

Botanical studies on some Lamiaceae plants

Prepared by:

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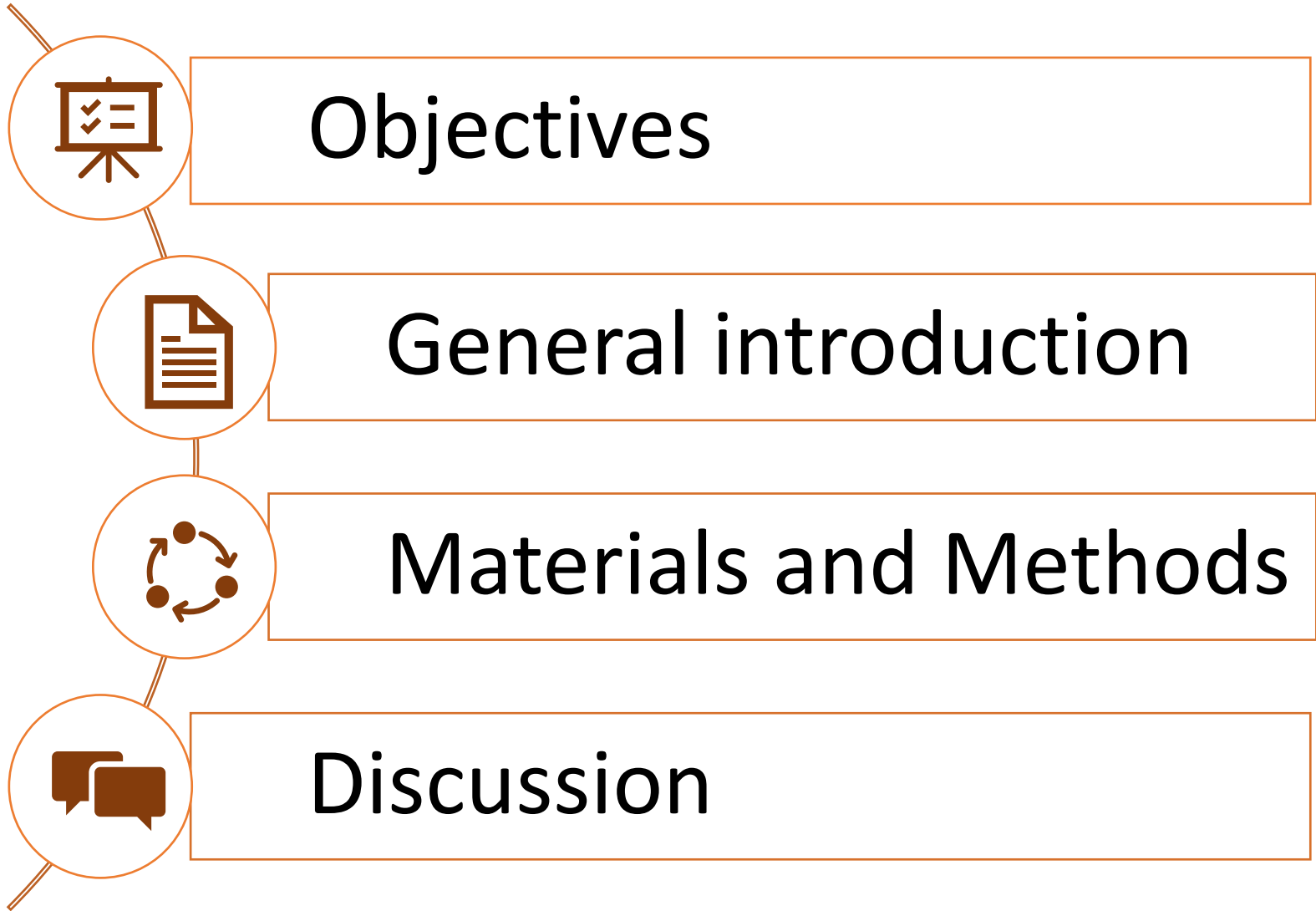
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Outline



Objectives

Introduction

M & M

Discussion

- **Lamiaceae** family one of those plants, also known as a Mint family containing about **236** genera and **7000** species.
- Some of these plants are rich in essential oils that enables them to overcome the higher temperature.



Winter mint



Rosemary



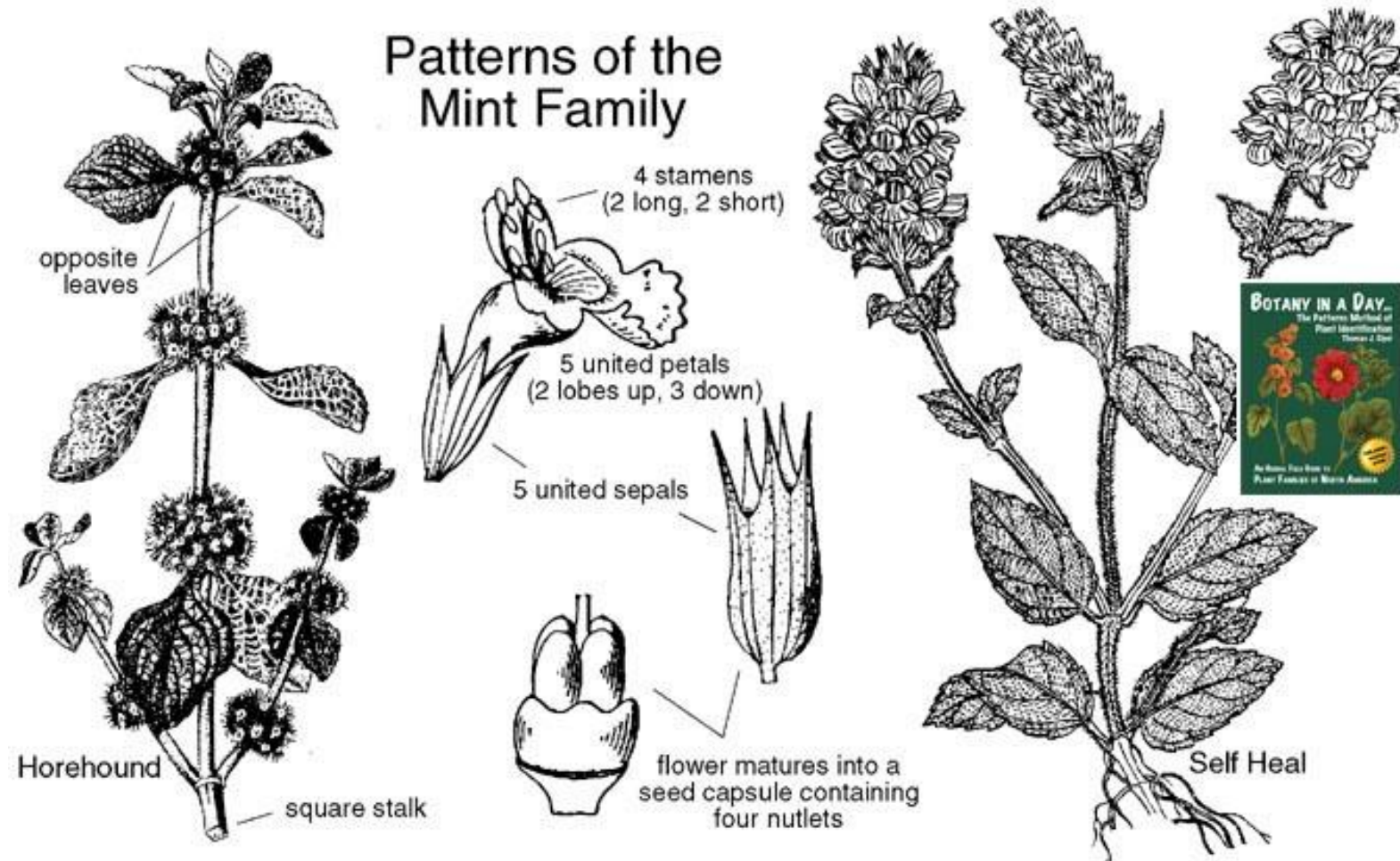
Lemon basil



Summer savory



Thyme



Lamiaceae

Distribution:

The members of this family are found throughout the world. They are being distributed both in temperate and tropical regions. The chief center of distribution of the family is the Mediterranean region.

Habit:

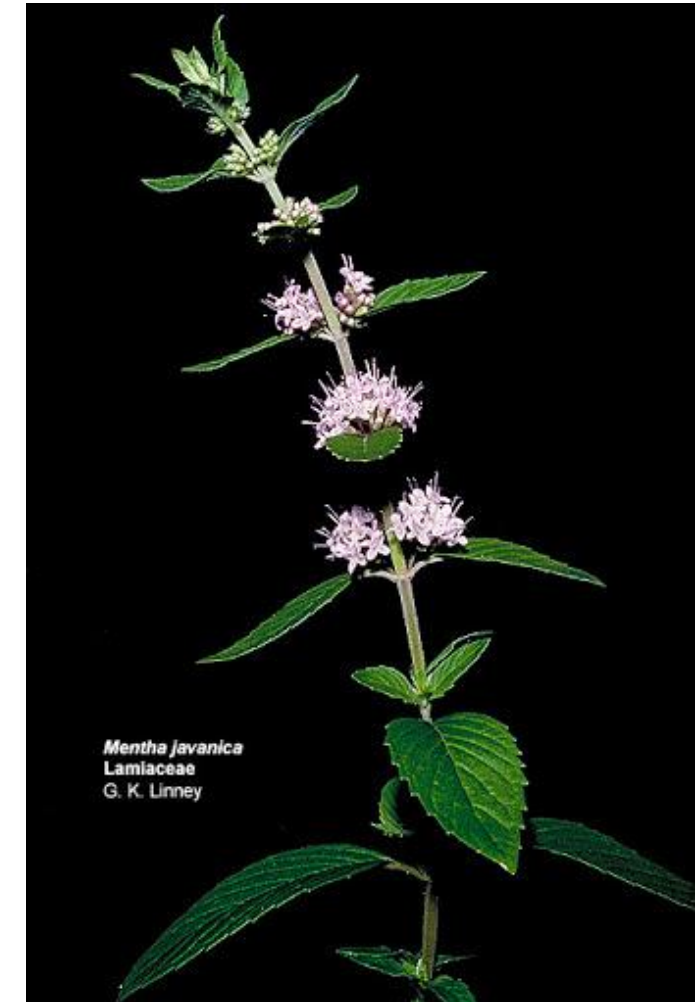
Majority of the plants are annual or perennial herbs, inhabiting the temperate regions. In warmer climates, the plants become shrubby in nature.

Leaves:

Usually the leaves are simple, opposite, decussate and exstipulate. They show many variations from an entire blade to toothed, lobed, cut or finely dissected.

Stem:

The young shoots are usually four-sided or quadrangular.



Objectives

Introduction

M & M

Discussion

- All parts of the plants, such as stem, leaves and inflorescence are more or less hairy and possess glandular hairs, which secrete characteristic scent. **Sessile scented oil secreting glands** are also found frequently on the epidermis.

Inflorescence:

- The characteristic inflorescence of the family is **verticillaster**. In this type of inflorescence the whorls of flowers develop at the nodes.
- This consists of a pair of cymose inflorescences.

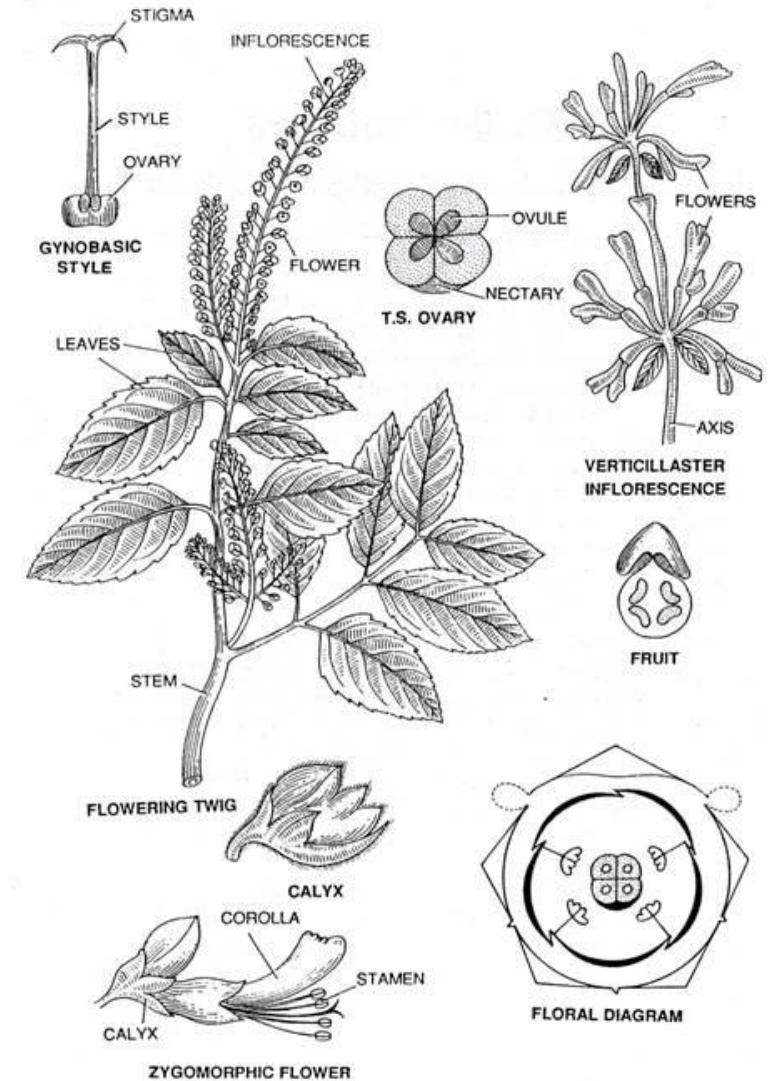
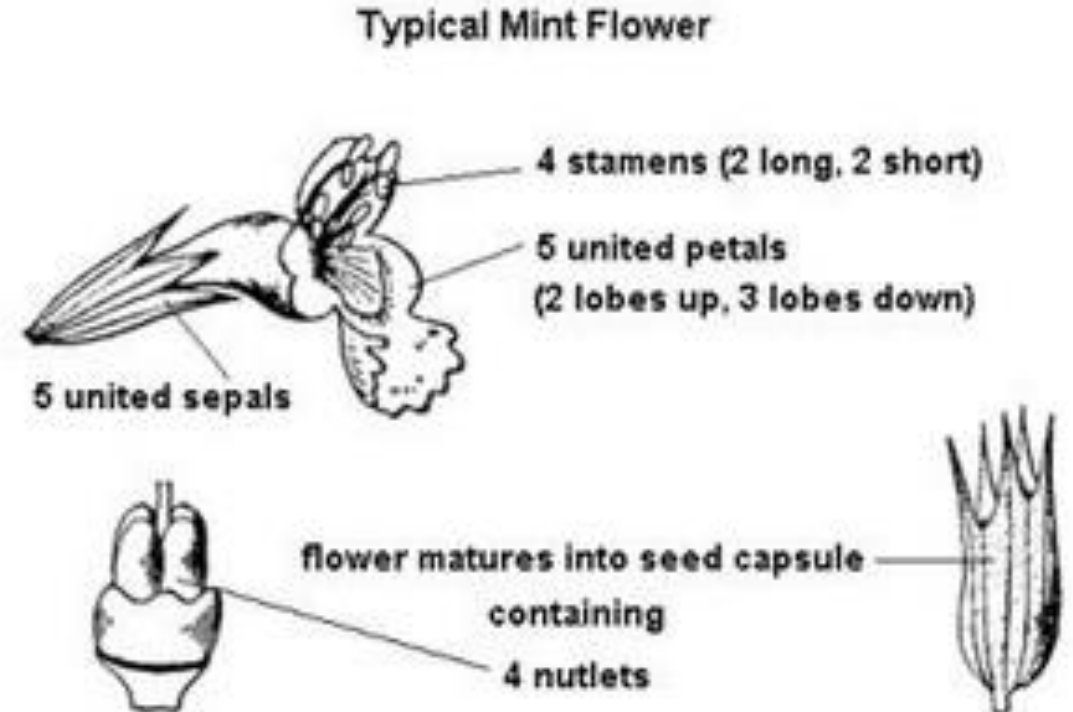


Fig. 28.1. Labiatae—*Ocimum sanctum* Linn. (Verna. tulsi).

Flowers:

The plan of construction of the flowers is uniform

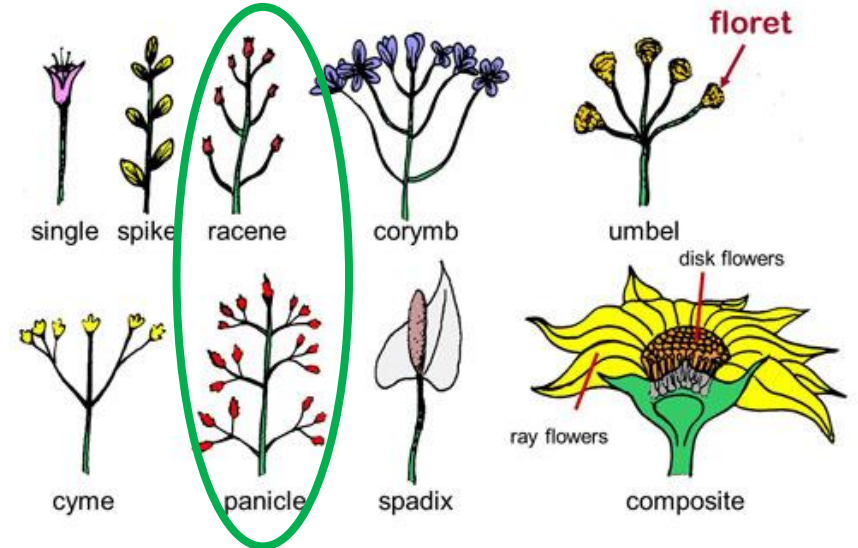
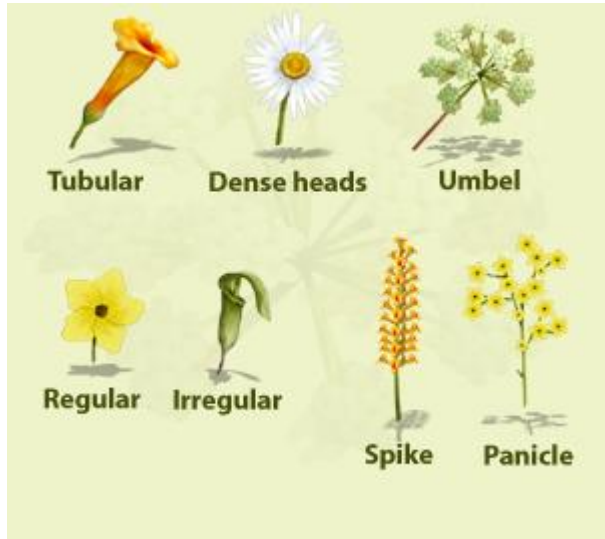
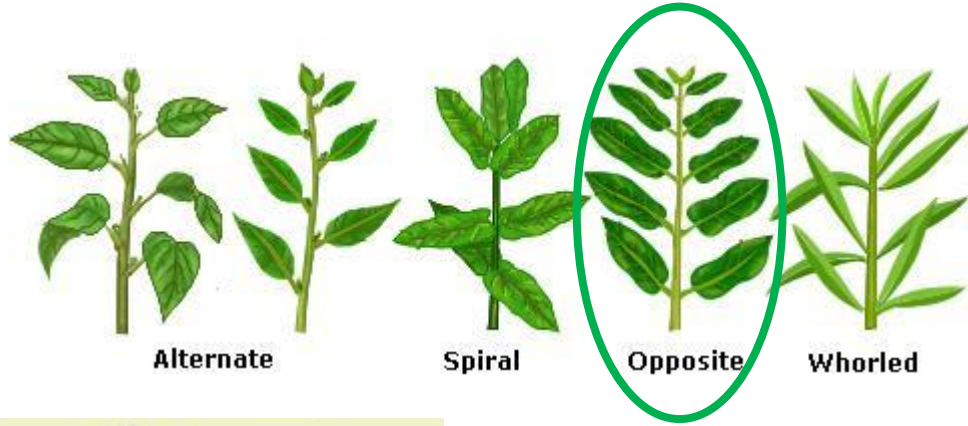


<https://www.slideserve.com/joey/lamiaceae-mint-family>

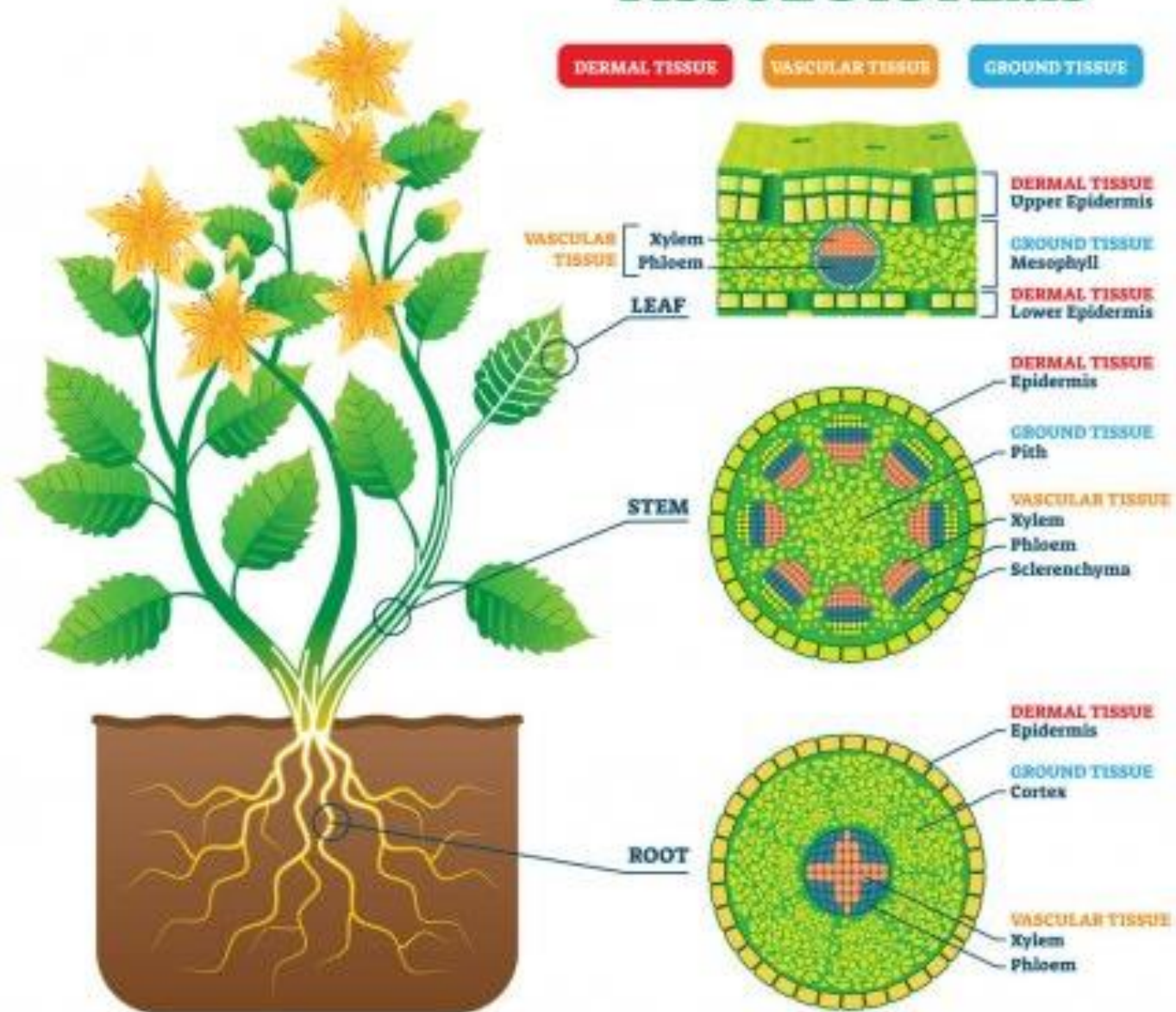
Satureja, L.

- Aromatic herbs and subshrubs grown in borders and also as pot-herbs; in the warmer regions of both hemispheres.
- **Leaves:** narrow and entire or broader and toothed
- **Floral leaves:** similar or sometimes smaller: flowers. in few- to many-flowered whorl-like cymes, The inflorescence: simple and subspicate, more or less racemose-paniculate.
- **Calyx:** tubular-campanulate or tubular, 5-toothed or sometimes 2-lipped.
- **Corolla:** corolla-tube short or long, exerted or scarcely so, upper lip flat and entire or emarginate, lower lip expanded, 3-cleft; stamens 4: nutlets ovoid, smooth.

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PLANT TISSUE SYSTEMS



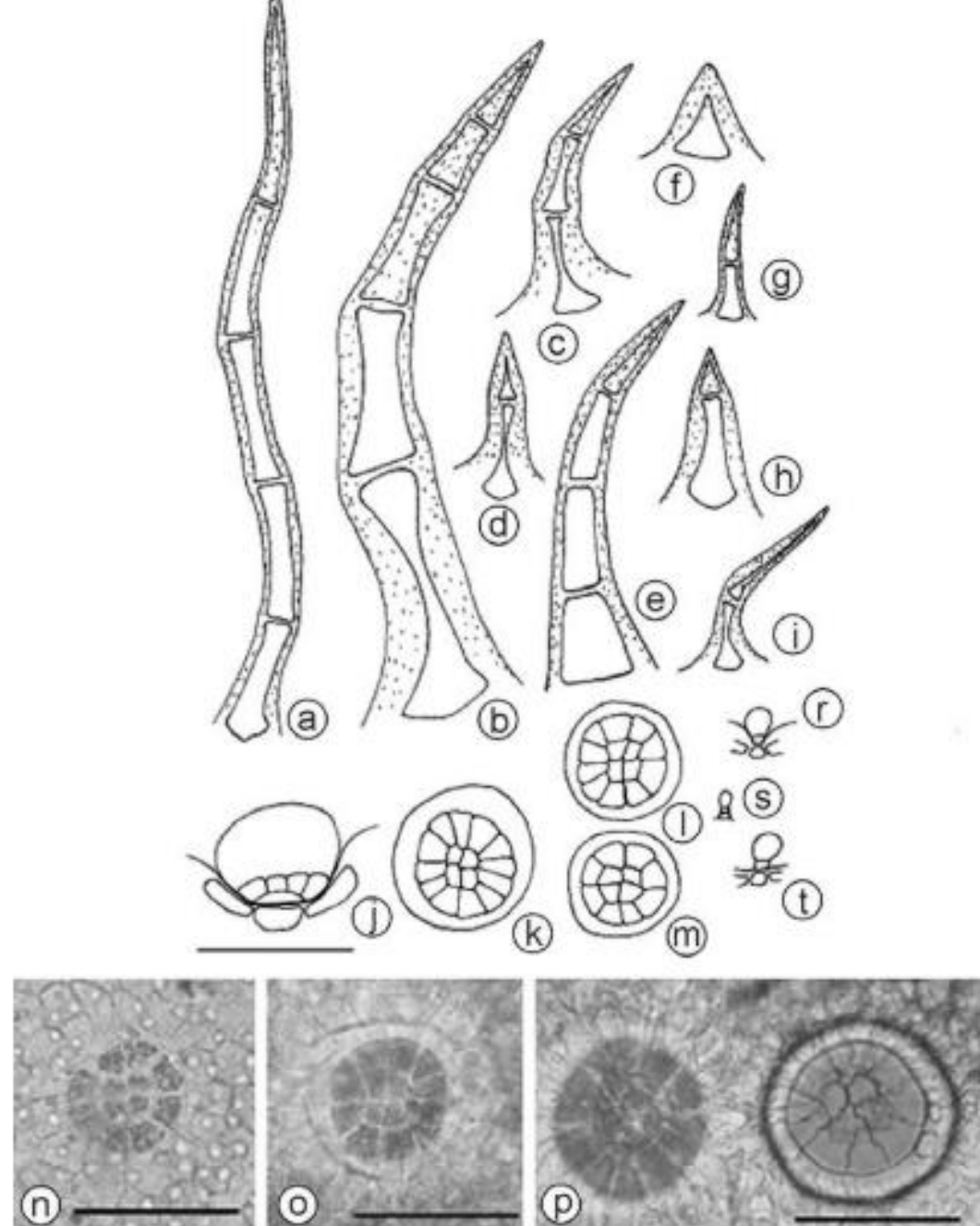


Fig. 1. Brightfield micrographs of Turkish *Satureja* leaf hairs. (a-t) nonglandular hairs, (j-p) peltate hairs (n - *S. ica-*
lica, o - *S. macrantha*, p - *S. thymbra*), (r-t) capitate hairs. Bar = 100 μ m.

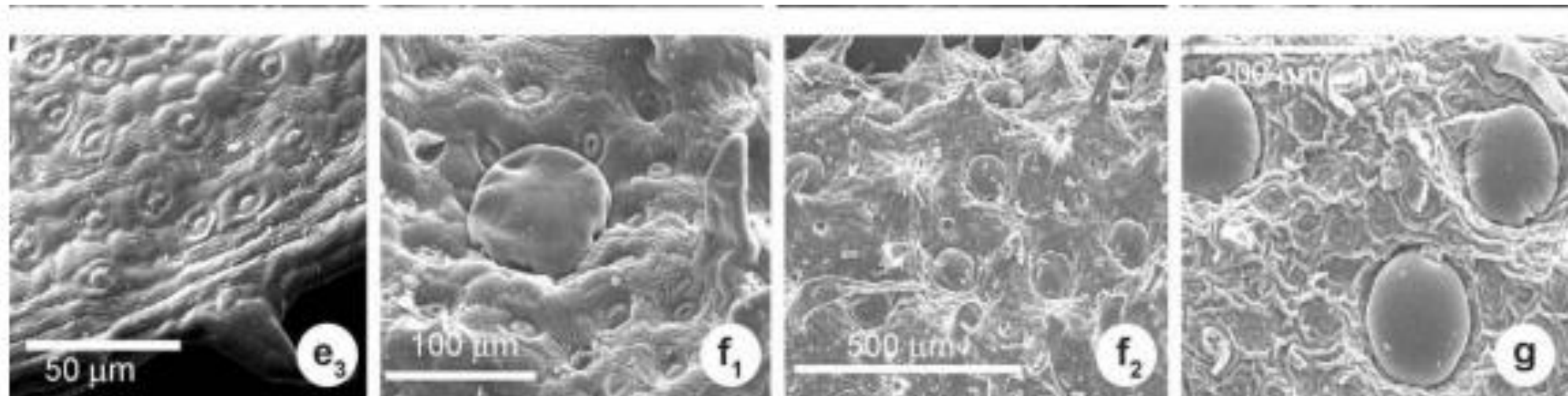


Fig. 2. Scanning electron micrographs of Turkish *Satureja* leaf hairs. (**a₁-a₄**) *S. amani* (adaxial, abaxial, respectively); (**b₁, b₂**) *S. aintabensis* (adaxial); (**c₁, c₂**) *S. botssleri* (adaxial); (**d₁, d₂**) *S. cilicica* (adaxial); (**e₁-e₃**) *S. coerulea* (abaxial, abaxial and adaxial, respectively); (**f₁, f₂**) *S. cuneifolia* (adaxial, abaxial, respectively); (**g**) *S. hortensis* (abaxial).

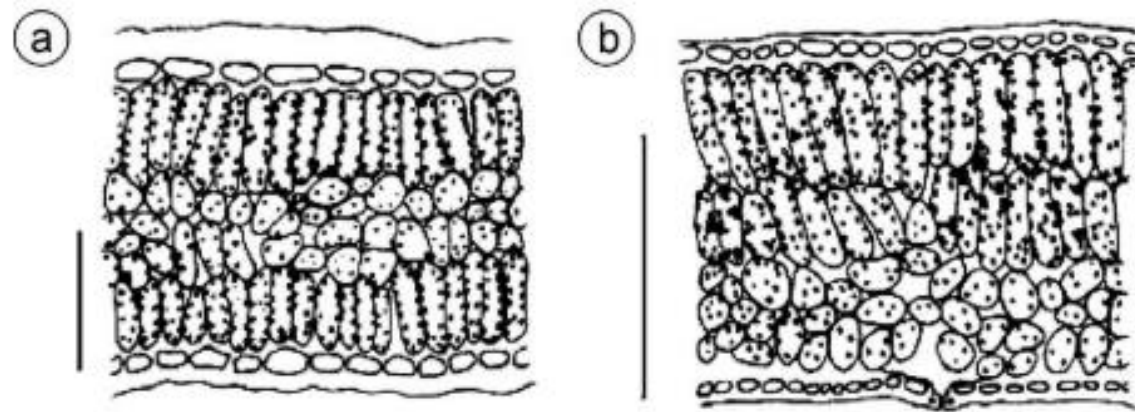


Fig. 3. Mesophyll types in *Satureja* species. (a) Type I, equifacial (in 14 *Satureja* species), (b) Type II, bifacial (in *S. spicigera*). Bar = 100 μm .

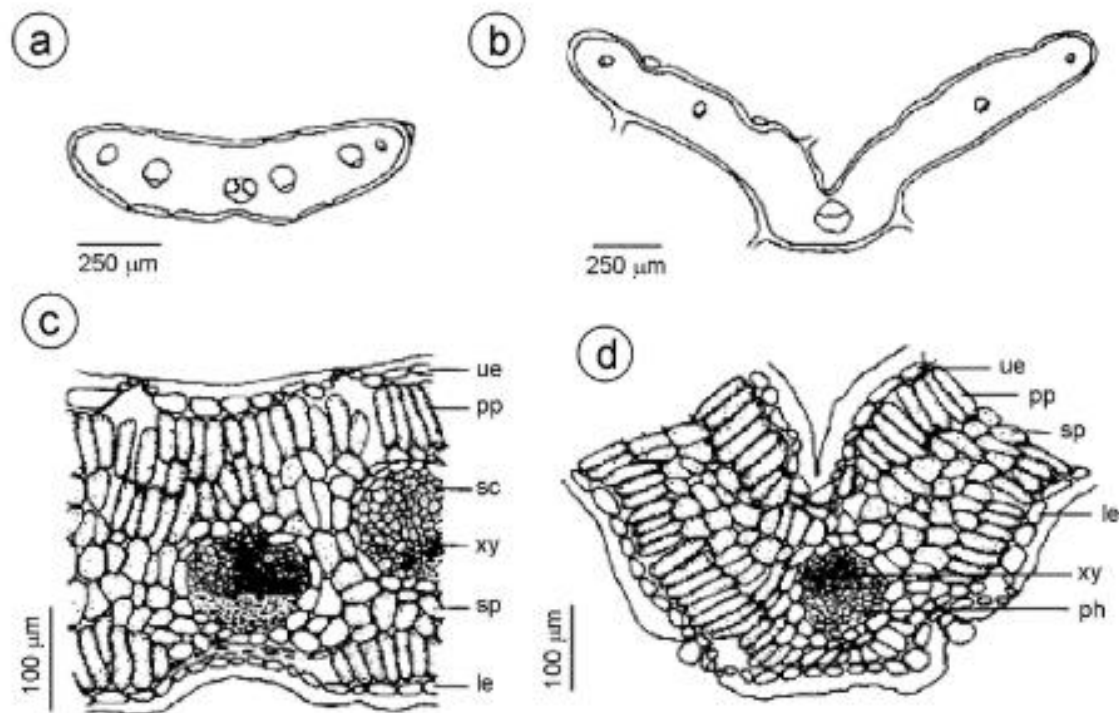
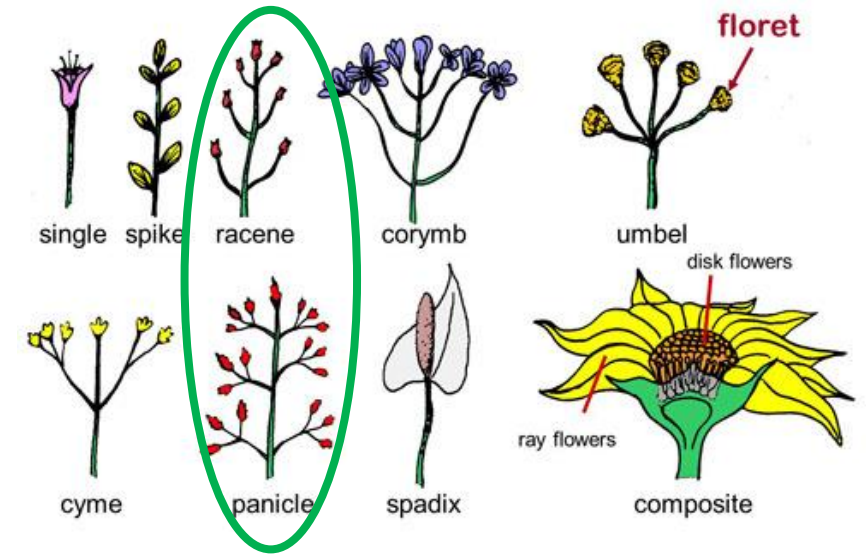
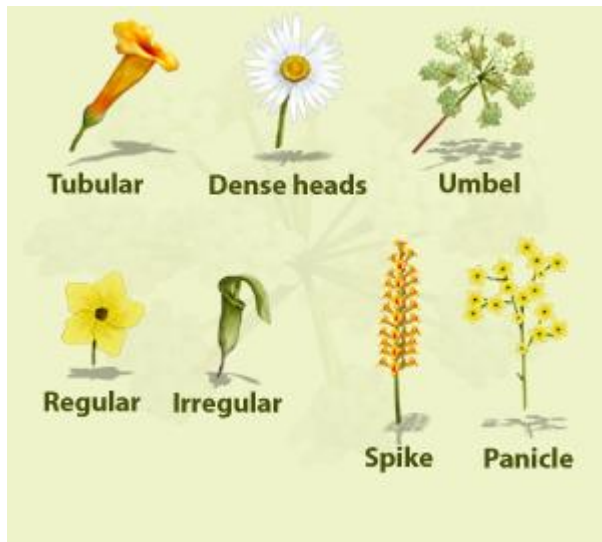
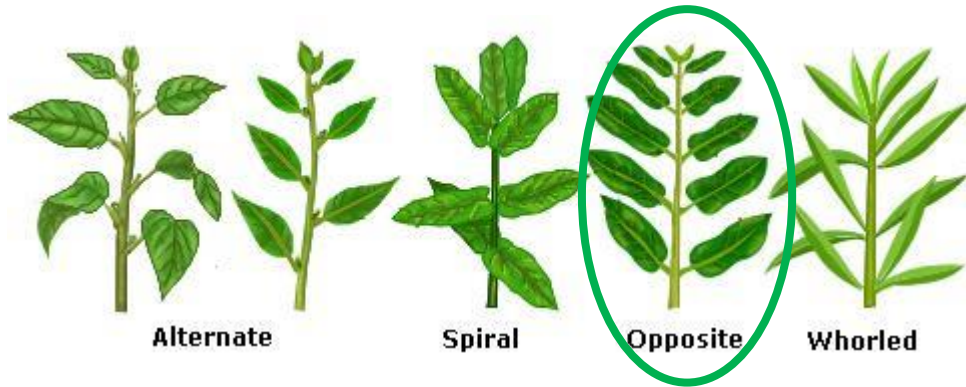


Fig. 4. Midrib region types in *Satureja* species. (a,c) Type I, with no projecting midrib (in *S. coerulea*), (b,d) Type II, projecting (in the other species). le - lower epidermis; ph - phloem; pp - palisade parenchyma; sc - sclerenchyma; sp - spongy parenchyma; ue - upper epidermis; xy - xylem.

Ocimum, L.

- Annual or perennial herbs or small shrubs of variable habit.
- **Leaves** are ovate and vary in size, depending on the cultivated variety, from the small leaves of the common basil to the large leaves of lettuce leaf basil
- **Flowers** mostly small the whorls usually 6-fld. and in terminal or paniculate racemes.
- **Calyx** deflexed in fr., the teeth unequal, the margin of the broad upper teeth decurrent into the tube
- **Corolla**-tube usually not exceeding the calyx, 2-lipped, the upper lip 4-lobed; stamens 4, declined; style shortly 2-cleft: nutlets ovoid or subglobose, smooth or punctate.



Experiment I

The present study are to detect the alternatives of inorganic NPK used as fertilizer for **summer savory and lemon basil** production under sandy soil conditions for assessing agricultural sustainability.

To meet the main objective, some specific objectives were formulated:

1- To conduct comparative experiment for studying the effect of NPK compounds from different resources; **inorganic, organic and bio-fertilizers**, **Cyanobacteria** and their combinations on **Summer savory** (*Satureja hortensis*) and **lemon basil** (*Ocimum X citriodorum*) under sandy soil conditions.

2- To prepare a comprehensive database for the whole studied factors based on differential NPK recourses and the available data and materials.

3- To conduct a land suitability evaluation using the non harmful NPK fertilizers sources to keep clean environment.

To fulfill these objectives, summer savory and lemon basil were selected to implement the proposed investigation.

Experiment II

- The study was designed to detect the **macro and micro morphological, anatomical and oil characteristics** of two aromatic and medicinal plant species namely; **Summer savory** (*Satureja hortensis*) and **lemon basil** (*Ocimum X citriodorum*) during their life span from seed to seed.
- Studying the effect of inorganic, organic and bio- fertilizers on the metabolites of medicinal plants.

The experiment was designed to be performed during the two successive seasons of **2020/2021, 2021/2022** at the **Aladlya Sekem Farm**, Department of Organic Agriculture, Faculty of Organic Agriculture, Heliopolis University.



1. Plant materials and experimental conditions

Lemon Basil (*Ocimum X citriodorum*)



Summer savory (*Satureja hortensis*)



1- Fertilization

1- **Biofertilizers** is a consortium containing (1×10^7) of

Azotobacter chroococcum, *Bacillus meaterium*, *Frateuria aurantia* and *Glomus sp* (10 IP) sourced from Gear Company, the product is called “Consort”.

2- **Compost** was obtained from **SEKEM** farm; the following tabulation represents the chemical analysis



3- **Conventional** NPK 19:19:19 + Mg was obtained from Plantx company, the produced is called “Fourland 19”.

2- Treatments

- The experimental work included **15** different treatments.
- The experiment layout was arranged in a **split-split plot design** with three replications.
- Each main plot contains the different treatments sources that allocated randomly in the sub plots.

Objectives

Introduction

The investigated treatments are presented in the following tabulation:-

Treatments

T1	Control
T2	Biofertilizer
T3	Cyanobacteria
T4	Bio. + Cyano.
T5	Chemical fertilizer
T6	Compost 50%
T7	Comp. 50 + Bio.
T8	Comp. 50 + Cyano
T9	Com. 50 + Bio. + Cyano.
T10	Comp. 50 + Chem. fertilizer
T11	Compost 100%
T12	Comp. 100 + Bio.
T13	Comp. 100 + Cyano
T14	Comp. 100 + Bio. + Cyano.
T15	Comp. 100 + Chem. fertilizer

Replica	Control				Compost 50%				Compost 100%			
	L 1	L 2	L 3	L 4	L 5	L 6	L 7	L 8	L 9	L 10	L 11	L 12
R1	1	1	1	1	6	6	6	6	11	11	11	11
	1	1	1	1	6	6	6	6	11	11	11	11
	1	1	1	1	6	6	6	6	11	11	11	11
	1	1	1	1	6	6	6	6	11	11	11	11
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5	5	5	5	10	10	10	10	15	15	15	15	
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R2	1	1	1	1	6	6	6	6	11	11	11	11
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R3	1	1	1	1	6	6	6	6	11	11	11	11
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5	5	5	5	10	10	10	10	15	15	15	15	

3- Recording of data

Experiment I

A. Effect of different NPK treatments on morphological and yield characters

- The morphological characters of savory and basil was determined every 30 days. Data were recorded on three plants from each replicate representing each treatment the following morphological, fresh and dry herb yield and volatile oil characteristics were studied as following

1. Plant height (cm) was measured from the surface to the uppermost point of the plant.
2. Number of branches per plant.
3. Growth parameters
 - A. Average leaf area (mm²).
 - B. Average fresh weight per plant (g).
 - C. Average dry weight per plant (g).
4. Average 1st cut fresh herb weight/plant (g).
5. Average 1st cut dry herb weight/plant (g).
6. Average 2nd cut fresh herb weight/plant (g).
7. Average 2nd cut dry herb weight/plant (g)
8. Average fresh herb yield per square meter
9. Volatile oil characteristics
 - Oil percentages
 - Oil physical characters
 - Oil micro constituents (HPLC)

3- Recording of data

Experiment II

A. The plant external morphology

- Plant root; length, number, weight/plant
- Plant stem; branching, number of internodes, internod length
- Plant leaf, size, description, Number of hairs and stomata per (mm)
- Plant inflorescences; length, flowers per info.
- Plant flower; structure and description
- Plant fruitlet; description
- Plant seed ; seed germination%, seed index

3- Recording of data

B. The plant internal structure (control Vs. Best treatment)

- Plant main root anatomical structure, T. sections
- Plant main stem anatomical structure T & L sections
- plant leaf anatomical structure, T. sections
- Plant inflorescences anatomical structure, T & L sections

C. Scanning Electronmicroscope

- Leaf upper and lower surface sculpture
- Seed surface sculpture



Thank you