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ANATOMICAL CONNECTION BETWEEN INTRACELLULAR AND EXTRACELLULAR SECRETION IN SPECIES OF EUPHORBIA GENUS

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Abstract

In our research we examined the histological structure of the nectary of six species of *Euphorbia* (*E. cyparissias* L., *E. seguieriana* NECKER., *E. lucida* W. et K., *E. virgata* W. et K., *E. angulata* JACQ., *E. burmannii* E. MEY) by LM. We found that the glandular tissue of the nectary which functions as an extracellular secretional system is thoroughly woven through by the latex system, the intracellular secretional system characteristic of *Euphorbia* species. The laticifers end on the boundary of the epidermis of the gland, the nectar-secreting surface, and the glandular tissue.

By the anatomical connection of the two secretional systems their functional connection becomes quite probable.

Key words: histology, nectary, plant secretion, recent *Euphorbia*.

Introduction

All species of *Euphorbia* genus have a latex system which weaves through the plant thoroughly, and this system has the function of intracellular secretion of the plant. This secretional system consists of non-articulated laticifers which are longitudinally expanded unicellular growths (ESAU, 1953). The latex system in *Euphorbia* originates from a few specialized cells in the cotylendonary node which subsequently develop into branching coenocytes (CUMMINGS, 1941). The portion of the system in the cortex of the hypocotyl, from which branches extend into the cotyledons, is largely independent of the laticiferous elements of the stem (CAMERON, 1936). In 1985 METCALFE wrote comprehensively about the latex secreting systems in members of *Euphorbiaceae.*

Nectaries of *Euphorbia* species that have the function of extracellular secretion, originate from hypsophylls. These nectaries can be found on the calyculus of the *Cyathium* inflorescence, which has five parts. There are usually four or five nectaries, or occassionaly eight within one inflorescence. By their position they are extra-floral (CASPARY, 1848; EWERT, 1932; BEUTLER, 1953), by shape they are automorph nectaries (DELPINO, 1886; SCHOENICHEN, 1922).

Nectary-types of *Euphorbiaceae* family were described by METCALFE and CHALK (1957); in *Euphorbia* genus the patelliform type occurs most often.

All examined species have crescent-shaped or elliptical varieties of nectary-type.

Materials and Methods

We examined the nectaries of five *Euphorbia* species that occur in Hungary (*Euphorbia cyparissias* L., *E. seguieriana* NECKER., *E. lucida* W. et K., *E. virgata* W. et K., *E. angulata* JACQ.) and a tropical succulent one (*E. burmannii* E. MEY).

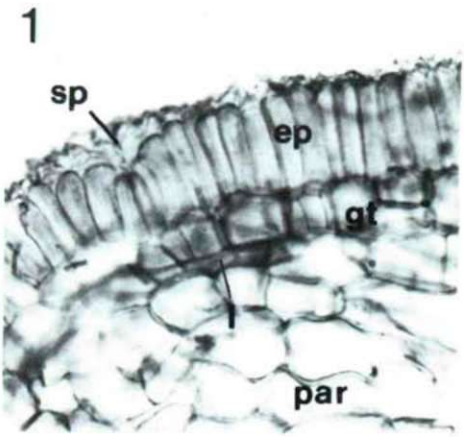
The glands collected from the plants were preserved in a 40 percent solution of ethylic alcohol until we used them. We embedded the glands in celloidin with the method described by KISSER (1920) and ROMEIS (1932) and modified by GULYÁS (1968). We made 20—30 μm thick cuttings of the embedded nectaries, then the celloidin was removed by ether, and, having cleaned the cuttings, we painted them with Erlich's haematoxilin and conserved them in Canada balsam. The slides were examined by NU-2 light microscope.

Results

In the longitudinal cuttings we studied the following tissue types:

The surface of the gland is built up of epidermis (ep); the major part of it works as nectar-secreting surface and is covered by cuticle (c). Its cells are perpendicularly expanded to the secreting surface, they look like columns put closely together. There are no stomas among them (Fig. 1). The nectar-secreting pores (sp) are built up of morphologically well-differentiated cells. They can be seen in the gland-epidermis of the species occuring in Hungary. In the gland-epidermis of the tropical species (Fig. 2) there are secreting papillas (sep). The epidermis of the tropical species mentioned above consists of slightly expanded, round cells in longitudinal cutting, divergently from the other species mentioned before. The blistered cuticle above the nectar-secreting papilla is shown on figure 2. The glandular tissue (gt) can be found under the epidermis. In the species that live in Hungary the glandular tissue consists of three or four layers of cells under the middle of the secreting surface, and two or three layers of cells in the marginal regions (Fig. 3). The glandular tissue of *E. burmannii* has seven or eight layers of cells. The cells of this tissue type are small, parenchyme and close to each other; there are no intercellular spaces between them (Fig. 4). In the glandular tissue laticifers (1) run towards the secreting surface, and they end on the epidermis of the gland and the glandular tissue (Fig. 4 and 6). They are parallel with the elements of the vascular tissue in a part of the calyculus connected to the gland, then they go on in disorder after the branching of the vascular tissue in the parenchyma weaving through the glandular tissue (Fig. 5 and 6). Under the secreting tissue the gland-parenchyma can be found (par). This is the storing part of the nectary. The parenchyma of the species occurring in Hungary is large in

Fig. 1—6.: Longitudinal cuttings of *Euphorbia* nectaries:
1. *E. cyparissias* 400 X; 2. *E. burmannii* 400 X;
3. *E. angulata* 100 X; 4. *E. burmannii* 400 X;
5. *E. seguieriana* 200 X; 6 *E. angulata* 480 X;


1
sp
ep
gt
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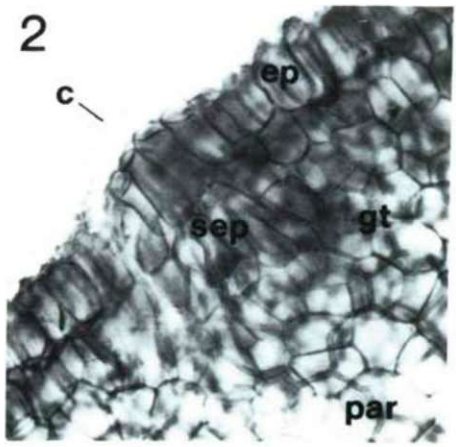
2
c
ep
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gt
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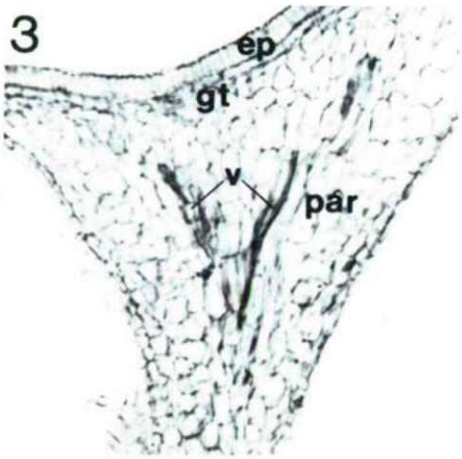
3
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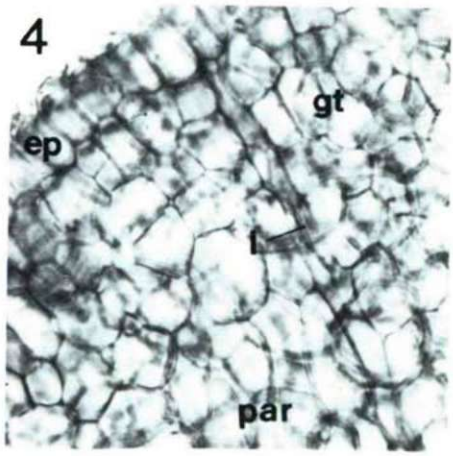
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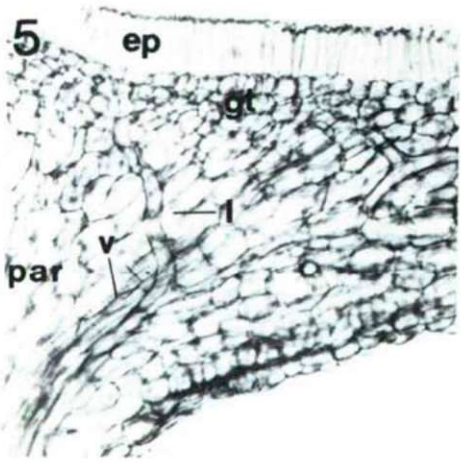
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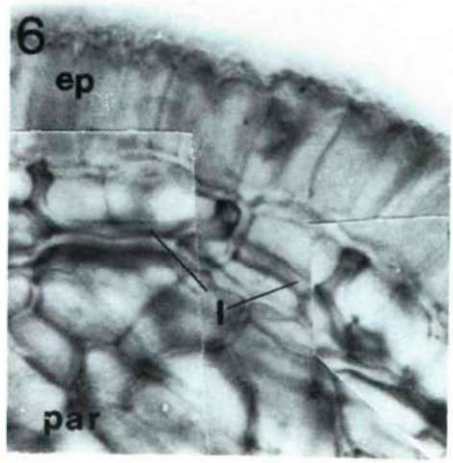
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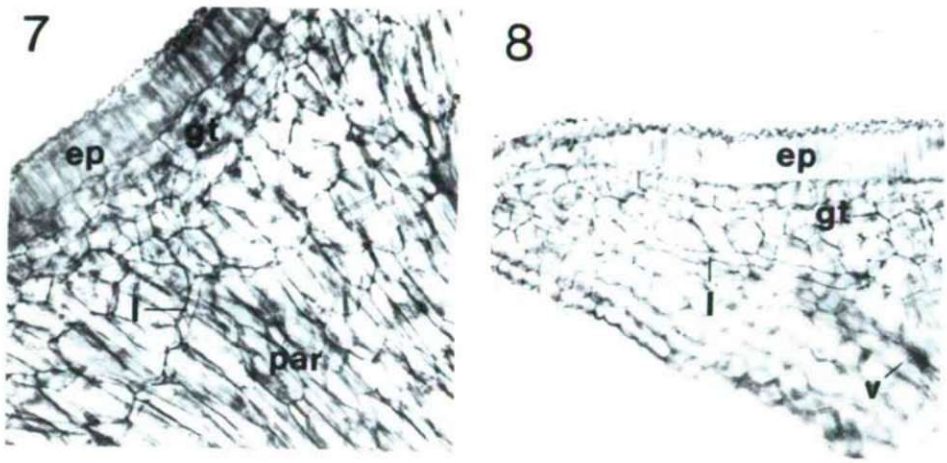

Fig. 7—8.: Longitudinal cuttings of *Euphorbia* nectaries:
7. *E. lucida* 200 X; 8. *E. virgata* 200 X; cuticle (c), epidermis (ep), nectar-secreting pore (sp), nectar-secreting papilla (sep), glandular tissue (gt), laticifer (l), elements of vascular tissue (v), gland-parenchyma (par).

the longitudinal cutting, its cells are expanded in a parallel direction with the elements of the vascular tissue (Fig. 3 and 7), there are small intercellular spaces between them. The parenchyma-cells of *Euphorbia burmannii* compared to those of the other species are large and round. Some of the elements of the vascular tissue that run here end well before the boundary of the glandular tissue and the parenchyma, others can reach the boundary of the two tissues.

Our research on the composition of nectar and latex led to results that suggest a further, functional connection between the two anatomically connected secretion systems. This means that in the nectar secretion certain components of the latex may be secreted into the nectar either transformed or unchanged. We will discuss these results in a later publication.

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