

Taxonomic study of epidermal patterns on some American species *Carex* using Scanning Electron Microscope

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SEM(주사현미경)에 의한 미국산 사초속 식물의 잎의 표피형에 관한 분류학적 연구

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적 요

미국산 사초속 식물의 잎의 표피형에 대한 조사로서 6 Sect., 6 Species에 대해 주사현미경을 사용하여 표피형을 조사하였다.

표피형의 구성요소인 숨구멍(Stomata), 세포벽(Cell wall), 유두돌기(Papillae), 가시돌기(Prickle), 납질(Waxy)등의 모양을 조사하였다.

표피형 구성세포의 특징이 종류에 따라 차이가 있어 사초속 식물의 감별 및 분류에 좋은 형질이 될수가 있다고 보는 바이다.

Introduction

American species of the genus *Carex* were studied by K.K. Mackenzie(1940) and M.L. Fernald(1942) using floristic and foliage characteristics. Recently, Kerry S. Walter's(1975) paper "A preliminary study of the achene epidermis of certain *Carex*(Cyperaceae) using Scanning Electron Microscopy" dealt with the morphology of the achene epidermis utilizing SEM methods.

The author has reported on the epidermal patterns of the leaf blades on Korean sedges(1969, 1971, 1972, 1973, 1974a, 1974b) and found them to provide very useful characteristics for sedges identification and classification. The author have found that the epidermal patterns of leaf blades may provide important taxonomic characteristics at the species level.

In this study the Scanning Electron Microscope were used to elucidate the structure of the epidermal surfaces in the genus *Carex*.

Materials and Methods

The materials for the study are preserved in the

Wiegand herbarium and the L.H. Bailey Hortorium at Cornell University(Ithaca, N.Y. 14853, U.S.A.). The specimens were prepared for SEM observation by fixing segments of the leaf blades. The leaves were softened by boiling in Glyciaeri (Glycerine 10cc, 10% Aerosol 3cc, Distilled water 90cc) in a 60°C paraffin oven for 2 hrs and then treated in F.A.A. for 3 days at room temperature.

After the treatment outlined above, other specimens were prepared for SEM observation by dehydration in a graded acetone sequence. This was used to bring the specimens to drying in 100% acetone followed by critical point drying with CO₂ in a sorvall critical point dryer. The specimens were then mounted on aluminum stubs with silver or graphite conducting paint and coated with gold or gold/palladium, and examined in an American Research Corporation 300 Scanning Electron Microscope on accelerating at voltage of 21 KV.

Observation was made under the SEM 300 with 500X and 1000X-magnification. The electron images were recorded with polaroid type 55/N 4×5 film.

The taxa of *Carex* investigated are as follows:

Sect.	Species	Localities	Collector	Date
Muhlenbergianae	<i>Carex disperma</i>	Keweenaw county	F.J. Hermann	1936.7.24
Macrocephalae	<i>C. macrocephala</i>	New York	J.A. Small	1939. Summer
Elogatae	<i>C. brunnescens</i>	Giles county	Robert F. Thorne	1956.7.22
Acutae	<i>C. aquatilis</i>	Montana	Clhitchcock & Cvmuhlich	1945.8.22
Athrochlaenae	<i>C. pyrenaica</i>	Idaho	J.W. Thompson	1937.7.28
Limosa	<i>C. limosa</i>	Canada	W.B. Schofield	1950.7.26

Results

Carex disperma Dewey. (Fig. 1~Fig. 7)

The cuticular wax is present on both surfaces of the leaf blade. The cuticle is thick and covered at leaf surfaces. Papillae are present only on adaxial surface. The surfaces of the cells are not smooth. The cell wall have long round projections. Subsidiary cells are swelled.

Carex macrocephala Willd. (Fig. 2~Fig. 8)

The cuticle plug on upper cuticle is well developed on both surfaces of the leaf blade. Papillae is developed only on abaxial surface of leaf surfaces. The surfaces of the cells are not smooth. Epidermal surfaces of cell walls appear helix wavy.

Carex brunnescens (Pars.) Poir. (Fig. 3)

The cuticular wax are present on the both surfaces of leaf blade. The surfaces is not smooth. Especially, papillae is present in intercostal zone of the adaxial surface. The cell walls of epidermal surfaces appeared tight helix wavy. The cuticular wax of epidermal cells is thick and not smooth. Subsidiary cells are swelled.

Carex aquatilis Wahl. (Fig. 4)

The cuticle plug on upper cuticle is well developed on both surfaces of the leaf blades. Papillae is well developed on both surfaces of leaf blade. The surfaces of the epidermal cells is not smooth. The silica bodies are distinct and the stomata are swelled.

Carex pyrenaica Wahl. (Fig. 5)

The cuticular wax are well developed on leaf surfaces and covered on leaf blade. Epidermal surfaces of cell is not smooth. Papillae is developed in intercostal zone on adaxial surface of leaf blade. Prickles is present in costal zone. The fungushyphae were present on adaxial surface. Epidermal cell walls appear slight depressions.

Carex limosa Linne. (Fig. 6)

The cuticular wax are well developed on the abaxial surface. Papillae are present on both surfaces on the leaf blade and well developed. Stomata surrounded by papillae. Silica body is present and papillae is bulbous shaped. Prickles is present on the leaf blade margin. Stomata have cuticle plugs.

Conclusions

This report is study the epidermal patterns of the leaf blade for comparison of American *Carex* including 6 sect., 6 species. There are many characteristics found in this study. These characteristics are subsidiary cell of stomata, intercostal cell walls, silica bodies, prickles, cuticle wax and fungushyphae.

Both papillae and prickles are present on the surfaces of the blade covered by a waxy cuticle plug. Fungushyphae covered and was well developed on the adaxial surfaces of *Carex pyrenaica* (Fig. 5).

As the result this study show, the leaf surfaces of *Carex* are well-suited for SEM study. Significant characteristic exists among species and the characteristics are useful for *Carex* taxonomy.

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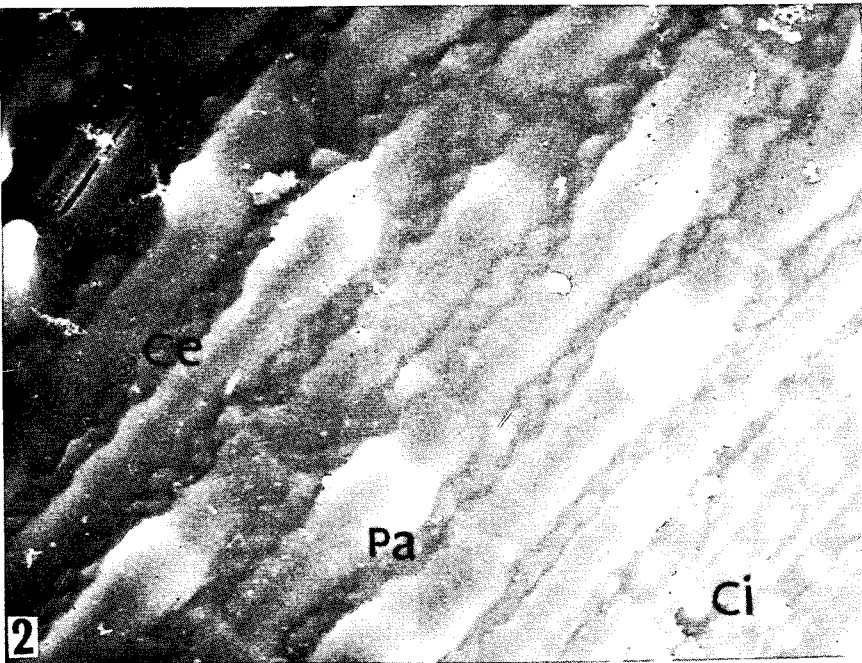
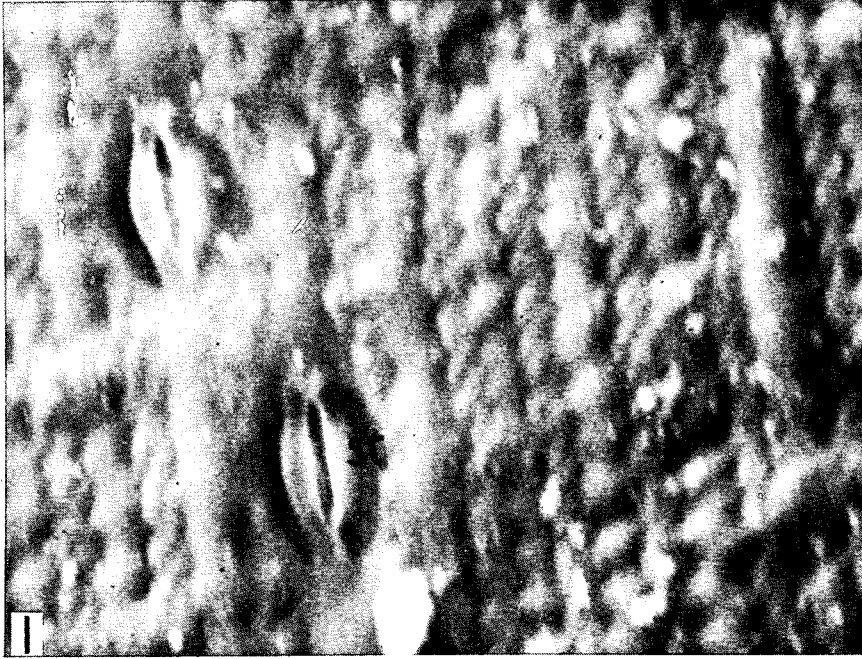


Fig. 1-2. Epidermis of leaf blades

1. *Carex disperma* Dewey (abaxial X 1000)

St. = Stomata

2. *Carex macrocephala* Willd. (abaxial X 1000)

Ce. = Cell wall, Pa. = Papillae, Ci. = Cilica body

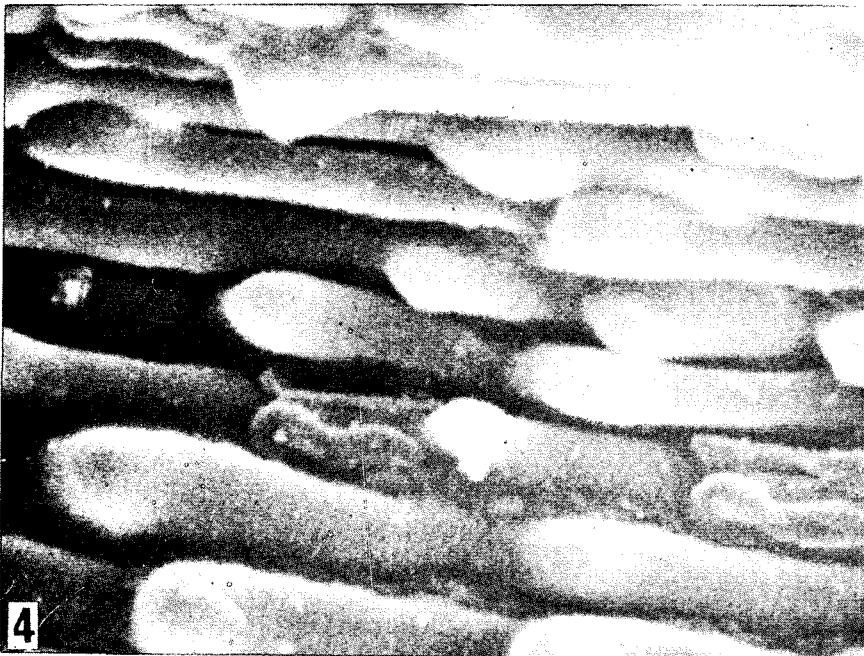
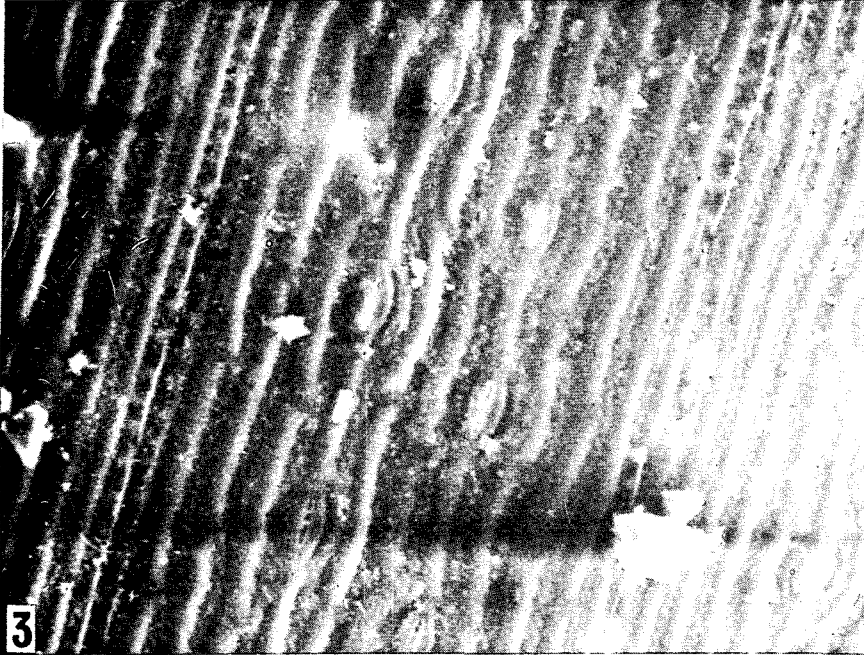


Fig. 3 - 4. Epidermis of leaf blades
3. *Carex brunnescens* (Pers.) Poir (abaxial X 500)
4. *Carex aquatilis* Wahl (adaxial X 1000)

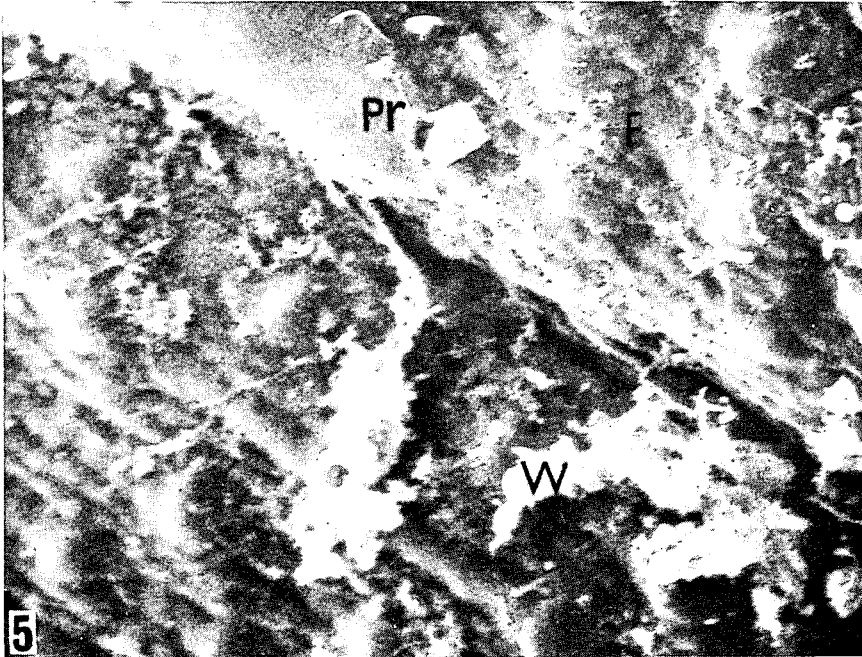


Fig. 5 - 6. Epidermis of leaf blades

5. *Carex pyrenaica* Wald (adaxial X 500)

Pr.=Prickle, F.=Fungushyphae, W.=Cuticular wax

6. *Carex limosa* Linne (abaxial X 1000)

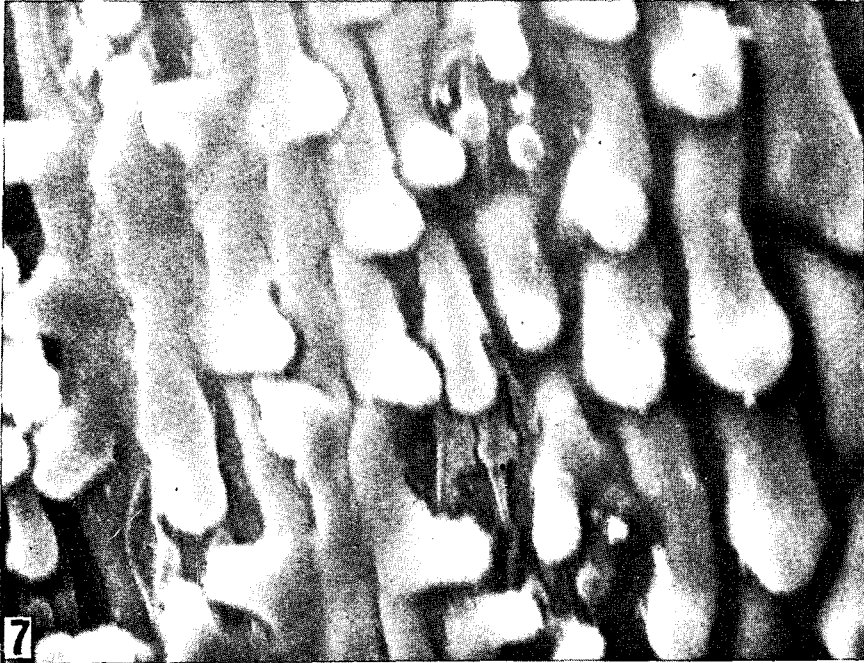


Fig. 7-8. Epidermis of leaf blades
7. *Carex disperma* Dewey (adaxial X 1000)
8. *Carex macrocephala* Wild. (adaxial X 1000)