

CHROMOSOME NUMBER OF SOME WILD PLANT SPECIES FROM KUWAIT

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Abstract. Meiosis was studied and gametic chromosome numbers were determined for seven species belonging to 5 families. These were: *Anthemis deserti*, n=9, *Launaea capitata*, n=9, and *Rhanterium epapposum*, n=6, (Compositae); *Moltkiopsis ciliata*, n=6, (Boraginaceae); *Haplophyllum tuberculatum*, n=9, (Rutaceae); *Gypsophila antari*, n=17, (Caryophyllaceae); and *Plantago coronopus*, n=5, (Plantaginaceae). Meiosis in all species studied was generally regular with the formation of bivalents and in some cases univalents at diakinesis, but having a low chiasma frequency per bivalent.

INTRODUCTION

There are over three hundred plant species scattered all over the different regions of Kuwait. A compilation list of most of these species was reported by Dickson (1955) and Halwagy & Macksad (1972). Similar species growing in neighbouring countries were fully identified and described (Rechinger 1964). A large number of these species has not been studied cytologically and the chromosome number of many of them is even not yet known. However, El-Bayoumi (1973), studied the meiosis of few wild plant species growing in Kuwait.

The present study is a continuation of that investigation carried out on Kuwaiti plants. It deals with the determination of chromosome

number and behaviour during meiosis in seven other species.

MATERIAL AND METHODS

Seven species growing in the Kuwaiti desert were studied cytologically. These species were: *Anthemis deserti* Boiss., *Launaea capitata* (Spreng.) Dandy, and *Rhanterium epapposum* Oliv. (Compositae); *Moltkiopsis ciliata* (Forssk.) I.M. Johnston (Boraginaceae); *Haplophyllum tuberculatum* (Forssk.) Adr. Juss. (Rutaceae); *Gypsophila antari* Post (Caryophyllaceae) and *Plantago coronopus* L. (Plantaginaceae).

The meiotic observations and chromosome number of each species were determined from the pollen mother cells (PMCs). Therefore, the

TABLE 1 : The gametic chromosome number of the species studied, their chiasma frequency and the basic chromosome numbers of the different genera.

| Species | Habit | (n) | (x) | Mean chiasma frequency |
|----------------------------------|-----------|-----|--------------|------------------------|
| Family Compositae | | | | |
| <i>Anthemis deserti</i> | annual | 9 | 9 | 1.75 |
| <i>Launaea capitata</i> | biennial | 9 | 7,8,9 | 1.15 |
| <i>Rhanterium epapposum</i> | perennial | 6 | not recorded | 1.16 |
| Family Boraginaceae | | | | |
| <i>Moltkiopsis ciliata</i> | perennial | 6 | not recorded | |
| Family Plantaginaceae | | | | |
| <i>Plantago coronopus</i> | annual | 5 | 4,5,6,9 | 1.20 |
| Family Caryophyllaceae | | | | |
| <i>Gypsophila antari</i> | annual | 17 | 17 | 0.76 |
| Family Rutaceae | | | | |
| <i>Haplophyllum tuberculatum</i> | annual | 9 | not recorded | 1.00 |

n = gametic chromosome number.

x = basic chromosome number (after Darlington & Wylie 1955).

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gametic (haploid) chromosome number (n) will be indicated. The flower buds were collected and immediately fixed in the field using Carnoy solution (3 parts ethyl alcohol and one part glacial acetic acid). The buds were kept in the fixative for 24 hours and then transferred into 70% ethyl alcohol, where they were stored in a refrigerator until the time of examination. The acetoc-orcein squash technique was used. The details of the technique were described in a previous report (El-Bayoumi 1973).

The chiasma frequency was determined at the diakinesis stage by counting the number of chiasma divided by the number of bivalents in each PMC. The average of at least 10 PMCs was taken as the chiasma frequency per bivalent for each species.

OBSERVATIONS

Chromosome number

The chromosome number of the species studied as represented by the haploid number and the chiasma frequency per bivalent for each species are shown in Table 1. The basic chromosome numbers (x) of the genera to which the species belong are also indicated.

Meiotic observations

a — *Anthemis deserti*. The gametic chromosome number was found to be 9. The basic chromosome number as previously reported for the genus is 9 (Darlington & Wylie 1955). Meiosis was regular, with the formation of nine bivalents at diakinesis appearing as ring or rod shape (Figs. 1 & 2). The chiasma frequency was 1.75 per bivalent. The chromosomes were regularly separated to the poles at anaphase I and anaphase II.

b — *Launaea capitata*. The gametic chromosome number was found to be 9. The basic chromosome number of the genus is 7, 8 or 9. Meiosis was regular with the formation of 9 bivalents at diakinesis appearing either as ring or rod form (Fig. 3). The mean chiasma frequency was 1.15 per bivalent. The chromosomes separated normally to the poles at anaphase I and anaphase II. The somatic metaphase complement observed in root tips of this species was found to be $2n = 18$ (Fig. 4).

c — *Rhanterium epapposum*. The gametic chromosome number was 6. The basic chromosome number of this genus has not been previously reported. Meiosis was regular with the formation of six bivalents at diakinesis, appearing as either rings or rods (Figs. 5 & 6). The

chiasma frequency was 1.16 per bivalent. During anaphase I and anaphase II the chromosomes were regularly distributed to the poles (Fig. 7).

d — *Moltkiopsis ciliata*. The gametic chromosome number of this species was found to be $n = 6$. Meiosis was regular in the PMCs. Six bivalents normally appeared as either rod or ring form during diakinesis. Arrangement of bivalents at the equatorial plane at metaphase I and the separation of chromosomes during anaphase I were normal (Figs. 8 & 9).

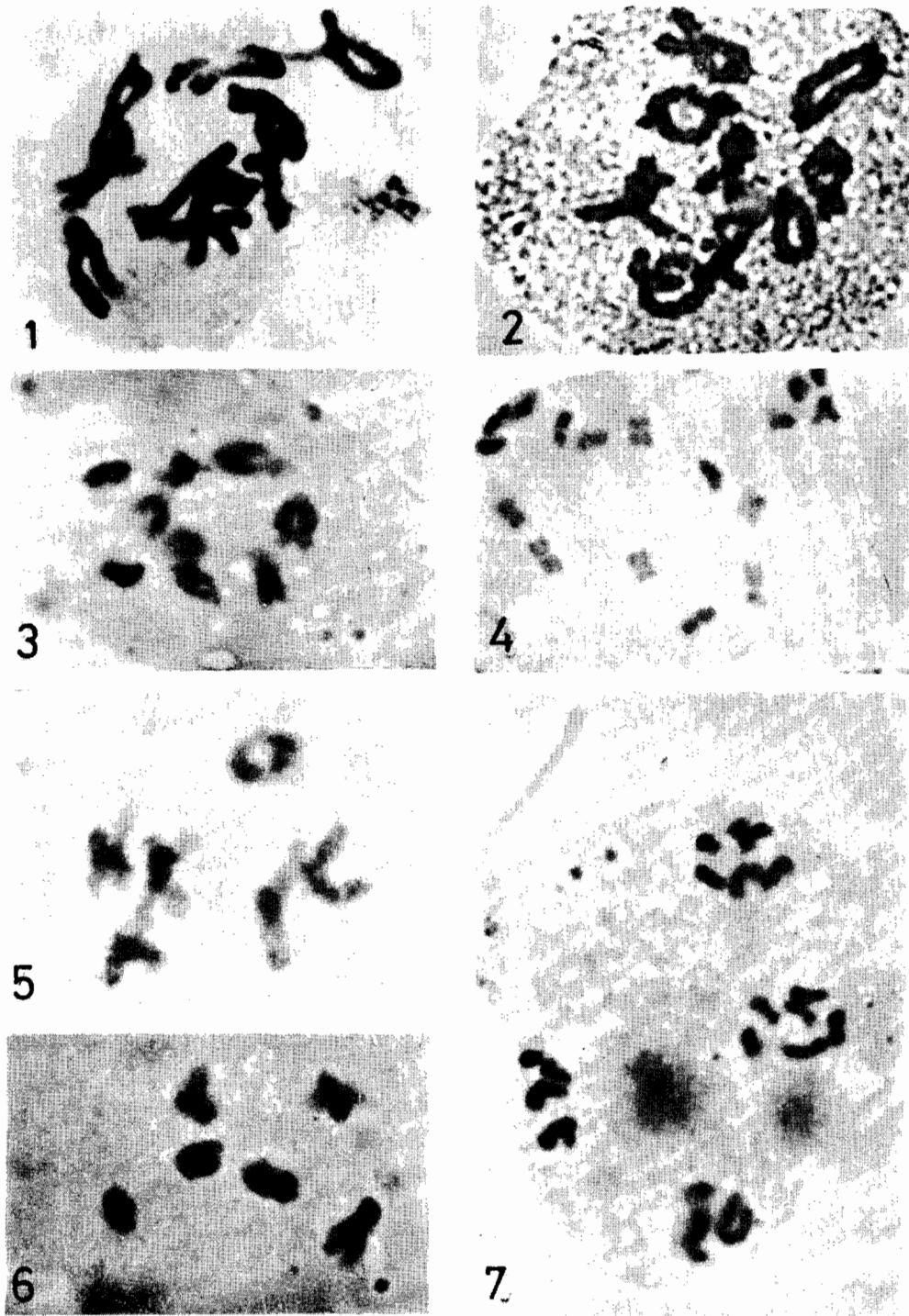
e — *Plantago coronopus*. The species was found to have a gametic chromosome number $n = 5$. This agrees with the previous count reported by Darlington and Wylie (1955) for the same species. Meiosis was regular with the formation of 5 bivalents. They appear as either rods or rings in the diakinesis stage (Fig. 10). The chromosomes separate regularly during anaphase I and anaphase II (Fig. 11).

f — *Gypsophila antari*. The gametic chromosome number of this species was found to be $n = 17$. The basic chromosome number was reported by Darlington and Wylie (1955) to be $x = 17$. During diakinesis the chromosomes appear as bivalents or univalents (Figs. 12 & 13). The number of univalents varied in different PMCs from 6 to 20. The bivalents at diakinesis usually appeared as rods but occasionally as rings attached by two loose terminal chiasma.

g — *Haplophyllum tuberculatum*. The gametic chromosome number of this species was found to be $n = 9$. The chromosomes synapse regularly with the formation of 9 bivalents at diakinesis. Most of the bivalents appeared as rods during diakinesis and first metaphase (Figs. 14 & 15). The chromosomes distributed regularly to the poles during anaphase.

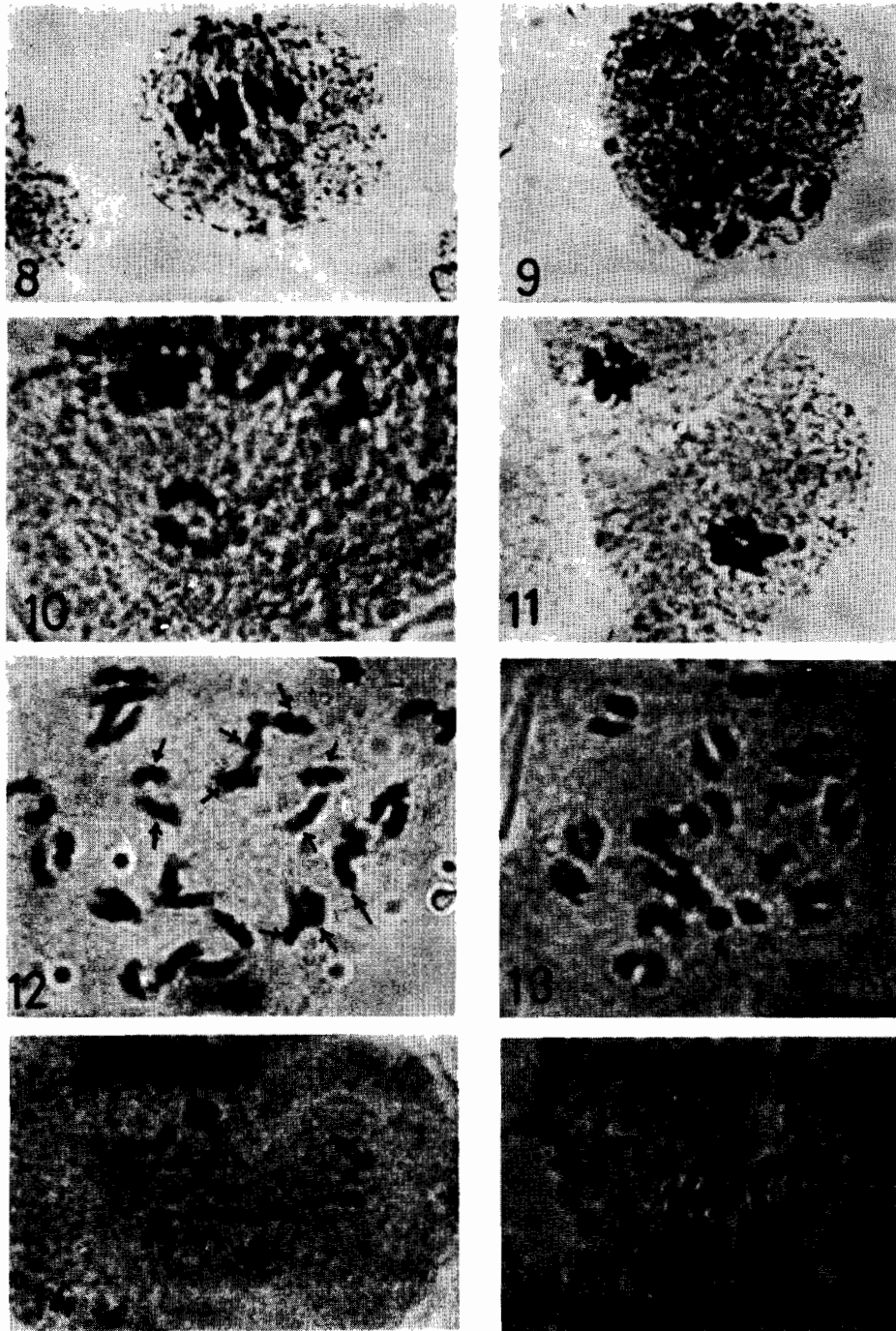
DISCUSSION

Meiosis in the species studied was normal except for *Gypsophila* where failure of pairing (univalents) indicated hybrid origin. Synapsis of the homologous chromosomes occurred regularly, but with low chiasma frequency per bivalent. The present results are similar to those previously found in other wild Kuwaiti plants (El-Bayoumi 1973). Johnes (1967) and Rees & Thompson (1958) showed that the distribution and the frequency of chiasma were under genetic and environmental control. Such results could also be applied to the Kuwaiti plants due to the nature of their desert habitat, where they finish their flowering period until seed setting from several days up to a few weeks. Such low chiasma frequency of the species studied could indicate a low



Figs. 1 - 7. Meiotic Stages 1900X

- 1 & 2. Diakinesis in *Anthemis deserti*. showing 9 bivalents.
3. Diakinesis in *Launaea capitata*, showing 9 bivalents.
4. Somatic chromosome complement of *Launaea capitata*, ($2n=18$).
5. Diakinesis in *Rhanterium epapposum* showing 6 bivalents.
6. Metaphase I in *Rhanterium epapposum* showing 6 bivalents.
7. Anaphase II in *Rhanterium epapposum* showing four groups, six chromosomes each.



Figs. 8 - 15. Meiotic stages 1900X

8. Metaphase I in *Moltkiopsis ciliata*, showing 6 bivalents.
9. Anaphase I in *Moltkiopsis ciliata*, showing two groups of 6 chromosomes each.
10. Diakinesis I in *Plantago coronopus*, showing 5 bivalents.
11. Anaphase I in *Plantago coronopus*, showing two groups of 5 chromosomes each.
12. Diakinesis in *Gypsophila antari*, showing 12 bivalents and 10 univalents.
13. Diakinesis in *Gypsophila antari*, showing 15 bivalents and 4 univalents.
14. Diakinesis in *Haplophyllum tuberculatum*, showing 9 bivalents.
15. Metaphase I in *Haplophyllum tuberculatum*, showing 8 bivalents and 2 univalents.

recombination frequency. Thus, it could be a limiting factor for the appearance of different genetic variabilities. Nevertheless, such low chiasma frequency ensures regular separation and distribution of chromosomes during anaphase. Consequently, this could increase the fertility of the plant, which is the case in the species investigated.

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العدد الكروموسومي لبعض النباتات البرية في الكويت

عبد العزيز السعيد البسيوني

قسم النبات بجامعة الكويت

خلاصة

لقد تمت دراسة الانقسام الاختزالي في براعم ازهار سبعة أنواع من النباتات البرية التي تنمو في صحراء الكويت . ومنها تم تحديد عدد الصبغيات (الكروموسومات) لكل نوع والتي لم تعرف من قبل . وتتنمي هذه الأنواع الى خمس عائلات نباتية . ولقد اتضح من الدراسة أن عدد الصبغيات لهذه الأنواع هي كالتالي : الجحويان (*Anthemis deserti*) ن = ٩ ، الحوة (*Launaea capitata*) ن = ٩ ، المرفج (*Rhanterium epapposum*) ن = ٦ ، الحماط (*Moltkiopsis ciliata*) ن = ٦ ، المسيكه (*Haplophyllum tuberculatum*) ن = ٩ ، السليكه (*Gypsophila antari*) ن = ١٧ وبلانتاجو كورونوباس (*Plantago coronopus*) ن = ٥ .

وقد بينت الدراسة أن السلوك الصبغي اثناء الانقسام الاختزالي يتم بصورة طبيعية مع انتظام تكوين الثنائيات في المرحلة التشتيتية ، ولو أنه في بعض الحالات ظهر وجود صبغيات في حالة أحادية ، وبصفة عامة فإن معدل حدوث الكيازما لكل ثنائي منخفض .