Pak. J. Bot., 46(1): 91-94, 2014.

KARYOLOGICAL STUDIES ON SOME *PHLOMIS* L TAXA (LAMIACEAE)

CANAN ÖZDEMİR[1], CENK DURMUŞKAHYA[2], HAKAN SEPET[1] AND BAHATTİN BOZDAĞ[1]

[1]*Celal Bayar University, Science and Art Faculty, Biology Department, Manisa, Turkey*
[2]*Celal Bayar University, Demirci of Education Faculty, Manisa, Turkey*
[*]*Corresponding author's e-mail: cozdemir13@gmail.com*

Abstract

In present study the chromosome number and morphology of some species of the genus *Phlomis* Linnaeus (Lamiaceae) were investigated using karyological techniques. The seeds of *Phlomis_grandiflora* H.S. Thompson, var. *grandiflora* and *Phlomis lunariifolia* Sm.were collected from natural habitats. The chromosome numbers were determined for all species as 2n = 20. The chromosome numbers and karyotype analysis of the species were here reported for the first time from Turkey.

Introduction

Labiatae (Lamiaceae) family has about 3200 species which mostly grows at Mediterranean area. Approximately 45 genus and 550 species of the family distributed naturally in Turkey (Davis, 1988; Güner *et al*., 2000). Many species of the Lamiaceae are aromatic and often used as herbs, spices, folk medicines and fragrances (Werker *et al.,* 1985). Herbs (usually), shrubs (sometimes ericoid), trees (rarely) and lianas (rarely) characteristically bearing essential oils (the crushed foliage aromatic or foetid, with taxonomic predictability).

The genus *Phlomis* is represented by 34 species, 6 varieties and 10 hybrids in *Flora of Turkey* (Huber-Morath, 1982; Dadandı & Duman, 2003). *Phlomis*, large genus of Old World has aromatic herbs, subshrubs and shrubs which often bear woolly leaves. This plant forms an excellent weed-smothering ground cover. The flowered stems dried make pretty winter decorations. Aromatic herbs and shrubs which have flowers resembling the lips of a mouth and four-lobed ovary, of which each lobe yields a seed are grown primarily for their dense whorls of lipped flowers and attractive foliage.

The leaves often wooly are highly variable in size and shape, though they are neatly arranged in opposing pairs. The flowered stems borne at shoot tips mostly in spring and in summer can be quite tall. The spaces among the usually ball-like clusters of flower buds that open into large, colorful, highly irregular flowers in lengthy succession are tight. Each flower has a hooded upper lip and a more open, spreading lower lip, much like some *Salvia* species. These are rugged and attractive plants for sunny sites. Depending on their size, they may display individual specimens or groups forming borders. They thrive in full exposure with reasonably well drained soil and are moderate to occasional deep watering. According to the literature, some studies have been carried out on the cytogenetic (Azizian & Cutler, 1982., Aparicio, 1997., Aparicio & Albaladejo, 2003; Li-Qin *et al*., 2007), palynolonogic (Yildiz *et al.,* 2009.) and vegetation (Hegazy *et al*., 2011; Tian *et al*., 2013) of *Phlomis* species. The aim of this study was to determine the number and morphological properties of chromosomes of *P.grandiflora* H.S. Thompson, var. *grandiflora, Phlomis lunariifolia* Sm., which grows in Turkey.

Materials and Methods

Plant materials were collected from natural distributions of the studied species in Turkey (Table 1). Voucher specimens are deposited in the herbarium of department of Biology at Celal Bayar University. The taxonomical nomenclatures adopted here follow Davis (1982). We used root tips to count chromosome numbers.

For the study of somatic chromosomes, root tips were obtained from germinating seeds in sterilized petri dishes. They were pre-treated in α-monobromonaphtalene (16 h) and then fixed in a mixture of ethanol and acetic acid (2 h). Root tips were hydrolyzed with 1 N HCl at 60°C for 15 minutes, stained in feulgen reagent for 1 hour in darkness, and finally squashed in 45% acetic acid (Elçi, 1994). Chromosome measurements were based on five metaphaseplates. Slides were examined under Leica DM 3000 LB photomicroscope and photographs were taken on the same microscope. The karyograms were drawn from mitotic metaphase. Karyotype analysis was carried out according to the method described by Levan *et al*., (1964).

Results

***P. grandiflora* var. *grandiflora*:** The chromosome number of this species is 2n = 20. Centromere of the 2 nd, 3 rd, 5 th 6 th, 8th, 9th and 10th chromosomes are at the median region (m); the 1 st and 4 th chromosomes are at the median (M) and of 7 th chromosomes are at the submedian (sm). No satellites were observed in the karyotype of this species. Chromosome sizes vary from 4.65 to 7.50µm. The longest arm is 3.75 µm and the shortest arm is 2.00 µm (Fig. 1A, B, C, D; Fig. 3; Table 2).

Table 1. Localities of investigated *Phlomis* species in this studies.

Taxon	Locality	Specimen number
P.grandiflora var. *grandiflora*	Antalya Korkuteli, 15.6.2010 1010 m	CDK 10225
P.lunariifolia	Elmalı, Cığlıkara region, 19.6.2010 1150 m.	CDK 10255

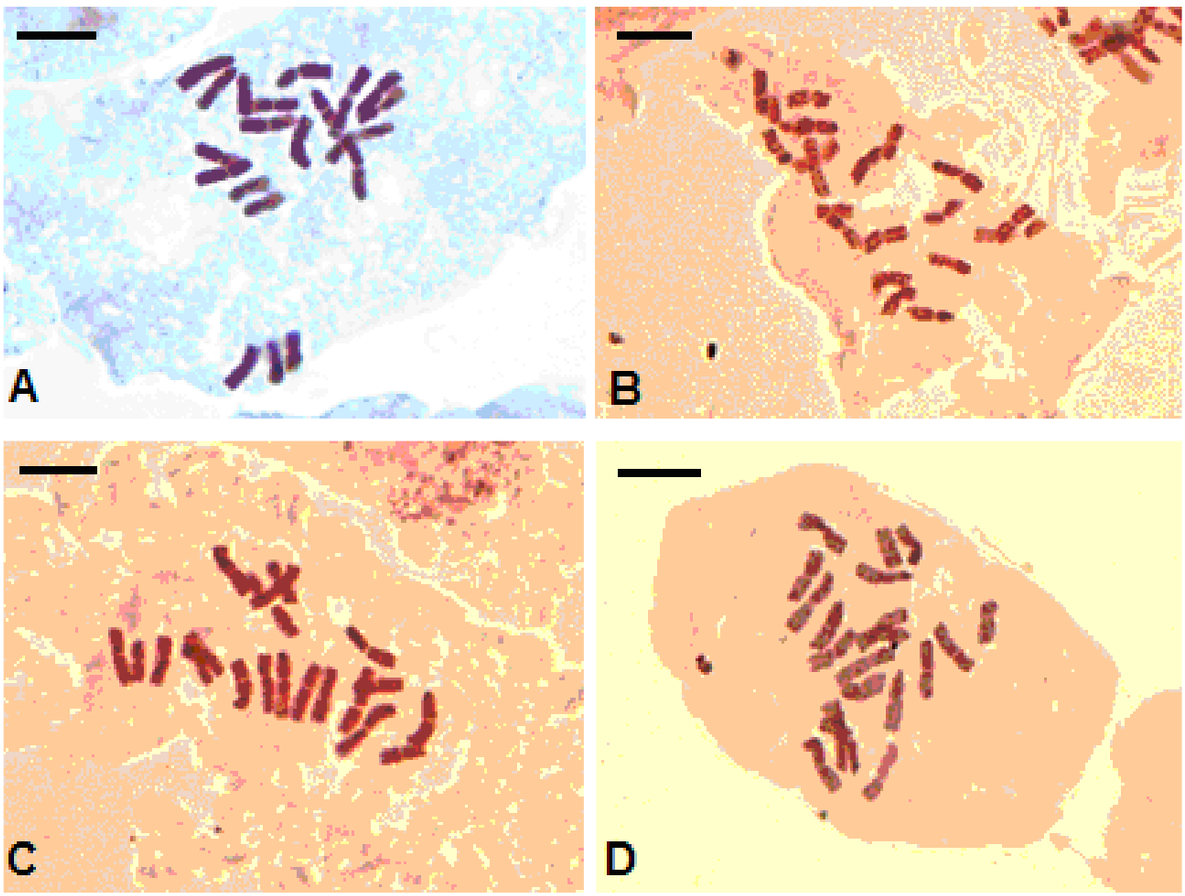

Fig. 1. Microphotograph of somatic metaphases *P.grandiflora* var. *grandiflora* (A,B,C,D) ; (2n = 20). Scale bars: 10µm.

Table 2. Karyomorphological parameters of *Phlomis* taxa.

Chromosome No.	Total length (C) µm	Long arm length (L) µm	Short arm length (S) µm	Arm ratio R: L/S	Centromeric index I: (S/C).100	Relative size	Centromeric position S.D.
			P. grandiflora* var. *grandiflora				
1	7.50	3.75	3.75	1.00	50.00	12.74	Median (M)
2	7.00	3.75	3.25	1.15	46.42	11.89	Median (m)
3	6.41	3.66	2.75	1.33	42.90	10.89	Median (m)
4	6.16	3.08	3.08	1.00	50.00	10.46	Median (M)
5	6.10	3.44	2.66	1.29	43.60	10.36	Median (m)
6	5.66	3.16	2.50	1.26	44.16	9.61	Median (m)
7	5.50	3.50	2.00	1.75	36.36	9.34	Submedian (sm)
8	5.10	3.00	2.10	1.42	41.17	8.66	Median (m)
9	4.75	2.60	2.15	1.20	45.26	8.07	Median (m)
10	4.65	2.50	2.15	1.15	46.35	7.91	Median (m)
			P. lunariifolia				
1	9.33	5.08	4.25	1.19	45.55	13.87	Median (m)
2	8.08	4.58	3.50	1.30	43.31	12.01	Median (m)
3	7.66	4.25	3.41	1.24	44.51	11.39	Median (m)
4	7.33	4.25	3.08	1.37	42.02	10.90	Median (m)
5	6.75	4.40	2.35	1.87	34.81	10.04	Submedian (sm)
6	6.33	3.75	2.58	1.45	40.75	9.41	Median (m)
7	6.13	3.55	2.58	1.37	42.08	9.11	Median (m)
8	5.66	2.83	2.83	1.00	50.00	8.41	Median (M)
9	5.30	3.25	2.05	1.58	38.68	7.88	Median (m)
10	4.66	2.66	2.00	1.33	42.91	6.93	Median (m)

***P. lunariifolia*:** The chromosome number of this species is 2n = 20. The karyotype of this species consists of 8 pairs of median region (m), 1 pair of median (M) and1 pair of Submedian (sm). Centromere of the 1 st , 2 nd , 3 rd, 4 th, 6 th, 7th and 9th and 10th chromosomes are at the median region (m); the 8 th, chromosomes are at the median (M) and 10th chromosomes is at the Submedian (sm). No satellites were observed in the karyotype of this species. Chromosome sizes vary from 4.66 to 9.33 µm. The longest arm is 5.08 µm and the shortest arm is 2.00 µm (Fig. 2-E,F,G,H; Fig. 3; Table 2).

Discussion

In present study, we determined chromosome numbers and detailed measurements of some species of the genus *Phlomis*. Previous reports show that all the investigated members of *Phlomis* have chromosome with 2n= 2x= 20, 22, 66. And the basic chromosome number of *Phlomis* sect. *Phlomoides* is confirmed to be x=11 (Li-Qin *et al.*, 2007). Azizian & Cutler (1982) reported that within Phlomis**,** two distinct groups can be recognized using chromosome data. *Phlomis* section *Phlomis* has 2n= 20 and larger chromosomes and *Phlomis* section *Phlomoides* has 2n= 22 and smaller chromosomes. The somatic chromosome numbers reported here support the earlier report on *Phlomis* (Azizian & Cutler, 1982). Investigated species have chromosome with 2n= 20. Averages of chromosomal lengths of investigated species ranged from 4.65 to 9.33 µm. The biggest chromosome was observed on *P.lunariifolia* while *P.grandiflora* var. *grandiflora* has the smallest chromosome (Table 2). The karyotypes of the investigated species are more or less similar with respect to centromere position. But the differences obtained for the total length of the chromosomes, length of the short arms and the long arms as well as chromosomes arms ratios among the species.

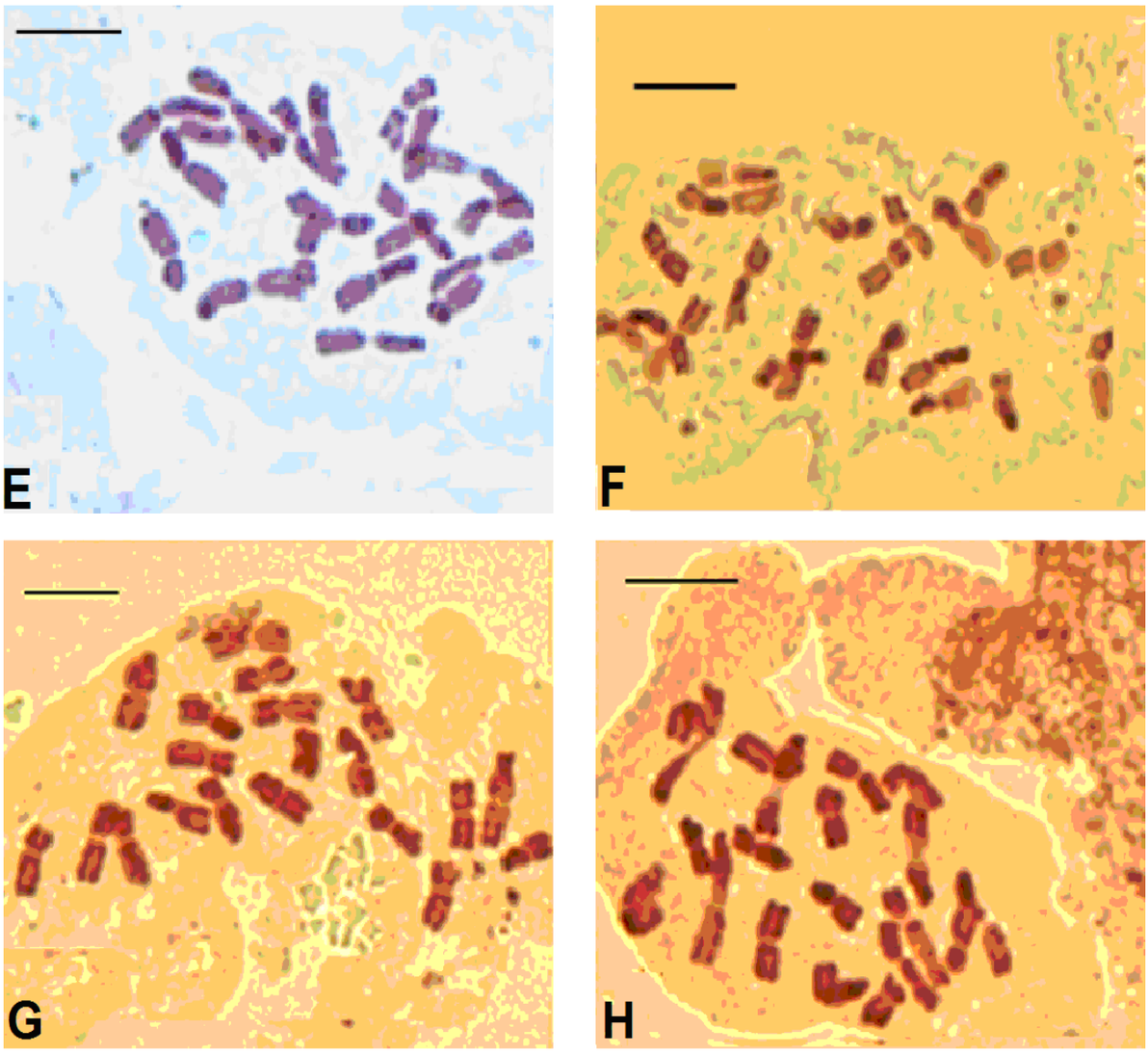

Fig. 2. Microphotograph of somatic metaphases *P.lunariifolia* (E,F,G,H); (2n = 20); Scale bars: 10 µm.

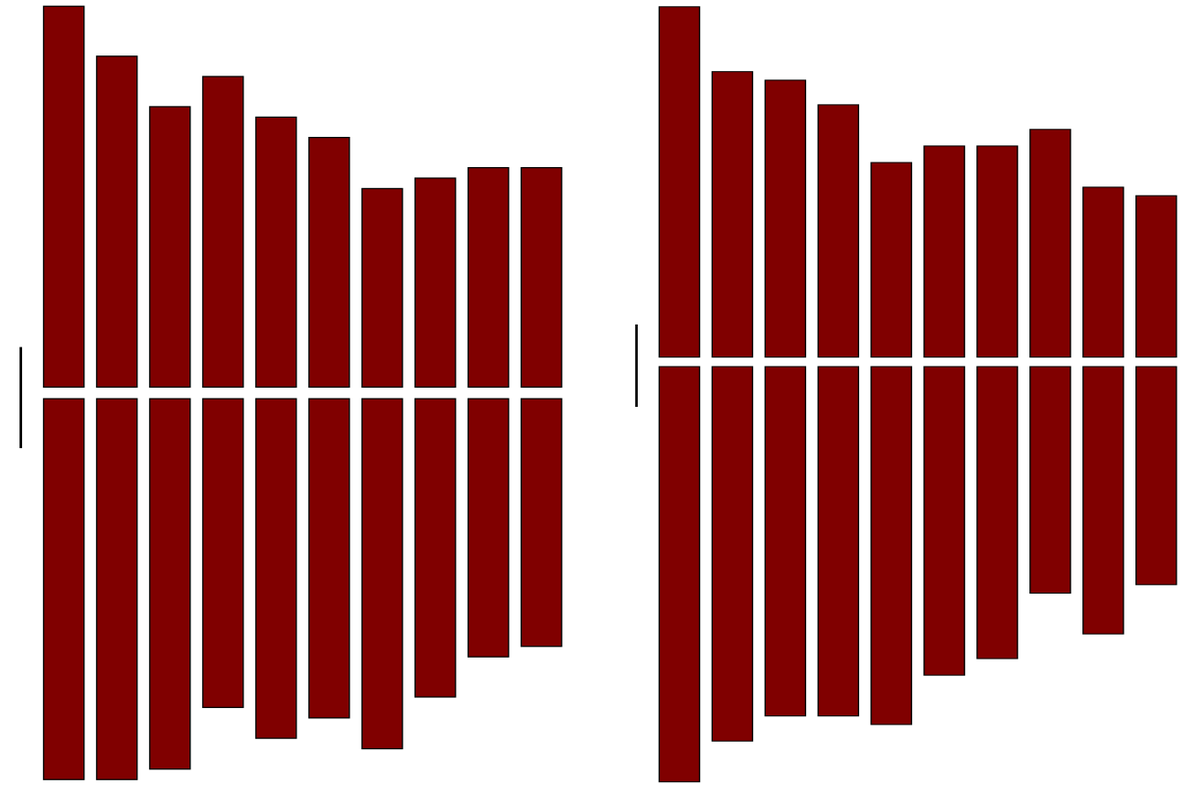

Fig. 3. Haploid idiograms *P.grandiflora* var. *grandiflora* (A), *P.lunariifolia* (B), (2n = 20); Scale bars: 1µm.

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(Received for publication 10 October 2012)