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Microhairs of *Plantago maritima* L. under electron scanning microscopy

With 4 Figures

Summary

The surface of leaves of *Plantago maritima* L. was investigated under scanning electron microscopy for the presence of microhairs. Two types of such hairs were observed: the headed microhairs – so-called morel-like – and headless – 1–3-celled microhairs.

Zusammenfassung

Die Oberfläche der Blätter von *Plantago maritima* L. wurden unter einem Elektronenmikroskop auf Mikrohaare untersucht. Es wurden zwei Mikrohaartypen festgestellt: Köpfchenmikrohaare, sog. morchelähnliche Haare, und 1- bis 3zellige kopflose Mikrohaare.

Introduction

Sea plantain – *Plantago maritima* L. – Plantaginaceae; subgenus *Plantago* sensu PILGER; subgenus *Coronopu* (LAM. & DC.) RAHN (RAHN 1996) sect. *Maritima* H. DIETR. – is a perennial halophytic species occurring in Europe on the sea coast and very rarely at the inland salt marshes (PILGER 1937; CHATER & CARTIER 1976; PIOTROWSKA 1988). It is described in the Polish Red Book of plants (PIOTROWSKA 1993) as vulnerable (v) and in the Red List of the flora of Slovakia as most vulnerable (Vm) (MAGLOCKY & FERAKOVÁ 1993). It grows well in non-salt soil (ANDRZEJEWSKA-GOLEC & ŚWIĘTOSŁAWSKI 1987). It is a highly variable species which is due to phenotypic plasticity (BLOM 1992).

The microhairs of the leaves of *P. maritima* have been examined previously under light microscopy (ANDRZEJEWSKA-GOLEC & ŚWIĘTOSŁAWSKI 1987; RAHN 1992). According to ANDRZEJEWSKA-GOLEC & ŚWIĘTOSŁAWSKI (1987) microhairs characteristic of the family Plantaginaceae are absent on the leaves of this species. On the leaves of *P. maritima* the microhairs with a small basal cell, a unicellular stalk that could be stained with Sudan III and 3–7-celled morel-like head, 0.05–0.07 mm long – were found. Short headless hairs 0.05–0.10 mm long, cone-shaped. thick – walled 1–3-celled ones were present, too.

Plantago maritimae folium has been used in folk medicine (BRODA & MOWSZOWICZ 1996). Similarly the leaves of ribwort-plantain – *Plantago lanceolata* (subgenus *Plantago* sensu PILGER; subgenus *Albicans* RAHN, sectio *Arnoglossum* DECNE.) – *Plantago lanceolatae folium* – a well-known pharmaceutical drug (French, German, Hungarian, Swiss and Polish pharmacopoeias) may be confused with leaves of *P. maritima* in coastal areas.

Materials and methods

The *Plantago maritima* L. specimens were obtained from our field culture (non-salt soil)-in the Garden of the Medicinal Plants of the Department of Pharmacognosy, Medical University of Łódź, (Fig. 1). The seeds for culture were obtained from the Botanical Garden in Wrocław (Poland). The identity of grown species was checked with Flora

Fig. 1
Plantago maritima L., cultivated by ANDRZEJEWSKA-GOLEC in field culture, × 0.5

Europaea (CHATER & CARTIER 1976) and PILGER's monography (1937). The material was collected in the florescence period. The fragments of the leaves of this species were prepared for SEM examination as described previously (ANDRZEJEWSKA-GOLEC & ŚWIĘTOSŁAWSKI 1987).

Results

The images of the microhairs of *P. maritima* obtained in scanning electron microscopy have been presented in Figs. 2, 3.

Two types of microhairs were observed: the headed microhairs – morel-like (Fig. 2) and short 1–3-celled headless hairs (Fig. 3). Also the traces of the headless microhairs were ob-

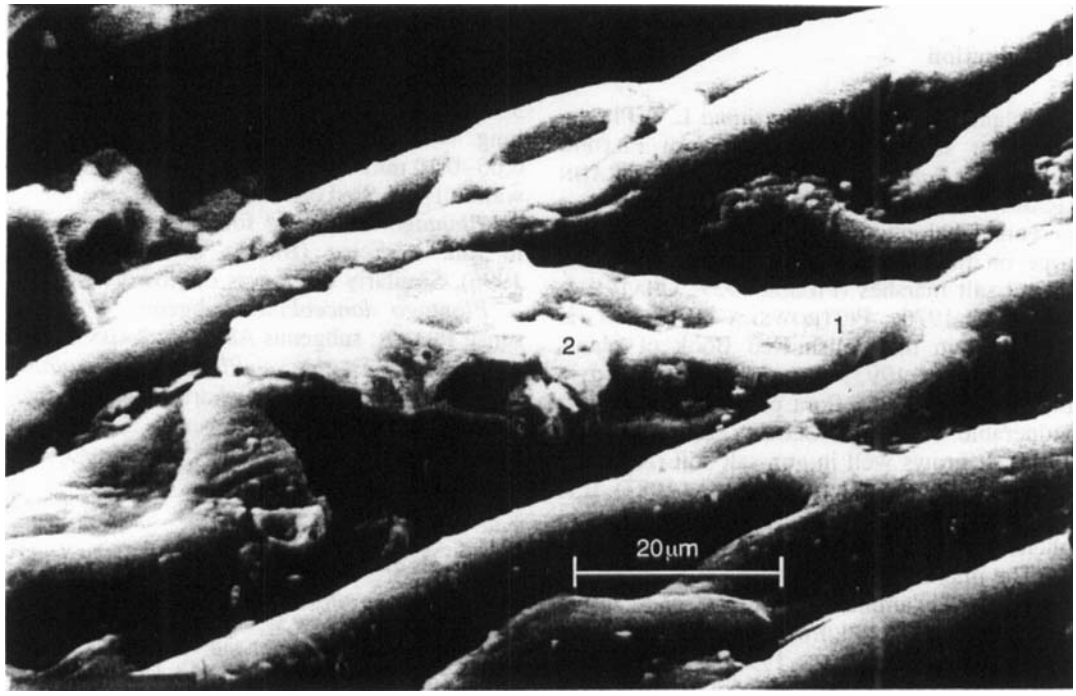

Fig. 2
Plantago maritima L., a headed microhair on the mature leaf, SEM
1 – a stalk; 2 – a head

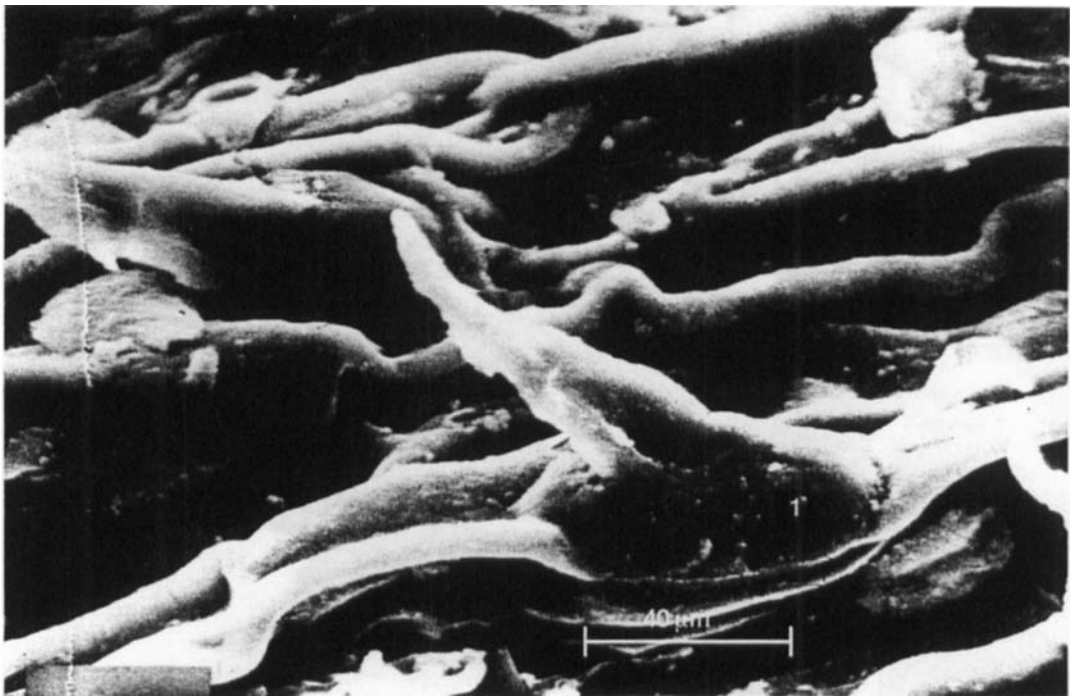

Fig. 3
Plantago maritima L., a headless microhair on the leaf, SEM
1 – a basal cell

served (Fig. 4). The traces have only a basal cell after physiological rejection other cells or after their mechanical damage.

These two microhair types commonly occur on the leaves of *P. maritima*, either on the upper epidermis or on the lower surface.

Discussion

We have not observed the presence of hairs typical of the Plantaginaceae family i.e. those with a unicellular stalk and a head divided vertically into two cells (ANDRZEJEWSKA-GOLEC 1992a, b, 1995; ANDRZEJEWSKA-GOLEC & ŚWIĘTOSŁAWSKI 1993, 1996a) on the mature leaves of *Plantago maritima* (sectio *Maritima*) either during previous investigations under light microscope (ANDRZEJEWSKA-GOLEC & ŚWIĘTOSŁAWSKI 1987) or in the present study. These hairs are absent on mature leaves in other representatives of the sectio *Maritima*, too (ANDRZEJEWSKA-GOLEC & ŚWIĘTOSŁAWSKI 1987). However the hairs of this type were observed at the early stages of ontogenesis of *Plantago maritima* var. *borealis* on cotyledons as four-celled stage of the morel-like hair only during the first days of germination (ANDRZEJEWSKA-GOLEC 1991).

A hair with a unicellular stalk and head divided vertically into two cells (or similar to it with a unicellular head) may be a parent hair for headed hairs in the Plantaginaceae family (ANDRZEJEWSKA-GOLEC 1994). ABU-ASAB & CANTINO (1987) published hypothetical transformation series of subsessile glandular trichome types in Lamiaceae and Verbenaceae. A hair with a two-celled head is the second in these series. The hairs with a unicellular stalk and a head divided vertically into two cells were transformed (probably) in the taxa of the sectio *Maritima* H. DIETR. and sectio *Arnoglossum* DECNE. into morel-like hairs.

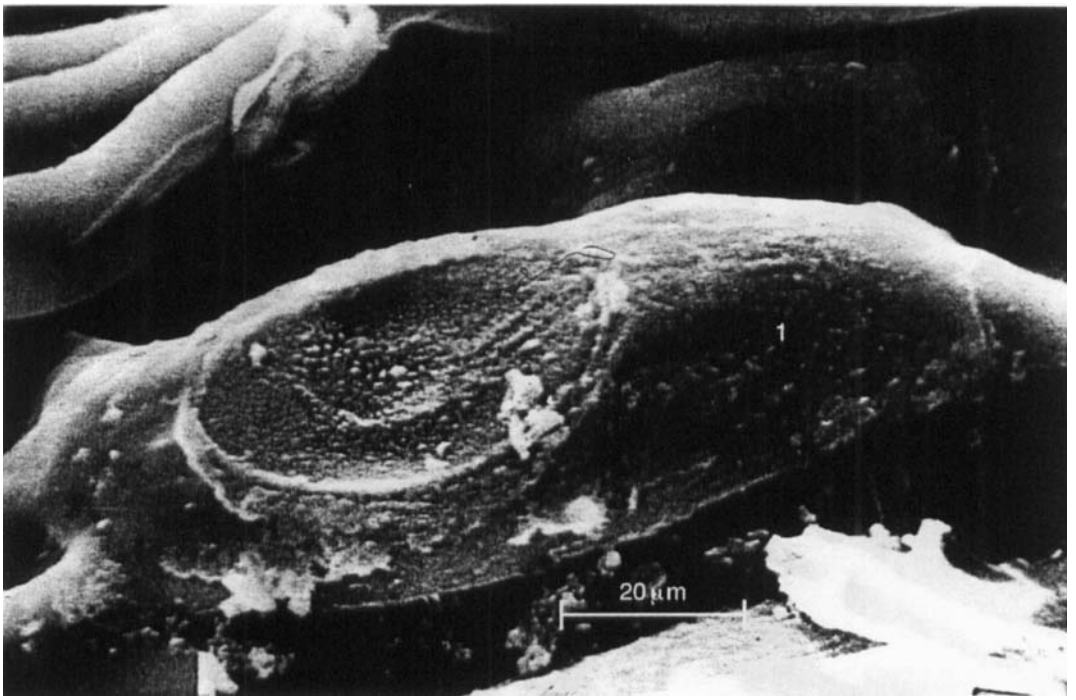

Fig. 4
Plantago maritima L., a cratered trace of a headless microhair, SEM
1 – a basal cell

The morel-like microhairs are similar to microhairs of the same type which were observed in SEM on the leaves of *P. lanceolata* (ANDRZEJEWSKA-GOLEC & ŚWIĘTOSŁAWSKI 1996a) (a possibility of mistaking the leaves of species *P. maritima* for *P. lanceolata* – see Introduction). Short 1–3-celled microhairs are characteristic for the leaves of *P. maritima* – they are absent on the leaves of *P. lanceolata*.

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