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Karyological investigation of seven Moroccan *Asteraceae*

Abstract

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The chromosome number of seven wild Moroccan species belonging to the *Asteraceae* family has been investigated for the first time in the region of Rabat-Salé-Kinétra (Morocco), using the root-tip squash. All these species show a diploid chromosome number which ranged from $2n = 18$ to $2n = 34$. Thus, we obtained for the following species: *Centaurea calcitrapa* $2n = 20$, *Cichorium intybus* $2n = 18$, *Glebionis segetum* $2n = 18$, *Pallenis spinosa* subsp. *maroccana* $2n = 10$, *Lactuca serriola* $2n = 18$, *Phagnalon rupestre* $2n = 18$, *Silybum marianum* $2n = 34$. These findings are discussed and compared with other results from elsewhere.

Keywords: *Compositae*, cytotaxonomy, chromosome number, Moroccan flora.

The *Asteraceae* family, with around 24,000-30,000 species and 1600-1700 genera, is well represented within angiosperms and is distributed around the world except for Antarctica (Friis & Balslev 2005; Funk & al. 2009). Many members of this family are used as aromatic and medicinal plants. Antifungal, antimicrobial, antibacterial and insecticide activities were also found in several species (Kordali & al. 2005; Romagnoli & al. 2005; Funk & al. 2009). In Moroccan vascular flora, the *Asteraceae* family ranks first in terms of specific wealth, with 550 species and 126 subspecies belonging toaround 128 genera. *Centaurea* being the richest genus with 51 species. Moreover, according to the rate of endemics, this family is ranked third with 24% right after *Lamiaceae* and *Plumbaginaceae* with respectively 40 % and 28% (Fennane & Ibn Tattou 2012). In terms of aromatic and medicinal plants, *Asteraceae* with 36 species rank first, followed by *Lamiaceae*, *Apiaceae* and *Fabaceae* with respectively 30, 28 and 20 species (Fennane & Rejdali 2016).

Concerning geographical distribution, the most important part of Moroccan vascular flora is found in semi-arid and sub-humid regions (Sauvage 1960; Fennane & Ibn Tattou 1999; Hammada & al. 2004), which is part our study area, Rabat-Salé-Kinétra, according to Emberger's bioclimatic subdivisions (Sauvage 1963).

Karyological studies on Moroccan flora are quite limited (El Alaoui-Faris & al. 2011), especially in *Asteraceae*. Thus we can quote as preliminary studies on this family: Humphries & al. 1978; Humphries 1979, 1981; Talavera & al. 1984; Molero & Montserrat

Martí 1986; Favarger & al. 1980; Galland 1990; Valdés & Parra 1997; Valdés & al. 1998; Vogt & Oberprieler 1993, 2008, 2012; Oberprieler & Vogt 1993; Oberprieler 1994; Hellwig & al. 1994; Kilian & al. 1995 and El Alaoui-Faris & al. 2010).

The aim of this study is to provide the chromosome number of some spontaneous taxa that belong to *Asteraceae* family in the region of Rabat-Salé-Kénitra, and to compare it with the chromosome numbers found in other populations and countries.

1955. *Centaurea calcitrapa* L. — 2*n* = 2x = 20.

Ma: Salé, national road 1, Avenue Ouali Al Had Sidi Mohamed, 34° 3' 50.425" N, 6° 47' 46.316" W (RAB 108852).

Centaurea is the richest genus in the *Asteraceae* in Morocco, with 51 species, 24 subspecies. Sixteen species and five subspecies being strictly endemic to Morocco (Fennane & Ibn Tattou 2012; Fennane & al. 2014). The present chromosome count regarding this species, 2*n* = 20 and the basic number x = 10, seems to be the first conducted in Morocco. Our count is in accordance with former counts conducted in Italy-Palermo (Colombo & Marcenò 1984), Portugal (Queirós & Viera 1990), Spain in Zaragoza province (Hellwig 1994) and Egypt (Kamel 2004).

1956. *Cichorium intybus* L. — 2*n* = 2x = 18.

Ma: Rabat, Avenue Mohamed Ben Abdellah Erregragui, 33° 59' 23.827 N, 6° 51' 49.409" W. Road P4029, 34° 1' 2.434" N, 6° 44' 5.623" W (RAB 108854).

There are two species in the genus *Cichorium* L. in Moroccan flora, *C. intybus* L. and *C. pumilium* Jacq. (Fennane & al. 2014). As far as we know, our count is the first chromosome report from Morocco for this species, and it corroborates previous counts obtained in the United States of America in Los Angeles Co (Tomb & al. 1978), Wisconsin (Löve 1981b), Pakistan in Thatta (Razaq & al. 1994) and Spain in Puente de Alba (Ortega-Olivencia & al. 2004). The basic chromosome number x = 9 of the genus is also confirmed by our result.

1957. *Glebionis segetum* (L.) Fourr. — 2*n* = 2x = 18.

Ma: Salé, national road 1, 34° 5' 43.508" N, 6° 45' 48.056" W. Road P4029, 34° 1' 3.042" N, 6° 44' 4.261" W (RAB 108849).

Glebionis counts in Morocco two annual species: *G. coronaria* (L.) Spach and *G. segetum* (L.) Fourr. (Fennane & al. 2014). This species was cytologically investigated for the first time in Morocco within populations in the province of Tetouan, Fès and Chefchaouene respectively by Vogt & Oberprieler 1993, 1994, 2008). Our count is also in agreement with

numerous previous reports from Portugal in Castro Verde (Queiros 1973) and the Mediterranean area e.g. Italy, in Sicily (Löve 1981a), Apulia and Sardinia (Paciolla & al. 2010), Cyprus in Paphos (Vogt & Aparicio 1999). Our results confirmed the basic chromosome number x = 9, which is the most common is the genus *Glebionis*.

1958. *Lactuca serriola* L. — 2*n* = 2x = 18.

Ma: Salé, Avenue Jbel Toubkal, 34° 4' 36.649" N, 6° 47' 0.635" W (RAB 108850).

Lactuca genus presents seven species and two subspecies in Morocco. Our count is in agreement with that reported for two Moroccan populations sampled in Guercif area, Taza (Vogt & Oberprieler 2012) and with other previous reports in different countries, Italy-Valley of Aosta (Gadella & Kliphuis 1970), Portugal-Lisbon (Queiros 1973), United States of America-California (Keil & Pinkava 1976), Spain-Sevilla (Gallego 1981), Egypt (Kamel 2004), Japan in Karuizawa (Matoba & al. 2007), and other countries (Mejías 1993). All these counts have shown that the basic number of this species is x = 9.

1959. *Pallenis spinosa* subsp. *maroccana* (Aurich & Podlech) Greuter — 2*n* = 2x = 10.

Ma: Salé, forest Ain Houla, 34° 1' 59.563" N, 6° 47' 27.585" W (RAB 108851).

The genus *Pallenis* is represented in Moroccan flora by five species (Fennane & al. 2014). The subject of our investigation is endemic subspecies to Morocco and Algeria. Its chromosome number 2*n* = 10 was reported for the first time in material from Morocco by Oberprieler & Vogt (1993) in populations from Beni Mellal (Middle Atlas) and Marrakech (High Atlas). They also confirmed this number later in other Moroccan populations from Meknes and Ouezzane (Vogt & Oberprieler 2012). Our count is also in agreement with the previous results from Portugal in Coimbra (Queiros 1973), Italy in Toscana, Garfagnana, North of Gallicano (Löve 1982), Arquà Petrarc, Euganean Hills (Marcucci & al. 2005) and Spain in Cordoba (Ubera 1979), Navarra, Taffala (Valdés Castrillón & Parra Martín 1998). The genus *Pallenis* has two basic numbers x = 5 and x = 6. The endemic subspecies *maroccana* has the basic chromosome number x = 5 (Oberprieler & Vogt 1993; Vogt & Oberprieler 2012).

1960. *Phagnalon rupestre* (L.) DC. — 2*n* = 18.

Ma: Kénitra, lake Sidi Boughaba, 34° 15' 10.264" N 6° 40' 9.35" W. Rabat, Avenue Ibn Hazm, 34° 0' 37.915" N, 6° 50' 21.447" W (RAB 108855).

The genus *Phagnalon* is represented in Morocco by ten species and eight subspecies. Six species and seven subspecies are endemic to Morocco; one species is endemic to Morocco, Algeria and the Iberian Peninsula (Fennane & al. 2014).

Our count is in agreement with the former reports based on Moroccan plants emanated from the province of Taza, Tetouan, Beni-Snassen, and Ouezzane (Oberprieler & Vogt 1993; Vogt & Oberprieler 2008, 2012), and with other reports from Spain in the province of Alicante and in Barcelona (Gadella & al. 1966), the Canary Islands-Lanzarote (Van Loon 1974), and Mallorca (Luque & al. 1984). Throughout the literature and our results, x = 9 appears to be the only basic number of this species.

1961. *Silybum marianum* (L.) Gaertn. — 2*n* = 2x = 34.

Ma: Salé, road P 4029, 34° 1' 2.395" N, 6° 44' 5.661" W (RAB 108853).

The genus *Silybum* in represented in Morocco by two species: *S. eburneum* Cross. & Dur. and *S. marianum* (L.) Gaertn. (Fennane & al. 2014). As far as we know, this is the first chromosome report of this species in Morocco and confirms other counts on populations from Spain in Valencia and Granada (Gadella & al. 1966), Portugal in Vila Velha de Ródão (Fernandes & Queiros 1971) and the Canary Island in Lanzarote, Valle de Rincon (Van Loon 1974). Our result supports the basic number x = 17.

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