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Ultrastructure of cleistothecia and the stages of life cycle of *Microsphaera palczewskii* by scanning electron microscope

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Several year long investigations of the developmental cycle of *Microsphaera palczewskii* occurring on the leaves of *Caragana arborescens* in Central Poland are reported. The material was studied with light and scanning electron microscopes. The scanning microscopy micrographs of the cleistothecia and appendages presented in this report are the first micrographs of this species.

Key words: *Microsphaera palczewskii*, *Erysiphales*, scanning electron micrographs, cleistothecium.

INTRODUCTION

During investigations concerning the powdery mildews of the *Erysiphaceae* family in Central Poland (K a l i n o w s k a–K u c h a r s k a and K a d ł u b o w s k a 1993) particular attention was paid to *Microsphaera palczewskii* Jacz. From Poland this species was first reported in the vicinities of Włodawa (S a ł a t a 1985). The taxon has not yet been studied with scanning electron microscopy.

MATERIAL AND METHODS

Infected leaves of *Caragana arborescens* were collected by us and by graduate students, from June to October under the authors' supervision, in the following sites: village of Bronisławów (vicinities of the town of Złoczew), towns of Konin, village of Czerwonka (vicinities of the town of Maków

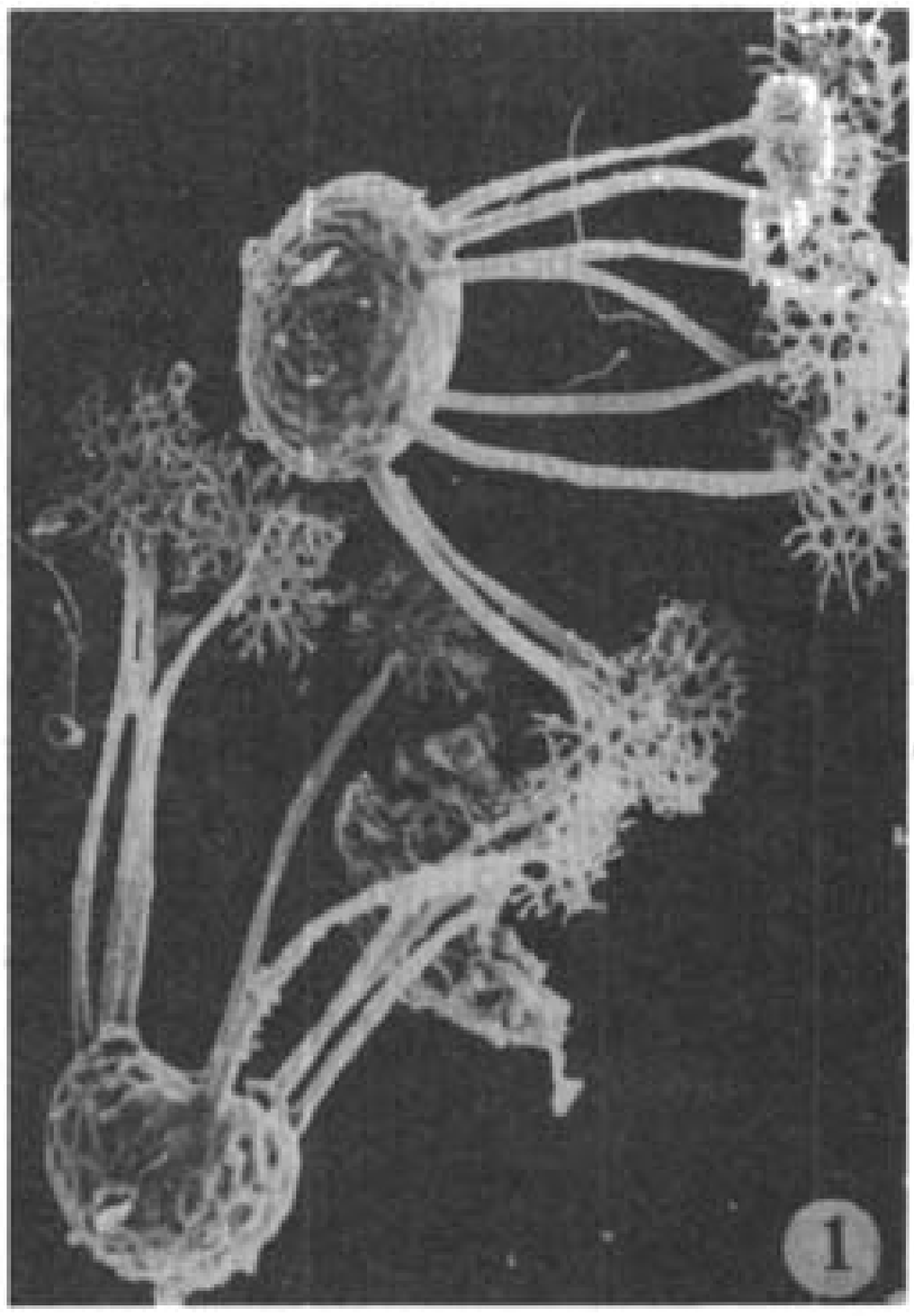
Mazowiecki), Łódź City and village of Grotniki. The period of observations covered the years 1989, 1992, 1993 and 1996. Precise dates of sampling at several sites and successive developmental stages of the powdery mildew species are presented in Table 1. Observations and identifications were carried out using light microscopy. The hyphae of the powdery mildew were mostly investigated from fresh, sometimes from desiccated leaves. Simultaneously, measurements of conidia, cleistothecia, appendages, asci and spores were made. Photographs (Figs. 1-4) were taken from materials that were collected at Bronisławów on 5. October 1989 and then selected by one of the authors (Kalinowska-Kucharska). While identifying, comparing dimensions and morphological features, the use was made of the S a ł a t a (1985) and B r a u n (1987) monographs, as well as the papers of C h e n G u i-q i n g et al. (1987), G e l j u t a (1987) and P a u l e c h (1995). Infected and desiccated leaves of *Caragana arborescens* are deposited in the Department of Algology and Mycology, University of Łódź.

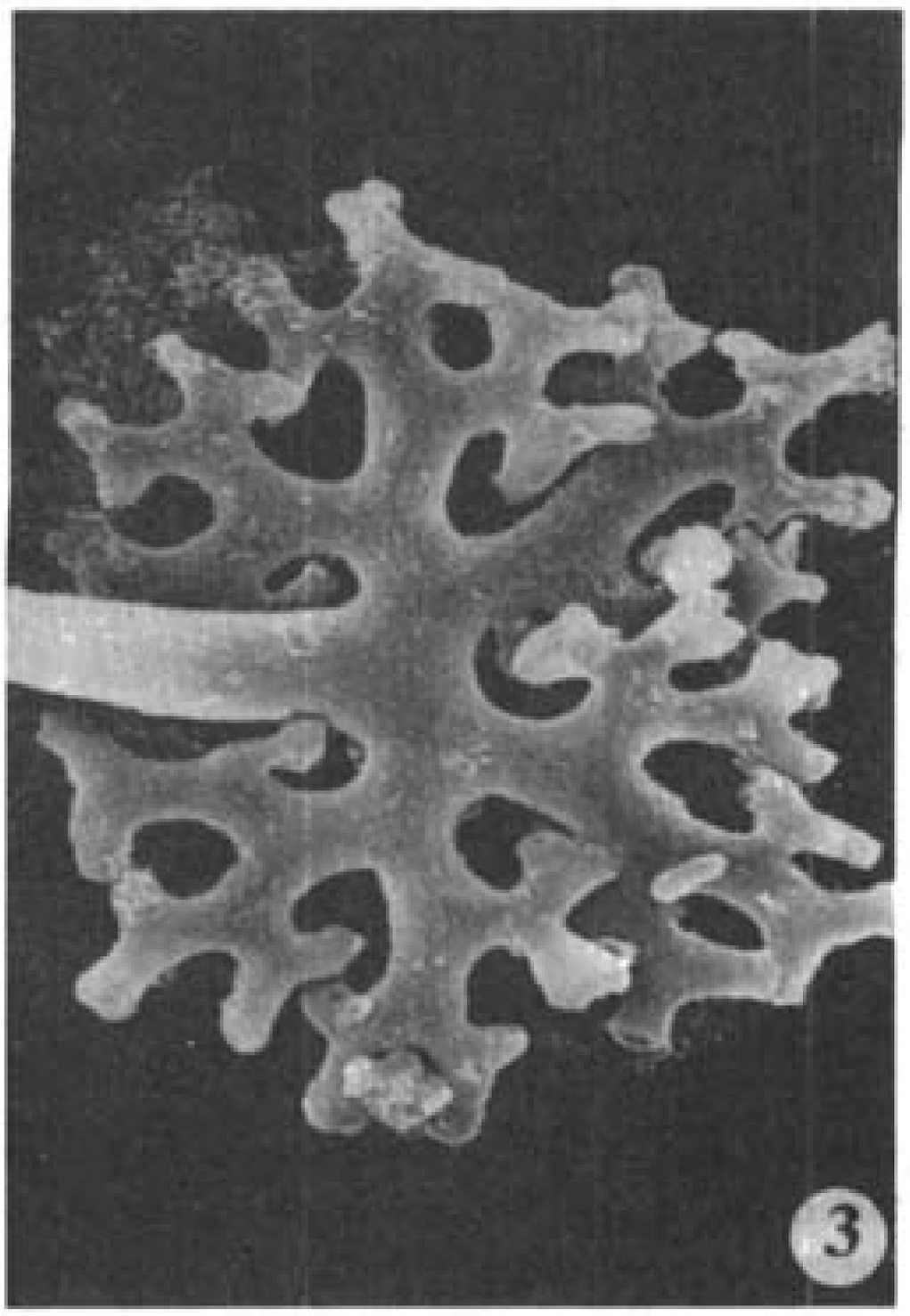
RESULTS AND DISCUSSIONS

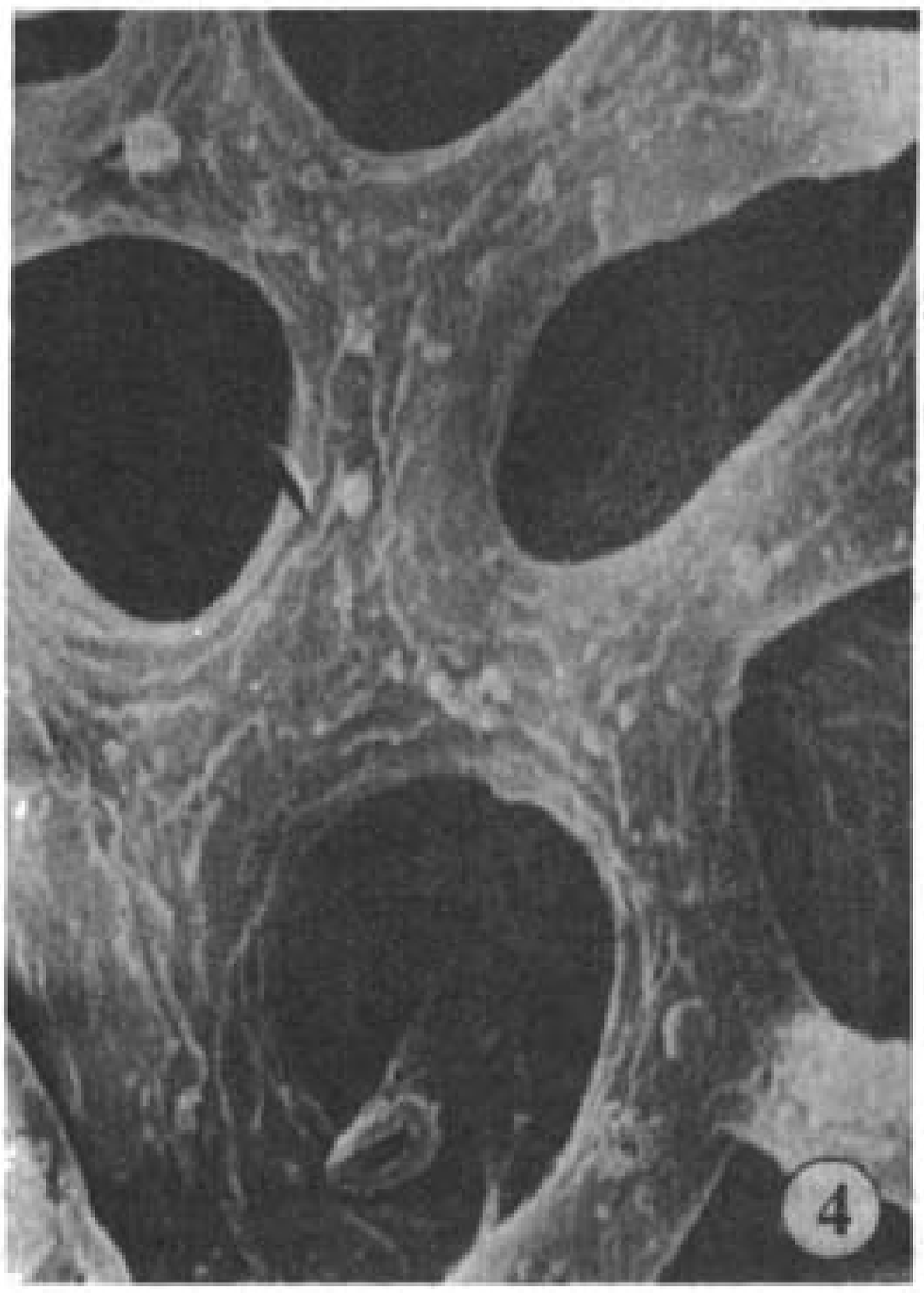
On the basis of observations carried out in Central Poland it is determined that *Microsphaera palczewskii* occurs abundantly on the leaves of *Caragana arborescens*. The beginning of the life cycle, i.e. production of mycelium and conidia, occurs in July (occasionally in June) and ends about two months later with the production of spores (Table 1).

T a b l e 1
Observation on stages of the life cycle of *Microsphaera palczewskii*

Localities and time of observation					
Stages of life cycle	Bronisławów	Konin	Czerwonka	Łódź	Grotniki
Mycelium on leaves single conidia	29.07.1989	07.08.1989	10.06.1992	07.07.1993	10.07.1996
Numerous conidia		15.08.1989	17.06.1992		
Cleistothecia; beginning of appendages formation	28.08.1989	02.09.1989	29.06.1992 05.07.1992 07.07.1992	14.07.1993	09.08.1996
Cleisthothecia with dichotomous, appendages	16.09.1989	18.09.1989 30.10.1989	12.07.1992		
Cleistothecia with asci	26.09.1989	06.11.1989	26.07.1992	06.09.1993	06.10.1996
Spores	05.10.1989	13.11.1989	05.08.1992		







Figs 1-4. SEM micrographs of *Microsphaera palczewskii*. Fig. 1. Cleistothecia with appendages upwards, ×220. Fig. 2. Mature cleistothecium with polygonal and irregular alveols, ×900. Fig. 3. Dichotomously branched end of appendage, ×1600. Fig. 4. Surface of appendage with ornamentation, ×6000

The dimensions of conidia, cleistothecia, asci and spores are typical for this species. In contrast, the ratio of cleistothecial diameter to appendage length, amounting to about 1 : 3 in our materials (Fig. 1), much differs from the value given by S a ł a t a (1985) who claims that appendages are as long as the cleistothecial diameter, exceptionally slightly longer. From the literature data it follows that this ratio varies depending on sampling locality. The appendages are "about 1-2 as long as the cleistothecial diam., rarely exceeding" in B r a u n (1987), 1.2-2 C h e n G u i-q i n g et al. (1987), 1-2.5 in P a u l e c h (1995), and about 1.5-2.5 in G e l j u t a (1989).

As far as we know, scanning microscopy micrographs of the cleistothecia and appendages of *Microsphaera palczewskii* that are enclosed to this study are the first micrographs of this species (Figs. 1-4). Distinct polygonal and irregular alveols of cleistothecium are clearly seen in Figure 2, while appendages ornamentation, similarly as in *Microspaera alphitoides* Griff. et Maubl. (T u r n a u and C z e r w o n k a 1986), is visible in Figs 3 and 4.

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Ultrastruktura otoczni i stadia cyklu rozwojowego *Microsphaera palczewskii* w skaningowym mikroskopie elektronowym

S t r e s z c z e n i e

Microsphaera palczewskii Jacz. występuje pospolicie w Polsce Środkowej na liściach *Caragana arborescens*. W czerwcu wytwarzane są zarodniki konidialne, a pod koniec lata dojrzałe otocznie. Wymiary ich są typowe dla tego gatunku. Stosunek średnicy otoczni do długości przyczepek przybiera różne wartości w zależności od miejsca zbioru. Zdjęcia skaningowe zamieszczone w pracy są pierwszymi tego gatunku.