



Research Article

Karyomorphology of Seven Different Angiospermic Plants

Pushpa Karna Mallick* 

Tribhuvan University, Department of Botany, Tri-Chandra Multiple Campus, Kathmandu, Nepal

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*Corresponding author

Pushpa Karna Mallick,

Tribhuvan University, Department of Botany, Tri-Chandra Multiple Campus, Kathmandu, Nepal

Email: karnapushpa@yahoo.com

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Keywords: Karyomorphology; Chromosome number; Angiosperm; Asteraceae; Aceto-orcien

Abstract

The focus of this study is on the karyomorphological examination of seven angiospermic plants: *Centaurea cyanus* L. belonging to the Cynareae tribe; *Coreopsis grandiflora* Nutt. ex Chapm. and *Eclipta prostrata* (Linn.) Linn. from the Heliantheae tribe; *Eupatorium adenophorum* Spreng from the Eupatorieae tribe; *Gnaphalium affine* D. Don. from the Inuleae tribe; *Rhynchospermum verticillatum* Reinw. from the Astereae tribe; and *Tridax procumbens* L within the Asteraceae family. Cytological analysis was used to assess the chromosome count and karyomorphology of all seven plants studied in central Nepal. The somatic chromosomal number found in this inquiry was $2n=24$ for *Centaurea cyanus*, which has the karyotype formula $M_{12}+m_6+sm_2+st_4$. Similarly, $2n=26$ was found for *Coreopsis grandiflora*, which has the karyotype formula $M_{14}+sm_{12}$ and $2n=22$ for *Eclipta prostrata* which has the karyotype formula $M_{14}+sm_6+st_2$. The karyotype formula for *Eupatorium adenophorum* is $M_4+m_{12}+sm_{26}+st_8$ and $2n=50$, while for *Gnaphalium affine*, it is $M_{10}+sm_4$, with a $2n=14$ value. The karyotype formula for *Rhynchospermum verticillatum* is $M_4+m_8+sm_6$ with $2n=18$. For *Tridax procumbens* L, $2n=26$ whose karyotype formula is $M_{18}+m_4+sm_2+st_2$. The examined taxa's total length varied from 0.3 μm to 2.6 μm .

Introduction

Understanding the origins and evolution of plant species, molecular phylogeny, and floristic geography are all aided by studies on karyotypes (Sun *et al.*, 2000). Calling the taxon *Eupatorium adenophorum* "crofton weed" is a common practice. It is referred to as Banmaaraa in Nepal. On boils, the leaf paste is administered. To stop bleeding from cuts and wounds, use bud paste and leaf juice (Rajbhandari, 2001). In Nepal, the plant is also utilized to make bricket, which is used as fuel. The taxon *Eclipta prostrata*, known in Nepal as Bhringraaj or Bhangeri Jhaar. The plant paste heals cough and asthma, rejuvenates skin and hair, and gets rid of intestinal worms (Anonymous,

1997; Joshi 2000; Joshi & Joshi, 2001; Baral & Kurmi, 2006). Similarly, *Rhynchospermum verticillatum*, *Centaurea cyanus*, and *Coreopsis grandiflora* are utilized as decorative plants in gardens and well as in home garden. The plant *Gnaphalium affine* has vulneary and astringent leaves (Anonymous, 2007). *Tridax procumbens* taxon is referred to as Hasura Jhaar in Nepali. The herbal paste used as a boil and zit remedy (Dongol & Gurung, 2000). It can also be used as a decorative or feed plant. The primary goal of this study is to ascertain the karyomorphology and somatic chromosomal count of various taxa.

Materials and Methods

The plants were moved to my home garden in earthen pots after being picked up from Kathmandu, Nepal. Healthy root tips were used to prepare somatic chromosomes. For three hours, they were pretreated with an aqueous solution of 0.002M 8-hydroxyquinoline. For one day, the sample was fixed in a 3:1 mixture of glacial acetic acid and absolute ethanol. The Central Department of Botany at Tribhuvan University prepared the chromosomes. In the lab, root tip materials were heated for a few seconds, then allowed for 30 minutes to 1 hour to hydrolyze and stain in a solution of 2% aceto-orcein and 1N HCl (9:1). We produced squash with 45% acetic acid. In order to choose the plates for photomicrography, observations were made based on this preparation. The opcolite-1366 Camera Lucida device was used to create the table-level drawings. Using a 12.1-megapixel digital camera, 10 x eye pieces, and a 100 x trinocular compound microscope objective, photomicrographs were obtained. At least three distinct preparations from root tips were used for karyotype investigations. The depicted figures were used to measure the chromosomes. The procedures were carried out in accordance with Levan *et al.* (1965).

Results and Discussion

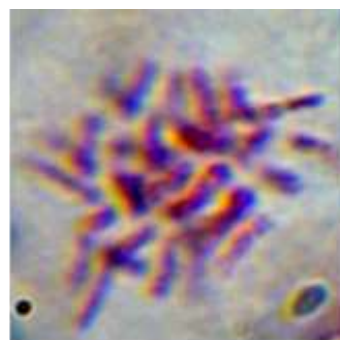
Centaurea cyanus L.

The plant is erect, 15–75 cm tall, branching, and either annual or biennial. Upper linear-lanceolate entire leaves, lower lanceolate, entire or lyrate-pinnatifid, acute, petiolate. Ovoid heads. Bracts involucrel; rectangular, obtuse, cottony, tip broad; edges scarios and serrated in brown. Blue outer petals with bluish interior. Achenes smooth and grey. Bees, flies, lepidoptera, and the flower itself fertilize the hermaphrodite blossoms. The plant can contract itself. The seeds ripen from August to October, and the plant flowers from June to August. It has been observed that insects are drawn to the flower. Pappus, measuring 4 mm in length. A live plant photograph is displayed in Fig. 1.

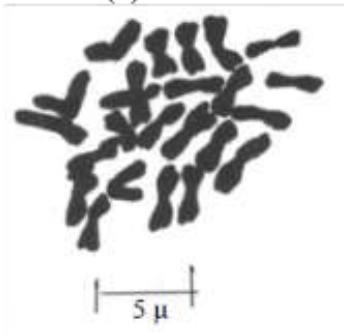
For this taxon, the determined chromosomal number is $2n=24$. Fig. 2 displays the somatic chromosome number obtained from the root tip cell, while Fig. 3 displays a drawing of the camera lucida. Figure 4 illustrates its ideogram. Table 1 provides the measurements of the chromosomes in *Centuria cyanus L.* Four distinct chromosome types, with centromeres at the median point, median region, sub-median region, and sub-terminal region, make up the karyotype. The length of the chromosomes varied between 0.8 and 2.6 μm , with a mean of 1.6 μm and an absolute length of 19.9 μm . 40.7 is the TF%. The formula for a karyotype is $M_{12} + m_6 + sm_2 + st_4$.



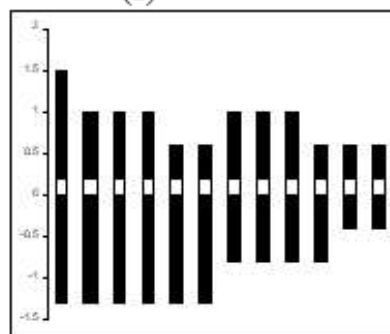
(1)



(2)



(3)



(4)

Figs. 1-4: *Centuria cyanus L.*

Fig. 1. Photograph of living plant. Fig. 2. Photomicrograph of somatic metaphase plate.
Fig. 3. Camera lucida drawing of the same. Fig. 4. Ideogram of the above.

Table 1: Chromosome measurement in *Centuria cyanus* L.

| Chrom. Pairs | Long Arm (µm) | Short Arm (µm) | Total Length (µm) | r-value | Relative Length (µm) | Position of Centromere |
|--------------|---------------|----------------|-------------------|---------|----------------------|------------------------|
| I | 1.3 | 1.3 | 2.6 | 1 | 13.0 | M |
| II | 1.3 | 0.8 | 2.1 | 1.6 | 10.5 | M |
| III | 1.3 | 0.8 | 2.1 | 1.6 | 10.5 | M |
| IV | 1.3 | 0.8 | 2.1 | 1.6 | 10.5 | M |
| V | 1.3 | 0.4 | 1.7 | 3.2 | 8.5 | St |
| VI | 1.3 | 0.4 | 1.7 | 3.2 | 8.5 | St |
| VII | 0.8 | 0.8 | 1.6 | 1 | 8.0 | M |
| VIII | 0.8 | 0.8 | 1.6 | 1 | 8.0 | M |
| IX | 0.8 | 0.8 | 1.6 | 1 | 8.0 | M |
| X | 0.8 | 0.4 | 1.2 | 2 | 6.0 | Sm |
| XI | 0.4 | 0.4 | 0.8 | 1 | 4.0 | M |
| XII | 0.4 | 0.4 | 0.8 | 1 | 4.0 | M |



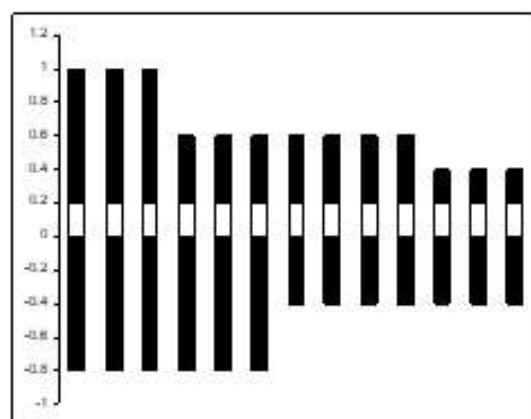
(5)



(6)



(7)



(8)

Figs.5-8: *Coreopsis grandiflora* Nutt. ex Chapm.

Fig. 5. Photograph of living plant. Fig. 6. Photomicrograph of somatic metaphase plate.
 Fig. 7. Camera lucida drawing of the same. Fig. 8. Ideogram of the above.

***Coreopsis grandiflora* Nutt. ex Chapm.**

The herbaceous perennial plant can grow to a height of 30 to 70 cm. It has sparse hairs or is glabrous. Along the stem, the leaves are spaced obliquely or alternately. They have deep lobed, pinnatifid features. The terminal segment is typically the largest of the linear and somewhat irregular

leaf segments. There may be a few leaves that are linear and lobeless near the top or bottom. Up to 3" long and 2" wide, these leaves A single, roughly two-and-a-half-inch-wide composite flower sits atop a rather lengthy, bare flowering stem at the top of the plant. It is made up of several golden yellow disk florets encircled by six to twelve yellow ray

florets. There are four to five notches on the outside of each ray floret.

This provides the composite flower with an attractive, somewhat ragged, appearance, little or no floral scent. The olive-green flower buds are smooth and spherical in shape. With two tiny scales at the apex, the achenes are flat and somewhat oblong. The wind distributes them to a certain degree. The blooming season lasts roughly a month and starts in the early to mid-summer. A live plant photograph is displayed in Fig. 5.

For this taxon, the determined chromosomal number is $2n=26$. Fig. 6 displays the somatic chromosome number obtained from the root tip cell, while Fig. 7 displays a drawing of the camera lucida. Fig. 8 illustrates its ideogram. Table 2 provides the measurements of the chromosomes.

There are two types of chromosomes, with the centromere located in the sub-median and median regions. The length of the chromosomes varied between 0.6 and 1.6 μm , with a mean of 1.1 μm and an absolute length of 14.3 μm . 43 is the TF%. Formula for karyotype is $M_{14}+sm_{12}$.

Eclipta prostrata (Linn.) Linn.

The plant is a strigose, pubescent, or hirsute perennial herb that grows diffusely or erectly. Leaves opposite, entire or sparsely toothed, sessile or short petiolate, lanceolate-linear. In the upper leaf axils, capitula are pedunculate, small, few-

flowered, radiating, and can occur singly or in pairs. hemispherical or campanulate involucre. Container convex or flat. Ray florets: glabrous, lamina oblong-elliptic, truncate, entire or 2- or 3-toothed, ciliate above, glandular-pilose on back of base; corolla white; tube somewhat compressed, much shorter than lamina. Style in a bifid manner. Cypsela, three-angled, oblong. A ring of fine hairs surrounds Pappus. Disc florets are bisexual, have a white corolla, tubular below, campanulate above, and four or five short lobes. Anthers are linear, blunt at the base, and have an ovate to rounded tip at the apex. Style: oblong, deltoid apex, papilllose exterior. Cypsela compressed, oblong. Pappus. A live plant photograph is displayed in Fig. 9.

For this taxon, the determined chromosomal number is $2n=22$. Figure 10 displays the somatic chromosome number obtained from the root tip cell, while Fig. 11 displays a drawing of the camera lucida. In Fig. 12, its ideogram is shown. Table 3 provides the measurements of the chromosomes.

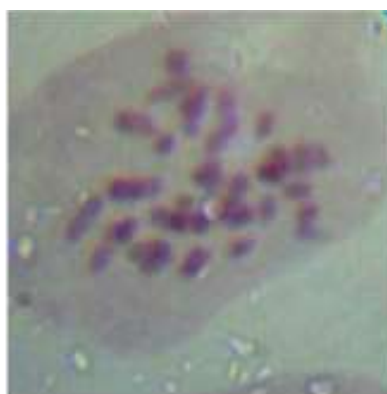
There are three kinds of somatic chromosomes found. Centromeres can be found in sub-median, sub-terminal, and median regions. The length of the chromosomes varied between 0.8 and 1.6 μm , with a mean of 1.2 μm and an absolute length of 13.3 μm . 46 is the TF%. The formula for karyotypes is $M_{14}+sm_6+S_{t2}$.

Table 2: Chromosome measurement in *Coreopsis grandiflora* Nutt. ex Chapm.

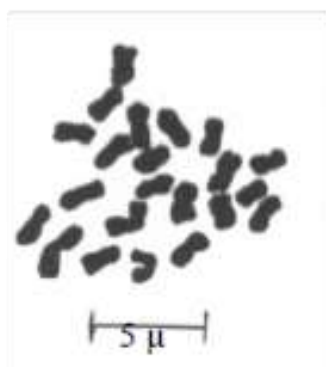
| Chrom. Pairs | Long Arm (μm) | Short Arm (μm) | Total Length (μm) | r-value | Relative Length (μm) | Position of centromere |
|--------------|----------------------------|-----------------------------|--------------------------------|---------|-----------------------------------|------------------------|
| I | 0.8 | 0.8 | 1.6 | 1 | 8.9 | M |
| II | 0.8 | 0.8 | 1.6 | 1 | 8.9 | M |
| III | 0.8 | 0.8 | 1.6 | 1 | 8.9 | M |
| IV | 0.8 | 0.4 | 1.2 | 2 | 8.9 | Sm |
| V | 0.8 | 0.4 | 1.2 | 2 | 8.9 | Sm |
| VI | 0.8 | 0.4 | 1.2 | 2 | 8.9 | Sm |
| VII | 0.4 | 0.4 | 0.8 | 1 | 5.9 | M |
| VIII | 0.4 | 0.4 | 0.8 | 1 | 5.9 | M |
| IX | 0.4 | 0.4 | 0.8 | 1 | 5.9 | M |
| X | 0.4 | 0.4 | 0.8 | 1 | 5.9 | M |
| XI | 0.4 | 0.2 | 0.6 | 2 | 4.4 | Sm |
| XII | 0.4 | 0.2 | 0.6 | 2 | 4.4 | Sm |
| XIII | 0.4 | 0.2 | 0.6 | 2 | 4.4 | Sm |



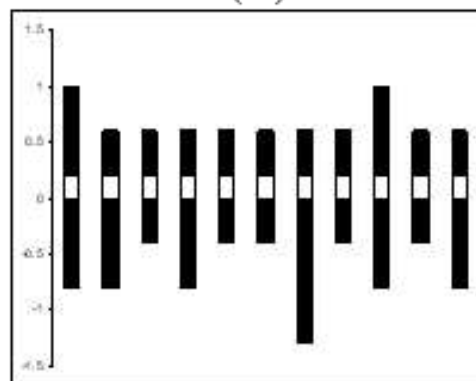
(9)



(10)



(11)



(12)

Figs.9-12 *Eclipta prostrata* (Linn.) Linn.

Fig. 9. Photograph of living plant. Fig. 10. Photomicrograph of mitotic metaphase plate.
Fig. 11. Camera lucida drawing of the same. Fig. 12. Ideogram of above.

Table 3: Chromosome measurement in *Eclipta prostrata* (Linn.) Linn.

| Chrom. Pairs | Long Arm (μm) | Short Arm (μm) | Total Length (μm) | r-value | Relative Length (μm) | Position of Centromere |
|--------------|---------------|----------------|-------------------|---------|----------------------|------------------------|
| I | 0.8 | 0.8 | 1.6 | 1 | 12.8 | M |
| II | 0.8 | 0.4 | 1.2 | 2 | 9.6 | Sm |
| III | 0.4 | 0.4 | 0.8 | 1 | 6.4 | M |
| IV | 0.8 | 0.4 | 1.2 | 2 | 9.6 | Sm |
| V | 0.4 | 0.4 | 0.8 | 1 | 6.4 | M |
| VI | 0.4 | 0.4 | 0.8 | 1 | 6.4 | M |
| VII | 1.3 | 0.4 | 1.7 | 3.2 | 12.9 | St |
| VIII | 0.4 | 0.4 | 0.8 | 1 | 6.4 | M |
| IX | 0.8 | 0.8 | 1.6 | 1 | 12.8 | M |
| X | 0.4 | 0.4 | 0.8 | 1 | 6.4 | M |
| XI | 0.8 | 0.4 | 1.2 | 2 | 9.6 | Sm |

***Eupatorium adenophorum* Spreng.**

The herb is a perennial that can grow up to one meter tall. Leaves: 2-8x5.5cm, glandular on nerves below, rhomboid-ovate, coarsely serrated, acute. terminal head corymbose. White flowers. Black, 5-angled achenes. Pappus's white, unclean hair. Fruiting and flowering season: March through October. A live plant photograph is displayed in Fig. 13.

For this taxon, the determined chromosome number is $2n=50$. Fig. 14 displays the somatic chromosome number obtained from the root tip cell, while Fig. 15 displays a drawing of the camera lucida. In Fig. 16, its ideogram is shown. Table 4 provides the measurements of the chromosomes.

Four different chromosome types—the centromere at the median point, median region, sub-median region, and sub-terminal region—make up the karyotype. The length of the chromosomes varied between 0.3 and 1.2 μm , with a mean of 0.7 μm and an absolute length of 18.4 μm . 34.7 is the TF%. The formula for karyotypes is $M_4+m_{12}+sm_{26}+st_8$.

***Gnaphalium affine* D.Don.**

The herb is an annual that grows to a height of 30 cm. Woolly and tomentose stem. Leaves: 2-5cm long, wooly

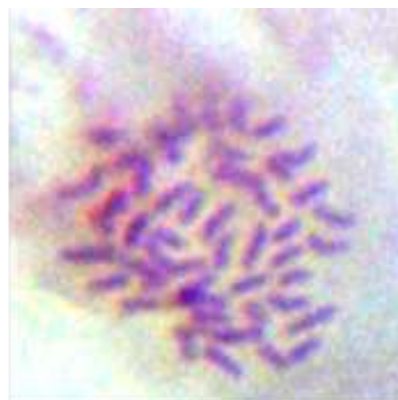
tomentose on both surfaces, lower leaves oblong-spathulate, upper leaves linear lanceolate. Heads in dense terminal corymbs, yellow-gold in color. Achenes papillose, linear. Pappus has white hair. From February to November is when it flowers and bears fruit. A live plant photograph is displayed in Fig. 17.

For this taxon, the determined chromosomal number is $2n=14$. Figure 18 displays the somatic chromosome number obtained from the root tip cell, while Fig. 19 displays a drawing of the camera lucida. In Fig. 20, its ideogram is shown. Table 5 provides the measurements of the chromosomes.

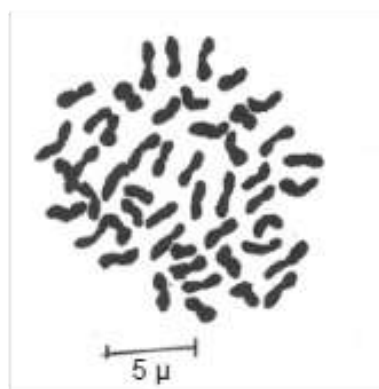
There are two different kinds of chromosomes seen: sub-median regions and centromeres with median points. The length of the chromosomes varied between 1.2 and 2.6 μm , with a mean of 1.7 μm and an absolute length of 12.06 μm . 46.4 was the TF%. Formula for karyotype is $M_{10}+sm_4$.



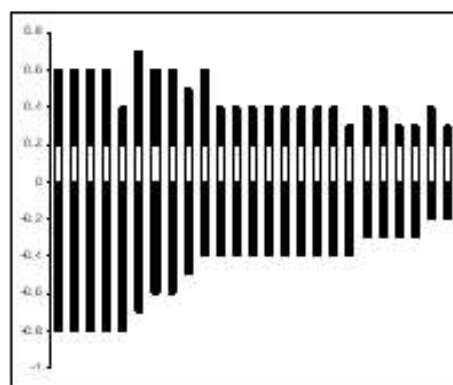
(13)



(14)



(15)



(16)

Fig13-16. *Eupatorium adenophorum* Spreng.

Fig.13. Photograph of living plant. **Fig.14.** Photomicrograph of somatic metaphase plate.
Fig.15. Camera lucida drawing of the same. **Fig.16.** Ideogram of the above.

Table 4: Chromosome measurement in *Eupatorium adenophorum* Spreng.

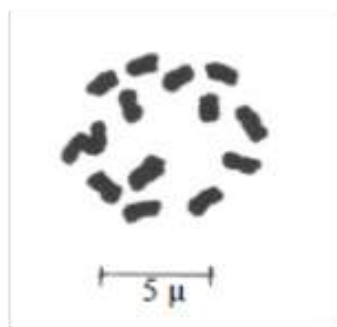
| Chrom. Pairs | Long Arm (µm) | Short Arm (µm) | Total Length (µm) | r-value | Relative Length (µm) | Position of Centromere |
|--------------|---------------|----------------|-------------------|---------|----------------------|------------------------|
| I | 0.8 | 0.4 | 1.2 | 2 | 6.5 | Sm |
| II | 0.8 | 0.4 | 1.2 | 2 | 6.5 | Sm |
| III | 0.8 | 0.4 | 1.2 | 2 | 6.5 | Sm |
| IV | 0.8 | 0.4 | 1.2 | 2 | 6.5 | Sm |
| V | 0.8 | 0.2 | 1.2 | 4 | 5.4 | St |
| VI | 0.7 | 0.5 | 1.2 | 1.4 | 6.5 | M |
| VII | 0.6 | 0.4 | 1 | 1.5 | 4.3 | M |
| VIII | 0.6 | 0.4 | 1 | 1.5 | 5.4 | M |
| IX | 0.5 | 0.3 | 0.8 | 1.6 | 4.3 | M |
| X | 0.4 | 0.4 | 0.8 | 1 | 4.3 | M |
| XI | 0.4 | 0.2 | 0.7 | 2 | 3.2 | Sm |
| XII | 0.4 | 0.2 | 0.6 | 2 | 3.2 | Sm |
| XIII | 0.4 | 0.2 | 0.6 | 2 | 3.2 | Sm |
| XIV | 0.4 | 0.2 | 0.7 | 2 | 3.2 | Sm |
| XV | 0.4 | 0.2 | 0.6 | 2 | 3.2 | Sm |
| XVI | 0.4 | 0.2 | 0.6 | 2 | 3.2 | Sm |
| XVII | 0.4 | 0.2 | 0.6 | 2 | 3.2 | Sm |
| XVIII | 0.4 | 0.2 | 0.6 | 2 | 3.2 | Sm |
| XIX | 0.4 | 0.1 | 0.5 | 4 | 2.7 | St |
| XX | 0.3 | 0.2 | 0.5 | 1.5 | 2.7 | M |
| XXI | 0.3 | 0.2 | 0.5 | 1.5 | 2.7 | M |
| XXII | 0.3 | 0.1 | 0.5 | 3 | 2.1 | St |
| XXIII | 0.3 | 0.1 | 0.4 | 3 | 2.1 | St |
| XXIV | 0.2 | 0.2 | 0.4 | 1 | 2.1 | M |
| XXV | 0.2 | 0.1 | 0.3 | 2 | 1.6 | Sm |



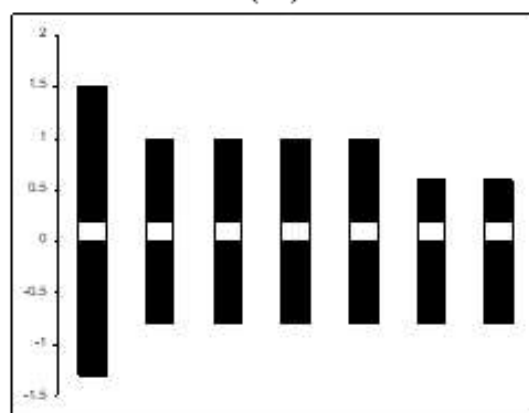
(17)



(18)



(19)



(20)

Figs. 17-20: *Gnaphalium affine* D. Don.

Fig.17. Photograph of living plant. Fig.18. Photomicrograph of somatic metaphase plate. Fig.19. Camera lucida drawing of the same. Fig.20. Idiogram of the above.

Table 5: Chromosome measurement *Gnaphalium affine* D.Don.

| Chrom. Pairs | Long Arm (µm) | Short Arm (µm) | Total Length (µm) | r-value | Relative Length (µm) | Position of Centromere |
|--------------|---------------|----------------|-------------------|---------|----------------------|------------------------|
| I | 1.3 | 1.3 | 2.6 | 1 | 21.5 | M |
| II | 0.8 | 0.8 | 1.6 | 1 | 14.2 | M |
| III | 0.8 | 0.8 | 1.6 | 1 | 14.2 | M |
| IV | 0.8 | 0.8 | 1.6 | 1 | 14.2 | M |
| V | 0.8 | 0.8 | 1.6 | 1 | 14.2 | M |
| VI | 0.8 | 0.4 | 1.2 | 2 | 10.7 | Sm |
| VII | 0.8 | 0.4 | 1.2 | 2 | 10.7 | Sm |

***Rhynchospermum verticillatum* Reinw.**

The plant is a 50 cm tall, branched, slender annual herb. Leaves: 2.5–10x 0.8–2 cm, lanceolate, membranous, coarsely toothed. Axillary, short-stalked heads that are frequently present in each axil along the branches. White ray flowers and yellowish green disc flowers. Fruiting and flowering from August through October. For this taxon, the determined chromosomal number is 2n=18. The root tip cell yielded the somatic chromosome number. A live plant photograph is displayed in Fig. 21.

For this taxon, the determined chromosomal number is 2n=18. Fig. 22 displays the somatic chromosome number obtained from the root tip cell, while Fig. 23 displays a drawing of the camera lucida. In Fig. 24, its ideogram is shown. The measurements of the chromosomes are provided in Table 6.

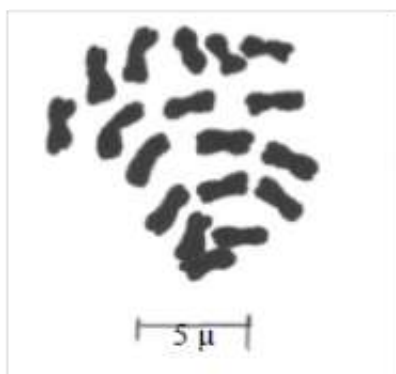
Three different chromosome types with centromeres at the median point, median region, and submedian region make up the karyotype. The length of the chromosomes varied between 0.5 and 0.8 µm, with a mean of 0.5 µm and an absolute length of 5.1 µm. 39.2 is the TF%. The formula for karyotype is M₄+ m₈+ sm₆.



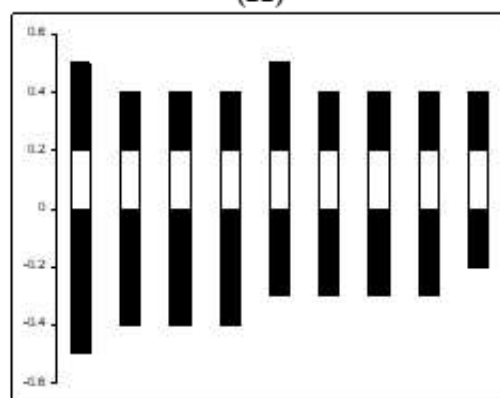
(21)



(22)



(23)



(24)

Figs. 21-24: *Rhynchospermum verticillatum* Reinw .

Fig.21. Photograph of living plant. **Fig.22.** Photomicrograph of somatic metaphase plate. **Fig.23.** Camera lucida drawing of the same. **Fig.24.** Ideogram the above.

Table 6: Chromosome measurement in *Rhynchospermum verticillatum* Reinw.

| Chrom. Pairs | Long Arm (µm) | Short Arm (µm) | Total Length (µm) | r-value | Relative Length (µm) | Position of centromere |
|--------------|---------------|----------------|-------------------|---------|----------------------|------------------------|
| I | 0.5 | 0.3 | 0.8 | 1.6 | 12.8 | M |
| II | 0.4 | 0.2 | 0.6 | 2 | 9.6 | Sm |
| III | 0.4 | 0.2 | 0.6 | 2 | 9.6 | Sm |
| IV | 0.4 | 0.2 | 0.6 | 2 | 9.6 | Sm |
| V | 0.3 | 0.3 | 0.6 | 1 | 6.4 | M |
| VI | 0.3 | 0.2 | 0.5 | 1.5 | 6.4 | M |
| VII | 0.3 | 0.2 | 0.5 | 1.5 | 6.4 | M |
| VIII | 0.3 | 0.2 | 0.5 | 1.5 | 6.4 | M |
| IX | 0.2 | 0.2 | 0.4 | 1 | 9.6 | M |

***Tridax procumbens* L.**

The plant is an annual herb that is typically prostrate, ascending, or hairy. leaves with few, narrow segments that are opposite, petiolate, toothed, or pinnately cut. Capitula radiate in a solitary manner on long peduncles. Involucre campanulate, with two or three rows of bracts. Container convex or flat, pale, membrane-covered paleae, keeled but hardly clasping. Female ray florets, strap-shaped, corolla yellow or creamy, fertile. Persistent bisexual, fertile disc florets with a cylindric, 5-lobed or 5-toothed corolla that is yellow or greenish in color. Apical appendages narrowly deltoid, bases sagittate on anthers. The style branches of disc florets are much longer, acuminate, with subulate appendages, and hairy on the outside faces than those of ray

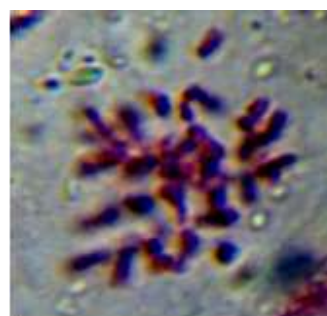
florets, which are shortly linear-lanceolate. Obconical and villous Cypselae. Pappus with numerous feathery bristles. A live plant photograph is displayed in Fig. 25.

Chromosome number determined for this taxon is $2n=26$. The somatic chromosome number determined from the root tip cell is shown in Fig. 26 and camera lucida drawing in Fig. 27. Its ideogram is represented in Fig. 28. The chromosome measurements are given in Table 7.

The karyotype consists of four types of chromosomes with centromere at median point, median region, sub-median region and sub-terminal region. The chromosome length ranged from 0.8 to 2.6 µm with mean length 1.6 µm and absolute length 20.9 µm. TF % is 44.4. Karyotype formula is $M_{18}+m_4+sm_2+st_2$.



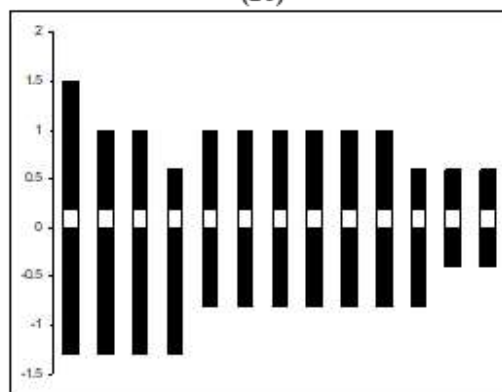
(25)



(26)



(27)



(28)

Figs. 25--28: *Tridax procumbens* L.

Fig. 25. Photograph of living plant.

Fig. 27. Camera lucida drawing of the same.

Fig. 26. Photomicrograph of mitotic metaphase plate.

Fig. 28. Ideogram of above.

Table 7: Chromosome measurement in *Tridax procumbens* L.

| Chrom. Pairs | Long Arm (µm) | Short Arm (µm) | Total Length (µm) | r-value | Relative Length (µm) | Position of Centromere |
|--------------|---------------|----------------|-------------------|---------|----------------------|------------------------|
| I | 1.3 | 1.3 | 2.6 | 1 | 12.4 | M |
| II | 1.3 | 0.8 | 2.1 | 1.6 | 10.0 | M |
| III | 1.3 | 0.8 | 2.1 | 1.6 | 10.0 | M |
| IV | 1.3 | 0.4 | 1.7 | 3.2 | 8.1 | St |
| V | 0.8 | 0.8 | 1.6 | 1 | 7.6 | M |
| VI | 0.8 | 0.8 | 1.6 | 1 | 7.6 | M |
| VII | 0.8 | 0.8 | 1.6 | 1 | 7.6 | M |
| VIII | 0.8 | 0.8 | 1.6 | 1 | 7.6 | M |
| IX | 0.8 | 0.8 | 1.6 | 1 | 7.6 | M |
| X | 0.8 | 0.8 | 1.6 | 1 | 7.6 | M |
| XI | 0.8 | 0.4 | 1.2 | 2 | 5.7 | Sm |
| XII | 0.4 | 0.4 | 0.8 | 1 | 3.8 | M |
| XIII | 0.4 | 0.4 | 0.8 | 1 | 3.8 | M |

Mitotic chromosomes $2n=22$ for *Eclipta prostrata* and $2n=36$ for *Tridax procumbens* were reported by Rajalakshmi (2001). For *Rhynchospermum verticillatum* from Taiwan, Peng and Hsu (1978) discovered $2n=18$, which agrees with the results of this study. Dekui (2001) reported that *Coreopsis grandiflora* has $2n=26$ chromosomes, while *Centaurea cyanus* has $2n=48$. *Centaurea cyanus* from Tuekey was reported by Romaschenko *et al.* (2004) to have $2n=16$. Eight species of *Centaurea* were collected from different locations in Turkey, and Martin *et al.* (2009) examined their karyomorphology. They found that *Centaurea cyanus* had $2n=24$. According to Khonglam and Singh (1980), *Eupatorium adenophorum* has a $2n=51$. Nishikawa (1984) found that *Gnaphalium affine* has a $2n=14$ ratio. *Verticillatum Rhynchospermum*. Sidhu and Pelia (1987) reported the somatic chromosomal number $2n=36$.

Conclusion

Thus, it can be inferred that structural and/or numerical variations within the currently studied taxa may have a major impact on how various angiospermic plants have evolved.

Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of this paper.

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