Bot. Bull. Academia Sinica **19**: 53-66 (1978)

CHROMOSOME NUMBERS IN TAIWAN COMPOSITAE[1]

CHING-I PENG[2] and CHIEN-CHANG HSU

Department of Botany, National Taiwan University,
Taipei, Taiwan, Republic of China

(Received November 19, 1977; Accepted November 30, 1977)

Abstract

Somatic chromosome counts for 76 taxa representing 47 genera are reported for Taiwan Compositae. First counts are reported for 1 genus (*Crossostephium*), 19 species, and 6 infraspecific taxa. Additional counts for those previously reported are made for 52 taxa, of which 13 are new numbers.

Introduction

A total of 74 genera, 178 species and 42 infraspecific taxa belonging to 11 tribes are recognized in the Compositae of Taiwan (Peng, 1976). To date, there have only been three chromosome reports (Chuang *et al.*, 1962; Hsu, 1967, 1970) on this well-represented family; all contain lists of chromosome numbers only, and two of them (Chuang *et al.*, 1962; Hsu, 1967) appeared along with many other families. A rapid glance over these references indicates not only that many species remain uncounted, but also that many taxa are known only from a single plant of a population.

This paper attempts, therefore, to report as many as possible of the new chromosome counts of the Taiwan Compositae, plus additional populational chromosome counts for taxa documented previously—with the hope that a better understanding of the evolutionary relationships among plants may be achieved.

Materials and Methods

The chromosome studies were made on root tips. Unless otherwise indicated, all the plant materials used in this study were collected by the writers on various field excursions between Augst 1974 and June 1976.

(1) This is a part of an M.S. thesis submitted by the senior author to the Faculty of the Research Institute of Botany, National Taiwan University, in partial fulfillment of the requirements for the degree of Master of Science (1976).

(2) Present address: Institute of Botany, Academia Sinica, Nankang, Taipei, Taiwan, Republic of China.

Root tips were pretreated in 0.5% colchicine for 0.5 to 2 hr, fixed in a solvent of acetic acid—95% ethanol (1:3, V/V) overnight, stained in lacto-propionic orcein or acetocarmine solution for 12 to 36 hr, treated with 2% pectinase at 30°C for 2 to 4 hr, and squashed. Chromosomes were examined with the aid of the microscope, and microphotographs were taken.

All the plants used in this study were identified by the senior author. Voucher sheets are deposited in the Herbarium of the Department of Botany, National Taiwan University (TAI).

Results and Discussion

Included in Table 1 are the taxa examined, along with the somatic chromosome count, figure number, location and voucher. The footnote[3] appearing in Table 1 indicates that the taxon has not previously been reported; while the footnote[4] signifies that the count differs from any previously published for the same taxon. Microphotogrphs are given in Figs. 1–14.

Table 1. *Chromosome counts in Taiwan* ***Compositae***

Taxon	Somatic chromosome numbers	Fig.	Location & Voucher
I. VERNONIEAE			
Elephantopus			
mollis H.B.K.	22		Taitung: Sanhsientai, *Peng 2653.*
scaber L.	22		Taipei: Pitouchiao, *Peng 2135.*
Pseudoelephantopus			
spicatus (Juss. ex Aubl.) Gleason	22		Taitung: Sanhsientai, *Peng 2647.*
Vernonia sp.	18		Pingtung: Chialoshui, *Peng 2690.*
II. EUPATORIEAE			
Eupatorium			
formosanum Hay. var. *quasitripartitum* (Hay.) Kitam.[5]	20		Taipei: Tatunshan, *Peng 2351.*
shimadai Kitam.	20		Taipei: Tatunshan, *Peng 2369.*
tashiroi Hay.[3]	20		Pingtung: Chialoshui, *Hsu & Peng 16573.*
III. ASTEREAE			
Aster			
subulatus Michx.	18		Taipei: N.T.U. campus, *Peng 2668.*
takasagomontanus Sasaki[3]	18	1	Ilan: Nanhutashan, *Peng 2477.*

Table 1. (*Continued*)

Taxon	Somatic chromosome numbers	Fig.	Location & Voucher
Aster	36		Taoyuan: Lalashan, *Peng 1063.*
trinervius D. Don subsp. *ageratoides* (Turcz.) Grierson[3]			
Conyza			
japonica (Thunb.) Less.	18		Taipei: Shihting, *Peng 2675.*
Dichrocephala			
integrifolia (L. f.) O. Ktze.	18		Taipei: N.T.U. Farm, *Peng 2665.*
Erigeron			
annus (L.) Pers.	27		Ilan: Paling, *Peng 1385.*
morrisonensis Hay.[3]	18		Ilan: Nanhutashan, *Peng 2475.*
sumatrensis Retz.	54		Taipei: N.T.U. campus, *Peng 2578.*
Grangea			
maderaspatana (L.) Poir.	18		Nantou: Lienhuachih, *Liu 1769.*
Heteropappus			
oldhamii (Hemsl.) Kitam.[3]	36		Taipei: Padoutze, *Peng 1586.*
oldhamii (Hemsl.) Kitam. forma *discoideus* Kitam.[3]	36		Taipei: Hopingdau, *Peng 1235.*
Kalimeris			
indica (L.) Sch.-Bip.	54		Miaoli: Toufenn, *Peng 469.*
Myriactis			
humilis Merr.	36[4]		Hualien: Tayüling, *Peng 725.*
Rhynchospermum			
verticillatum Reinw.	18		Ilan: Nanhutashan, *Peng 2389.*
Solidago			
altissima L.	54		Taipei: Liherlii, *Peng 2588.*
IV. INULEAE			
Anaphalis			
margaritacea (L.) Benth. et Hook. f. subsp. *morrisonicola* (Hay.) Kitam.	28		Hualien: Hohuanshan, *Peng 740.*
Blumea			
aromatica DC.[3]	18		Hualien: Lintienshan, *Peng 2610.*
balsamifera (L.) DC. var. *microcephala* Kitam.	18[4]		Pingtung: Santimen, *Hsu & Peng 16647.*
hieraciifolia (D. Don) DC.[3]	48		Taipei: Pitouchiao, *Peng 2129.*
lacera (Burm. f.) DC.	36[4]		Hualien: Tailuko, *Peng 2661.*
laciniata (Roxb.) DC.	18[4]		Taipei: Liuchangli, *Peng 2455.*
lanceolaria (Roxb.) Druce[3]	18		Hualien: Lintienshan, *Peng 2604.*

Table 1. (*Continued*)

Taxon	Somatic chromosome numbers	Fig.	Location & Voucher
Blumea			
riparia (Bl.) DC. var. *megacephala* Randeria[8]	16	2	Hualien: Lintienshan, *Peng 2608.*
sp.	30[4]	3	Pingtung: Santimen, *Hsu & Peng 16645.*
Gnaphalium			
japnicum Thunb.	28		Taipei: N.T.U. campus, *Peng 2670.*
purpureum L.	28		Taipei: N.T.U. campus, *Peng 2580.*
Pluchea			
indica (L.) Less.	20		Pingtung: Ssuchungchi, *Hsu & Peng 16638.*
V. HELIANTHEAE			
Bidens			
bipinnata L.	72		Pingtung: Santimen, *Hsu & Peng 16663.*
Galingsoga			
parviflora Cav.	16		Taipei: N. T.U. campus, *Peng 2669.*
Glossogyne			
tenuifolia Cass.[8]	24	4	Penghu: Huchi, *Peng 1943.*
Sigesbeckia			
orientalis L.	30		Nantou: Wusheh, *Peng 2307.*
Synedrella			
nodiflora (L.) Gaertn.	40		Ilan: Chiaochi, *Peng 2377.*
Wedelia			
prostrata (Hook. & Arn.) Hemsl.	30		Penghu: Huchi, *Peng1890.*
VI. HELENIEAE			
Gaillardia			
pulchella Fouger.	34		Penghu: Huchi, *Peng 1869.*
VII. ANTHEMIDEAE			
Artemisia			
capillaris Thunb.	36[4]		Pingtung: Chialoshui, *Hsu & Peng 16588.*
oligocarpa Hay.[8]	18		Ilan: Nanhutashan, *Peng 2455.*
Centipeda			
minima (L.) A. Br. & Asch.	20		Taipei: N.T.U. Farm, *Peng 2681.*
Chrysanthemum			
arisanense Hay.[8]	18	5	Kaohsiong: Tienchih, *Hsu & Peng 15818.*
Crossostephium			
chinense (L.) Makino[3]	18	6	Taipei: N.T.U. campus, *Peng 2561.*

Table 1. (*Continued*)

Taxon	Somatic chromosome numbers	Fig.	Location & Voucher
VIII. SENECIONEAE			
Emilia			
sagittata (Vahl.) DC.	20[4]		Pingtung: Santimen, *Hsu & Peng 16651.*
Farfugium			
japonicum (L. f.) Kitam. var. *formosanum* (Hay.) Kitam.	60		Taipei: Chihsingshan, *Peng 2563.*
Gynura			
bicolor (Willd.) DC.[3]	20		Taipei: N.T.U. campus, *Peng 2586.*
formosana Kitam.	20		Hualien: Fongbin, *Peng 2628.*
japonica (Thunb.) Juel var. *flava* (Hay.) Kitam.[3]	20	7	Taipei: Tatunshan, *Peng 2386.*
Ligularia			
japonica (Thunb.) Less.	60		Taipei: Huangtsueishan, *Peng 2510.*
Petasites			
formosanus Kitam.[3]	60		Ilan: Nanshan, *Peng 2445.*
Senecio			
scandens Buch.-Ham. ex D. Don	20	8	Ilan: Nanshan, *Peng 2438.*
IX. CARDUEAE			
Cirsium			
albescens Kitam.[3]	34		Pingtung: Chialoshui, *Hsu & Peng 16603.*
arisanense Kitam.[3]	34		Ilan: Nanhutashan, *Peng 2448.*
morii Hay.[3]	34		Ilan: Nanshan, *Peng 2441.*
Hemistepta			
lyrata (Bunge) Bunge	36		Taoyuan: Yangmei, *Peng 2688.*
Saussurea			
japonica (Thunb.) DC.	28[4]		Hualien: Tailuko, *Peng 2659.*
X. MUTISIEAE			
Ainsliaea			
latifolia (D. Don) Sch.-Bip.	24[4]		Ilan: Nanhutashan, *Peng 2391.*
XI. LACTUCEAE			
Crepidiastrum			
lanceolatum (Houtt.) Nakai	10	9	Taipei: Pitouchiao, *Peng 2132.*
taiwanianum Nakai[3]	10	10	Pingtung: Kuluanpi, *Kuoh s.n.* July 8, 1975.

Table 1. (*Continued*)

Taxon	Somatic chromosome numbers	Fig.	Location & Voucher
Hypochoeris			
radicata L.	8		Nantou: Mayfeng, *Peng 2236.*
Ixeris			
chinensis (Thunb.) Nakai	16(4)		Taipei: N.T.U. Farm, *Peng 2574.*
chinensis (Thunb.) Nakai forma *lacerrima* (Hay.) Yamam.(3)	16		Taipei: N.T.U. campus, *Peng 2691.*
laevigata (Bl.) Sch.-Bip. ex Maxim.	14	11	Taoyuan: Lalashan, *Peng 1055.*
Lactuca			
formosana Maxim.	18		Taipei: Liuchangli, *Peng 2557.*
indica L.	18		Pingtung: Chialoshui, *Hsu & Peng 16589.*
sororia Miq.	18(4)	12	Taipei: Shihting, *Peng 1435.*
Lapsana			
takasei (Sasaki) Kitam.(3)	16		Ilan: Nanhutashan, *Peng 2446.*
Picris			
hieracioides L. subsp. *morrisonensis* (Hay.) Kitam.	10(4)		Hualien: Hohuanshan, *Peng 739.*
hieracioides L. subsp. *ohwiana* (Kitam.) Kitam.	10(4)	13	Ilan: Nanhutashan, *Peng 2457.*
Sonchus			
arvensis L.	18		Pingtung: Santimen, *Hsu & Peng 16646.*
oleraceus L.	32		Taipei: N.T.U. campus, *Peng 2583.*
Taraxacum			
formosanum Kitam.(3)	16	14	Taipei: Shihmen, *Peng 851.*
officinale Weber	24		Taipei: City, *Peng 2576.*

(3) The taxon whose chromosome number has not previously been counted.
(4) The chromosome number which differs from any previous report for the same taxon.

Because many of the counts presented here corroborate previous reports, comments will be made only when items in Table 1 that call for elaboration, and/or when information regarding taxonomic or evolutionary significance may be provided.

The sequence of comments, as well as the sequence used in Table 1 and Figs. 1–14 follows that of the tribes in the classification made by Bentham and Hooker (1873). The genera within each tribe and the species within each genus are, however, listed alphabetically.

Tribe I. Vernonieae

Vernonia is a large genus comprising about 1,000 species, chiefly distributed

in America, Africa, and tropical Asia. The New World species examined have the basic chromosome number of 17 or, in some cases, 16; for four African species basic number of X=10 has been reported (Jones, 1970).

Of the five species of *Vernonia* present in Taiwan, chromosome numbers of *V. cinerea* (n=9: Hsu, 1967, 1970) and *V. patula* (n=9: Turner in King, 1965) have previously been reported. A very dwarf plant of *Vernonia,* whose specific epithet cannot be idetified without further investigation(5), was counted by the present authors as having $2n$=18.

Tribe II. Eupatorieae

Grant (1953) made a cytotaxonomic study on American *Eupatorium* and concluded that 10 and 17 are the two basic numbers of the genus. Moreover, polyploidy has played a major role in the formation of species in *Eupatorium.* The present examination of three *Eupatorium* species based on Taiwan materials shows that they are all diploid with the basic number of X=10.

The count of $2n$=20 for *Eupatorium formosanum* var. *quasitripartitum* differs from the tetraploid report (n=20) made by Hsu (1970) for the species.

Hsu (1970) reported n=20 and n=10 for *E. chinense* var. *simplicifolium.* After an examination of the voucher specimens, the authors found that the counts were based on *E. shimadai.* Thus the present count of $2n$=20 for *E. shimadai* confirms the meiotic determination made by Hsu (1970).

Tribe III. Astereae

There is now a fairly good understanding of chromosome numbers in the tribe Astereae. Species and genera with a basic number of X=9 are the most abundant (Raven *et al.*, 1960; Solbrig *et al.*, 1964; Solbrig *et al.*, 1969).

The count of $2n$=18 for *Aster subulatus* agrees with most previous reports. However, n=5 was counted by Turner *et al.* (1961).

Dichrocephala is a small genus, comprised of about 5 species in South Asia and Africa (Kitamura, 1965). The present count of $2n$=18 for *D. integrifolia* agrees with all previous reports except that of n=6 proposed by Hsu (1967).

The number of $2n$=18 for *Erigeron morrisonensis* corroborates a previous finding by Hsu (1970), who observed n=9 for *E. fukuyamae,* a plant intimately related to the former species.

(5) It is a few-headed plant of about 5 cm in lengh, collected from a cliff of southernmost Taiwan. Its achenes had been sown in the experiment garden. One offspring thus obtained grew very well and flowered under exposed situations. It was even more of a dwarf than its parent, however, its heads and achenes have a close affinity to those of *V. cinerea.*

Hexaploid count of $2n=54$ for *E. sumatrensis* confirms all previous reports except the tetraploid count of $n=18$ presented by Hsu (1967).

Myriactis is a small genus of South Asian and Japan distribution (Kitamura, 1965). The present count of $2n=36$ for *M. humilis* disagrees with the numbers $n=13$ and $n=26$ proposed by Hsu (1970), which seem to be deviating from the basic number of X=9 established for the tribe Astereae. However, $2n=36$ was also reported for two other Indian *Myriactis* species (*M. nepalensis* and *M. wallichi*) by Mehra *et al.* (1965).

Tribe IV. Inuleae

Gametic chromosome numbers of 5, 7, 8, 9, 10, 11, and 13 are known in the tribe. Many genera are based on 5 and 7, but the tribe is not so well known as many of the others in the family (Solbrig, 1963).

Hsu (1970) reported $n=14$ for *Anaphalis contorta* Hook. f., a name which has long been used for *A. margaritacea* subsp. *morrisonicola* (Hay.) Kitam. Thus the present count of $2n=28$ for the latter subspecies corresponds with Hsu's report.

Blumea is a tropical and subtropical genus of about 49 species (Randeria, 1960). In Taiwan, 12 species of *Blumea* were recognized (Peng, 1976). Chromosome numbers in 8 of the 12 taxa are here reported; they represent either first or new counts. It was observed that the genus has a distinct karyotype characterized by having one to several pairs of long chromosomes among the predominantly short ones in its complement.

Blumea balsamifera var. *microcephala* was counted as having $n=10$ by Chuang *et al.* (1962) and Hsu (1970). In the Philippines, Pancho (1973) reported a somatic chromosome count of $2n=20$ for the species. The present count of $2n=18$ for the plant material from southernmost Taiwan differs from all previous reports.

Several different chromosome counts, $n=9$ (Subramanyam and Kamble, 1966), $n=10$ (Hsu, 1970), $n=11$ (Mehra *et al.*, 1965) were reported for *B. lacera*. The present study reveals an additional tetraploid count of $2n=36$.

B. laciniata was reported as having $2n=20$ (Pancho, 1973), $n=11$ (Mehra and Remanandan, 1969). Somatic chromosome count of $2n=18$ in the present study is a new number.

The count of $2n=18$ for *B. lanceolaria* is a first report, however, Pancho (1973) reported $2n=20$ for *B. lanceolaria* var. *spectabilis*.

The count of $2n=16$ (Fig. 2) for *B. riparia* var. *megacephala* does not agree with the only previous determination of $2n=20$ (Pancho, 1973) for the species.

One *Blumea* species collected in its vegetative state from southernmost Taiwan has revealed $2n=30$ (Fig. 3). The count of this probable triploid (based on X=10) represents a new polyploid level for the genus. Vegetatively this plant is similar to *B. membranacea,* which was counted as having $n=11$ by Mehra *et al.* (1965) and Mehra and Remanandan (1969). The present authors cannot be sure whether this is a new count for *B. membranacea* or that of some other *Blumea* taxon until its reproductive parts can be collected and examined.

Judging from the fact that in *Blumea,* X=8, 9, 10, 11 are observed and polyploids are met in several cases, aneuploidy and polyploidy must play important roles in the speciation of this genus. However, more cytological examinations are needed to give a clearer picture of the chromosomal evolution in this group of plants.

Tribe V. Heliantheae

The basic chromosome number of *Bidens* has since Darlington and Wylie (1955) been proposed as X=12. In the present study, the hexaploid chromosome count of $2n=72$ for *B. bipinnata* accords with that advanced by Mangaly *et al.* (1967). The count of $n=12$ was, however, reported by Hsu (1970) for the same taxon.

Glossogyne is a small genus comprised of about six species in tropical Asia and Australia (Kitamura, 1965). Only one species, *G. bidens,* had previously been studied cytologically ($n=12$: Shetty, 1967). The number of $2n=24$ for *G. tenuifolia* is a first count which corresponds with Shetty's report for the same genus.

The number of $2n=30$ for *Sigesbeckia orientalis* agrees with all previous reports except for $2n=20$ (Hsu, 1967), $n=12$ (Subramanyam and Kamble, 1967), and $2n=60$ (Mehra *et al.,* 1965).

Tribe VII. Anthemideae

Basic chromosome numbers of X=8, 9, 10, and 17 have been reported for this tribe, with the majority of the species and genera having X=9 (Solbrig, 1963).

The number of $2n=36$ represents a new tetraploid count for *Artemisia capillaris.* Counts previously reported were all based on diploid level of $2n=18$.

In *Centipeda minima,* the count of $2n=20$ is consistent with all previous reports except $2n=18$ reported by Ishikawa (1916).

Crossostephium, a monotypic genus distributed in East Asia, was segregated from *Artemisia* chiefly by the presence of its connate scale-like pappus on the

achenes. Chromosome number of $2n=18$ (Fig. 6) in *C. chinense* is a first report for the genus.

Tribe VIII. Senecioneae

The ancestral basic number for the tribe has since Afzelius (1949) been postulated as X=5. Recently, however, Ornduff *et al.* (1963, 1967) proposed a more likely basic number of X=10 for Senecioneae, and considered the apparent X=5 of *Emilia*, a small genus related to *Senecio*, as being derived through aneuploid reduction.

Diploid counts of $n=5$ were reported by Turner and Irwin (1960) based on *E. coccinea*, which is considered by the present authors to be synonymous with *E. sagittata*. This species has recently been found naturalized in southern Taiwan (Peng, 1976), and has been counted as having $2n=20$.

Chromosome counts of 3 species (there are 4 in Taiwan) of *Gynura* are all reported as having $2n=20$ (Fig. 7). They corroborate a previous finding of $n=10$ for *G. formosana* (Chuang *et al.*, 1962).

Tribe IX. Cardueae

Gametic chromosome numbers of 8, 9, 10, 11, 12, 13, 15, 17, 19, and multiples have been reported in this tribe; $n=17$ has been proposed as basic, the lower numbers being interpreted as a reduction series (Solbrig, 1963).

In 3 species of endemic *Cirsium: C. albescens, C. arisanense*, and *C. morii*, chromosome numbers of $2n=34$ are reported for the first time.

The count $2n=36$ for *Hemistepta lyrata* is in keeping with all previous reports except that of Hsu (1970), who reported $n=9$ for it.

Chromosome number of $2n=28$ for *Saussurea japonica* does not correspond with the only reported count of $2n=26$ (Zhukova, 1967 in Ornduff, 1969).

Tribe X. Mutisieae

Relatively few species of this tribe have been studied, therefore no definite basic chromosome number has so far been proposed.

The present study reveals $2n=24$ for *A. latifolia*. However, the number of $n=6$ for *A. morrisonicola* (which was considered to be a synonym of *A. latifolia* var. *nimborum* by the present authors) was reported by Hsu (1970).

Tribe XI. Lactuceae

A compilation of cytological data from 53 genera of the Lactuceae by Stebbins *et al.* (1953) indicated that nine is the basic number for the tribes.

Counts of $2n=10$ (Figs. 9, 10) for *Crepidiastrum lanceolatum* and *C. taiwan-*

ianum corroborate previous report of $n=5$ for *C. lanceolatum* (Chuang *et al.*, 1962).

Crepidiastrum is a small, usually littoral genus, comprised of about 10 species in East Asia (Kitamura, 1965). It was named and circumscribed by Nakai (1920) in a revision of *Ixeris*. *Crepidiastrum* has since been segregated from *Ixeris* by its shrubby habit, lack of a beak and less prominent ribs on the achene. Stebbins (1937), however, considered these differences unimportant and concluded that *Crepidiastrum* should be merged with *Ixeris*.

The present study, collaborating with many of the previous chromosome counts documented for these two genera (Kitamura *et al.*, 1977), established the basic number of X=5 for *Crepidiastrum*, and X=8 or its derivative (7) for *Ixeris* (see below). The results tend to support Nakai's treatment.

Several different counts have previously been reported for *Ixeris chinensis:* $n=6$ (Hsu, 1970, as *I. dentata*), $n=7$ (Chuang *et al.*, 1962, as *I. dentata*), $n=9$, $2n=18$ (Hsu, 1967, as *Lactuca chinensis*), $n=12$ (Hsu, as *I. transnokoensis*), $2n=32$ (Babcock *et al.*, 1937 in Darlington and Wylie, 1955). The present count of $2n=16$ represents a new report.

Ixeris chinensis forma *lacerrima* differs from the species only by its leaves irregularly cleft; the diploid count of $2n=16$ was also observed.

The count of $2n=14$ for *Ixeris laevigata* corroborates all previous reports except the number of $2n=16$ (Hsu, 1967).

Chromosome number of $2n=18$ (Fig. 12) in the 3 Taiwan *Lactuca* species examined (out of the total 4, the fourth being a species supposed to be a hybrid) corroborates the data from Japan (Kitamura *et al.* 1977). Together they support the basic number of X=9 in East Asian *Lactuca*. The number of $2n=14$ was, however, reported by Hsu (1970, as *Ixeris microcephala*) for *Lactuca sororia*.

According to Vuilleumier (1973), chromosome number of $2n=10$ has been reported in all nine of the *Picris* species investigated. The present count of $2n=10$ (Fig. 13) for two endemic subspecies of *Picris hieracioides* is in keeping with the above reports. However, the meiotic counts of $n=10$ were proposed by Hsu (1970) for the above two subspecies from Taiwan.

Acknowledgment

The authors are grateful to Drs. Chi-Chang Chen and Charles E. DeVol for their valuable criticisms and kind reading of the manuscript.

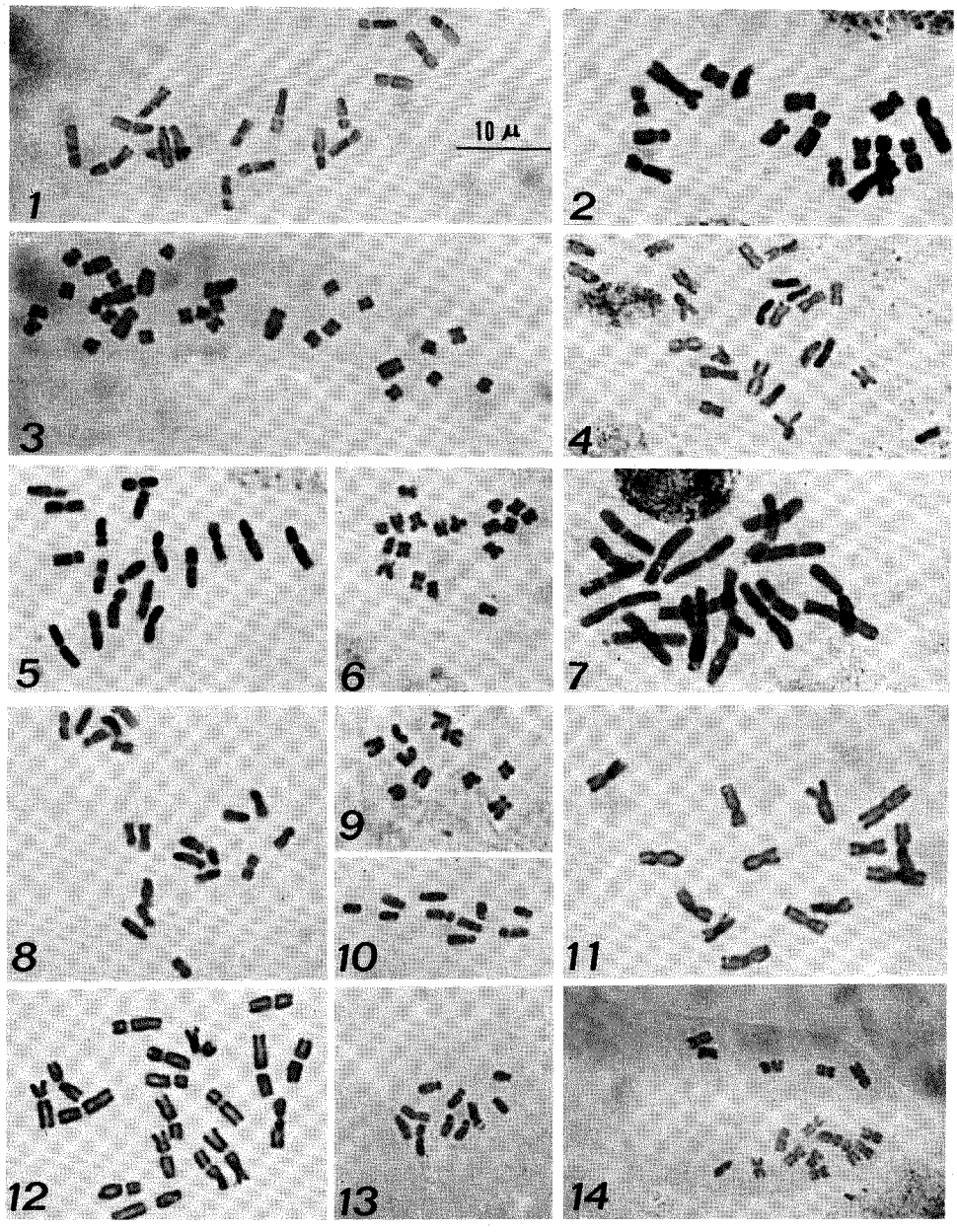

Plate 1. Microphotographs of somatic chromosomes of Taiwan Compositae

Fig. 1. *Aster takasagomontanus* Sasaki, $2n=18$. Fig. 2. *Blumea riparia* (Bl.) DC. var. *megacephala* Randeria, $2n=16$. Fig. 3. *Blumea* sp., $2n=30$. Fig. 4. *Glossogyne tenuifolia* Cass., $2n=24$. Fig. 5. *Chrysanthemum arisanense* Hay., $2n=18$. Fig. 6. *Crossostephium chinense* (L.) Makino, $2n=18$. Fig. 7. *Gynura japonica* (Thunb.) Juel var. *flava* (Hay.) Kitam., $2n=20$. Fig. 8. *Senecio scandens* Buch.-Ham. ex D. Don, $2n=20$. Fig. 9. *Crepidiastrum lanceolatum* (Houtt.) Nakai, $2n=10$. Fig. 10. *Crepidiastrum taiwanianum* Nakai, $2n=10$. Fig. 11. *Ixeris laevigata* (Bl.) Sch.-Bip. ex Maxim., $2n=14$. Fig. 12. *Lactuca sororia* Miq., $2n=18$. Fig. 13. *Picris hieracioides* L. subsp. *ohwiana* (Kitam.) Kitam., $2n=10$. Fig. 14. *Taraxacum formosanum* Kitam., $2n=16$.

Literature Cited

AFZELIUS, K. 1949. On chromosome numbers in *Senecio* and some allied genera. Acta Horti Bergiani **15**: 65-77.

BENTHAM, G. and J. D. HOOKER. 1873. Compositae. Gen. Pl. **2**: 163-533.

CHUANG, T. I., C. Y. CHAO, W. L. HU and S. C. KWAN. 1962. Chromosome numbers of the vascular plants of Taiwan. Taiwania **8**: 51-66.

DARLINGTON, C. D. and A. P. WYLIE. 1955. Chromosome atlas of flowering plants, 2nd edition. George Allen & Unwin Ltd., London.

GRANT, W. F. 1953. A cytotaxonomic study in the genus *Eupatorium*. Am. J. Bot. **40**: 729-742.

HSU, C. 1967. Preliminary chromosome studies on the vascular plants of Taiwan (I). Taiwania **13**: 117-129.

HSU, C. 1970. Preliminary chromosome studies on the vascular plants of Taiwan (III). The Aster family, Compositae. Taiwania **15**: 17-29.

ISHIKAWA. M. 1916. A list of the number of chromosomes. Tokyo Bot. Mag. **30**: 404.

JONES, S. B. 1970. Chromosome numbers in Compositae. Bull. Torrey Bot. Club **97**: 168-174.

KING, R. M. 1965. Chromosome numbers of Tailand Compositae. Phytologia **11**: 217-218.

KITAMURA, S. 1965. Compositae. pp. 855-930. *In* Meyer and Walker (eds.), Flora of Japan, Eng. edition. Smithsonian Institution, Washington, D.C.

KITAMURA, S., G. MURATA and M. HORI. 1977. Coloured illustrations of herbaceous plants of Japan (Sympetalae). Hoikusha Press, Osaka. pp. 1-90.

MANGALY, J. K., R. A. Davidson and R. A. Dunn. 1967. In IOPB chromosome number reports IX. Taxon **16**: 62-66.

MEHRA, P. N., B. S. GILL, J. K. MEHTA and S. S. SIDHU. 1965. Cytological investigations on the Indian Compositae. I. North-Indian taxa. Caryologia **18**: 35-68.

MEHRA, P. N. and P. RAMANADAN. 1969. In IOPB chromosome number reports XXII. Taxon **18**: 433-442.

NAKAI, T. 1920. Notulae ad plantas Japoniae et Koreae. XXIII. Bot. Mag. Tokyo **34**: 147-158.

ORNDUFF, R. (ed.). 1969. Index to plant chromosome numbers for 1967. Regnum Vegetabile **59**: 101-129. IPTN Press, Netherland.

ORNDUFF, R., T. MOSQUIN, D. W. KYHOS and P. H. RAVEN. 1967. Chromosome numbers in Compositae. VI. Senecioneae II. Am. J. Bot. **54**: 205-213.

ORNDUFF, R., P. H. RAVEN, D. W. KYHOS and A. R. KRUCKEBERG. 1963. Chromosome numbers in Compositae. III. Senecioneae. Am. J. Bot. **50**: 131-139.

PANCHO, J. V. 1973. Chromosome numbers of Philippine weeds. Kalikasan Philipp. J. Biol. **2**: 167-171.

PENG, C. I. 1976. Systematic studies on Taiwan Compositae, with a chromosome count. M. S. thesis, National Taiwan University, Taipei.

RANDERIA, A. J. 1960. The Compositae genus *Blumea*, a taxonomic revision. Blumea **10**: 176-317.

RAVEN, P. H., O. T .SOLBRIG, D. W. KYHOS and R. SNOW. 1960. Chromosomes in Compositae. I. Astereae. Am. J. Bot. **47**: 124-132.

SHETTY, B. V. 1967. In IOPB chromosome number reports XIV. Taxon **16**: 552-571.

SOLBRIG, O. T. 1963. The tribes of Compositae in the southeastern United States. J. Aronld Arb. **44**: 436-461.

SOLBRIG, O. T., L. C. ANDERSON, D. W. KYHOS, P. H. RAVEN and L. RÜDENBERG. 1964. Chromosome numbers in Compositae. V. Astereae II. Am. J. Bot. **51**: 513-519.

SOLBRIG, O. T., L. C. ANDERSON, D. W. KYHOS and P. H. RAVEN. 1969. Chromosome numbers in Compositae. VII. Astereae III. Am. J. Bot. **56**: 348-353.

STEBBINS, G. L. JR. 1937. Critical notes on the genus *Ixeris*. J. Bot. **75**: 43-51.

STEBBINS, G. L. JR., J. A. JENKINS and M. S. WALTERS. 1953. Chromosomes and phylogeny in the Compositae, tribe Cichorieae. Univ. Calif. Publ. Bot. **26**: 401-429.

SUBRAMANYAM, K. and N. P. KAMBLE. 1966. In IOPB chromosome number reports VII. Taxon **15**: 155-163.

SUBRAMANYAM, K. and N. P. KAMBLE. 1967. In IOPB chromosome number reports XII. Taxon **16**: 341-350.

TURNER, B. L., W. L. ELLISON and R. M. KING. 1961. Chromosome numbers in the Compositae. IV. North American species, with phyletic interpretations. Am. J. Bot. **48**: 216-223.

TURNER, B. L. and H. S. IRWIN. 1960. Chromosome numbers in the Comositae II. Meiotic counts for fourteen species of Brazilian Compositae. Rhodora **62**: 122-126.

VUILLEUMIER, B. S. 1973. The genera of Lactuceae (Compositae) in the southeastern United States. J. Arnold Arb. **54**: 42-93.

臺灣菊科植物染色體數之研究

彭鏡毅　許建昌

國立臺灣大學植物學系

本篇報告47屬、76種省產菊科植物之染色體數，並加以討論；其中1屬（*Crossostephium*）及25種之染色體數爲以往文獻所未曾記載者，另有13種與前人之研究報告不同。