

論 説

カナダ産 *Typha* sp. 花粉の形態学的研究*

水野瑞夫**・山崎 太***・瀧 和子***

Morphological studies on the pollen grains
of the Canadian species of *Typha**

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The electron microscopic study on the pollen grains of some Canadian species of *Typha* is carried out, and its results are as follows.

- 1) The pollen grains of three kinds of Cattails, namely *Typha latifolia*, *T. angustifolia* and *T. × glauca* can be discriminated by comparison with shapes and germinal aperture-diameters. It can not be possible to be discriminated by comparison with interior configurations.
- 2) It can not be possible to be found the remarkable features by comparison among shapes, muri-widths, lumina-numbers per unit areas and pollen walls on the ornamentations of three species of *Typha*.
- 3) Though monads, dyads, triads and tetrads are found in one unit of specimen in the pollen grains of *T. × glauca* which is the hybrid between *T. latifolia* and *T. angustifolia*, the major ones are monads (97.2%) and it is recognized that the pollen grains of *T. × glauca* simultaneously possess each characters of two species of *Typha*.
- 4) The exterior and interior configurations of the pollen grains of *Typha latifolia* which was reported by the authors and offered from Canada were the same.

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About six species¹⁻⁴⁾ of the pollen grains were observed with the light microscope on Cattails (*Typha* sp.) and the electron microscopic examinations on the pollen walls were reported on four species.^{1,5)} As the authors obtained the pollen grains of *Typha latifolia*, *T. angustifolia* and *T. × glauca* (*T. latifolia* × *T. angustifolia*) from Canada, the comparative studies of them among the pollen grains of the Japanese species of *Typha* and the Chinese crude drug called "Puhuang" were carried out, and its results were reported here.

Experimental

Materials and Methods

Typha latifolia L. : East River Point, Lunenburg Co. Nova Scotia, June 7 1938.

Typha angustifolia L. : Port Burwell, Elgin Co. Ontario, June 24 1952.

Typha × glauca GODRON : Fox Point, Lunenburg Co. Nova Scotia, June 29 1949.

The pollen grains were soaked into 3% glutaraldehyde -0.05M sodium cacodylate buffer solution (pH 7.4) and 2~3 drops of 2~3% surfactant solution were added.

After fixing for three hours in the room temperature with shaking sometimes. They were washed three times for one hour by the buffer solution, and after dehydration with acetone series, they were set onto an aluminum stub with the capillaries. After drying, they were vacuum-coated with carbon and gold, then the exterior configurations were observed with the scanning electron microscope (JSM-S1). On the other hand, the pollen grains which were fixed in 3% glutaraldehyde were postfixed in 1% osmium tetroxide -0.05M sodium cacodylate buffer solution (pH 7.4) for three hours in the room temperature with shaking sometimes. After dehydration with acetone series, they were embedded into the mixed resin (Epon 812-Araldite 6005) and sectioned. The sections were doubly stained with uranyl acetate reagent and lead citrate reagent.⁶⁾ The interior configurations and the pollen walls were observed with the transmission electron microscope (JEM-100B). The pollen grains of *T. × glauca* were observed with the light microscope, too.

Exterior Configurations of the Pollen Grains

Typha latifolia : Its pollen grains were yellow tetrads and tetrad 7B^b types³⁾ (Fig. 1.). Its dimensions were P (Polar diameter) × E (Equatorial diameter) = 32.3 × 16.2 μm, ornamentations were subreticulum, muri-widths were 0.56 μm, lumina-numbers per square 3 μm on the sculpture were 11 and germinal aperture-diameters were 2.1 μm in average (Table I). Each member of tetrads was cohered with the bridge-like organisms, which were the developed tectums¹⁾ (Fig. 1.).

T. angustifolia : Its pollen grains were yellow monads and ulcerate 3A^a types (Fig. 2.). Its dimensions were P × E = 20.3 × 22.1 μm, ornamentations were subreticulum, muri-widths were 0.52 μm, lumina-numbers per square 3 μm on the sculpture were 12.2 and germinal aperture-diameters were 3.3 μm in average (Table I.).

T. × glauca : Yellow monads, dyads, triads and tetrads were found in one unit of specimen in its pollen grains (Fig. 3.). Monads were ulcerate 3A^a types and tetrads were tetrad 7B^b types. Dimensions were P × E = 19.6 × 22.2 μm in monads, 31.0 × 19.5 μm in dyads, 36.2 × 21.3 μm in triads, 32.2 × 19.5 μm in squared

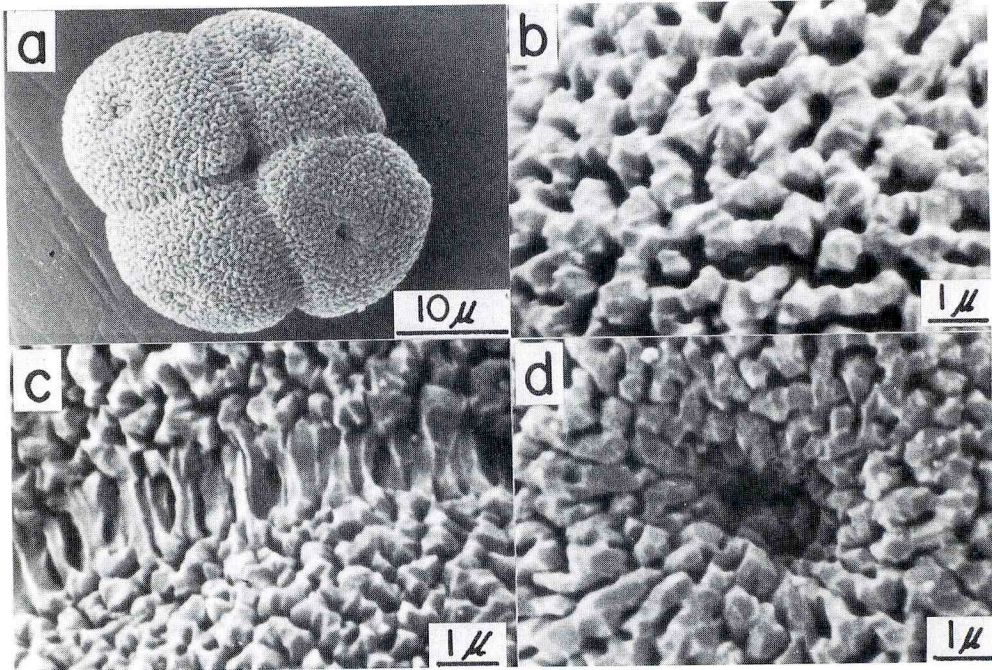


Fig. 1. Pollen Grain of *Typha latifolia*

a : whole view b : ornamentation c : cohered portion d : aperture

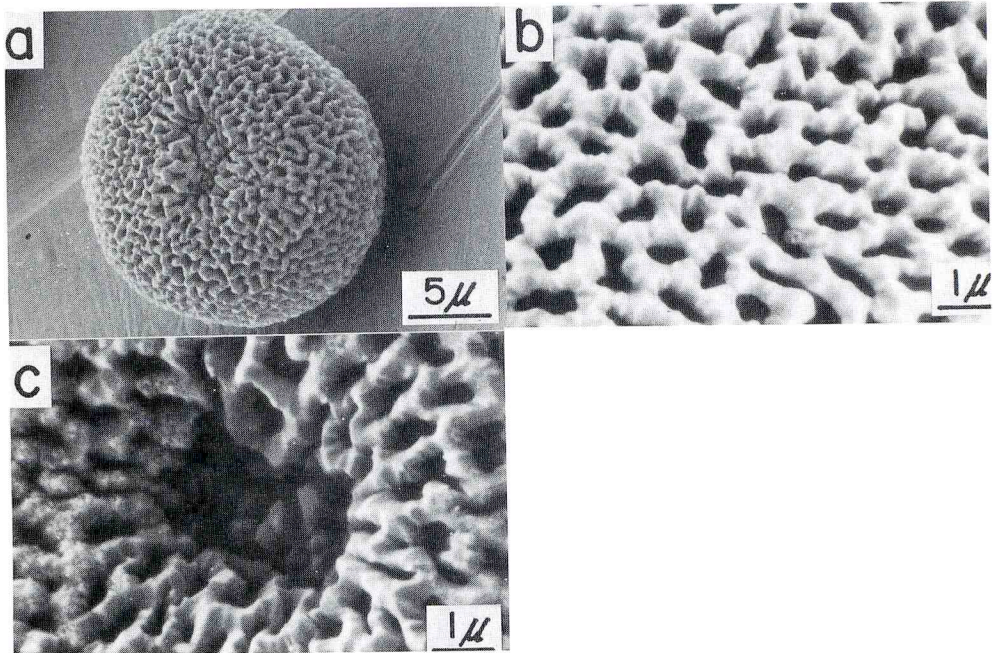


Fig. 2. Pollen Grain of *Typha angustifolia*

a : whole view b : ornamentation c : aperture

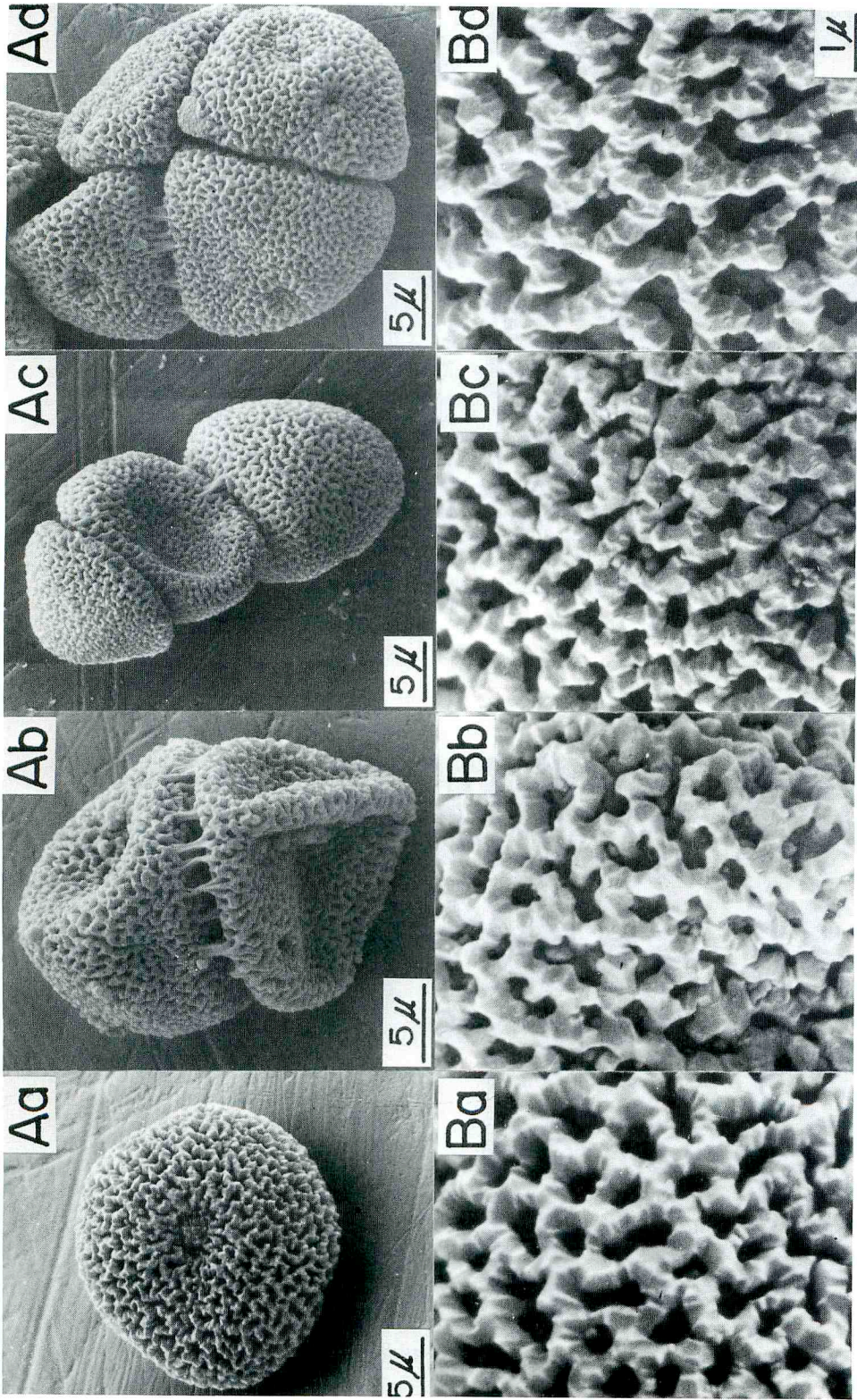


Fig. 3. Pollen Grains of *Typha* × *glauca*

A : whole view B : ornamentation

a : monad' b : dyads c : triads d : tetrads

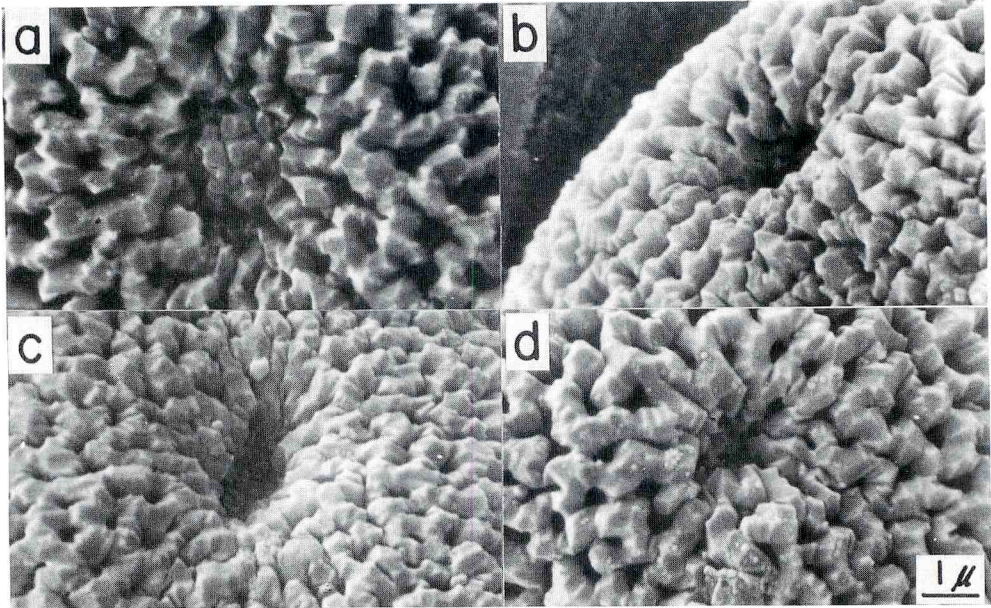


Fig. 4. Germinial Apertures of the Pollen Grains of *Typha*×*glauca*

a : monad b : dyads c : triads d : tetrads

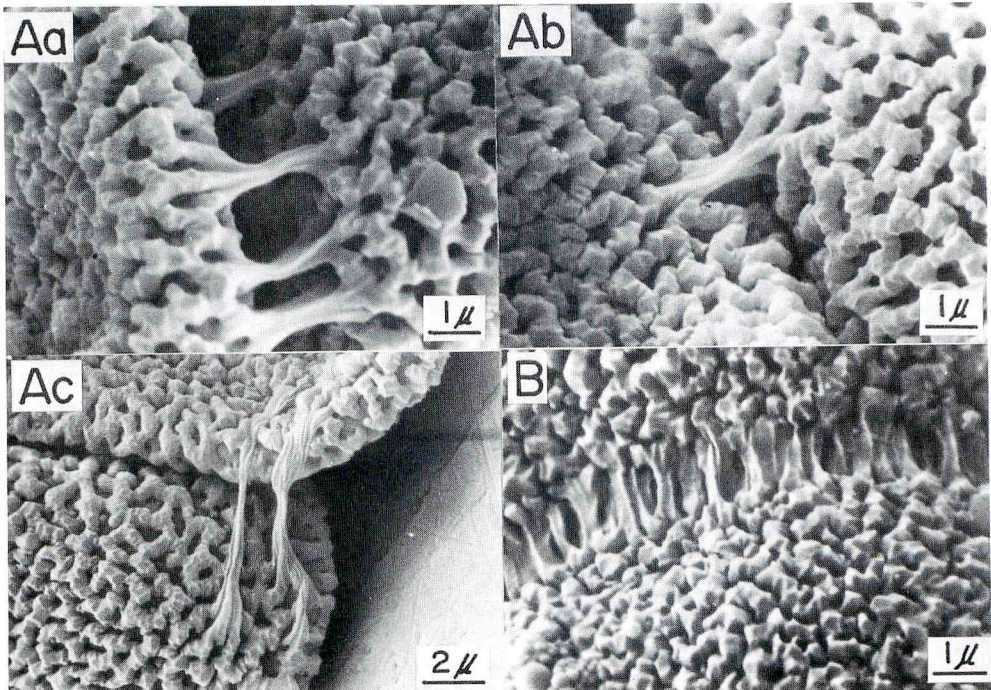


Fig. 5. Comparative Observations on Cohesion of the Pollen Grains of *Typha* spp.

A : *T.*×*glauca* B : *T. latifolia*

a : dyads b : triads c : tetrads

tetrads and $50.0 \times 19.4 \mu\text{m}$ in lineared tetrads. Ornamentations were similar subreticulum each other. Muri-widths were $0.47 \sim 0.57 \mu\text{m}$, lumina-numbers per square $3 \mu\text{m}$ were $10.4 \sim 13.6$ and germinal aperture-diameters were $1.9 \sim 2.2 \mu\text{m}$ (Fig. 4.) (Table I.). Though each member of dyads, triads and tetrads was cohered with such bridge-like tectums as that of *T. latifolia*, the numbers of the tectums were very few and their lengths were longer than those of *T. latifolia*. For examples, the lengths were $9 \mu\text{m}$ in lineared tetrads as against $1.0 \sim 1.2 \mu\text{m}$ in *T. latifolia* (Fig. 5.).

When the pollen grains of *T. x glauca* were observed with the light microscope, the items of four types of the pollen grains were monads : 1402 (97.2%), dyads : 19 (1.3%), triads : 8 (0.5%), squared tetrads : 13 (0.9%) and lineared tetrads : 1(0.1%) in total numbers or 1443.

Interior Configurations of the Pollen Grains

The pollen walls of three species of *Typha* were composed of ectexine (tectum, columella and foot-layer), endexine and intine (Fig. 6.). The numerical values on the pollen walls and the ridge-heights were indicated in Table II.

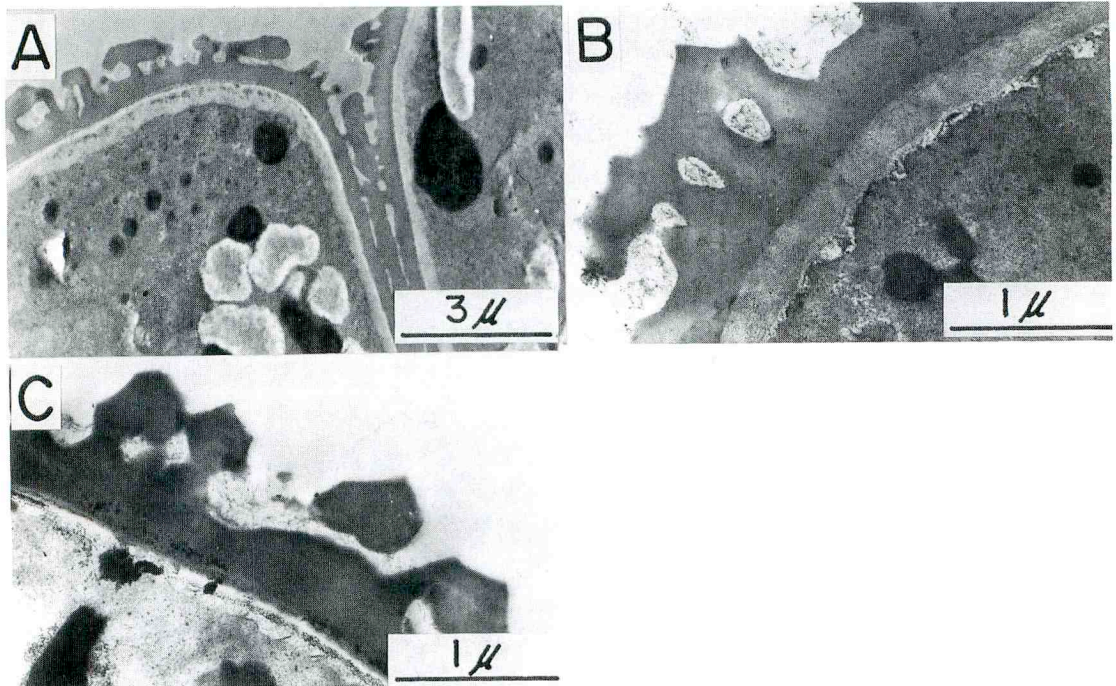


Fig. 6. Comparative Observations on the Pollen Walls of *Typha* spp.

A : *T. latifolia* B : *T. angustifolia* C : *T. x glauca*

Table I. Exterior Configurations of the Pollen Grains of *Typha* spp.

specimens	dimensions		dimensions		lumina-number /square $3\mu\text{m}$	muri-width	germinal aperture diameter
	P	E	per individual grain				
<i>T. latifolia</i>	32.3	16.2	16.8	16.2	7- 11.0 -14	0.56	1.9- 2.1 -2.3
<i>T. angustifolia</i>	20.3	22.1	—	—	9- 12.2 -17	0.52	2.9- 3.3 -4.0
<i>T. × glauca</i> monad	19.6	22.2	—	—	8- 10.4 -14	0.57	1.8- 2.0 -2.2
dyads	31.0	19.5	15.3	19.5	9- 11.0 -14	0.47	1.8- 1.9 -2.1
triads	36.2	21.3	11.5	21.3	11- 13.6 -17	0.49	2.0- 2.1 -2.2
squared tetrads	32.2	19.5	15.1	19.5	10- 13.2 -16	0.52	2.1- 2.2 -2.4
lineared tetrads	50.0	19.4	12.1	19.4	7- 10.4 -14	0.52	2.2

P : Polar diameter unit : μm

E : Equatorial diameter

Table II. Interior Configurations of the Pollen Grains of *Typha* spp.

specimens	tectum	columella	foot-layer	endexine	intine	ridge-height
<i>T. latifolia</i>	0.37	0.21	0.36	0.06	0.39	0.30
<i>T. angustifolia</i>	0.43	0.19	0.32	0.04	0.24	0.35
<i>T. × glauca</i>	0.41	0.31	0.28	0.05	0.28	0.32

unit : μm

Results and Discussion

The pollen walls of *Typha latifolia*, *T. angustata* and *T. orientalis* which were observed with the electron microscope and already reported¹⁾ by the authors, and the similar observations on *T. latifolia*, *T. angustifolia* and *T. × glauca* were reported now. Though the authors have observed the pollen walls of five species of *Typha*, it was difficult to discriminate them because their structures were very similar. But it was recognized to be able to discriminate the pollen grains observing the dimensions and germinal apertures with the electron microscope on the exterior configurations.

It can not be possible to be found the remarkable features by comparison among shapes, muri-widths, lumina-numbers per unit areas and pollen walls as indicated in Table I on the ornamentations of three

species of *Typha*.

Monads, dyads, triads and tetrads were found in one unit of specimen in the pollen grains of *T. × glauca* which was the hybrid between *T. latifolia* and *T. angustifolia*. The bridge-like tectums in the cohered portions of each member of dyads, triads and tetrads were less numbers and longer than those of *T. latifolia*, so they were not so strongly cohered as that of *T. latifolia*. The pollen grains of dyads, triads and tetrads were all abortive in shapes, and the major ones were monads (97.2%). The dimensions of monads agreed with those of *T. angustifolia* and its germinal aperture-diameters agreed with those of *T. latifolia*. It was recognized that the pollen grains of *T. × glauca* simultaneously have possessed each character of two species of *Typha*.

When measured the ridge-heights of the pollen grains of *T. latifolia*, *T. angustifolia* and *T. × glauca*, they were almost the same as indicated in Table II. Therefore the authors could not recognize the facts that the ridge-height was highest in *T. × glauca* and lowest in *T. latifolia* as reported by Dugle²⁾

The exterior and interior configurations of the pollen grains of *Typha latifolia* which was reported by the authors¹⁾ and offered from Canada were the same.

Once "Han Puhuang" which was one of the Puhuang of the Chinese origins was identified as *T. angustifolia* with the references⁴⁾ by the authors, but though its germinal aperture-diameters were agreed with those of *T. angustifolia* in Canada, its dimensions were not similar each other by the electron microscopic observation. So it was presumed that "Han Puhuang" was originated in another species of *Typha*.

Acknowledgement

The authors would like to thank Mr. I. J. Bassett and Dr. C. W. Crompton, Biosystematics Research Institute, Central Experimental Farm, Ottawa, Canada, for kindly offering materials for this study.

References

- 1) K. Taki, F. Yamazaki and M. Mizuno, Pharmacognostical Studies on the Market Articles "Hoo" at Hong Kong, *Japan. J. Pharmacog.*, **30**(1), 29-37 (1976).
- 2) J. R. Dugle and T. P. Copps, Pollen Characteristics of Manitoba Cattails, *Canadian Field Naturalist*, **86**(1), 33-40 (1972).
- 3) M. Ikuse, "Pollen Grains of Japan," Hirokawa Publishing Co., Tokyo, 1956, p. 38.
- 4) T. C. Huang, "Pollen Flora of Taiwan," National Taiwan University Botany Department Press, Taipei, 1972, p. 272.
- 5) J. J. Skvarla and D. A. Larson, Nature of Cohesion within Pollen Tetrads of *Typha latifolia*, *Science*, **140**, 173-175 (1963).
- 6) T. Sato, A Modified Method for Lead Staining of Thin Sections, *J. Electron Microscopy*, **17**(2), 158-159 (1968).

抄 録

カナダ産 *Typha* 属花粉を電子顕微鏡で検鏡し次のような結果を得た。

1) 3種の *Typha* sp. — *Typha latifolia*, *T. angustifolia* および *T. × glauca* — 花粉はその外形と発芽口径を比較することにより区別が可能である。しかし内部形態によって区別することは不可能である。

2) 花粉粒の彫紋についてはその形状、畝幅、単位面積あたりの網目数、花粉膜の厚さについて

Typha 属3種の間特に目立った特徴は見い出されなかった。

3) *T. × glauca* (*T. latifolia* × *T. angustifolia*) の花粉中には monad, dyads, triads および tetrads を認めるが、大部分(97.2%)は monad であり、この monad は *T. latifolia* と *T. angustifolia* の両方の形質をそなえていることがわかった。

4) 日本産 *T. latifolia* とカナダ産 *T. latifolia* の花粉粒は各々その外部形態、内部形態とも同一であった。

☆ 論文紹介勝田満江ら：日本列島の空中花粉(昭和52年)

著者は国立療養所南福岡病院小児科医長である。福岡大学医学部・樋口謙太郎教授の指導のもとに研究班をつくり、永年にわたって空中花粉の検索をして来た。花粉の同定は同病院の岩崎真由美らであり、資料提供者は北海道から沖縄までの病院などである。

最近、同病院院長・長野準編著により気管支喘息診療ハンドブック(金原出版 K.K. 昭和52年7月 ¥7,800)が出された。この書の第8章(pp. 316—345)には勝田が「花粉と喘息」を記している。その中で「原因抗原としての花粉」では木本植物、イネ科、草本植物、栽培植物と分けて説明している。例えばスギ花粉については北海道から九州までの花粉カレンダーを表示し、イネ花粉などでは椎内・柳井・熊本の三市における表がある。沖縄地区のサトウキビその他の花粉の年間グラフは興味ある型を示し、イチゴハウス内における花粉飛散状況も顕著なグラフを示してある。とくに日本列島の空中花粉の調査はこれまで試みられなかった雄大なスケールで、その実態を総合的に集大成した業績は高く評価したい。すなわち木本シーズン(スギ・マツ・ブナ・ニレ・カバノキ・イチヨウなど)、草本シーズン(イネ・イラクサ・カナムグラ・タデ・ブタクサ・ヨモギなど)の日本列島の花粉地図をはじめ、スギ科空中花粉地図、スギ科花粉前線、マツ科空中花粉地図、マツ科花粉前線、イチヨウ空中花粉地図、イチヨウ花粉前線、カナムグラ空中花粉地図、カナムグラ花粉前線、ヨモギ属空中花粉地図、ヨモギ属花粉前線、ブタクサ空中花粉地図、ブタクサ花粉前線、イラクサ属空中花粉地図、イラクサ属花粉前線、イネ科空中花粉地図、イネ科花粉前線などを図示している。調査地点の数としてブタクサ・イラクサなどは若干問題があるが、これを土台として立派な日本列島の空中花粉地図を完成されるように祈ってやまない。(上野実朗)

〔参考文献〕 樋口謙太郎・中川俊二・勝田満江：西日本地区における空中飛散花粉および花粉症の調査(第1報 花粉編)アレルギー(26)2、1977

☆ 第18回日本花粉学総会集会報告

日時 昭和52年10月16日(日曜日) 9:00~17:00

場所 東京都千代田区西神田1-8 日本大学9号館12階会議室

世話 守屋喜久夫(日本大学理工学部教授)

プログラム

9:00 受付開始(別室にて幹事会)

9:30 講演開始 (1)幾瀬マサ・佐橋紀男*・大山陽子(東邦大学薬学部): ミョウガの花粉形態と発芽の観察

10:00 (2)瀧 和子・山崎 太*・水野瑞夫(岐阜薬科大学): カナダ産 *Typha* sp. の花粉形態について

10:30 (3)小西茂毅*・横田博実・組谷美和子(静岡大学農学部): 花粉の生長におよぼすアルミニウムの影響

11:00 (4)渡辺光太郎*(京都市政短大)・原 彰・塚本康雄(名城大学農学部): ライムギ花粉のペクチナーゼと柱頭反応

11:30 (5)上野実朗(国立音楽大学): 第4回国際花粉学会議に参加して

12:00 昼 食

13:00 昭和52年度総会

13:30 (6)石崎 達(独協医科大学): 花粉症について

14:30 (7)空中花粉シンポジウム

(a)市河三次*(花粉研究会・京都)・川村智子*(東北大学理学部): 花粉の動態

(b)宇佐神 篤*・庄司光江(静岡済生会病院): 花粉症の補助的診断法としての表層土花粉検索

(c)勝田満江*・岩崎真由美(南福岡病院): 日本の空中花粉地図

(d)佐渡昌子*・間宮昌子・白石 彰・額田 繁(東邦大学薬学部): Volumetric 法による空中花粉の調査III

(e)幾瀬マサ・佐橋紀男・高城 優*(東邦大学薬学部): 千葉県における空中飛散花粉の季節的変動

(f)総合討論 (*印は発表者)

17:00 終 了

☆講演要旨は別に記す。