



COMPARATIVE CYTOLOGICAL STUDIES OF TWO MEDICINALLY IMPORTANT MEMBER OF FAMILY COMMELINACEAE.

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Abstract:

Commelinaceae family belongs to flowering monocot plants; also referred to as day flower family or spider wort family. Suitable condition for its growth is Xeric, semi aquatic and most saline condition. Diploid set of chromosome no of *Tradescantia pallida* (Rose) D.R ($2n= 2X=18$) and *Tradescantia spathacea* Sw.($2n= 2X=12$).

Index term - Cytology, Commelinaceae, Diploid, *Tradescantia*.

I.INTRODUCTION:

Commelinaceae is a family of flowering monocot plant. Members of spider wort or day flower family distributed in tropical and subtropical regions of the world. Plants of this family used for many medicinal purposes. Such as cancer, venereal disease, diabetes and cardio vascular disorder. (Gonzalez Avila et. al 2013).

This family consist wide range of chromosome numbers Karyotype morphology and size of chromosome varies greatly. The basic chromosome number in the family is low as $x=4$ to highest $x=19$ (Bhattacharaya 1975). In present investigation chromosome number of *Tradescantia pallida* (Rose) D.R, Hunt $2n=18$ and *Tradescantia spathacea* Sw. $2n=12$ observed.

II.MATERIAL AND METHOD:

The plants of *Tradescantia* were collected from Botanical garden of Department of Botany Ranchi University, Ranchi, Jharkhand. Plants were potted in a mixture of sand and vermicompost. Young root apices about 1.2cm long were excised between 1:00 PM to 2:00 PM. The root apices were pretreated by 1,4 -paradichloro-benzene for 4 hours. After pretreatment root apices were thoroughly washed and transferred to 1:3 acetoalcohol (i.e, carnoy's fluid) for 24 hours, after 24 hours they were transferred to 70% alcohol for preservation. The slides were prepared by staining and squashing technique. The root apices were stained with 2% acetocarmine. Photographs of well separated metaphase stage were taken and statistical data analysis done by following formulae.

- Absolute length, relative length, angular value, long value, form percentage, arm ratio, total chromatin index, index gradient index, symmetry index, mitotic index, prophase index, metaphase index, anaphase index, telophase index were calculated which helped in preparation of ideogram, histogram and graphs.

T.C.L. = Total sum of haploid set of chromosomes

$$\text{Relative length } (\mu) = \frac{\text{Length of Chromosome Pair}}{\text{Length of Longest chromosome pair}} \times 100$$

$$\text{Form percentage } (\%) = \frac{\text{Length of the Short Arm}}{\text{Length of the Chromosome Pair}} \times 100$$

$$\text{Arm ratio} = \frac{\text{Length of Long Arm}}{\text{Length of Short Arm}}$$

$$\text{Total Chromatin Index } (\%) = \frac{\text{Length of Chromosome Pair}}{\text{Length of Longest chromosome pair}} \times 100$$

$$\text{Total Form Percentage } (\%) = \frac{\text{Total Sum of Short Arm Length}}{\text{Total Sum of the Chromosome Length}} \times 100$$

$$\text{G.I.} = \frac{\text{Length of shortest Chromosome of the complement} \times 100}{\text{Length of Longest Chromosome of the Complement}}$$

$$\text{S.I.} = \frac{\text{Total Length of all Short Arms} \times 100}{\text{Total Length of all Long Arms}}$$

- ❖ Classification of chromosome was made on the basis of table given by Abraham & Prasad 1983.

III.RESULT AND DISCUSSION:

The study of Karyotype is a great importance in modern taxonomy. The *Tradescantia pallida* (Rose) D.R and *Tradescantia spathacea* Sw. showed diploid chromosome no. - $2n=2x=18$ and $2n=2x=12$ respectively. (Kammathy and Rao, Bibha bhattacharya)

Total chromatin length observed 77.97μ in *Tradescantia pallida* (Rose) D.R and in *Tradescantia spathacea* Sw. was recorded 44.90μ in table 2. The Karyotype symmetry of the species was deduced in accordance with the Stebbins (1971). The Table 1 based on the difference between longest and shortest chromosome of the complement.

In *Tradescantia pallida* (Rose) D.R.Hunt the chromosome were classified as 1 nearly sub-median and 8 nearly median whereas in *Tradescantia spathecea* Sw. 1 nearly sub-median and 5 nearly median chromosome respectively depicted in table-2.

In T.pallida T.F% was 42.22 S.I. was 76.64 and D.I. was 40.26 which was max. While minimum value were observed in T. spathacea Sw. with TF- 39.42%, SI= 59.67 and D.I was 26.92.

Idiograms of both the species were made with the help of long arm and short arm value of each chromosome and it is depicted in fig.5 and 6 and comparative data of TCL, DI, GI and SI were in following tables 3.1 to 3.3 and column graphs showing the related values.



FIG1: *Tradescantia pallida*(Rose)D.R.

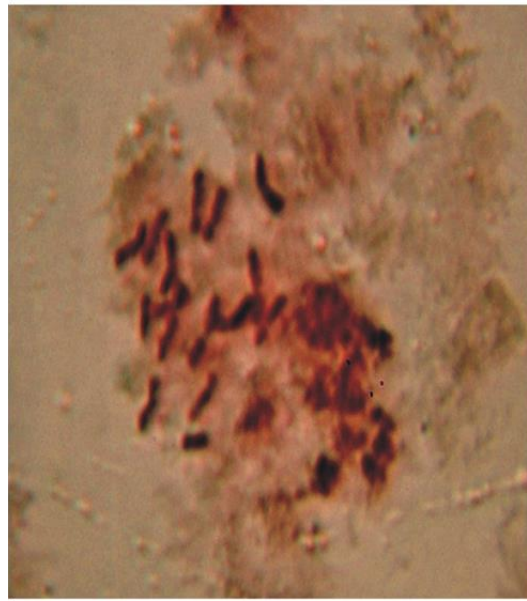


FIG2: Photomicrograph showing chromosomes at metaphase



FIG 3: *Tradescantia spathacea* Sw.

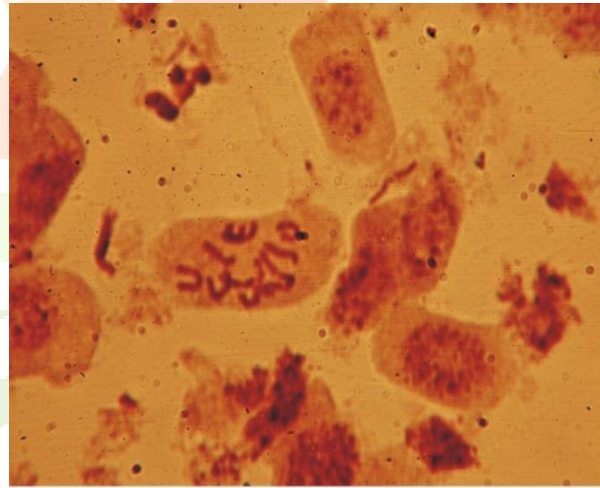
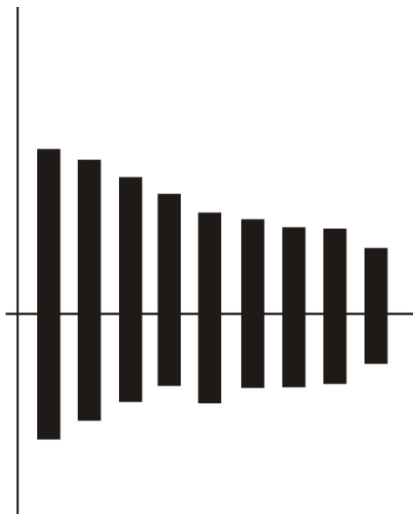
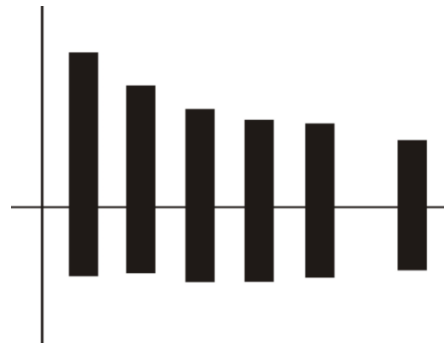


FIG 4: Photomicrograph showing chromosomes at Metaphase

Idiograms of Mitotic Metaphase Chromosome

FIG 5: *Tradescantia pallida*(Rose)D.R.FIG 6: *Tradescantia spathacea* Sw.TABLE 3.1: Cytotaxonomical data of *Tradescantia pallida* (Rose) D.R Hunt

| Sl. No. | Arm Length(μ) | | Chromosome Length(μ) | Arm Ratio LA/SA | R.L. | F% | TCI | Classification |
|---------|---------------------|-------------------|----------------------------|------------------|-------|-------|-------|----------------|
| | Long Arm | Short Arm | | | | | | |
| 1 | 6.8 \pm 0.08 | 5.28 \pm 0.54 | 12.14 \pm 0.59 | 1.44 \pm 0.14 | 100 | 43.49 | 15.57 | nsm(-) |
| 2 | 6.4 \pm 0.24 | 4.5 \pm 0.38 | 10.9 \pm 0.46 | 1.54 \pm 0.20 | 89.78 | 41.28 | 13.97 | nm(-) |
| 3 | 5.86 \pm 0.24 | 3.8 \pm 0.2 | 9.6 \pm 0.27 | 1.57 \pm 0.11 | 79.07 | 31.25 | 12.31 | nsm(-) |
| 4 | 5.12 \pm 0.24 | 3.16 \pm 0.027 | 8.91 \pm 0.38 | 1.42 \pm 0.11 | 73.39 | 42.19 | 11.42 | nsm(-) |
| 5 | 4.34 \pm 0.22 | 3.95 \pm 0.0.22 | 8.29 \pm 0.4 | 1.11 \pm 0.05 | 68.28 | 47.64 | 10.63 | nm(-) |
| 6 | 4.06 \pm 0.2 | 3.24 \pm 0.14 | 7.35 \pm 0.3 | 1.24 \pm 0.05 | 60.59 | 44.08 | 9.4 | nsm(-) |
| 7 | 3.77 \pm 0.16 | 3.14 \pm 0.17 | 6.91 \pm 0.26 | 1.23 \pm 0.008 | 56.91 | 45.44 | 8.86 | nsm(-) |
| 8 | 3.7 \pm 0.16 | 3 \pm 0.13 | 6.7 \pm 0.19 | 1.23 \pm 0.07 | 55.18 | 44.77 | 8.59 | nsm(-) |
| 9 | 2.9 \pm 0.24 | 2.25 \pm 0.18 | 5.17 \pm 0.39 | 1.27 \pm 0.09 | 42.58 | 43.52 | 6.63 | nsm(-) |

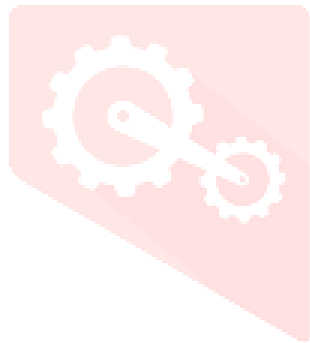
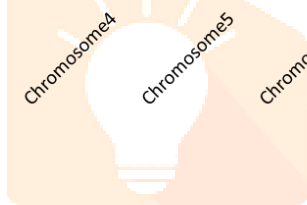
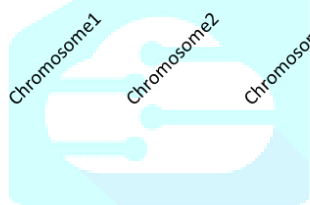
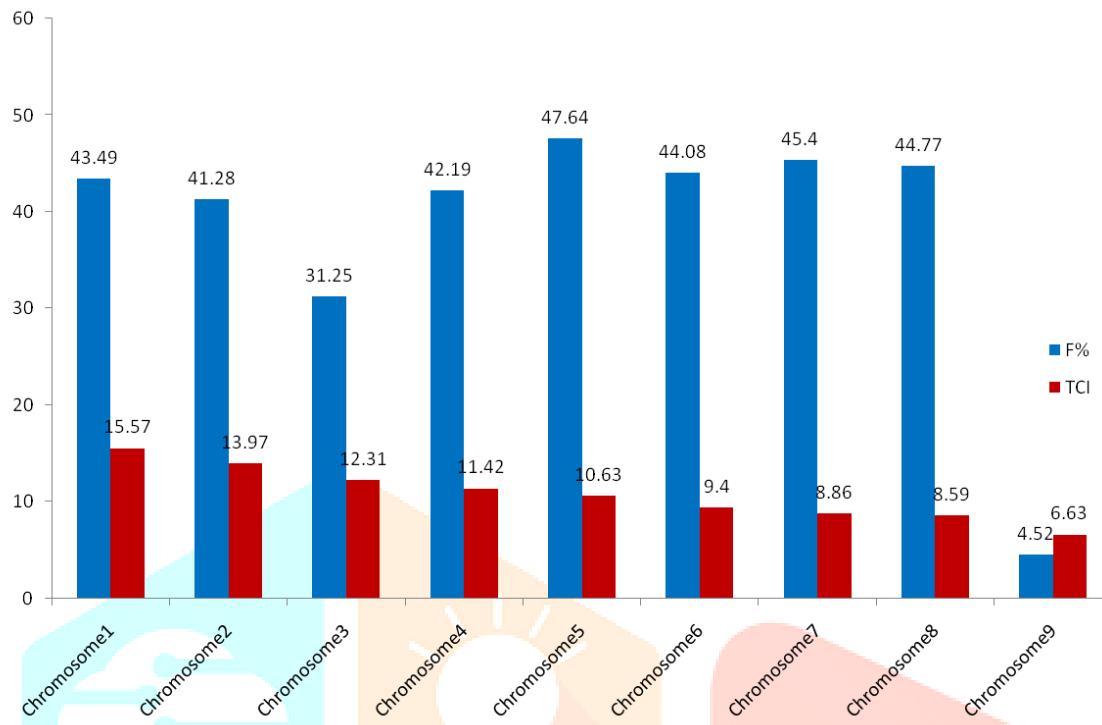
Table 3.2: Cytotaxonomical Data of *Tradescantia spathacea* Sw.

| Sl. No. | Arm Length(μ) | | Chromosome Length(μ) | Arm Ratio LA/SA | R.L. | F% | TCI | Classification |
|---------|---------------------|----------------|----------------------------|-----------------|-------|-------|-------|----------------|
| | Long Arm | Short Arm | | | | | | |
| 1 | 6.9 \pm 0.4 | 3 \pm 0.02 | 9.9 \pm 0.52 | 2.39 \pm 0.18 | 100 | 30.30 | 22.04 | nsm(-) |
| 2 | 5.46 \pm 0.42 | 2.9 \pm 0.19 | 8.4 \pm 0.5 | 1.9 \pm 0.16 | 84.84 | 34.52 | 18.70 | nsm(-) |
| 3 | 4.3 \pm 0.25 | 3.2 \pm 0.10 | 7.5 \pm 0.29 | 1.35 \pm 0.07 | 75.75 | 42.66 | 16.70 | nsm(-) |
| 4 | 3.8 \pm 0.13 | 2.9 \pm 0.22 | 6.7 \pm 0.31 | 1.41 \pm 0.11 | 67.67 | 43.28 | 14.92 | nm |
| 5 | 3.6 \pm 0.14 | 3 \pm 0.18 | 6.7 \pm 0.28 | 1.2 \pm 0.07 | 67.67 | 44.77 | 14.92 | nm |
| 6 | 2.9 \pm 0.15 | 2.7 \pm 0.19 | 5.7 \pm 0.29 | 1.13 \pm 0.09 | 57.57 | 47.36 | 12.6 | nm |

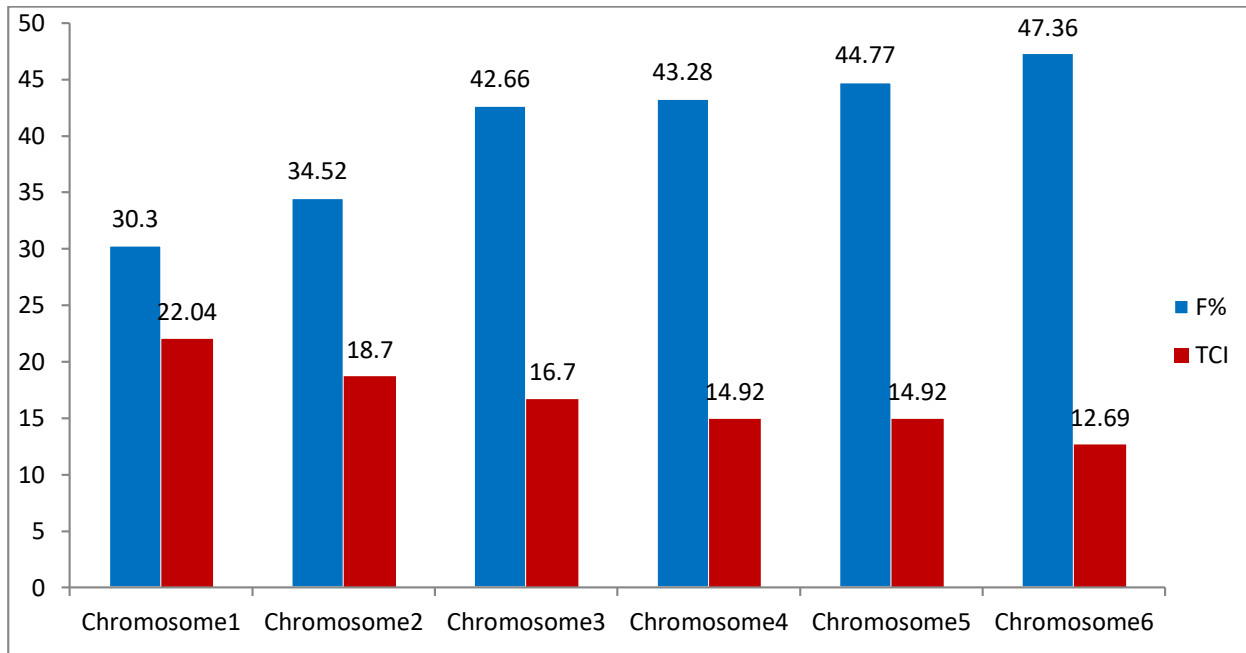
TABLE 3.3: Data related to Karyotype of four members of family Commelinaceae

| Species under Consideration | Total Chromatin Index (μ) | Total Form Percentage (TF%) | Gradient Index (GI) | Symmetry Index (SI) |
|--|---------------------------------|-----------------------------|---------------------|---------------------|
| <i>Tradescantia pallida</i> (Rose) D.R | 77.97 | 42.22 | 42.58 | 76.64 |
| <i>Tradescantia spathacea</i> Sw. | 44.90 | 39.42 | 57.57 | 65.65 |

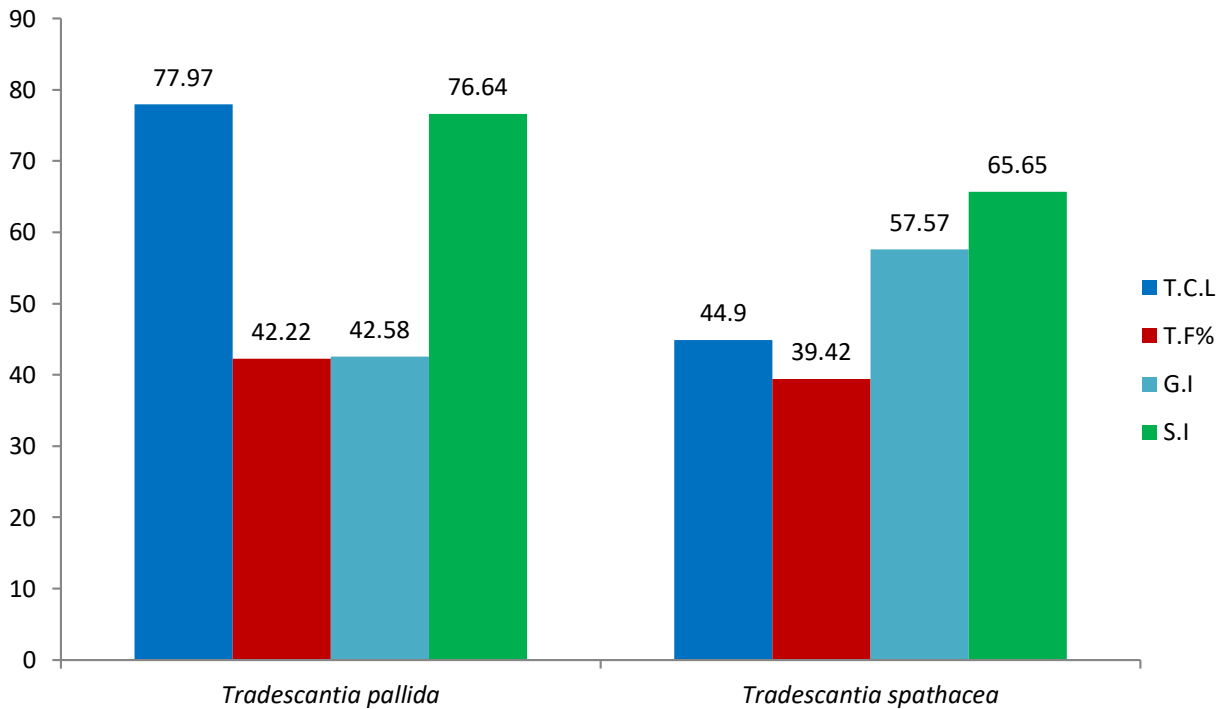
Column Graph showing Comparative Form Percentage(F%) and Total Chromatin Index(TCI) of *Tradescantia pallida*(Rose) D.R.



Column Graph showing Comparative Form Percentage(F%) and Total Chromatin Index(TCI) *Tradescantia spathacea* Sw.



Column Graph Showing Comparative Total Chromatin Length(in μ), Total Form%, Gradient Index and, Symmetry Index of few members of COMMELINACEAE



IV. Summary and Conclusion

The Karyotypic study is important as it provides correlation between modern taxonomy and evolution. This concept has been reviewed by Stebbins, 1971 and connected with the evolution of their Karyotype (Levan et.al). In this research work attempt has been made to find out the closeness of the given species based on Karyotype evolution; the different parameters were used such as Total Chromatin length, Karyotype formulae, gradient index, symmetry index and disparity index. Karyotype studies showed that plants of *Tradescantia pallida* were $2n=18$ and *Tradescantia spathacea* $2n=12$ chromosome. Karyotypic formula for *Tradescantia pallida* was $x=9=1nsm(-)+3nm$ whereas in *Tradescantia spathacea* $x=6=1nsm(-)$ and $5nm$ chromosomes were observed.

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