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Original Research Article

A Morphological and Anatomical Study of the *Glycyrrhiza glabra* Plant in the Zab District - Hawija District - Kirkuk Governorate

Alahin Arif Salman Yosif Al Bayati[1*]
[1]General Directorate of Salahaddin Province Education, Ministry of Education, Department Amerli Salahaddin Iraq

***Corresponding Author:** Alahin Arif Salman Yosif Al Bayati
General Directorate of Salahaddin Province Education, Ministry of Education, Department Amerli Salahaddin Iraq

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Abstract: According to our research, liquorice leaves (*Glycyrrhiza glabra*) have stomata that are capable of secreting salt crystals. Although their population grows well, salt excretion should theoretically interfere with the stomata's regular function and thus G. glabra's growth and development. We have a suspicion that the interchange of gases from the leaves in various places and the excretion of salt in the stomata may be mutually exclusive. Thus, we examined the chlorophyll content, anatomical structure, net photosynthetic rate, conductivity, and salt excretion capability of the stomata from leaves at various liquorice locations. The arrangement of the mesophyll cells in the upper leaves was the densest, while the lower leaves had the lowest density. The stomata of the lower leaves demonstrated the strongest capacity to secrete salt, but the stomata of the higher leaves did not produce any salt. Since the stomata in the upper leaves had the highest rate of net photosynthesis and conduction and the stomata in the lower leaves had the lowest, we can conclude that the upper leaves' stomata are primarily used for gas exchange, whereas the lower leaves' stomata exhibit impaired representation. Excess salt is eliminated through photosynthesis.

Keywords: Stem, Leaves, Licorice, Stomata, Phenotypic Shape, Anatomical Structure.

INTRODUCTION

Glycyrrhiza glabra L., licorice plant of wild herbaceous plants ranging in height between (50-125 cm) and bear branches flowers violet (Violet) in the local variety, and be shaped in the Russian and Spanish varieties purple to blue (Purplish-blue), which is with small petiole and cup compound and pustules glandular and corolla is not conjunctive and the top beak-shaped and fruits foot shape length (1.5-2.5 and width 4-6 cm)، The seeds are renal shape (reniform seed) consists of the root system of long rhizomes and thin purlins (Stolons) thin, and the main root branches under the soil to several branches penetrate the soil to a depth of more than 1 meter and branch from the root main purlins, which are horizontal stems up to 180 cm long near the soil surface, blooms (Cruenwald *et al*., 1998; Hayashi *et al*., 1993) Botany in Iraq in May and June (Chakravarty, 1976).

Study Area

The samples were collected in the period of March from 2024 to June 2024 in Al-Zab district, Hawija district, Kirkuk governorate.

Materials and Methods of Work

Materials distilled water ethyl Alcohol, safranin form. Tools: glass slide, slide cover, forceps, Glcerin, dropper, sharp blade, tape measure, camera, optical microscope.

Preparation of Cross Sections

1. The soft plant specimens (stem and leaf) are washed to remove any dust and left to dry. As for the dry specimens, they may be placed in hot water for 10_15 minutes and then left to dry.
2. A fixed place is taken on the stem, and the leaf is taken fully grown and cut in half.

3. The models are held between the index finger and thumb in a vertical position and then cut with a sharp blade into very thin pieces so that they are flat and not slanted.
4. Place the thin samples on a glass slide containing drops of distilled water to soften the thin pieces for 3 minutes.
5. After removing the distilled water, the samples were stained with safranin stain and left for 1_2 minutes.
6. The sections were transferred to 70% ethyl alcohol to remove excess dye.
7. The section are washed again with 70% ethyl alcohol several times until light colored sections are obtained.
8. Add adrop of glycerin to the sections and then cover the slide gently to prevent bubbles from forming.
9. Sections were examined under an Altay compound microscope at 40x magnification, using an eyepiece microscope to measure plant body tissues.

Morphological Study

The morphological characteristics of the different plants parts (stem, leaf, flower and fruits) of the Glycerrhiza glabra plant were studied during the flowering stage, except for what is related to the fruits, as the study was based on plant samples during the fruiting stage.

The Leaf

Chlorophyll content (CHL) and gas exchange parameters in the leaves are important indicators of the physiological characteristics of the plant and act as an important factor affecting the intensity of photosynthesis. It is an important organ in photosynthesis, and its anatomical properties are the key to determining the ability of plants to survive in a given environment (Tylskap V *et al*., 2013). Its physiological function is based on its natural structure (Abjanaczu *et al*., 2021).

Figure 1: The phenotypic shape of *Glycerrhyza glabra leaf*

Stomata

They serve as the channels by which plants exchange gases with the outside world. For example, stomata allow external carbon dioxide to enter the plant's leaves and are also required to remove oxygen and water vapour from the interior of the leaves. Additionally, stomata automatically regulate the photosynthesis of leaves, which is crucial for respiration, water metabolism, the immune system, and regulating the temperature of the plant's leaves. Therefore, for plants to grow and develop healthily, the stomata must continue to operate normally.

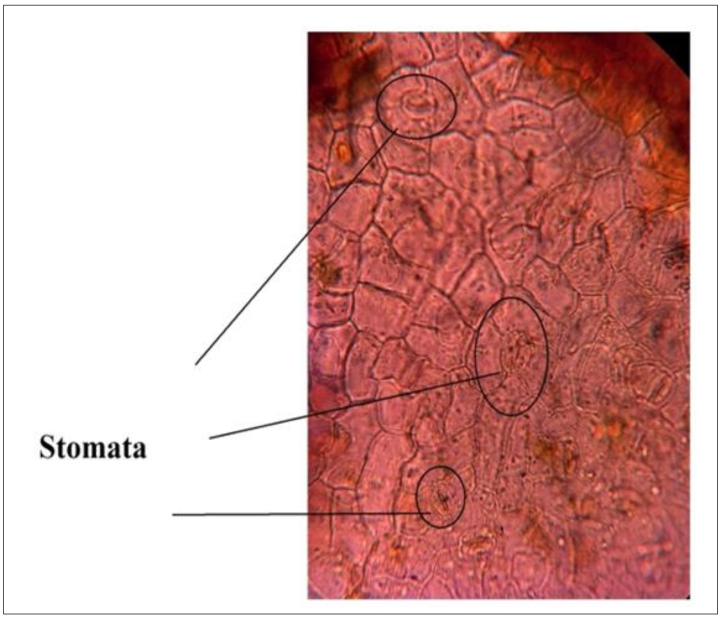

Figure 2: shows the type of stomata in Glycerrhiza glabra leaf

Leaf Appearance

Since the plant (Glycyrrhiza glabra) has stomata in its leaves that can secrete salt crystals, salt excretion should theoretically impact the stomata's normal function, which in tum affects G. glabra's growth and development. However, there is a trade-off between gas exchange from different positions of the leaves and salt excretion in the stomata. Thus, we examined the chlorophyll content, anatomical structure, net photosynthetic rate, conductivity, and salt excretion capability of the stomata from leaves at various liquorice locations. While the stomata of the upper leaves did not secrete any salt, the stomata of the lower leaves shown the strongest capacity to do so, and the top and middle leaves had a far higher chlorophyll content than the bottom leaves. While the mesophyte cells in the upper leaves had the densest order, the mesotheliotus cells in the lower leaves had the least.

Anatomical Structure of Leaf

Healthy, fully stretched leaves in different positions were chosen at random, cut into small pieces (0.5 cm × 0.5 cm), and then left in an FAA solution for 48 hours. Conventional paraffin cutting was used to create leaf cross-sections (5 µm thick), which were then dyed with green and fast safranin, closed, observed with an Olympus BX51 light microscope, and imaged with an Olympus DP70.

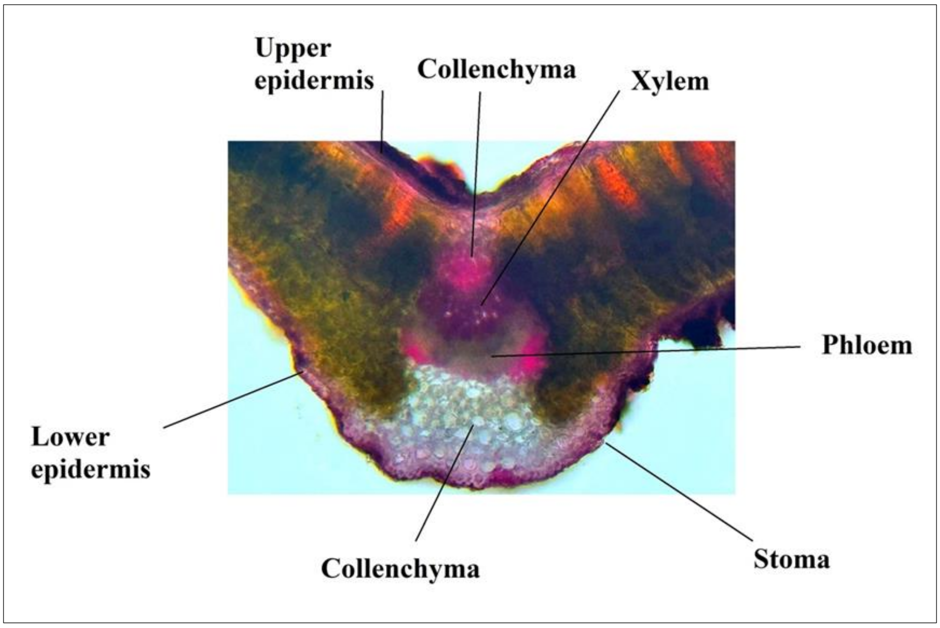

Figure 3: Anatomical section of Glycyrrhiza glabra leaf

Glycyrrhiza Glabra Anatomical Shape of the Phenotypic and Stem

Anatomical differences between the leaves and the stem can help identify the organs present in licorice, the cross section of a stem from a single bud piece showed a functional vascular cambium and the formation of a secondary vascular system in the form of a muscular trunk, showing the cross section of a stem grown from a part with two buds. A large pulp occupies the center of the leg and the vascular system has the shape of a full circle. The arrangement of the primary vascular system is typical for all stems, i.e. primary wood towards the pulp and secondary wood in centrifugal mode, the cross-section of the stem obtained from the seeds showed a structure similar to the stem planted from two or three pieces of shoots. The image shows a cross section of a licorice stem planted from two pieces of buds, pulp, primary wood, secondary wood, vascular cambium, bark, periphery fibers, cortex, and surrounding dermis.

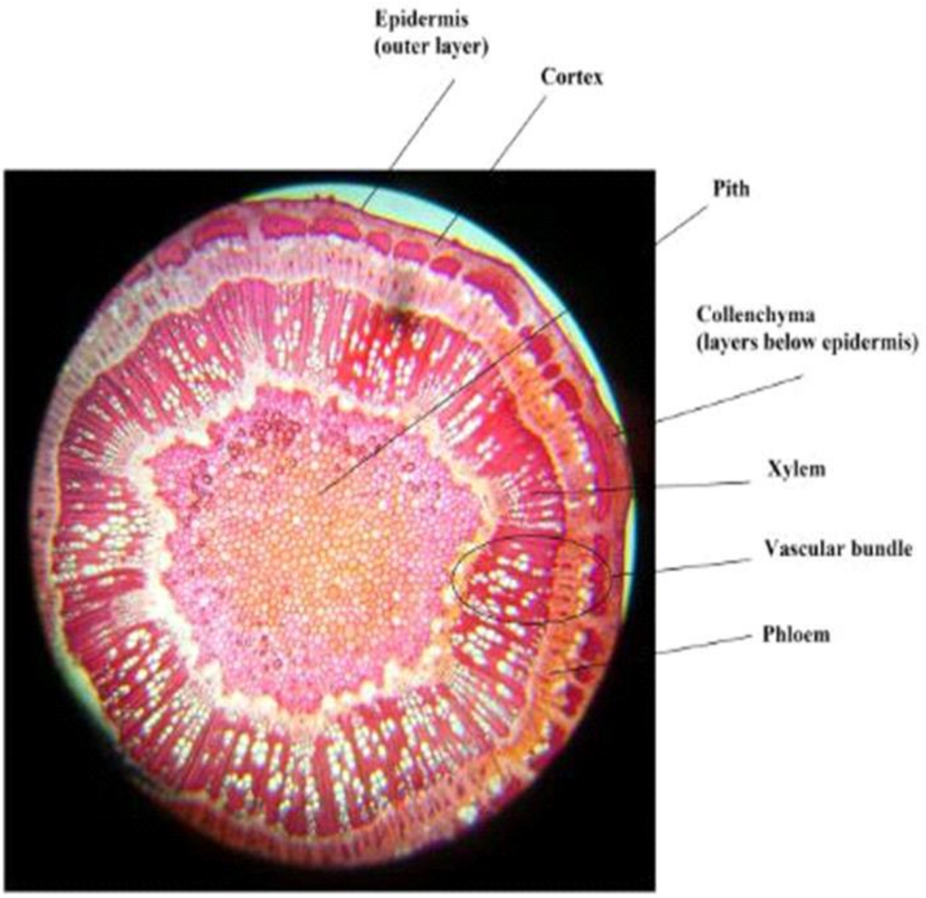

Figure 4: Show the anatomical shape of the stem of the plant *Glycyrrhiza glabra*

Flowering

Bisexual radial symmetry or lateral (butterfly). The cup is coated and has five corolla lobes of. Petals are either separate or butterfly in shape, i.e. two front fused (jojo) with stamens inside and two separate sides (wings) and one back, which is the largest in size (flag). Stams 10 are two-beamed dladelphous, single bundles, or numerous, distinct. The tock opens with longitudinal notches. The pistil of one (simple) carburetor is high-ovary. One chamber and the placenta are parietal along the abdominal stitching (the eggs are organized in two opposite rows on both ends of the placenta). One pen and one stigma (Alkatib., 1988).

Figure 5: The two pictures show the flowers and fruits of plant *Glycerrhiza glabra*

Table 1: shows the morphological characteristics of the Glycerrhiza glabra plant stem

Type	The color	Nature	Surface coating	Branching
Glycerrhiza glabra	light green	erect	smooth	Superiorly branched

Table 2: shows the morphological characteristics of the plant parts (leaves, flowers, fruits) of Glycerrhiza glabra

Type	Permanence	Surface coating	Base of blade	Shape of blade	Apix of blade	Flower color	Type of fruits
G.glabra	perennial	smooth	round	spear	Triangular	purple	Legumes

DISCUSSION

Leaf dissection and clarification of stomata and hairs In terms of the anatomical structure of the leaves, the effect of silver nitric oxide on botamogetone showed a type of aqueous adaptation including reduced thickness of epithelial cells, capillaries, stomata and vascular tissue, as well as increased cell spaces in mesophiles (Al-Saadi *et al*., 2013). These results are consistent with the current study. For 20 minutes, the experiment was carried out at 121 °C (121° 1 atm) and 1 atmospheric pressure. The light interval was set at 16:8 light hours (using 36 W fluorescent lamps 30 cm from the samples): dark. In order to determine the area of the leaf, we prepared vegetative organs such as the liquorice plant's stem and leaves. The stem structural distinctions between liquorice and stomata can also be used to identify the organs that are present in liquorice. Demonstrated the leaf's growth in cross section. Modifications to the wood vessels' structure directly impact their hydraulic conductivity, which in turn affects their capacity to absorb water According to studies, high salt concentrations caused a decrease in the area and number of leaves, an increase in the thickness and epidermis of the leaves, a decrease in the number and diameter of xylem vessels, an increase in the volume of xylem and intercellular space, and a decrease in the volume of spongy tissue (Poupha, 2017). These findings suggest that the structure of the leaves is destroyed and photosynthesis is hampered. The way that plants adapt to their surroundings is reflected in their leaf shape, physiological traits, and anatomical structure, which are all progressively produced over the course of the evolutionary process (NQ Ma Y *et al*., 2013).

CONCLUSIONS

Both the increase in leaf area and the rise in the stems' longitudinal growth seem to be the result of inhibitory actions. Under these circumstances, the strategy of the treated plants to achieve maximum development with the least amount of anatomical modifications is probably related to changes in the anatomical structure of the vegetative organs.

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