

## Miscellaneous notes

### VARIOUS AUTHORS

#### CHROMOSOME STUDIES ON AFRICAN PLANTS. 3.

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

#### POACEAE

##### Arundinelleae

*Arundinella nepalensis* Trin.: **n = 10, ~35.**

TRANSVAAL.—2530 (Lydenburg): 31 km from Lydenburg to Roossenekal (-AB), *Spies 1615* (n = 10); Frischgewaagd Farm near Dullstroom (-AC), *Spies 1571* (n = ~35).

*Tristachya leucothrix* Nees: **n = 24.**

TRANSVAAL.—2430 (Pilgrim's Rest): Mac-Mac Waterfalls (-DD), *Spies 1433a*.

##### Andropogoneae

*Sorghum bicolor* (L.) Moench. subsp. *arundinaceum* (Desv.) De Wet & Harlan: **n = 20.**

TRANSVAAL.—2529 (Witbank): 10 km from Belfast to Stoffberg (-DB), *Spies 1637*.

*Bothriochloa insculpta* (A. Rich.) A. Camus: **n = 30.**

TRANSVAAL.—2529 (Witbank): 67 km from Lydenburg to Roossenekal (-BB), *Spies 1624*.

*Andropogon eucomus* Nees: **n = 10, 20.**

TRANSVAAL.—2430 (Pilgrim's Rest): Blyderivierspoort Nature Reserve (-DB), *Spies 1428a* (n = 10). 2530 (Lydenburg): 31 km from Lydenburg to Roossenekal (-AB), *Spies 1608* (n = 20).

CAPE.—3228 (Butterworth): near Cintsa-West turnoff on road from East London to Butterworth (-CC), *Spies 1677* (n = 10).

*Andropogon huillensis* Rendle: **n = ~50.**

TRANSVAAL.—2529 (Witbank): 10 km from Belfast to Stoffberg (-DB), *Spies 1642*.

*Cymbopogon plurinodis* (Stapf) Stapf ex Burtt Davy: **n = 10.**

CAPE.—3225 (Somerset East): 7 km from Somerset East to Pearston (-CB), *Spies 1131*.

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

TRANSVAAL.—2530 (Lydenburg): 6 km from Goede Hoop to Roossenekal (-AA), *Spies 1494*.

*Hyparrhenia dregeana* (Nees) Stapf: **n = 10.**

TRANSVAAL.—2529 (Witbank): 67 km from Lydenburg to Roossenekal (-BB), *Spies 1634*.

##### Panicaceae

*Digitaria diagonalis* (Nees) Stapf var. *diagonalis*: **n = 18.**

CAPE.—3228 (Butterworth): near Sunrise-On-Sea (-CC), *Spies 1663*.

*Digitaria eriantha* Steud.: **n = 18.**

TRANSVAAL.—2430 (Pilgrim's Rest): 23 km from Boshhoek to Olifantshoek (-CD), *Spies 1544*.

*Digitaria monodactyla* (Nees) Stapf: **n = 9, 18.**

TRANSVAAL.—2530 (Lydenburg): 6 km from Goede Hoop to Roossenekal (-AA), *Spies 1492* (n = 18); 41 km from Goede Hoop to Roossenekal (-AA), *Spies 1592* (n = 9), *1597* (n = 18).

*Digitaria natalensis* Stent: **n = 9.**

CAPE.—3228 (Butterworth): near Cintsa-West turnoff on road from East London to Butterworth (-CC), *Spies 1676*.

*Paspalum dilatatum* Poir.: **n = 20, 25.**

TRANSVAAL.—2530 (Lydenburg): 31 km from Lydenburg to Roossenekal (-AB), *Spies 1611* (n = 20).

CAPE.—3225 (Somerset East): Daggaboersnek Pass (-DB), *Spies 1110* (n = 20). 3227 (Stutterheim): Kabusie Forest (-CB), *Spies 1698* (n = 25). 3228 (Butterworth): near Sunrise-On-Sea (-CC), *Spies 1667* (n = 20).

*Paspalum urvillei* Steud.: **n = 20.**

TRANSVAAL.—2530 (Lydenburg): 31 km from Lydenburg to Roossenekal (-AB), *Spies 1612*.

*Paspalum* sp.: **n = 20.**

TRANSVAAL.—2529 (Witbank): 15 km from Stoffberg to Belfast (-BD), *Spies 1444a*.

*Brachiaria subulifolia* (Mez) Clayton: **n = 18.**

TRANSVAAL.—2430 (Pilgrim's Rest): Mac-Mac Waterfalls (-DD), *Spies 1433*.

*Setaria sphacelata* (Schumach.) Moss var. *sericea* (Stapf) Clayton: **n = 18.**

CAPE.—3228 (Butterworth): near Cintsa-West turnoff on road from East London to Butterworth (-CC), *Spies 1673*.

*Pennisetum macrourum* Trin.: **n = 7, ~60.**

TRANSVAAL.—2530 (Lydenburg): Frischgewaagd Farm near Dullstroom (-AC), *Spies 1570* (n = ~60); Goede Hoop Farm near Lydenburg (-AC), *Spies 1579* (n = 7 + 0-4B).

*Pennisetum thunbergii* Kunth: **n = 9.**

TRANSVAAL.—2530 (Lydenburg): 15 km from Dullstroom to Goede Hoop (-AC), *Spies 1459*.

*Cenchrus ciliaris* L.: **n = 29/2.**

CAPE.—3325 (Somerset East): 51 km from Port Elizabeth to Jansenville (-AC), *Spies 1650*.

*Rhynchelytrum nerviglume* (Franch.) Chiov.: **n = 18, 36.**

TRANSVAAL.—2530 (Lydenburg): 6 km from Goede Hoop to Roossenekal (-AA), *Spies 1487* (n = 18), *Spies 1490* (n = 36).

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

TRANSVAAL.—2530 (Lydenburg): Goede Hoop Farm near Lydenburg (-AC), *Spies 1591*.

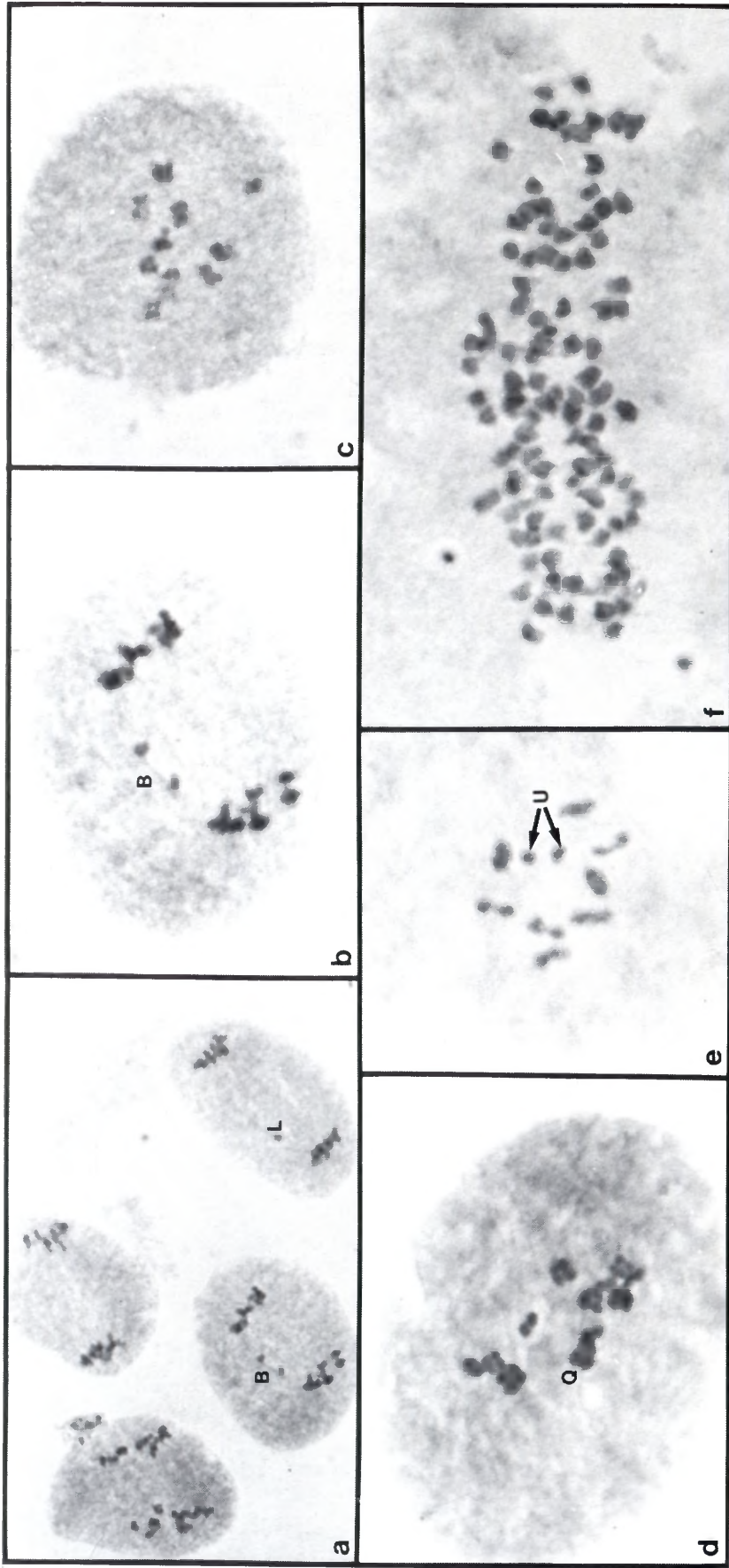


FIGURE 1.—Meiotic cells: a-c, *Arundinella nepalensis*, Spies 1615; d, *Hyparrhenia dregeana*, Spies 1634; e, *Digitaria monodactyla*, Spies 1592; f, *Andropogon huillensis*, Spies 1642. a, anaphase I, note the laggard (L) and the chromosome bridge (B); b, enlargement of the chromosome bridge in a; c, diakinesis showing 10<sub>0</sub>; d, diakinesis showing one quadrivalent (Q); e, diakinesis with two univalents (U); f, early anaphase I. Scale: a, x 1500; b-f, x 2900.



## Stipeae

*Stipa dregeana* Steud. var. *elongata* (Nees) Stapf:  $n = 24$ .

CAPE.—3227 (Stutterheim): Kabusie Forest (—CB), *Spies 1693*.

## DISCUSSION

The 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, R. J. 1970–1977; Moore, D. M. 1982; Goldblatt 1981 & 1984).

Deviations from the expected chromosome numbers were observed in two different specimens. The somatic chromosome number of  $2n = 40$  given for *Sorghum bicolor* subsp. *arundinaceum* (*Spies 1637*) deviates from the expected somatic number of 20 described by Celarier (1958 & 1959), Harlan & De Wet (1972), De Wet (1978) and Spies (1980). The other exception is *Cenchrus ciliaris* (*Spies 1650*) where a somatic chromosome number of 29 clearly indicates the aneuploid nature of the specimen.

Meiotic chromosome pairing was abnormal in a significant number of the specimens studied. Abnormalities were observed in the following species:

1, *Arundinella nepalensis* (*Spies 1615*): this supposed diploid plant exhibited a rather abnormal meiosis with up to three laggards during anaphase I (Figure 1a–c);

2, *Tristachya leucothrix* (*Spies 1433a*): one trivalent and one univalent were observed in one cell of this specimen;

3, *Hyparrhenia dregeana* (*Spies 1634*): meiotic chromosome analysis of this presumed diploid specimen indicated that chromosome configurations varied from  $10_1 5_{II}$  to  $5_{IV}$ , with  $6_{II} 2_{IV}$  the most common form (Figure 1d). This unexpected multivalent formation in a supposed diploid specimen seems to indicate that this species has a basic chromosome number of five rather than a basic number of ten and the plant is, therefore, tetraploid and not diploid;

4, *Digitaria monodactyla* (*Spies 1592*): two univalents per cell were observed in two cells of this diploid specimen (Figure 1e);

5, *Paspalum dilatatum*: all specimens indicated abnormal meiotic chromosome behaviour. In *Spies 1110* univalents were observed during metaphase I and up to nine laggards were present during anaphase I. Another tetraploid specimen, *Spies 1611*, also had abnormal chromosome pairing resulting in univalents during metaphase I, as well as anaphase I laggards, resulting in an unequal segregation of chromosomes. A third specimen, *Spies 1667*, exhibited an unsynchronized chromosome segregation during anaphase I (the chromosomes in one part of the metaphase plate had already segregated to the polar region before segregation started in another part of the metaphase plate), as well as a number (up to five) of chromosome bridges during anaphase I. The pentaploid specimen, *Spies 1698* (Figure 2a & b), had 8–14 laggards during anaphase I and a large number of micronuclei were observed in cells which were in the telophase I stage;

6, *Paspalum urvillei* (*Spies 1612*): univalents were observed in some of the cells studied (Figure 2c & d);

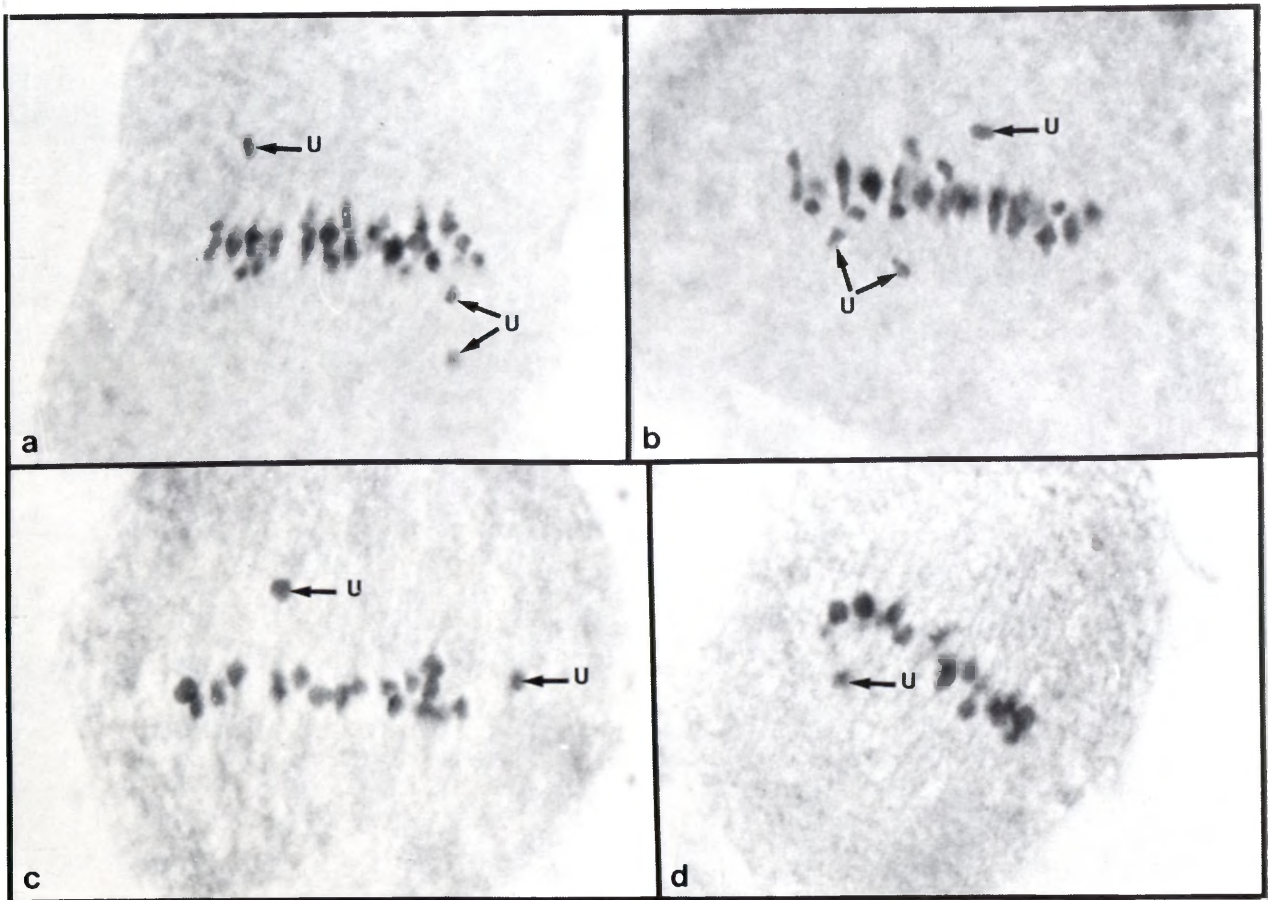


FIGURE 2.—Meiotic cells: a & b, *Paspalum dilatatum*, *Spies 1698*; c & d, *Paspalum urvillei*, *Spies 1612*. a & b, metaphase I showing univalents (U); c & d, metaphase I showing univalents (U). Scale:  $\times 2900$ .



FIGURE 3.—Diakinesis in *Pennisetum macrourum*, Spies 1579: a, seven bivalents; b & c, nine bivalents; d, eight bivalents. Scale:  $\times 2900$ .

7, *Paspalum* sp. (Spies 1444a): in contrast to the other specimens of this genus, this one was relatively normal. Only one abnormal anaphase I cell with seven laggards was observed;

8, *Cenchrus ciliaris* (Spies 1650): this aneuploid specimen had from one to seven univalents during metaphase I. No chromosome laggards were observed during anaphase I. The somatic chromosome number of 29 may imply chromosome loss in a tetraploid specimen, hence the univalents. However, further investigation is necessary before such a conclusion can be reached;

9, *Stipa dregeana* (Spies 1693): up to five chromosome bridges were observed during anaphase I.

Apart from the meiotic abnormalities observed during this study, the possible occurrence of B-chromosomes obscured the easy interpretation of some results. In one *Pennisetum macrourum* specimen, Spies 1579, 37,5 % of the cells studied had seven bivalents, 33,3 % had eight bivalents and 29,2 % had nine bivalents (Figure 3). Since the chromosomes in all cells were well stained and good spreading was obtained, it was impossible to confuse a bivalent with a univalent. Our only explanation for this phenomenon is that this *P. macrourum* specimen had 14 somatic chromosomes that form 7 bivalents during meiosis and that 0–4 B-chromosomes, which mimic euchromosome meiotic behaviour, were present.

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#### POACEAE

##### Aristideae

*Aristida congesta* Roem. & Schult. subsp. *congesta*: **n = 22.**

TRANVAAL.—2530 (Lydenburg): 14 km from Boshhoek to Diepgeteset (-AC), *Spies* 1537.

##### Eragrostideae

*Eragrostis barbinodis* Hack.: **n = 25.**

TRANVAAL.—2528 (Pretoria): 35 km from Warmbaths to Pretoria (-AB), *Spies* 2046.

*Eragrostis curvula* (Schrad.) Nees: **n = 20, 30, 40.**

TRANVAAL.—2430 (Pilgrim's Rest): 18 km from turnoff on Lydenburg-Ohrigstad road to Pilgrim's Rest (-DC), *Spies* 1557 (n = 40), 1559 (n = 20). 2530 (Lydenburg): 10 km from Boshhoek to Bufelsvlei (-AC), *Spies* 1526 (n = 30).

CAPE.—3224 (Graaff-Reinet): 23 km from Pearston to Graaff-Reinet (-BD), *Spies* 1139 (n = 20).

*Eragrostis lehmanniana* Nees: **n = 20, 30.**

CAPE.—3224 (Graaff-Reinet): 2 km from Jansenville to Kirkwood (-DD), *Spies* 1099 (n = 20). 3225 (Somerset East): 35 km from Somerset East to Pearston (-CA), *Spies* 1135 (n = 20). 3325 (Port Elizabeth): 1 km from Lake Mentz to Waterford (-AA), *Spies* 1083 (n = 30), 1094 (n = 20).

*Eragrostis plana* Nees: **n = 10.**

TRANVAAL.—2530 (Lydenburg): 11 km from Goede Hoop to Lydenburg (-AB), *Spies* 1506.

CAPE.—3227 (Stutterheim): Kabusi Forest (-CB), *Spies* 1697.

*Eragrostis planiculmis* Nees: **n = 21.**

TRANVAAL.—2530 (Lydenburg): 31 km from Lydenburg to Roosenekal (-AB), *Spies* 1620.

*Eragrostis superba* Peyr.: **n = 20, 40.**

TRANVAAL.—2529 (Witbank): 67 km from Lydenburg to Roosenekal (-BB), *Spies* 1625 (n = 40).

O.F.S.—2925 (Jagersfontein): near Perdeberg (-AA), *Spies* 2003 (n = 20).

*Eragrostis trichophora* Coss. & Dur.: **n = 30.**

TRANVAAL.—2528 (Pretoria): near Sphinx Station (-CA), *Spies* 2031.

*Pogonarthria squarrosa* (Roem. & Schult.) Pilg.: **n = 40.**

TRANVAAL.—2528 (Pretoria): near Sphinx Station (-CA), *Spies* 2020.

*Sporobolus africanus* (Poir.) Robyns & Tournay: **n = 30.**

CAPE.—3225 (Somerset East): 7 km from Somerset East to Pearston (-CB), *Spies* 1129. 3228 (Butterworth): near Sunrise-On-Sea (-CC), *Spies* 1659.

*Sporobolus pectinatus* Hack.: **n = 20.**

TRANVAAL.—2530 (Lydenburg): 13 km from Boshhoek to Bufelsvlei (-AC), *Spies* 1530.

##### Cynodonteae

*Chloris gayana* Kunth: **n = 10.**

CAPE.—3228 (Butterworth): near Sunrise-On-Sea (-CC), *Spies* 1660.

*Chloris virgata* Swartz: **n = 10.**

TRANVAAL.—2528 (Pretoria): near Sphinx Station (-CA), *Spies* 2021.

O.F.S.—2925 (Jagersfontein): near Perdeberg (-AA), *Spies* 2005.

#### DISCUSSION

These chromosome numbers conform, in most instances, with the numbers for either the species itself or for other species in the same genus, given in the chromosome atlases of Darlington & Wylie (1955), Ornduff (1967-1969), Fedorov (1969), Moore, R. J. (1970-1977), Moore, D. M. (1982) and Goldblatt (1981 & 1984). The only exception was *Eragrostis planiculmis* with  $2n = 42$  instead of a multiple of 10 expected in the Eragrostideae. Since 21 bivalents were observed in every cell studied, it is concluded that this specimen, *Spies* 1620, represents an aneuploid form of *E. planiculmis* with  $2n = 4x + 2 = 42$ .

Meiotic chromosome pairing was normal in most specimens studied.

Two univalents were observed in every cell of a diploid *Eragrostis plana* specimen, *Spies* 1506. This asynapsis of a chromosome pair may perhaps be attributed to hybridization.

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