA. The elevated levels of IAA and cytokinin at the site of infection lead to uncontrolled plant cell proliferation and expansion and gall formation. Other genes localized on the T-DNA direct production and secretion of opines, compounds that provide carbon and nitrogen to support growth of the *A. tumefaciens* cells residing in the gall tissue.





The effect of auxin:cytokinin ratios on morphogenesis can also be seen in crown gall tumors by mutation of the T-DNA of the Agrobacterium Ti plasmid. Mutating the ipt gene (the tmr locus) of the Ti plasmid blockszeatin biosynthesis in the infected cells. The resulting high auxin:cytokinin ratio inthe tumor cells causes the proliferation of roots instead of undifferentiated callus tissue. In contrast, mutating either of the genes for auxin biosynthesis (tms locus) lowers the auxin:cytokinin ratio and stimulates the proliferation of shoots.

14. To study effect of heat stress on plant growth

Introduction: Among the ever-changing components of the environment, the constantly rising ambient temperature is considered one of the most detrimental stresses. The global air temperature is predicted to rise by 0.2 °C per decade, which will lead to temperatures 1.8–4.0 °C higher than the current level by 2100. This prediction is creating apprehension among scientists, as heat stress has known effects on the life processes of organisms, acting directly or through the modification of surrounding environmental components. Plants, in particular, as sessile organisms, cannot move to more favorable environments; consequently, plant growth and developmental processes are substantially affected, often lethally, by heat stress.

Growth: Among the growth stages of plant the germination is affected first of all. Heat stress exerts negative impacts on various crops during seed germination though the ranges of temperatures vary largely on crop species. Reduced germination percentage, plant emergence, abnormal seedlings, poor seedling vigor, reduced radicle and plumule growth of geminated seedlings are major impacts caused by heat stress documented in various cultivated plant species.

Photosynthesis: Photosynthesis is one of the most heat sensitive physiological processes in plants. High temperature has a greater influence on the photosynthetic capacity of plants especially of C3 plants than C4 plants. In chloroplast, carbon metabolism of the stroma and photochemical reactions in thylakoid lamellae are considered as the primary sites of injury at High temperature. Thylakoid membrane is highly susceptible to High temperature. Major alterations occur in chloroplasts like altered structural organization of thylakoids, loss of grana stacking and swelling of grana under heat stress.

Reproductive Development: Although all plant tissues are susceptible to heat stress at almost all the gowth and developmental stages, the reproductive tissues are the most sensitive, and a few degrees elevation in temperature during flowering time can result in the loss of entire grain crop cycles. During reproduction, a short period of heat stress can cause significant decrease

in floral buds and flowers abortion although great variations in sensitivity within and among plant species and variety exists. Even heat spell at reproductive developmental stages plant may produces no flowers or flowers may not produce fruit or seed.

Yield: Elevated temperatures are raising apprehension regarding crop productivity and food security. Its affect is so terrible that even a small (1.5 °C) increase in temperature have significant negative effects on crop yields. Higher temperatures affect the grain yield mostly through affecting phenological development processes.

15. To study methods for visualising mycorrhizal association in plant roots.

Plant Material: mycorrhizal roots

Procedure

1. Place roots in holders so that your sample fits in the lower 50% of the container. Commonly used containers are scintillation vials and test tubes of various sizes. Aside from the size, the only other consideration is that the container is made of a material that is autoclavable. If you are processing many samples, you may want to cover the containers with snug-fitting mesh so solutions can be easily changed out. Open lids (with mesh in them) may be purchased for 40mL scintillation vials.

2. Add 10% KOH (w/v) to each container, making sure that the sample is completely covered and that the fluid does not fill more than half of the container. For field grown roots, you may soak the tissue overnight, making sure to replace with fresh KOH before the heat treatment. You will find that the KOH turns yellow overnight, indicating that tannins have left your tissue and gone into solution. The overnight soak may be done prior to or following heat treatment. In some tissues two periods of soaking may be necessary.

3. The heat treatment may be via boiling in a waterbath, or by autoclaving. This is the part of the procedure that most needs optimizing. For greenhouse-grown plant roots 2-3 weeks old, only 15 minutes of autoclaving (with no prior KOH soaking) is necessary. Field grown adventitious roots of plants that are 1cm in diameter and 2-3 months old require overnight soaking and 1 hour of autoclaving. Some tissues may require multiple soaking and more than an hour in the autoclave. Boiling time is generally longer than corresponding autoclave time.

Roots that have been well cleared resemble cooked rice noodles. They are both translucent and transparent, and are white (not even remotely yellowish!). Remember that clearing with KOH removes many compounds in the cell wall, so after this process, your roots will be mushy and flimsy. Lateral roots may partially or completely disintegrate. Caution should be taken not to dissolve parts of the ground tissue (the cortex usually goes first). It is difficult to ascertain if roots have been completely cleared without staining, but examination of cleared and unstained roots under 4x magnification of a light microscopy will reveal white tissue composed of cells surrounded by thin grey cell walls. Also, you should be able to focus through the sample.

4. Remove samples from autoclave and rinse in tap water three times. Add 5% HCl and let it sit for about a minute. Pour out the HCl and add trypan blue stain. Let it sit overnight (or longer is fine as well), and examine the roots under a dissecting scope.

If the roots are very dark blue, they did not clear long enough in KOH and further optimization is necessary.

Stain:

1 L glycerol

950 ml distilled water 50 ml acetic acid

0.2 g trypan blue

5. The typical method of quantifying colonization of the root is by the gridline intersect method (McGonigle et al, 1990). This method has been adapted many times, and each investigator should consider optimizing these examination and quantification procedures to suit desired data collection. Below are a few possible approaches.

Methods of Examination

Light Microscope

Roots may be examined in small segments between two microscope slides (a version of the "squash"method), and quantification may be done using either an ocular or stage grid graticule or micrometer. Several advantages exist with this method. First, tissue is being examined under a light microscope which allows for better imaging than with a stereomicroscope. Further, tissue is easily smashed and spread out here, allowing for visualization of more fungal structures. One disadvantage here is an increased expenditure of time

Stereo (Dissecting) Scope

Whole roots may be examined using a Petri dish that has been fitted with a gridded piece of plexiglass. Roots are placed in the dish with water, and the grid is placed over them. The investigator moves the dish in a back and forth motion so that all intercepts of the grid are examined. An advantage here is that a larger amount of tissue can be examined. A disadvantage is that it may be more difficult to recognize or identify fungal structures with a dissecting scope.