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The hairs of *Plantago reniformis* BECK, section *Eremopsyllium* PILG. (Plantaginaceae)

With 4 Figures and one Table

Summary

The paper is a continuation of the investigations on the hairs in representatives of family Plantaginaceae. It regards monotypic section *Eremopsyllium* PILG. separated by PILGER from sectio *Lamprosantha* DECNE. According to RAHN and RØNSTED it is incorrect. In *Plantago reniformis* headed hairs typical of the family Plantaginaceae are present. They are plesiomorphic hairs with one celled stalk and head divided vertically into two cells. Headless hairs also are similar to hairs in subgenus *Plantago* sensu RAHN.

Introduction

Monotypic section *Eremopsyllium* PILG. was formed by PILGER (1937) through the separation of an endemic Balkan species – *Plantago reniformis* BECK – from section *Lamprosantha* DECNE. The reason for his decision was the differentiating feature – heart-shaped or renal-shaped leaves and the prevalence of only two ovules.

According to DIETRICH (1980) individuation of the sectio *Eremopsyllium* is not justified. RAHN (1996) included sectio *Eremopsyllium* PILG. and some other sections sensu PILGER (*Polyneuron* DECNE., *Palaeopsyllium* PILG., *Holopsyllium* PILG., *Lamprosantha* DECNE. and *Gentianoides* PILG.) in a big paraphyletic section *Plantago*. However, this section is, according to RØNSTED (2002) “badly resolved”.

Next RAHN joined sectio *Plantago* sensu RAHN with four other sections: *Micropsyllium* DECNE.,

Zusammenfassung

Die Haare von *Plantago reniformis* BECK, Sektion *Eremopsyllium* PILG. (Plantaginaceae)

Dieser Beitrag ist eine Fortsetzung der Untersuchungen von Haaren an Vertretern der Plantaginaceae. Der vorliegende Artikel betrifft die monotypische Sektion *Eremopsyllium* PILG. PILGER löste die Sektion *Eremopsyllium* aus der Sektion *Lamprosantha* heraus. Nach RAHN und RØNSTED ist dies nicht berechtigt. Bei *Plantago reniformis* treten nur für die Familie Plantaginaceae typische Köpfchenhaare auf. Diese plesiomorphen Haare haben einzellige Stiele und die Köpfchen sind vertikal in zwei Zellen geteilt. Die Art besitzt auch ähnliche kopflose Haare wie die Taxa des Subgenus *Plantago* sensu RAHN.

Mesembrynia (DECNE.) RAHN, *Virginica* BARN. and *Oliganthos* BARN. and included in one subgenus *Plantago*.

Materials and methods

The *Plantago reniformis* BECK specimens were obtained from own field culture in the Garden of Medicinal Plants of the Department of Pharmacognosy, Medical University of Łódź (Fig. 1). The seeds for this culture were obtained from Botanischer Garten der Justus-Liebig-Universität Göttingen, Germany.

The identity of the cultivated plants was checked with the use of description and keys from PILGER monograph and Flora Europaea (CHATER & CARTIER 1976).

The well-developed mature leaves were examined in light microscopy. Fresh material was used:



Fig. 1
Plantago reniformis BECK, cultivated by ANDRZEJEWSKA-GOLEC, $\times 0.25$

leaf lamina (upper and lower epidermis, nerves), petiole (upper and lower epidermis) and base of the leaf.

Results

The results of the studies are shown in Table 1 and Figures 2–4.

Headed hairs

Only one type of the headed hairs was observed on all parts of the leaf. It was the type typical of the family Plantaginaceae. They have a unicellular stalk and a head divided vertically into two cells. The basal cell of these hairs was relatively small. They are surrounded by (4) 5–6 (7) adjacent cells. The length of these hairs was about 60–240 μm . The hairs are covered by a smooth cuticle. The walls of the stalk stained intensely with Sudan III. The stalk was sometimes two-celled.

The headed hairs were present on the upper and lower epidermis, nerves of the leaf lamina, and petiole. More hairs occurred on the upper

Table 1
The hairs on leaves in taxa of the subgenus *Plantago* sensu RAHN

Section		Type of hairs		
sensu RAHN (1996)	sensu PILGER (1937)	headed – with one-celled stalk and two-celled head	headless	
			consisting of several cells	web-like
<i>Plantago</i>	<i>Eremopsyllium</i> PILG.	+	+	+
	<i>Paleopsyllium</i> PILG. ^{1,5}	+	+	+
	<i>Polyneuron</i> DECNE. ^{2,5}	+	+	+
	<i>Lamprosantha</i> Decne. ^{2,5}	+	+	+
	<i>Gentianoides</i> PILG. ⁵	n	n	n
	<i>Holopsyllium</i> PILG. ⁵	+	+	n
<i>Oliganthos</i> BARN.	<i>Oliganthos</i> BARN. ⁵	+	+	+
	<i>Microcalyx</i> PILG. ^{3,5}	+	+	+
<i>Micropsyllium</i> DECNE.	<i>Micropsyllium</i> DECNE. ⁵	+	+	n
<i>Mesembrynia</i> (DECNE.) RAHN	<i>Mesembrynia</i> Decne. ^{4,5}	+	+	+
<i>Virginica</i> BARN.	<i>Novorbis</i> DECNE. ^{4,5}	+	+	+

+ – presence of hairs; n – not investigated

1–5 presence of hairs according to literature

1–4 own earlier investigations:

1 – ANDRZEJEWSKA-GOLEC (2000); 2 – ANDRZEJEWSKA-GOLEC & ŚWIĘTOSŁAWSKI (1991); 3 – ANDRZEJEWSKA-GOLEC & ŚWIĄTEK (1993); 4 – ANDRZEJEWSKA-GOLEC (1991);

5 – RAHN (1992)

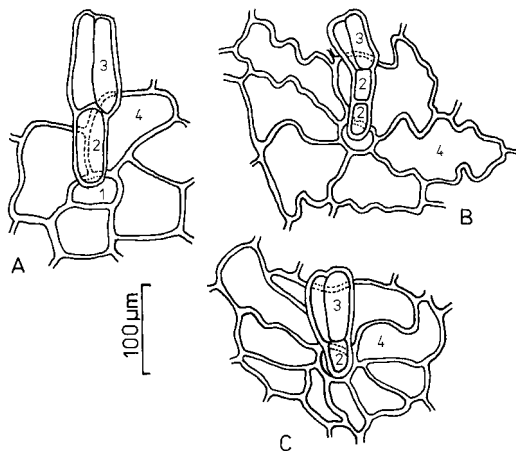


Fig. 2
Plantago reniformis BECK, hairs on the leaf, headed hairs

A — from the upper epidermis of leaf lamina; B — from the lower epidermis of leaf lamina; C — from the lower epidermis of petiole. 1 — a basal cell, 2 — a stalk cell, 3 — a head, 4 — surrounding cells

than on the lower epidermis of the leaf, but on the petiole inversely.

Headless hairs

On the leaf lamina there are two types of headless hairs:

1. Hairs consisting of (3–5) 6–8 (9–10) cells. The length of these hairs is about 0.5–1.5 mm. They have a big round basal cell different from the surrounding cells. The number of surrounding cells varies from 6 to 17. The top cells are usually conical or hooked. Some cells of these hairs have collapsed walls.

2. Multicellular hairs, the so-called web-like or arachnoid hairs present only on the leaf base. These hairs consist of 10–30 cells. The length of these hairs is about 0.3–1.5 cm. The walls of the hairs are thin. They have single or double-rowed bases. The first cell of these hairs is small. The top cell is sharp, sometimes hook-ended.

Discussion

In *Plantago reniformis* similar types of hairs to those found in taxa of the subgenus *Plantago* sensu RAHN are present. The type of headed

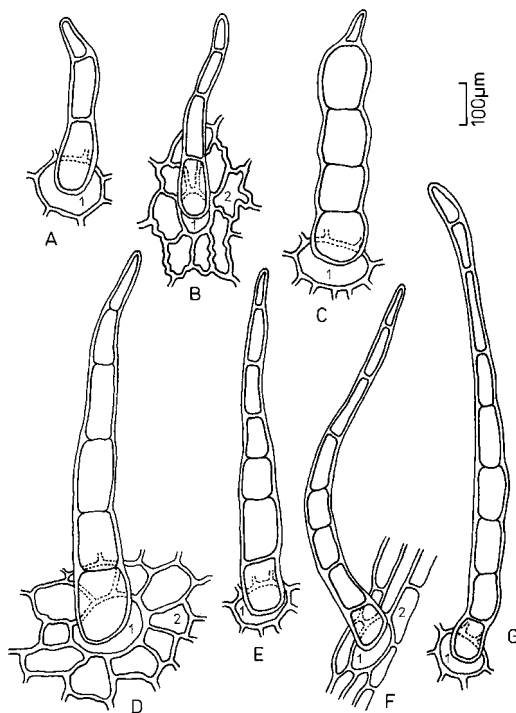


Fig. 3
Plantago reniformis BECK, hairs on the leaf, headless hairs consisting of several cells

A, B — 3- and 4-celled hairs from the lower epidermis of leaf lamina; C — 5-celled hairs from the upper epidermis of leaf lamina; D, E — 6- and 7-celled hairs from the leaf lamina; F — 8-celled hairs from the lower epidermis of petiole; G — 9-celled hairs from the lower epidermis of leaf lamina. 1 — a basal cell, 2 — surrounding cells

hairs is common for the Plantaginaceae family (ANDRZEJSKA-GOLEC 1992a, 1995, 1998). They are treated as plesiomorphic type (RAHN 1992; ANDRZEJSKA-GOLEC 1998; RØNSTED 2003). The headless hairs are similar to those seen in sections of the subgenus *Plantago* sensu RAHN, but also in subgenus *Psyllium* sensu PILGER and subgenus *Coronopus* sensu RAHN (ANDRZEJSKA-GOLEC 1992b, c; ANDRZEJSKA-GOLEC & ŚWIĘTOSŁAWSKI 1993). The results of own investigations confirm the correctness of RAHN'S inclusion (1996) of the taxon *Eremopsyllium* PILG. into the sectio *Plantago* subgenus *Plantago*. According to RAHN (1996) and RØNSTED (2002) subgenus *Plantago* is a plesiomorphic taxon. There is not much morphological and chemical

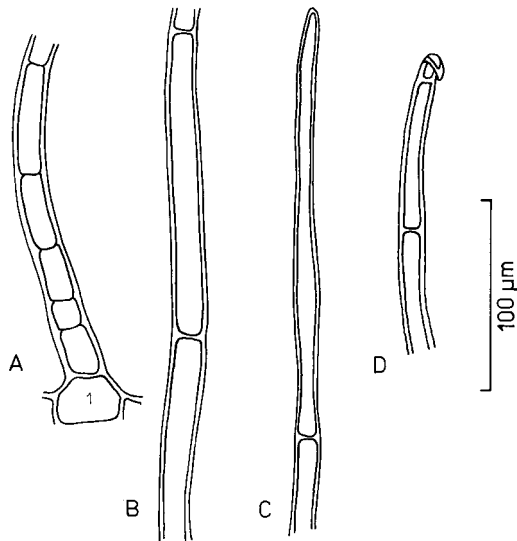


Fig. 4
Plantago reniformis BECK, hairs on the leaf, web-like hairs, fragments

A — base of the hair; B — middle fragment; C, D — top of the hair. 1 — a basal cell

variation between species within the subgenus *Plantago* (RØNSTED 2002). The results of my present and earlier investigations and also the studies firm of RAHN (1992, 1996) show very low variation of the hairs in the taxa of subgenus *Plantago* sensu RAHN.

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Manuscript received: September 20th, 2002.