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Originals

Cytological Studies of Chinese Cyperaceae (1) Chromosome Counts of Nine Species Collected from Jilin, Liaoning and Hebei Provinces

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中国産カヤツリグサ科植物における細胞学的研究（1） 吉林，遼寧，河北省より採集した9種の染色体数

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Chromosome numbers are reported for 38 collections of nine species. Chromosome counts are reported for the first time for *Carex coriophora,* 2n = 56; *Carex pseudo-longerastrata,* 2n = 70; *Eleocharis valleculosa* form. *setosa,* 2n = 16; and *Scirpus tabernaemontani,* 2n = 42. Chromosome counts for *Carex pilosa* (2n = 42) and *Kobresia bellardii* (2n = 56) were different from previous reports for these species. The karyotype of *Eleocharis mamillata* var. *cycrocarpa* (2n = 16) was the same as that for Japanese plants, but two small satellite chromosomes were observed in Chinese plants. Chromosome numbers for 26 individuals of *Carex siderosticta* collected from four localities were 2n = 24. Tetraploid plants of *Carex siderosticta* may be widely distributed from Japan to Northwestern China.

Introduction

Cytological studies in the family Cyperaceae remain important to understand the evolution of this large and diverse family. Cyperaceae, with 4500 to 5000 species in 100 to 105 genera, are probably the seventh largest family of vascular plants (Goetghebeur 1987). However, the chromosome number of Chinese Cyperaceae was reported for only one species by Tang Yan-cheng and Xiang Qiu-yun (1989).

During a field survey in China in 1990, six genera, 26 species, and 94 individuals of

Cyperaceous plants were collected from Jilin, Liaoning, and Hebei Provinces. The object of this paper is to report the chromosome numbers of Chinese Cyperaceae plants collected from these Provinces in Northwestern China.

Materials and Methods

Table 1 gives localities and voucher specimens of the materials studied. The voucher specimens were deposited in the Herbarium of the Institute of Botany, Academia Sinica (PE).

Somatic chromosomes were observed in the meristematic cells of fresh root tips. The root tips were obtained from plants collected in the field and pretreated in 8mM 8-hydroxyquinoline for 5 to 8 hr. They were fixed in a 3:1 mixture of absolute ethanol and glacial acetic acid for one day. After fixation, the root tips were preserved in 70% ethanol, then stained by Feulgens nuclear reaction and macerated in a mixture of 1% pectinase and 1% cellulase for one hour at 30°C. After maceration, they were stained in 1% aceto-orcein for 5 to 10 minutes and then squashed.

Results and Discussion

Chromosome numbers of nine species in 39 individuals were determined, and observations of the morphology of somatic metaphase chromosomes are reported below.

Carex coriophora showed 2n=56 chromosomes (Fig. 1A), the first number determined for this species. Mitotic metaphase chromosomes varied in gradual length from 0.7 μm to 0.3 μm.

Although the chromosome number of *Carex pilosa* was reported to be 2n=64 by Okuno (1939), a new number, 2n=42, was observed in the one stock collected from Changbai Mt., Jilin Province (Fig. 1B). Mitotic metaphase chromosomes varied in gradual length from 1.4 μm to 0.7 μm.

Carex pseudo-longerostrata showed 2n=70 chromosomes (Fig. 1C), the first number to be determined for this species. Mitotic metaphase

Table 1. Voucher specimens collected from Jilin, Liaoning, and Hebei Provinces in Northwestern China.

Carex coriophora Fish. et Mey. ex Kunth. Jilin Province, Yanbianchaoxiangzu Zizhizhou, Changbai Mt. 2050 m alt., upper slope. *2989.*

C. pilosa Scop. Jilin Province, Yanbianchaoxiangzu Zizhizhou, Toudaobaihe. 800 m alt., the edge of *Acer-Tilia-Ulmus* forest. *3005.*

C. pseudo-longerostrata Y.L. Chang et Y.L. Yang Jilin Province, Yanbianchaoxiangzu Zizhizhou, Changbai Mt. 2050 m alt., upper slope. *2988.*

C. siderosticta Hance Jilin Province, Yanbianchaoxiangzu Zizhizhou, Toudaobaihe. 800 m alt., the edge of *Acer-Tilia-Ulmus* forest. *2970, 2973.* Hebei Province, Xinglong County, Wuling Mt. 1160 m alt., roadside. *3064–3065, 3067–3070.* Liaoning Province, Baihua Mt. edge of *Betula-Quercus-Populus* forest. 1200 m alt. *3079–3082;* 1400 m alt. *3084*; 1580 m alt. *3086–3090*; 1700m alt. *3091–3093*; 1800 m alt. *3094–3096*; 1820 m alt., upper open slope *3098–3099.*

Eleocharis mamillata Lindb. var. *cycrocarpa* Kitagawa Liaoning Province Benxi City, Huanren County, near Laotudingzi Peak. 62 m alt., roadside. *2967.*

E. valleculosa Ohwi f. *setosa* (Ohwi) Kitagawa Jilin Province, Yanbianchaoxiangzu Zizhizhou, Changbai Mt. 830 m alt., edge of pond. *3000.* Liaoning Province, Dalian City, near Wafangdian City. 110 m alt., river side. *3013.*

Kobresia bellardii (All.) Degl. Jilin Province, Yanbianchaoxiangzu Zizhizhou, Changbai Mt. 2050 m alt., upper slope. *2982.*

Scirpus sylvaticus Linn. var. *maximowiczii* Rgl. Jilin Province, Yanbianchaoxiangzu Zizhizhou, Changbai Mt. 830 m alt., edge of pond. *3001.*

S. tabernaemontani Gmel. Liaoning Province, Benxi city, Huanren County, near Laotudingzi Peak. 62 m alt., roadside. *2968.* Jilin Province, Yanbianchaoxiangzu Zizhizhou, Changbai Mt. 830 m alt., edge of pond. *3002.*

S. triqueter Linn. Liaoning Province, Benxi City, near water cave. 290 m alt., roadside. *2965.* Liaoning Province, Xingcheng City, near Suizhong County. 100 m alt., edge of pond. *3016.* Liaoning Province, Qiangzilu. 340 m alt., river side. *3076.*

chromosomes varied in gradual length from 1.0 μm to 0.2 μm.

Twenty six individuals of *Carex sidersticta* showed 2n = 24 chromosomes, confirming the previous report of 2n = 24 by Tanaka (1940). Mitotic metaphase chromosomes varied in gradual length from 2.4 μm to 1.3 μm (Fig. 1D).

One stock of *Eleocharis mamillata* var. *cycrocarpa* showed 2n = 16 chromosomes, confirming the previous reports of 2n = 16 by Hoshino (1987). The 1st to 4th metaphase chromosomes ranged from 5.0 μm to 4.5 μm in length (Fig. 1E) and were regarded as large chromosomes (L). The 5th to 16th chromosomes ranged from 3.2 μm to 2.5 μm in length and were regarded as small chromosomes (S). Two of the small chromosomes

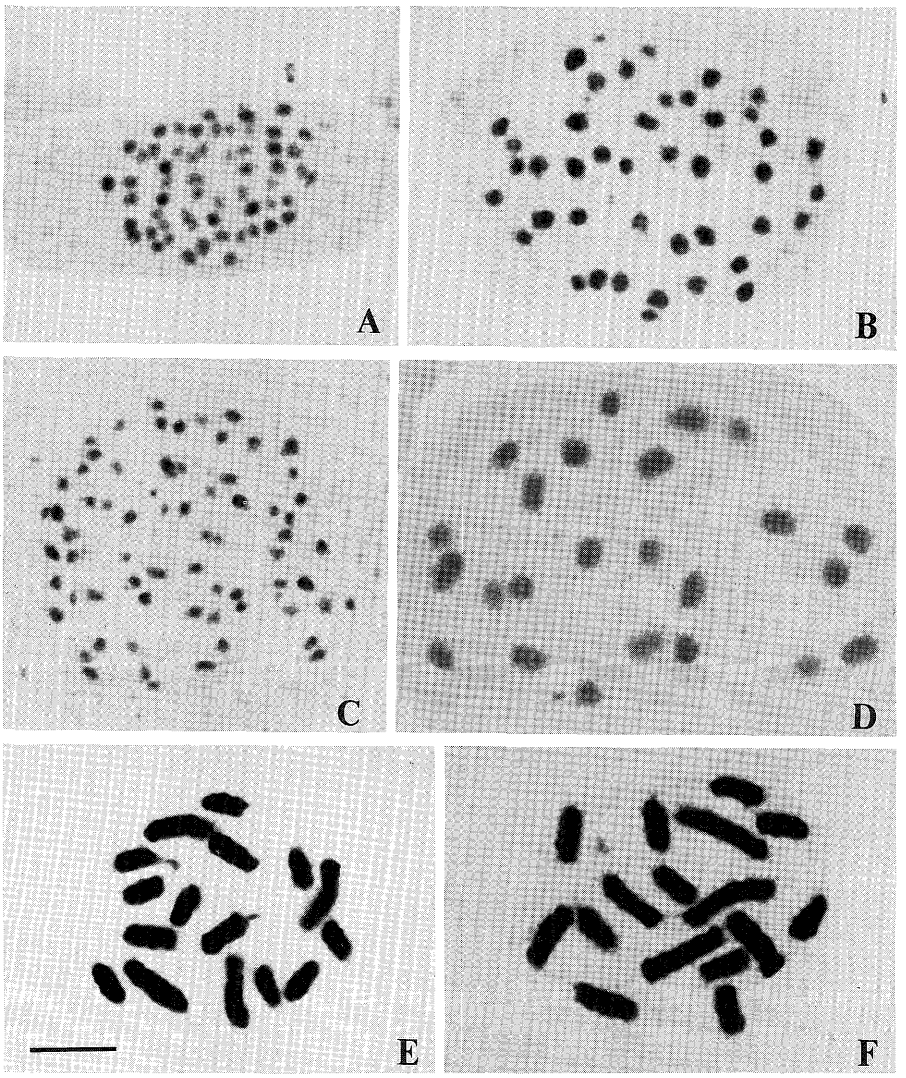

Fig. 1. Mitotic metaphase chromosomes of six species of *Carex* and *Eleocharis*. A. *Carex coriophora* (2n = 56). B. *Carex pilosa* (2n = 42). C. *Carex pseudo-longerostrata* (2n = 70). D. *Carex sidersticta* (2n = 24). E. *Eleocharis mamillata* var. *cycrocarpa* (2n = 16). F. *Eleocharis valleculosa* f. *setosa* (2n = 16). Bar indicates 5 μm.

possessed satellites. The karyotype formula of the mitotic metaphase chromosomes was 2n=16=4L+12S.

Eleocharis valleculosa form. *setosa* showed 2n=16 chromosomes (Fig. 1F), the first number to be determined for this species. The 1st to 4th metaphase chromosomes range from 6.0 μm to 5.0 μm in length and were regarded as L. The 5th to 16th metaphase chromosomes ranged from 4.3 μm to 3.0 μm in length and were regarded as S. The karyotype of the mitotic metaphase chromosomes was 2n=16=4L+12S, the same as for *Eleocharis mamillata* var. *cycrocarpa*.

Although the chromosome number of *Kobresia bellardii* was reported to be 2n=52 by Böcher (1938), a new number, 2n=56, was observed in the one stock collected from Changbai Mt., Jilin Province (Fig. 2A). Mitotic metaphase chromosomes varied in gradual length from 1.4 μm to 0.2 μm.

Scirpus tabernaemontani showed 2n=42 chromosomes (Fig. 2B), the first number to be determined for this species. Mitotic metaphase chromosomes varied in gradual length from 1.3 μm to 1.0 μm.

One stock of *Scirpus triqueter* showed 2n=42 chromosomes, confirming the previous report of 2n=42 by Otzen (1962). Another stock collected from Qiangzilu, Beijing City in Liaoning Province had 2n=41 chromosomes, a new number. The 42 metaphase chromosomes varied in gradual length from 1.4 μm to 1.0 μm (Fig. 2D). The 41 metaphase chromosomes varied in gradual length from 1.3 μm to 0.7 μm (Fig. 2C).

The following seven species showed Sino-Japanese distribution: *Carex pilosa, Carex sidero-*

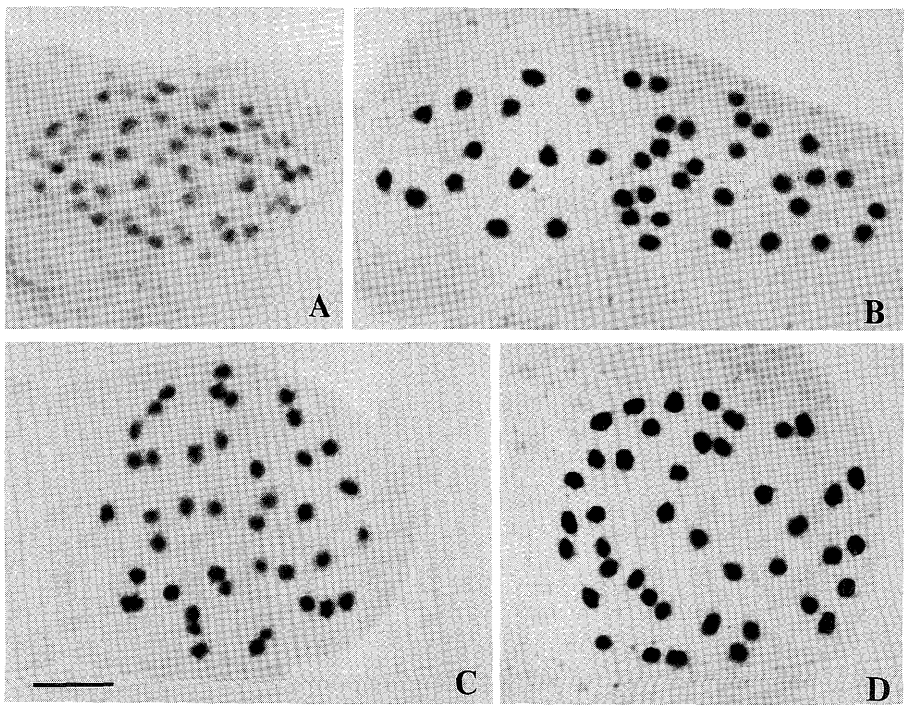

Fig. 2. Mitotic metaphase chromosomes of three species of *Kobresia* and *Scirpus*. A. *Kobresia bellardii* (2n=56). B. *Scirpus tabernaemontani* (2n=42). C. *Scirpus triqueter* (2n=41). D. *Scirpus triqueter* (2n=42). Bar indicates 5 μm.

sticta, Eleocharis mamillata var. *cycrocarpa, Eleocharis valleculsa* form. *setosa, Kobresia bellardii, Scirpus tabernaemontani, Scirpus triqueter.* Chromosome numbers of *Carex pilosa, Kobresia bellardii* and *Scirpus triqueter* were different from those previously reported. These three species may have intraspecific aneuploids which are common in Cyperaceae plants. The karyotype of *Eleocharis mamillata* var. *cycrocarpa* was the same as for the Japanese plants reported by Hoshino (1987), except for two satellite chromosomes. *Carex siderosticta* is a typical element of the Sino-Japanese Forest Flora, and is distributed in Japan, Korea, Ussuri, and East China. Intraspecific polyploids (2n = 12 and 24) were reported in Japanese *Carex siderosticta* (Tanaka 1940, Hoshino and Tanaka 1977). Y. C. Tang and Q. Y. Xiang (1989) observed 2n = 24 and mixoploid chromosome number in this species collected from Zhejiang and Liaoning Provinces. In this study, all plants collected from three populations of China were tetraploids (2n = 24). Aneuploids were not found. In Baihua Mt., Liaoning Province, 18 individuals collected from six populations grown at different altitudes were also tetraploids. These facts indicate that tetraploid plants of *Carex siderosticta* are widely distributed in East Asia.

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要 旨

中国，吉林，遼寧，河北省より採集したカヤツリグサ科植物 9 種 38 株について染色体数の算定を行い，次の 4 種で初めて染色体数を明らかにした．*Carex coriophora* (2n＝56), *Carex pseudolongerastrata* (2 n ＝ 70), *Eleocharis valleculosa* form. *setosa* (2n＝16), *Scirpus tabernaemontani* (2 n＝42). *Carex pilosa* では 2n＝42 を観察し従来の報告 2n＝64 (Okuno 1939) とは異なっていた．また *Kobresia bellardii* では 2n＝56 を観察し，従来の報告 2n＝52 (Bocher 1938) とは異なった染色体数が観察された．*Eleocharis mamillata* var. *cycrocarpa* は染色体数が 2n＝16 であり，大型の染色体 4 本，小型の染色体 12 本が観察され日本産のものと同様な核型を持っていたが，中国産のものは 2 本の小型の染色体に付随体が見られた．*Carex siderosticta* は 4 場所産 26 株ですべて 2n＝24 であり，本種の 4 倍体は日本から中国の東北地方に広く分布していると考えられる．