The present work is devoted to morphological, histochemical and ultrastructural research of the trichomes covering a leaf, petiole, phyllary, and peduncle in six Senecioneae species (Doronicum macrophyllum, D. orientale, Ligularia dentata, Senecio integrifolius, S. viscosus и Tussilago farfara). The secretory structures of each species have specific morphological features. In D. macrophyllum and D. orientale a head contains one layer of the secretory cells (from two to five cells) and the long stalk (Fig. 1). Trichomes of Ligularia dentata are mainly 1-seriate, 2-seriate ones are found rarely. In S. viscosus 2–4 secretory cells form two layers of the head (Fig. 2). Leaf trichomes differ by the stalk height (from 3 to 7 cells). In S. integrifolius the trichomes of a phyllary are smaller; they have one-celled head and a short stalk. In T. farfara the trichome of the leaf and peduncle consist of a head on a long 2-seriate stalk. 3–5 layers of the secretory cells are in the head and 10–12 layers are in the stalk.

All studied trichomes are capable to auto fluoresce in UV radiation without application of the markers. Yellow colour is typical for the walls of the head cells, whereas the red auto fluorescence is found in the chloroplasts of the stalk cells. The yellow-green fluorescence of phenylpropanoids is revealed in the secretory cells in the presence of Natural or Wilson reagents. Phenylpropanoids are located in the subcutical space and in the cell wall. Using the histochemical dyes, in the trichome secretory cells it is possible to find the total, acid and neutral lipids, tannins, polyphenols, terpenoids and sesquiterpene lactones. The most intensity of the colouring is characteristic for 2–3 upper layers of the secretory cells; the stalk cells are colourless.

General ultrastructural features are revealed in the secretory cells of the trichomes in all studied species (Fig. 3). The upper cell wall is heterogeneous: numerous light lamellas are under a cuticle. Secretion is accumulated in the periplasmic space as the small drops. In cytoplasm of the secretory cells abundant smooth endoplasmic reticulum is formed. During maturation the dark contents are accumulated in it. Cisternae of the rough endoplasmic reticulum are rare. In the terminal head cells the leucoplasts have a various form and extended surface. They are rounded, oval, amoeboid, and with cup-shaped invaginations. Tubular membrane elements, plastoglobuli and amorphous inclusions are found in the plastid stroma. Elements of endoplasmic reticulum are met in proximity to the outer membrane of the leucoplast envelope. In the secretory cells situated under the terminal ones and also in all stalk cells there are the chloroplasts. Lipid drops are typical for cytoplasm of the head cells.

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Fig. 1: Trichomes of the peduncle in Doronicum orientale (A-F) and D. macrophyllum (G-I). Scale bars: A, G – 250 µm; bars: A – 100 µm; B-D – 50 µm. B-F, H-I – 50 µm.

Fig. 2: Trichomes of the leaf in Senecio viscosus. Scale bars: A – 100 µm; B-D – 50 µm.