

## CHROMOSOME NUMBERS OF NORTH AFRICAN PHANEROGAMS. VII. SOME NOTES ON NORTH AFRICAN GRAMINEAE

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**Resumen.** Se incluye el número cromosómico de 13 taxones pertenecientes a 9 géneros de *Gramineae*. Dos taxones no han sido estudiados cariológicamente, o difieren de recuentos anteriores. Los recuentos de otros cinco taxones constituyen el primer estudio de material de norte de Africa.

**Abstract.** Chromosome numbers are reported for 13 taxa belonging to 9 genera of *Gramineae*. Two taxa have not previously been studied cytologically or have chromosome numbers differing from previous reports. Counts for five additional taxa are the first reports for North Africa.

### INTRODUCTION

The seventh contribution (for previous contributions see VOGT & OBERPRIELER, 1993 & 1994; OBERPRIELER & VOGT, 1993 & 1996; HELLWIG & al., 1994; and KILIAN & al., 1995) in this series dealing with cytological investigations in the North African flora provides some counts in the family *Gramineae*. The seed material used for this study was collected during a field trip to Morocco organized by the Botanic Garden and Botanical Museum Berlin-Dahlem in 1993. Chromosome numbers were obtained from somatic mitoses of root tips of seeds germinated in Petri dishes. Standard techniques described earlier (VOGT & OBERPRIELER, 1993) were used to stain chromosomes. Voucher specimens of the original collections are deposited in B. The species are listed in alphabetical order.

## RESULTS

*Aegilops geniculata* Roth var. *eventricosa* (Eig) Hammer $2n = 28$ 

MOROCCO: Monts des Beni-Snassen, road 5311 between Mechrâ-Homadi and Berkane, slopes along the road c. 1km E of the junction with road S 412 (Mechrâ-Homadi - El-Aioun), *Tetraclinis articulata* woodland, 200m, 34°43'N - 02°48'W, 06.05.1993, Vogt 10978 & Oberprieler 5426.

Our count of  $2n = 28$  chromosomes - the first for this variety - is in accordance with all former reports from the Mediterranean area for this widespread species which have provided HUMPHRIES & al. (1978 sub *Aegilops ovata* L.) from Morocco, DEVESA & ROMERO (1981) and DEVESA & al. (1990) from Spain, and BALTISBERGER & LEUCHTMANN (1991) from Albania.

*Avena barbata* Pott ex Link subsp. *hirtula* (Lag.) Tab. Mor.*A. hirtula* Lag. $2n = 14$  (Fig. 1A)

MOROCCO: Prov. Figuig, road P 32 between Bouarfa and Figuig, north-facing slopes of Djebel Grouz c. 23 km W Figuig, mountains c. 6 km S of road P 32, rocks and stony slopes, 1100-1300 m, 32°08'N-01°24'W, 01.05.1993, Vogt 10557 & Oberprieler 5005. Monts des Beni Snassen, Gorges du Zegzel between the villages of Trhasroute and Moulay Ahmed, slopes of the gorge below and above road, riverbed, 450-550 m, 34°49'N - 02°22'W, 10.05.1993, Vogt 11590 & Oberprieler 6038.

*Avena barbata* s. lat. seems to occur in different ploidy levels. Besides the diploid ( $2n = 2x = 14$ ) subsp. *hirtula* mentioned above there are also tetraploid ( $2n = 4x = 28$ ) and hexaploid ( $2n = 6x = 42$ ) taxa, not always morphologically clearly demarcated. Our finding of a diploid number ( $2n = 14$ ), the first report for northern Africa, is in accordance with previous counts on material (without subspecies designation) from the Mediterranean area, i.e. from Portugal (FERNANDES & QUEIRÓS, 1969; QUEIRÓS, 1973; QUEIRÓS, 1974), the Canary Islands (VAN LOON, 1974), and Spain [ARAUJO & TALAVERA, 1981 ( $n = 7$  for var. „*hirsuta*“)]. Tetraploid numbers are typical for subsp. *barbata* and have been reported from Italy (LARSEN, 1956), Portugal (FERNANDES & QUEIRÓS, 1969), France (KLIPHUIS & WIFFERING, 1972), Albania (STRID, 1974), Syria (KLIPHUIS & BARKOUDAH, 1977), Turkmenistan (SOKOLOVSKAYA &

PROBATOVA, 1975), Spain [ARAUJO & TALAVERA, 1981 ( $n = 14$  for var. *barbata*), DEVESA & al., 1990 ( $n = 14$ )], and Libya [FARUQUI, QURAISH & INAMUDDIN, 1987 ( $n = 14$ )]. The only hexaploid ( $2n = 42$ ) number known until now has been reported by BORGAN (1974) studying material from the Canary Islands.

***Avena eriantha* Dur.**

$2n = 14$  (Fig. 1B)

MOROCCO: Middle Atlas, Tahout-ou-Fillali, road P 33 between Khenifra and Midelt, c. 2,5 km W pass, *Quercus* woodland and *Pinus* plantation, 1990 m, 32°47'N-05°35'W, 26.5.1993, Vogt 11982.

This is the first record of a chromosome number from northern Africa for this species distributed in N Africa and SW Asia. The only previous count carried out by SOKOLOVSKAYA & PROBATOVA (1975) on plant material from Turkmenistan also yielded the diploid set of  $2n = 14$  chromosomes.

***Avena wiestii* Steud.**

$2n = 14$  (Fig. 1C)

MOROCCO: Prov. d'Er-Rachidia, road P 32 between Er-Rachidia and Boudnib, c. 19.2 km E of junction to Erfoud, dry Oued with *Ziziphus*, 1030 m, 31°55'N - 04°08'W, 30.04.1993, Vogt 10421 & Oberprieler 4869. Prov. d'Er-Rachidia, Charis, road P 32 between Er-Rachidia and Goulmima, dry Oued c. 23 km E Goulmima, 1090m, 31°47'N-04°50'W, 12.05.1993, Vogt 11690 & Oberprieler 6138.

This first count of a chromosome number in N African plant material of *Avena wiestii* corroborates a count by ROMERO ZARCO (1984) based on Spanish material of this species which is distributed from northern Africa and the E Mediterranean eastwards to the Caucasus and Afghanistan.

***Brachypodium distachyon* (L.) Beauv.**

*Trachynia distachya* (L.) Link

$2n = 20$

MOROCCO: Mediterranean coast W of Saidia, surroundings of the mouth of Oued Moulouya c. 10 km W Saidia, dunes c. 1 km inland, 10 m, 35°07'N -

02°18'W, 05.05.1993, Vogt 10897 & Oberprieler 5345. Prov. Figuig, road P 32 between Bouarfa and Figuig, north-facing slopes of Djebel Grouz c. 23 km W Figuig, montains c. 6 km S of road P 32, rocks and stony slopes, 1100-1300 m, 32°08'N-01°24'W, 01.05.1993, Vogt 10558 & Oberprieler 5006.

$$2n = 30$$

MOROCCO: Monts des Beni-Snassen, road 5311 between Mechrâ-Homadi and Berkane, slopes along the road c. 1km E of the junction with road S 412 (Mechrâ-Homadi - El-Aioun), *Tetraclinis articulata* woodland, 200m, 34°43'N - 02°48'W, 06.05.1993, Vogt 10973 & Oberprieler 5421.

*Brachypodium distachyon* occurs in three different ploidy levels. Besides the tetraploid ( $2n = 4x = 20$ ) and hexaploid ( $2n = 6x = 30$ ) cytotypes there is also an indication of the diploid ( $2n = 2x = 10$ ) cytotype. Our finding of a tetraploid number ( $2n = 20$ ), the first report for northern Africa, is in accordance with the only previous count from Spain (TALAVERA, 1978). Hexaploid ( $2n = 30$ ) or hypo-hexaploid numbers ( $2n = 28$ ) have been reported from Morocco (HUMPHRIES & al., 1978), Tunisia (GOULD & SODERSTROM, 1970), Portugal (FERNANDES & QUEIRÓS, 1969), France (KLIPHUIS & WIFFERING, 1972), Spain (BAILEY & STACE, 1989; DEVESA, & al. 1991), and Albania (BALTISBERGER & LEUCHTMANN, 1991). Additional records of hexaploids as well as reports with references to diploid ( $2n = 10$ ) cytotypes are given in SCHIPPMANN (1991).

***Bromus rigidus* Roth**

$$2n = 42$$

MOROCCO: Mediterranean coast W of Saidia, surroundings of the mouth of Oued Moulouya c. 10 km W Saidia, dunes c. 1 km inland, 10 m, 35°07'N - 02°18'W, 05.05.1993, Vogt 10896 & Oberprieler 5344.

Our finding of  $2n = 42$  chromosomes for this species widespread in the Mediterranean is in accordance with the former reports on material from Tunisia GOULD & SONDERSTROM (1970), Israel (OVADIAHU-YAVIN 1969), France and Algeria (ESNAULT & HUON 1987), Libya (FARUQUI & al. 1987), and Spain (SÁNCHEZ ANTA & al. 1988). The octoploid number ( $2n = 56$ ) found by NATARAJAN (1978) in plant material of French provenance, and by OVADIAHU-YAVIN (1969 sub *B. rigidus* subsp. *gussonei* (Parl.) Maire) in plants from Palestine may belong here (or to *B. diandrus* Roth?).

***Bromus rubens* L.** $2n = 28$ 

MOROCCO: Prov. d'Er-Rachidia, road P 32 between Er-Rachidia and Boudnib, c. 19.2 km E of junction to Erfoud, dry Oued with *Ziziphus*, 1030 m, 31°55'N - 04°08'W, 30.04.1993, Vogt 10424 & Oberprieler 4872.

Our count of  $2n = 28$  chromosomes corroborates the results from N African provenances reported by FERCHICHI & al. (1994) for Tunisia, HUMPHRIES & al. (1978) for Morocco, and REESE (1957) for Algeria. It confirms the tetraploid nature of this widespread mediterranean weed. In a population from Tazensout in Morocco HUMPHRIES & al. (1978) observed 4 additional B-chromosomes.

***Cutandia memphitica* (Sprengel) K. Richter** $2n = 14$ 

MOROCCO: Prov. d'Er-Rachidia, road P 32 between Er-Rachidia and Boudnib, c. 19.2 km E of junction to Erfoud, dry Oued with *Ziziphus*, 1030 m, 31°55'N - 04°08'W, 30.04.1993, Vogt 10422 & Oberprieler 4870.

Our findings corroborate former results for N African plant material reported by REESE (1957) for Algeria, by FERCHICHI & al. (1994, sub *C. dichotoma* (Forssk.) Trab.) and GOULD & SODERSTROM (1970, sub *C. dichotoma* var. *memphitica* (Sprengel) Maire & Weiller) for Tunisia, and by FARUQUI & al. (1987) for Libya. FARUQUI & al. (1987) report the inconstant occurrence of a single accessory B-chromosome in their meiotic preparations of  $n = 7$ .

***Hordeum murinum* L. subsp. *glaucum* (Steud.) Tzvelev***H. glaucum* Steud. $2n = 14$  (Fig. 1D)

MOROCCO: Prov. d'Er-Rachidia, road P 32 between Er-Rachidia and Boudnib, c. 19.2 km E of junction to Erfoud, dry Oued with *Ziziphus*, 1030 m, 31°55'N - 04°08'W, 30.04.1993, Vogt 10423 & Oberprieler 4871. Prov. Figuig, mountains W of Djebel Maiz near road P 32 between Bouarfa and Figuig, c. 55 km WNW Figuig, dry Oued, stony slopes, and rocks, 1200m, 32°14'N-01°44'W, 02.05.1993, Vogt 10597 & Oberprieler 5045. Monts des Beni-Snassen, road 5311 between Mechrâ-Homadi and Berkane, valley SE point

351 m c. 2 km E Mechrâ-Homadi, *Tetraclinis articulata* woodland, limestone cliffs, dry Oued, 200-250 m, 34°45'N - 02°47'W, 07.05.1993, Vogt 11058 & Oberprieler 5506.

Material from three Moroccan populations of this widespread species proved to have  $2n = 14$  chromosomes. This number is in accordance with reports from N African countries, i.e. by HUMPHRIES & al. (1978) and GALLAND (1988) for Morocco, by GOULD & SODERSTROM (1970) for Tunisia, and by FARUQUI (1985) and FARUQUI & al. (1987) for Libya.

***Hordeum murinum* L. subsp. *leporinum* (Link) Arcang.**

*H. leporinum* Link

$2n = 28$  (Fig. 1E)

MOROCCO: Rharb, road S 216 between Arbaoua and Moulay Bousselham, c. 3.4 km W of junction with road to Lalla-Rhano and Ksar-el-Kebir, ungrazed field margin, 10 m, 34°51'N - 06°10'W, 24.04.1993, Vogt 10177 & Oberprieler 4625.

Our count of  $2n = 28$  corroborates the previous counts from the Mediterranean area, i.e. by WAISEL (1962) for Israel, by DAHLGREN & al. (1971) for the Balearic Islands, by QUEIROS (1973) for Portugal, and by FARUQUI & al. (1987) for Libya. Counts of  $n = 7$  chromosomes were given by DEVESA & al. (1990) for plant material from the Spanish Extremadura and by FERCHICHI & al. (1994 sub *H. murinum* L.) for Tunisia, but probably refer to *H. murinum* subsp. *glaucum* (see above). The hexaploid number ( $2n = 42$ ) is only known from Asian countries (JACOBSEN & BOTHMER, 1995).

***Schismus barbatus* (L.) Thell.**

$2n = 12$  (Fig. 1F)

MOROCCO: Prov. d'Er-Rachidia, road P 32 between Er-Rachidia and Boudnib, c. 19.2 km E of junction to Erfoud, dry Oued with *Ziziphus*, 1030 m, 31°55'N - 04°08'W, 30.04.1993, Vogt 10453 & Oberprieler 4901. Mediterranean coast W of Saidia, surroundings of the mouth of Oued Moulouya c. 10 km W Saidia, dunes c. 1 km inland, 10 m, 35°07'N-02°18'W, 05.05.1993, Vogt 10894 & Oberprieler 5342.

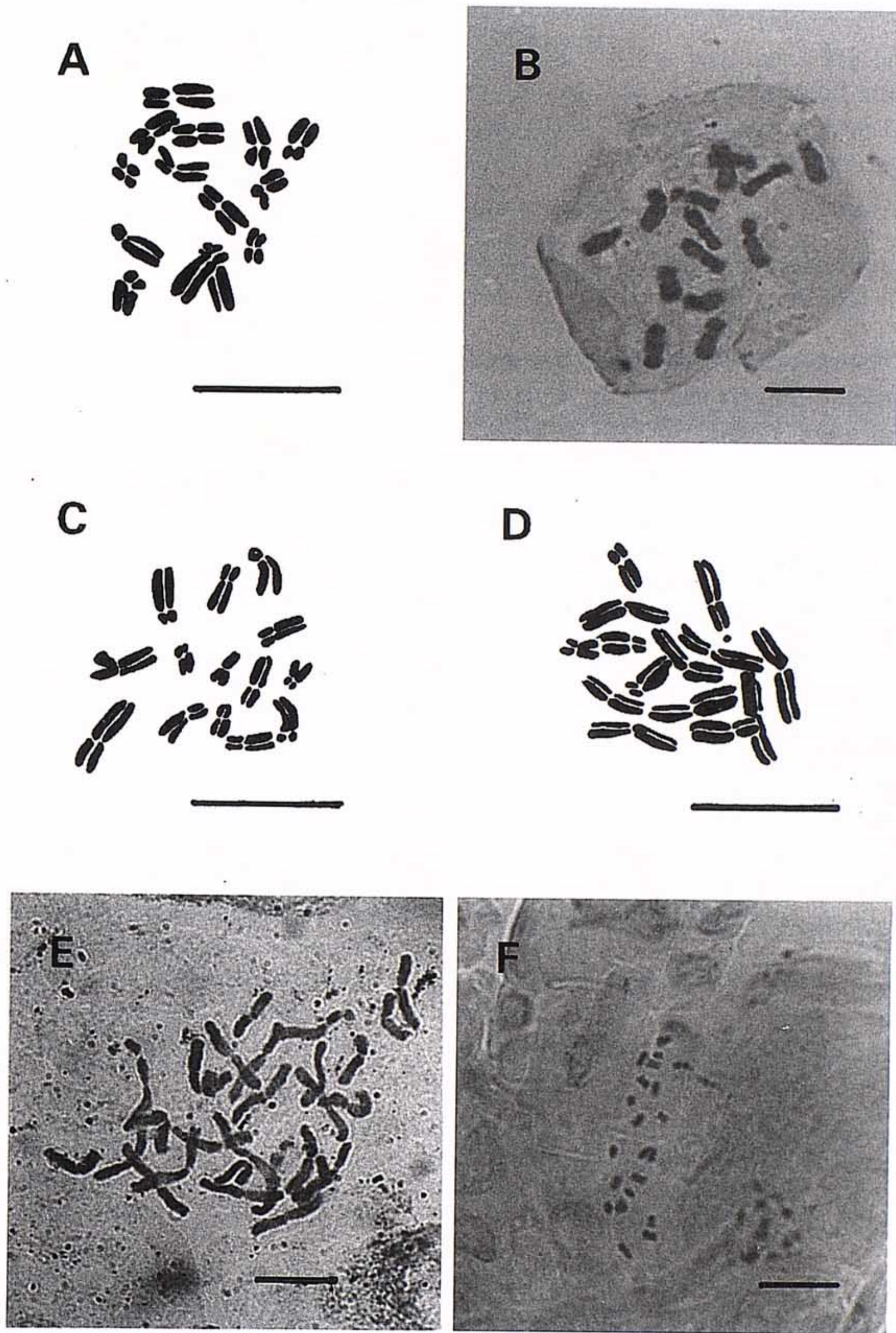


Fig 1. Metaphases of root-tip mitoses. A: *Avena barbata* subsp. *hirtula*,  $2n = 14$ . B: *Avena eriantha*,  $2n = 14$ . C: *Avena wiestii*,  $2n = 14$ . D: *Hordeum murinum* subsp. *glaucum*,  $2n = 14$ . E: *Hordeum murinum* subsp. *leporinum*,  $2n = 28$ . F: *Schismus barbatus*,  $2n = 12$ . (Scale: 10  $\mu$ m)

Our counts from two Moroccan populations of this western Mediterranean and SW Asian species are in accordance with all previous counts on material from northern Africa, i.e. from Morocco (HUMPHRIES & al., 1978), Tunisia (GOULD & SODERSTROM, 1970), and Libya (FARUQUI & QURAIH, 1979; FARUQUI & al., 1987).

***Stipa capensis* Thunb.**

$$2n = 36$$

MOROCCO: Prov. Figuig, mountains W of Djebel Maiz near road P 32 between Bouarfa and Figuig, c. 55 km WNW Figuig, dry Oued, stony slopes, and rocks, 1200m, 32°14'N-01°44'W, 02.05.1993, Vogt 10595 & Oberprieler 5043. Monts des Beni-Snassen, road 5311 between Mechrâ-Homadi and Berkane, slopes along the road c. 1km E of the junction with road S 412 (Mechrâ-Homadi - El-Aioun), *Tetraclinis articulata* woodland, 200m, 34°43'N - 02°48'W, 06.05.1993, Vogt 10972 & Oberprieler 5420. Monts des Beni-Snassen, road 5311 between Mechrâ-Homadi and Berkane, valley SE point 351 m c. 2 km E Mechrâ-Homadi, *Tetraclinis articulata* woodland, limestone cliffs, dry Oued, 200-250 m, 34°45'N - 02°47'W, 07.05.1993, Vogt 11082 & Oberprieler 5530.

These first counts in plant material of Moroccan provenance corroborate the former reports from the Mediterranean area on this widespread species. It has been studied in Tunisia by GOULD & SODERSTROM (1970), in Portugal by FERNANDES & QUEIROS (in FERNANDES 1969) and QUEIROS (1974), in the Balearic Islands by DAHLGREN & al. (1971), and in Spain by DEVESA & al. (1991).

***Stipagrostis obtusa* (Delile) Nees**

$$2n = 36$$

MOROCCO: Djebel Siroua, road P 32 between Tazenakht and Taliouine, c. 0,5 km W Tazenakht, roadsides, 1430m, 30°35'N-07°12'W, 13.5.1993, Vogt 11722 & Oberprieler 6170.

The new count of  $2n = 36$  is unexpected. Previous reports of  $2n = c. 42$  and  $2n = 44$  chromosomes in *Stipagrostis obtusa* from Algeria (REESE, 1957), Tunisia (GOULD & SONDERSTROM, 1970), and Namibia (de WINTER, 1965, SPIES & al., 1991) fit well to  $x = 11$ , the basic chromosome number in the genus *Stipagrostis* (SPIES & al., 1991). Further investigations are needed.



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