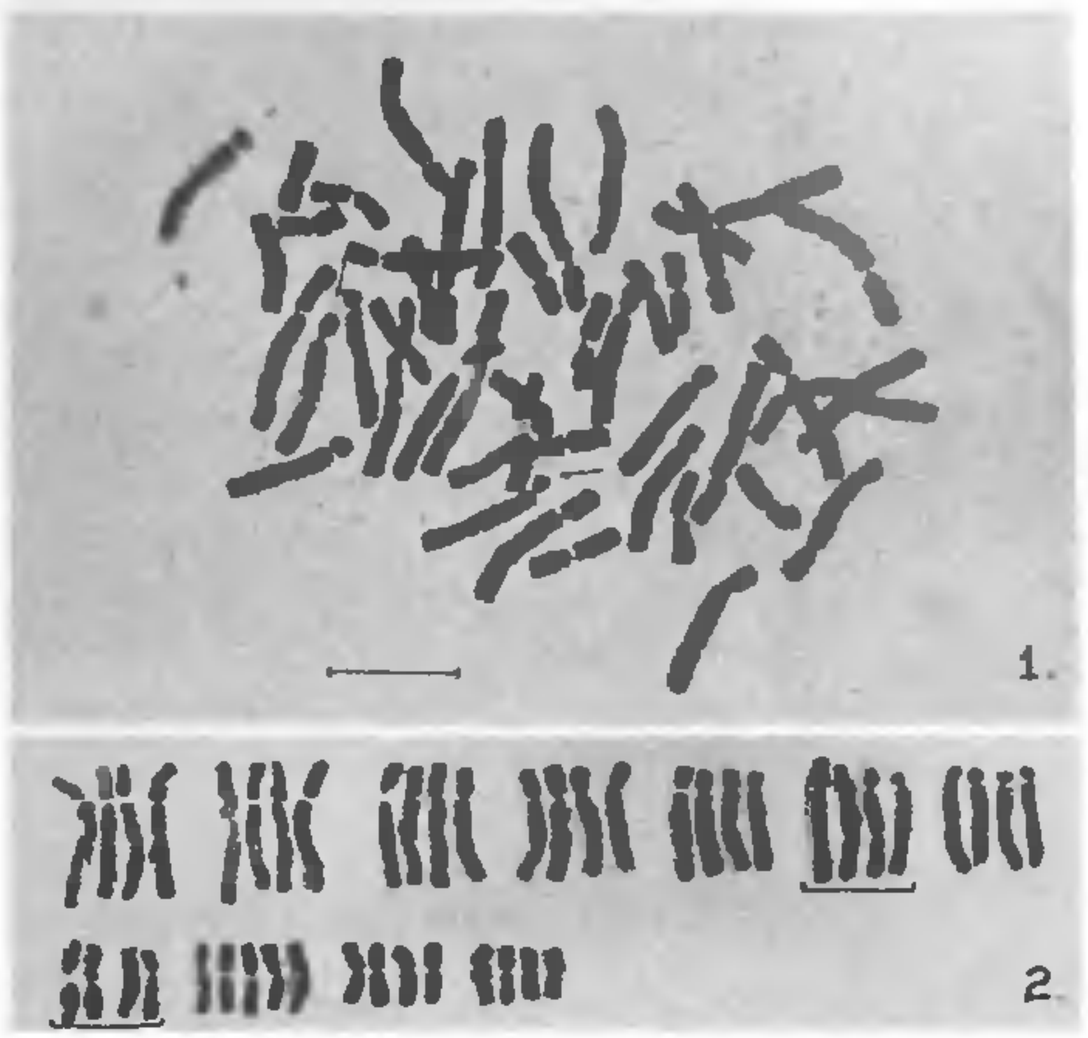
resemble with those of *M. larici-populina* Kleb[2], but differs from it in not having a prominent urediniospore side wall thickening. In addition teliospores are very small in size.

The authors thank Dr. Donald H. Pfister, Associate Curator, The Farlow Herbarium of Harvard University, USA (*F.H.*), and the Director, Rijksherbarium, Leiden (*L*) for loaning certain specimens. We are grateful to Drs K. R. Saxena and M. V. Pattabhiraman, Principals, P. G. College of Science, Saifabad and Nizam College respectively for encouragement. GB expresses gratitude to the authorities of UGC and CSIR for financial assistance.

20 February 1984; Revised 7 May 1984

1. Bagynarayana, G. and Ramachar, P., *Curr. Sci.*, 1984, **53**, 215.
2. Klebahn, H., *Zschr. f. Pfl. Kr.* 1902, **12**, 43.



Figures 1, 2. 1. Somatic metaphase in *Hippeastrum* var 'Dawn' showing 45 chromosomes. Note 2 satellited chromosomes. (scale 10 μ). **2.** Karyoidiogram. Note the heteromorphic quadruplets.

A 45 CHROMOSOME VARIETY OF *HIPPEASTRUM* HYBRID

J. L. KARIHALOO
Division of Ornamental Crops,
Indian Institute of Horticultural Research,
Hessaraghatta Lake, Bangalore 560089, India.

CULTIVATED varieties of *Hippeastrum*, a bulbous ornamental of tropics, are complex hybrids of 5–6 species[1]. Basic chromosome number of the genus is 11; euploids ranging from $2x$ to $7x$ and aneuploids with $2n = 18, 24, 46$ and 49 chromosomes have been recorded[2–4]. In this communication, karyotype, comparative morphology and pollen germination of variety 'Dawn' having $2n = 4x + 1 = 45$ chromosomes is presented.

Young root tips, obtained by placing bulbs in moist sand, were prefixed in 0.05% colchicine solution for 3 hr and later fixed in 1:3 acetic-alcohol for 24 hr. These were hydrolysed in 9:1 mixture of aceto-orcein and 1 N-HCl at 60°C for 5 min and squashed in 1% aceto-orcein. Five well-spread cells were photographed for karyotype analysis. The chromosomes were classified according to Levan *et al*[5]. *In vitro* pollen germination was studied by hanging drop method[6] using a solution of 0.1 M sucrose and 0.01% boric acid as medium. This mixture was found to give best results.

All root tip cells were found to bear 45 chromosomes; 28 long to medium and 17 short (figures 1, 2). These fall into 11 groups of 4 chromosomes each, except for the ninth group which has 5 chromosomes (table 1). Two quadruplets, sixth and eighth, are heteromorphic. In the former, only 2 of the 4 chromosomes are satellited. In the latter, 2 chromosomes are longer and have centromeres in median region whereas the other 2 are shorter and bear submedian centromeres. The nature of karyotype heteromorphicity suggests that the variety is an interspecific hybrid involving at least two species. The presence of satellites on only two chromosomes of the sixth quadruplet represents a case of amphiplasty[7] whereby the nucleolar organizing regions of one species are suppressed by those of the other.

Aneuploidy is known to bring about changes in phenotype and gamete fertility[8]. Comparison of 'Dawn' with 5 randomly selected tetraploid varieties (table 2) indicates that the addition of one chromosome does not produce any significant change in plant morphology or pollen viability. Most probably the tetraploid constitution of the variety is able to buffer the effect of one additional small chromosome.

Irregularities in chromosome synapsis or disjunction during meiosis resulting in numerically altered gametes are well-known sources of aneuploidy. An additional mechanism[9,10] suggested in vegetatively reproducing plants involves the origin of variation in

Table 1 *Chromosome morphometry of Hippeastrum var. 'Dawn.'*

Chromosomes	short arm (μ)	long arm (μ)	total (μ)	arm ratio	centromere*
1–4	3.8	9.5	13.3	2.50	sm
5–8	4.0	9.2	13.2	2.30	sm
9–12	3.1	9.0	12.1	2.90	sm
13–16	2.0	8.9	10.9	4.45	st
17–20	1.6	8.4	10.0	5.24	st
21–24	1.1	8.7	9.8	7.91	t
25–28	1.2	8.5	9.7	7.08	t
29, 30	3.6	3.9	7.5	1.08	m
31, 32	2.4	4.3	6.7	1.79	sm
33–37	3.0	3.4	6.4	1.13	m
38–41	2.5	2.8	5.3	1.12	m
42–45	2.3	2.9	5.2	1.26	m

*m: median region; sm: submedian; st: subterminal; t: terminal region

Table 2 *Comparative morphology and pollen germination of 45 chromosome and 44 chromosome Hippeastrum varieties.*

Character	'Dawn' ($2n = 45$)	5 varieties ($2n = 44$)
Leaf length (cm)	39.8	37.0 – 44.3
Leaf breadth (cm)	5.2	4.9 – 6.1
Flower diameter (cm)	16.8	14.3 – 18.0
Tepal length (cm)	13.7	11.8 – 14.8
Tepal breadth (cm)	8.4	5.9 – 8.9
Pollen germination (%)	76.7	67.1 – 94.7

somatic tissues, known as aneusomaty, followed by differentiation of altered cells into new propagules. Aneusomaty has been recorded from root tip cells of some varieties of *Hippeastrum* and the related garden amaryllis[2, 11]. Khoshoo and Narain[11] attributed these somatic variations to nucleo-cytoplasmic instability caused by polyploidy and hybridity. In variety 'Dawn' however, in spite of aneuploidy and hybridity, the chromosome number seems to be quite stable since no aneusomatic cells could be observed during the course of present investigation.

The author expresses his thanks to Director, IIHR and Head, Division of Ornamental Crops for facilities.

24 April 1984

1. Staff of the L. H. Bailey Hortorium, Hortus third, Macmillan Publishing Co. Inc., New York, 1976, p. 1290.
2. Mookerjea, A., *Caryologia*, 1955, **8**, 1.
3. Fedorov, An. A., *Chromosome numbers of flowering plants*, Academy of Sciences, U.S.S.R., 1967, p. 926.
4. Narain, P., *Plant Life*, 1977, **38**, 42.
5. Levan, A., Fredga, K. and Sandberg, A., *Hereditas*, 1964, **52**, 201.
6. Stanley, R. G. and Linskens, H., *Pollen: biology, biochemistry, management*, Springer-Verlag, Berlin, 1974, p. 307.
7. Navashin, M., *Cytologia*, 1934, **5**, 169.
8. Garber, E. D., *Cytogenetics: An introduction*, McGraw-Hill, New York, 1972, p. 259.
9. Sharma, A. K., *Caryologia*, 1956, **9**, 93.
10. Sharma, A. K. and Sharma, A., *Bot. Rev.*, 1959, **25**, 514.
11. Khoshoo, T. N. and Narain, P., *Indian J. Genet. Plant Breed.*, 1967, **27**, 322.

FLORAL ANATOMY OF *TETRATHECA EFOLIATA* FVM. (TREMANDRACEAE)

C. SUVARTHA, M. SATYAVATHI and L. L. NARAYANA,
Department of Botany, Kakatiya University, Vidyaranyapuri, Warangal 506 009, India.

THE family Tremandraceae is Australian and comprises 3 genera and 25 species[1]. Saunders[2] studied the floral anatomy of *Tetratheca thymifolia* supporting her theory of carpel polymorphism. In the present note the findings on the floral anatomy of *Tetratheca efoliata* FVM are presented.

The flower is pedicellate, bisexual, hypogynous, pentamerous except the gynoecium and tetracyclic. The free sepals and petals exhibit valvate and induplicate valvate aestivation respectively (figures 4–9, 16). The androecium consists of five pairs of antipetalous stamens which are apically sterile (figures 8, 9, 16). The bicarpellary, syncarpous gynoecium is 2-locular bearing two ovules in each loculus (figures 12–15) and unilocular above. The stylar canal is lined by rudimentary transmitting tissue.

Both sepals and petals are 3-traced. There is connation between the common sepal laterals and adnation between sepal midribs and common petal laterals. The petal midribs arise independently (figures 1–5). The five staminal traces, organised along the petal radii, undergo early bifurcation and the resulting ten traces supply the ten stamens (figures 6–9). Judging from the origin of staminal traces, the androecium is inter-