Bothalia 18, 1: 111–123 (1988)

Miscellaneous notes

VARIOUS AUTHORS

CHROMOSOME STUDIES ON AFRICAN PLANTS. 6.

The presentation of chromosome numbers in this report conforms with the outlay described in the first publications in this series (Spies & Du Plessis 1986a & b; 1987a & b; Spies & Jonker 1987).

POACEAE

Arundineae

Urochlaena pusilla Nees: **n = 6.**

CAPE.—3119 (Calvinia): 32 km south of Nieuwoudtville (–CA), *Spies 3118*.

Chaetobromus dregeanus Nees: **n = 36.**

CAPE.—3119 (Calvinia): 4 km south of Nieuwoudtville (–AC), *Spies 3115*.

Pentaschistis airoides (Nees) Stapf: **n = 7, n = 14, n = 28.**

CAPE.—3017 (Hondeklipbaai): 12 km east of Hondeklipbaai (–AD), *Spies 3036* (n = 14). 3118 (Vanrhynsdorp): Gifberg Pass (–DC), *Spies 3088* (n = 28), *Spies 3102* (n = 14). 3119 (Calvinia): Vanrhyns' Pass (–AC), *Spies 3113* (n = 7). 3218 (Clanwilliam): Versveld Pass (–DC), *Spies 3166* (n = 7). 3219 (Wuppertal): Peerboomhoek (–CD), *Spies 3151* (n = 14); Hartnekskloof (–DC), *Spies 3145* (n = 14). 3220 (Sutherland): 2 km from Sutherland to Calvinia (–BC), *Spies 3130* (n = 7), *3133* (n = 14).

P. aristifolia Schweick.: **n = 14.**

CAPE.—3119 (Calvinia): 32 km south of Nieuwoudtville (–CA), *Spies 3119*.

P. eriostoma (Nees) Stapf: **n = 26.**

CAPE.—3219 (Wuppertal): Hartnekskloof (–DC), *Spies 3144*.

P. malouinensis (Steud.) Clayton: **n = 7.**

CAPE.—3320 (Montagu): Tradouw Pass (–DC), *Spies 3259*.

P. tomentella Stapf: **n = 14.**

CAPE.—2917 (Springbok): 10 km from Springbok to Hondeklipbaai (–DD), *Spies 3008*.

Karroochloa tenella (Nees) Conert & Turpe: **n = 6.**

CAPE.—3119 (Calvinia): 20 km from Calvinia to Loeriesfontein (–AB), *Spies 3125*. 3220 (Sutherland): 2 km from Sutherland to Calvinia (–BC), *Spies 3129*.

Merxmuellera dura (Stapf) Conert: **n = 28.**

CAPE.—3119 (Calvinia): 18 km south of Nieuwoudtville (–CA), *Spies 3116*.

Schismus scaberrimus Nees: **n = 24, n = 36.**

CAPE.—3017 (Hondeklipbaai): Kamiesberg Pass (–BB), *Spies 3051* (n = 24), *3054* (n = 36).

Dregeochloa pumila (Nees) Conert: **n = 21.**

CAPE.—2816 (Oranjemund): Beauvallon (–DA), *Spies 2957*.

Andropogoneae

Cymbopogon prolixus (Stapf) Phill.: **n = 20.**

CAPE.—3018 (Kamiesberg): Studers' Pass (–AC), *Spies 3065*.

Hyparrhenia anamesa Clayton: **n = 20, n = 30.**

CAPE.—3318 (Cape Town): near Stellenbosch intersection on road from Paarl to Franschhoek (–DD), *Spies 3200* (n = 30). 3320 (Montagu): Tradouw Pass (–DC), *Spies 3263* (n = 20).

H. hirta (L.) Stapf: **n = 30.**

CAPE.—2917 (Springbok): Wildeperdehoek Pass (–DB), *Spies 3017*.

Paniceae

Digitaria sp.: **n = 9.**

CAPE.—3321 (Ladismith): Seweweekspoort (–AD), *Spies 3271*.

Panicum stapfianum Fourc.: **n = 18.**

CAPE.—3318 (Cape Town): Tini Versveld Wildflower Reserve (–AD), *Spies 3188*.

Paspalidium obtusifolium (Del.) Simpson: **n = 18.**

NATAL.—2832 (Mtubatuba): Lake Bangazi (–BA), *Spies 2370*.

Rhynchelytrum repens (Willd.) C. E. Hubb.: **n = 18.**

CAPE.—3118 (Vanrhynsdorp): Gifberg Pass (–DC), *Spies 3100*.

DISCUSSION

The basic chromosome numbers presented in this article conform, in most instances, to published results for the same species, or for other species of the genus (Darlington & Wylie 1955; Ornduff 1967–1969; Fedorov 1969; Moore 1970–1977, 1973; Goldblatt 1981–1985).

This study concentrated on the tribe Arundineae. The classification of the genus *Pentaschistis* is according to the preliminary results of a revision of this genus by Dr H. P. Linder (Bolus Herbarium, University of Cape Town) and all the specimens were identified by him.

The chromosome number of 2n = 6x = 42 for *Dregeochloa pumila* is the first chromosome number reported for this genus. A basic number of seven is suggested because, if the basic number was six, this plant would be a heptaploid and either univalents or multivalents should be present. Since neither were present, we regard seven to be the basic chromosome number for this species.

Deviations from the previously reported chromosome numbers were observed in two of the specimens studied. The first specimen was *Urochlaena pusilla* (Figure 1a), where 2n = 4x = 12 was observed in contrast to the basic number of x = 7 described by Watson, Dallwitz & Johnston (1986). Unfortunately it is not possible to trace their source for this basic number, since the DELTA system (Descriptive Language for Taxonomy) does not include references. The normal chromosome behaviour observed in this specimen gives no indication of aneuploidy. Since the geographical distribution of this

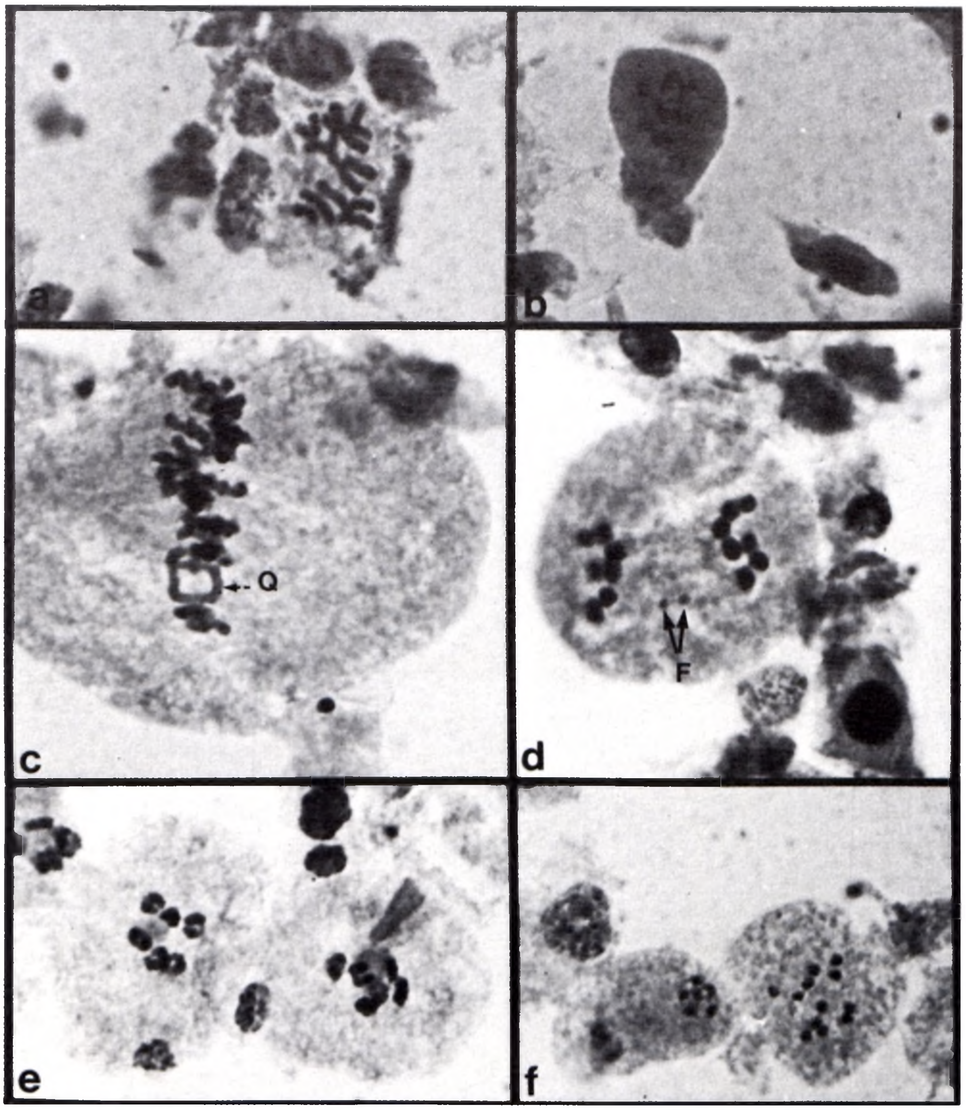

FIGURE 1.—Chromosomes in: a, *Urochlaena pusilla* (*Spies 3118*, 2n = 12); b, *Pentaschistis airoides* (*Spies 3130*, n = 7); c, *P. eriostoma* (*Spies 3144*, n = 26, with one large ring-shaped quadrivalent (Q) in each cell); d, *P. malouinensis* (*Spies 3259*, n = 7, with two fragments (F) indicated by arrows); e & f, *Karroochloa tenella* (*Spies 3125*, n = 6). All × 1250.

species is restricted to a very small area in South Africa, large scale aneuploidy, with subsequent karyotype evolution to form only bivalents, does not seem likely. More specimens must be studied before more definite conclusions can be made.

The second deviation from the expected number was observed in *Merxmuellera dura*. The specimen studied has a chromosome number of 2n = 8x = 56, in contrast to the expected multiples of six. Watson *et al.* (1986) described a basic chromosome number of x = 6 with diploid and hexaploid specimens. This is probably based on the *M. arundinacea* (2n = 12), *M. disticha* (2n = 12) and *M. stricta* (2n = 36) specimens described by De Wet (1954 & 1960). With a basic number of six the specimen studied must either represent 2n = (9x + 2) = 56 or 2n = (10x − 4) = 56. If the specimen is nonaploid with two additional chromosomes, between four (the two additional chromosomes are at least homoeologous to two chromosomes of the ninth genome) and eight univalents (the additional chromosomes are not homoeologous to any chromosomes of the ninth genome or to one another) must be visible in each cell since no multivalents are formed. As some cells contained no univalents, this rationale is invalid. If this specimen represents a decaploid in which four chromosomes were somehow lost, a maximum of four univalents is expected. However, in high polyploids univalents are often present due to competition to pair (Alonso & Kimber 1981; Espinasse & Kimber 1981; Kimber & Alonso 1981, Jackson & Casey 1982; Spies 1984). Up to six univalents were observed, therefore it seems possible that this species might be an aneuploid form where four chromosomes were lost from a decaploid. It is also possible that this species has a basic chromosome number of seven and this specimen represents an octoploid form. Further studies in this group will show whether six or seven is the basic chromosome number for the genus.

The basic chromosome numbers of the genus *Pentaschistis* are 7, 10 or 13 (Watson *et al.* 1986). Our study confirms a basic chromosome number of seven for the species *P. airoides* (Figure 1b), *P. aristifolia*, *P. malouinensis* (Figure 1d) and *P. tomentella*, as well as a basic number of 13 for *P. eriostoma* (Figure 1c). The basic chromosome number of 10 reported by Watson *et al.* (1986) is probably based on a report of Hedberg (1957) of 2n = ± 40 for *P. mannii*. This number may represent

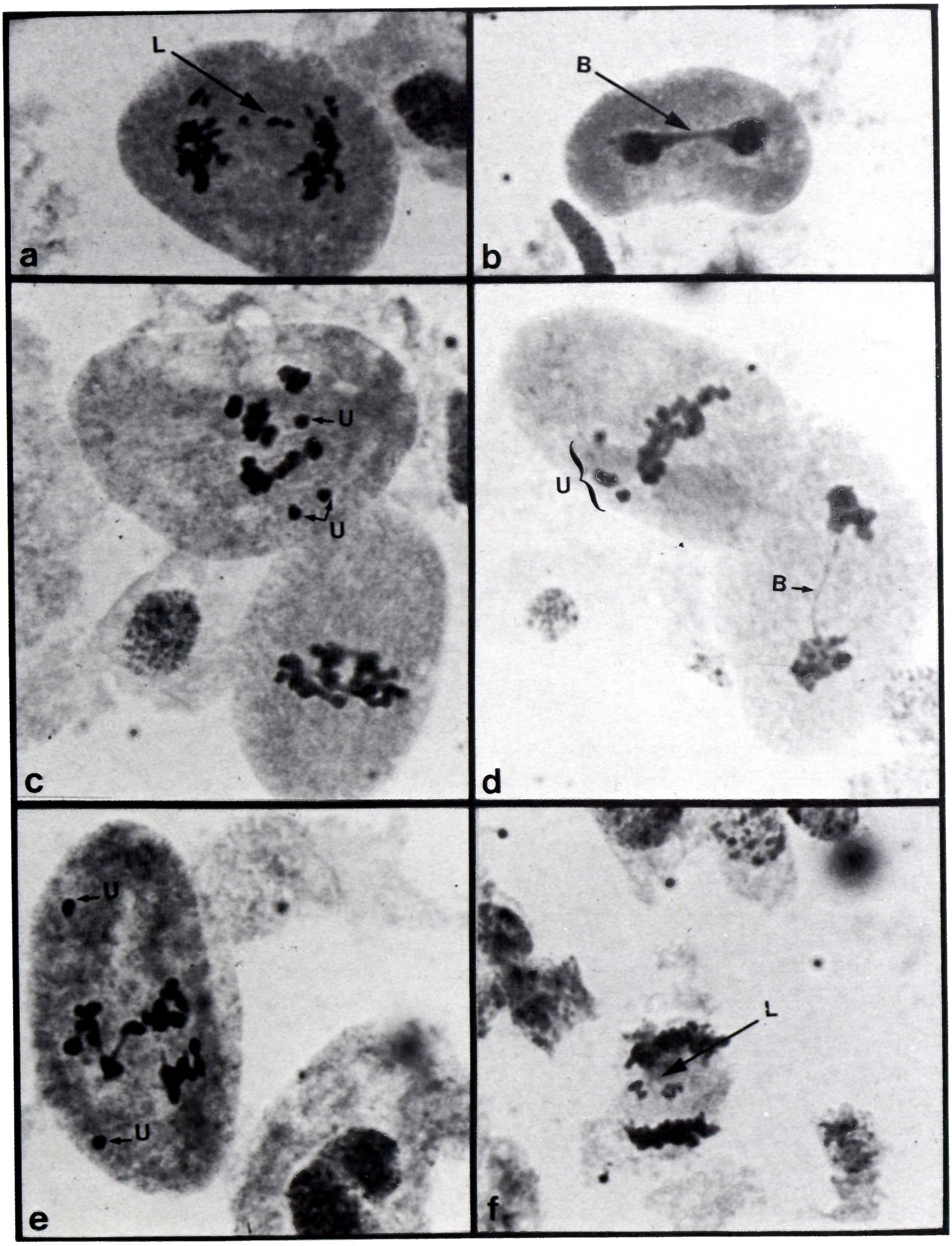

FIGURE 2.—Meiotic chromosomes in: a–e, *Merxmuellera dura* [*Spies 3116*, n = 28, with univalents (U), anaphase laggards (L) and bridges (B)]; f, *Schismus scaberrimus* [*Spies 3051*, n = 24, with anaphase laggards (L)]. All × 1250.

a triploid (2n = 3x = 39) (Hedberg & Hedberg 1977) and a basic number of 10 must yet be proved. In addition, a basic chromosome number of six for the genera *Chaetobromus*, *Karroochloa* (Figure 1e & f) and *Schismus* is confirmed by this study, as well as a basic chromosome number of seven for *Dregeochloa*. It is clear, therefore, that the Arundineae has two primary basic chromosome numbers, i.e. six and seven.

Meiotic abnormalities were observed in some of the specimens studied. These abnormalities included the presence of fragments, univalents and laggards during anaphase I, as well as anaphase bridges.

In *Pentaschistis eriostoma* (2n = 4x = 52) multivalents were formed and consequently univalents were present. One large ring quadrivalent was present in most cells (Figure 1c). An insufficient number of cells were available to determine whether this plant resulted from autoploidy or segmental alloploidy.

P. tomentella (2n = 4x = 28) had 1–4 univalents in 30% of the cells studied, as well as anaphase I bridges, suggesting karyotype evolution in the form of paracentric inversions.

Meiosis in the *Merxmuellera dura* specimen, *Spies 3116*, was very abnormal. From 0–6 univalents were observed (Figure 2c–e) and the same range of anaphase I laggards (Figure 2a), with 2–4 laggards in the majority of cells, was present. In association with the laggards a bridge was usually present from early anaphase I to telophase I in some instances (Figure 2b). No multivalents were observed.

The *Schismus scaberrimus* (2n = 8x = 48) specimen had up to four univalents, as well as up to seven multivalents (trivalents and quadrivalents) per cell. Chromosome laggards were usually present during anaphase I (Figure 2f). From the chromosome behaviour it can be predicted that this plant will experience reproductive difficulties and a study of embryo sac development in this species is required to determine the mode of reproduction.

In conclusion, it can be stated that more cytogenetic studies in the tribe Arundineae are required to determine the relationship between the genera and species with basic chromosome numbers of six and seven. Such a study will also indicate if the secondary basic chromosome number of 13 observed in the genus *Pentaschistis* originated through hybridization of plants with basic numbers of six and seven or through aneuploidy (the loss of a chromosome from the secondary basic number of 14) as suggested by Davidse, Hoshino & Simon (1986).

ACKNOWLEDGEMENTS

Dr H. P. Linder (Bolus Herbarium) is thanked for identifying the *Pentaschistis* specimens. We are grateful to Drs G. Davidse (Missouri Botanical Garden) and R. P. Ellis (Botanical Research Institute) for useful suggestions on the text.

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MS. received: 1987.05.25.