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Biomorphological Features and Anatomical Structure of the Leaf of the Akmella Plant

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ABSTRACT: In this article, there are determined the anatomical structure of the leaves of the vegetative organs of the Acmella plant has been studied, and diagnostic and adaptive structural features. Also, the localization of biologically active substances in assimilative organs is explained on the basis of anatomical studies.

KEYWORDS: Acmella plant, biomorphological features, anomcytic type, dorsiventral structure, anatomical structure, leaf, vegetative organs, Photomicrograph, seed germination, epidermal cell, adaptive structural features, biologically active substances, assimilative organs, localization.

INTRODUCTION

Acmella oleracea is a natural anesthetic and analgesic. Preparations from the plant are used as a folk remedy to treat toothache and throat infections, and to relieve muscle tension. The inflorescences contain the largest amount of spilanthol. They need to be collected weekly or once every 2 weeks when they are large and elongated. The leaves are harvested in the fall (several weeks before frost), before fruiting, when they begin to acquire a bronze color. The plant is lush, densely leafy, 30–60 cm high and 30–75 cm wide. It grows quickly. The shoots are thin, creeping. The stems are often reddish and bare. The leaves are 5–10 cm long, opposite, simple, oval or ovate, pubescent, with wavy, slightly jagged edges and wrinkled veins. The flowers are small, yellow to orange; collected in round capitate inflorescences up to 2.5 cm in diameter. Blooms for a long time from mid–summer until the first autumn frosts.

On average and poor soils, its height does not exceed 20–25 cm. In fertile soil it grows up to 30-40 cm. The leaves are dark green with a bronze tint. The flowers are yellow with a red center. Flowering is very abundant and long lasting. It copes excellently with the role of a ground cover plant and grows without problems in container culture.

Creeping annual. The bushes are 40–60 cm high and grow up to 80 cm wide. The leaves are dark green, with a slight olive tint. The inflorescences are yellow with a burgundy spot at the top. Can be used in cooking and folk medicine. This plant is better known as Spilanthes oleracea, but you can find a second name–Spilanthes acmella var. oleraceae. It is native to South America from Brazil to Argentina. Believed to be descended from a Brazilian species of Acmella. Winter hardiness corresponds to zones 9a–11b. In its homeland, in regions with an average air temperature of +27.7ºC, heavy rainfall and a relative humidity of 85%, Acmella oleracea grows in nature and in culture as a perennial plant. Acmella (lat. Acmella) is a genus of flowering plants in the Asteraceae family. Native to subtropical regions (widespread in the Americas), Acmella is very widespread, and prized for its flavor–enhancing properties. Its French name can be translated as “hot herb”; this name comes directly from its area of use as a seasoning. However, this is not the only application–a remedy with akmella perfectly eliminates the pain that occurs with dental disease, the plant was studied, and scientists concluded that it can be used as a pain reliever. Acmella extract also contains a particularly valuable component spilanthol (N–2–isobutyl–2,6,8–decatrienamide), which reduces the amplitude of contractions of facial muscles, which is manifested by a noticeable smoothing of facial wrinkles, and it also prevents the appearance of new ones.

According to many experts, akmella is the safest and most natural plant–based muscle relaxant that helps block muscle contractions that lead to the development of superficial and facial wrinkles.

Indeed, the extract that is extracted from the flowers of the Acmella Oleracea plant is considered a natural alternative to botulinum toxin, making Acmella a valuable ingredient in anti-aging cosmetics. Today, cosmetics containing acmella flower extract

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are used topically, as are neuropeptide complexes. Acmella flower extract is considered a natural muscle relaxant, and some studies have shown that regular use relaxes facial muscles, reducing facial wrinkles caused by facial tension or contracture. In one clinical study, 75% of patients experienced an immediate smoothing effect of Acmella Oleracea extract, with results appearing the day after the first application. This is a completely reversible effect that lasts no more than 24 hours. However, the researchers say that "an interesting cumulative effect" can be expected from Acmella flower extract when a product based on it is used daily.

The main effects of cosmetics that contain acmella flower extract: Rejuvenating and toning–akmella "tightens" aging skin due to the unique effect of "herbal botox".

Astringent, sebum regulating and soothing, Acmella helps balance oily skin while soothing the skin.

In order to treat the disease and prevent it in time, medicines are prepared from medicinal plants containing bioactive substances, and pure preparations are obtained [1]. Acmella is one of the medicinal plants containing bioactive substances. Acmella is a genus of flowering plants belonging to the asteraceae family. Acmella species are common in North and South America. The most famous species of this species is Acmella Oleracea. The estimated homeland of acmella is Brazil, where it is used as a medicinal plant. Actually, it is a perennial plant, but in Russia it can be grown only as an annual crop, because it is resistant to–3.8 degrees of frost. In medicine, a decoction of leaves and flowers is used to treat toothache and stomatitis.

METHODS AND TECHNIQUES

Studying the morphological and anatomical structure of the leaf, it was fixed in 70^0 ethyl alcohol. Anatomical preparations for the study of leaf epidermis and leaf stomata were made by hand, by preparing paradermal and transversal sections. In the study of the anatomical structure of the leaf mesophyll, transverse sections were prepared from the middle part of the leaf, the sections were stained with methylene blue and sealed with glycerin–gelatin (Barykina and Dr., 2004). Basic tissue and cells K. Esau (1969), N.S. Kiseleva (1971), epidermis–S.F. It was described according to Zakharevich (1954). Photomicrographs were taken using a computer photomicroscope, a Canon A123 digital camera, and a Motic B1–220A–3 microscope.

Before planting the seeds of the cultivated acmella plant, the seed germination is determined. The seed germination in laboratory conditions at 20–25 C was 90% (Figure 1).

Figure 1. Sow the seed of the acmella plant

In the spring, on the 1st and 10th day of March, the seeds of this plant were sown in pots and planted. The grown seedlings were planted in the experimental plot in April. In May, the plant has 4–5 leaves (Figure 2).

Figure 2. Seedlings planted in open ground

The height of the grass was 3–4 cm. In June, the number of leaves reached 6–7, and the height of the plant was 8 cm. The leaves are all green and opposite on the stem. In the second decade of July, the height of the plants was 9–10 cm. The number of leaves reached 10–12. The plant began to grow well. In the second decade of July, the height of the plant reached 13–15 cm. The number of leaves was 13–15, the side kings were 7–8 (Figure 3).

Figure 3. Budding period of plants

At this time, the growth of plants and the formation of side branches is very accelerated. By the first decade of August, the generative period of plants began and buds were formed. The flower opened in the second decade of August. At this time, the height of the plant reached 16–18 cm. In the months of August and September, the plants were in the gulag period. Budding, flowering, fruiting and ripening of fruits were observed simultaneously in September, October and November (Figure 4).

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Figure 4. Seed ripening period

A leaf is a vegetative organ of a plant that performs the functions of photosynthesis, transpiration and gas exchange.

In the paradermal section of the leaf of Akmella plant, the wall of the epidermal cells is wavy and the projection is polygonal. Adaxial epidermal cells are slightly different from abaxial epidermal cells. The adaxial epidermal cells are larger and relatively wavy, while the abaxial epidermal cells are relatively small, very wavy, and the presence of multiple trichomes was found in them (Figure 5).

In the leaves of Ekma akmella plant, leaf mouths were found to be oval in shape. The connecting cells of the mouthparts are almost the same length. It was found that the mouths are of anomocyte type and are not located deep in the epidermal cells (Figures 5–6).

A cross–section of the leaf mesophyll of Ekma akmella shows a dorsiventral structure characteristic of dicots (Butnik et al., 2015). Epidermis consists of a series of cells and consists of a thin layer of cuticle.

Adaxial epidermal cells are larger than abaxial epidermal cells. Between the adaxial and abaxial epidermal cells is an absorptive tissue consisting of columnar and porous cells. Beneath the adaxial epidermal cells are columnar parenchyma cells, consisting of 2 rows of large cells (Figure 2).

Porous parenchyma cells are located between abaxial epidermis and columnar cells, consisting of 4–5 rows of round, oval–shaped large and small cells with small intercellular spaces (Figure 2).

Columnar and spongy parenchyma cells have chlorophyll granules, and between these cells, many lateral connectives are located in the central part of the leaf mesophyll (Figure 2).

The main vein bulges towards the lower side of the leaf and has a parenchyma–combination structure. The epidermis consists of a thin–walled cuticle layer and a series of small cells. Below the adaxial and abaxial epidermal cells are 1 row of plate–like collenchyma cells. The main vein of the leaf consists of conducting bundles, schizogenous separation channels and parenchyma cells (Figure 2).

Conductive bonds are of closed bicollateral type, which is explained by the fact that phloem is formed on both sides of the xylem. Conductive ligaments are lignified due to the development of mechanical tissue–sclerenchyma cells, and consist of 1 large and 2 small conductive ligaments. The xylem is thick–walled, rounded, and arranged in spirals and chains. Schizogen–type separation channels are located around the large conducting bundle, in which the accumulation of biologically active substances was determined. Parenchyma cells consist of large and small round–oval cells, among which hydrocytic cells were found (Figure 2).

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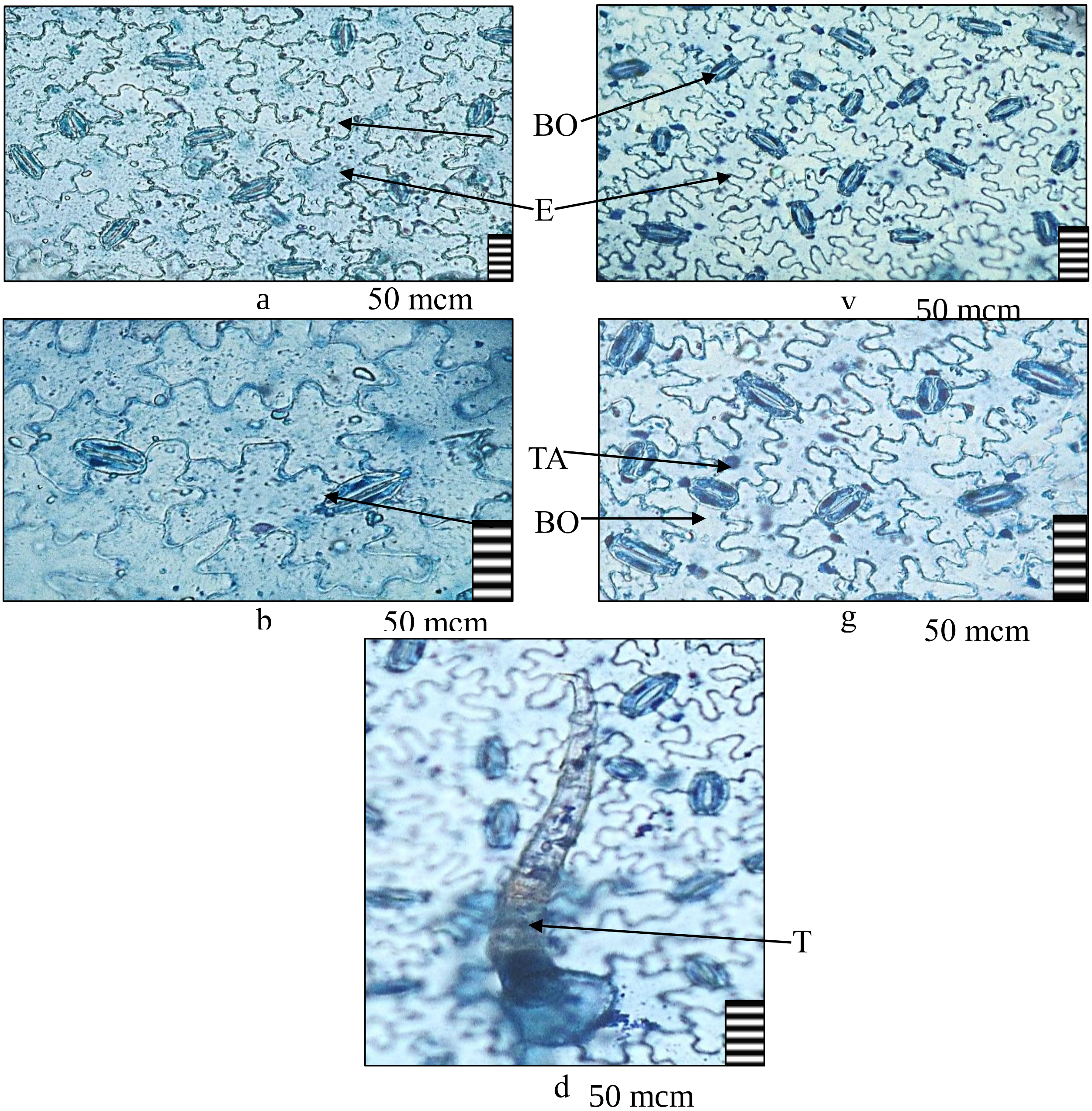

Figure 5. Anatomical structure of the leaf epidermis of Ekma akmella plant in the paradermal section: a–b–adaxial (upper) epidermis; v–g–abaxial (lower) epidermis; d–trichomes in the cells of the lower epidermis. Conditional symbols: BO–leaf tip, T–trichome, TA–trichome base, E–epidermis.

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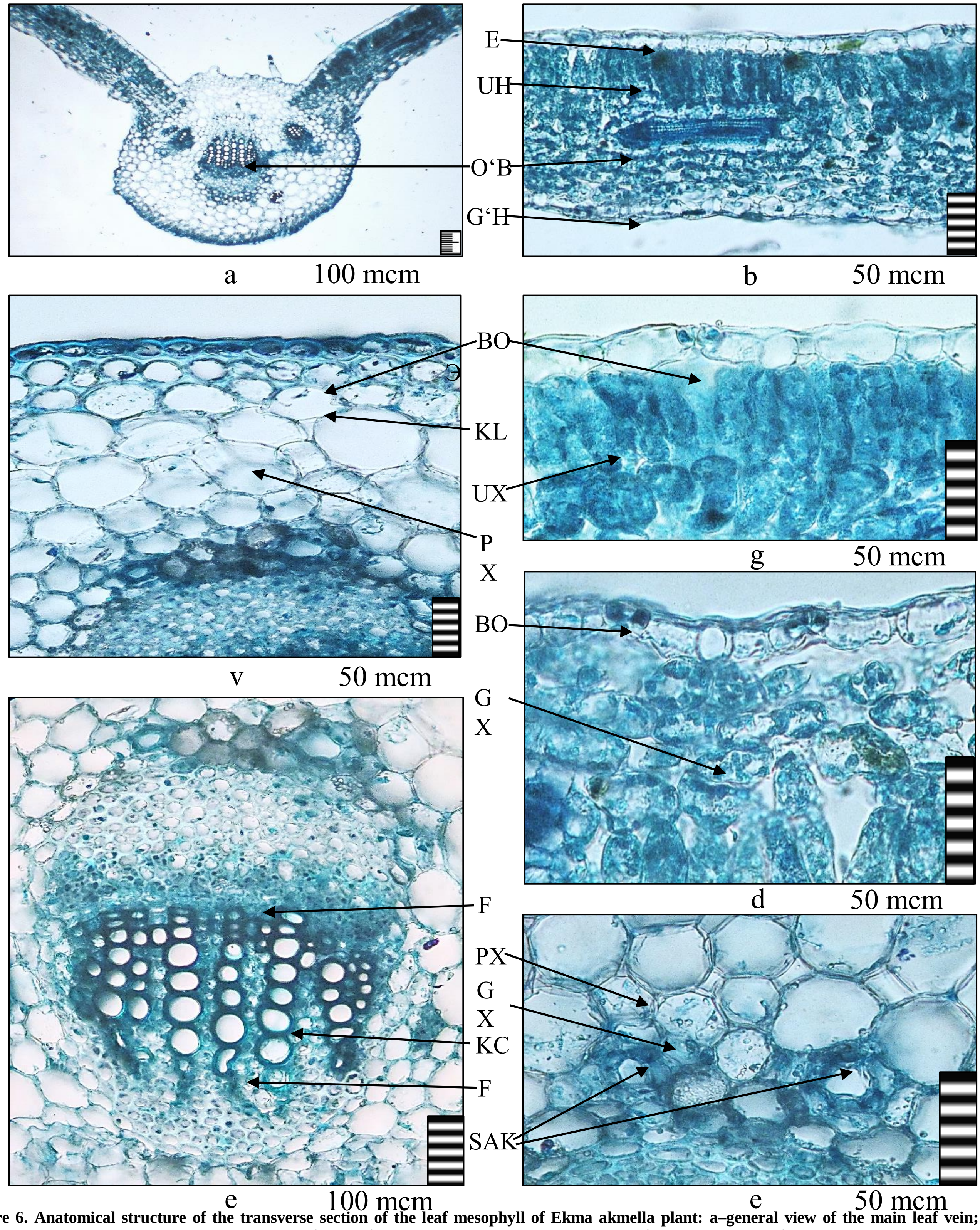

Figure 6. Anatomical structure of the transverse section of the leaf mesophyll of Ekma akmella plant: a–general view of the main leaf vein; b–leaf mesophyll; v–collenchyma cells in the main vein of the leaf; g–d–columnar and porous cells in leaf mesophyll and leaf mouths; e – the conducting link in the main vein of the leaf; e–schizogenous separation channels, parenchyma and hydrocytic cells. Conditional symbols: BO–leaf mouths, GH–hydrocyte cells, KL–collenchyma, Ks–xylem, Ph–parenchyma cells, SAK–schizogenous separation channel, UH–columnar cell, F–phloem, E–epidermis, O'B–conductive ligament, G'P–porous parenchyma.

CONCLUSION

For the first time, the anatomical structure of the leaf of the cultivated acmella plant planted and grown in Uzbekistan was studied and its diagnostic structural features were determined.

In conclusion, based on the study of the anatomical structure of the leaf of the cultivated akmella plant, the following diagnostic signs are found: dorsiventral type of leaf mesophyll; thin–walled and undulating, polygonal projection of epidermal cells; the presence of multiple trichomes in the cells of the lower epidermis; anomocytic type of leaf mouths and their surface location in epidermal cells; chlorophyll of columnar and porous cells in leaf mesophyll; closed bicollateral type of conductive bonds; the presence of schizogenous separation channels in the main vein of the leaf and the accumulation of biologically active substances in them; presence of thin–walled parenchyma and hydrocyte cells was determined. These identified diagnostic characters can be used in the process of identification of raw material of the species.

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