Table I. Antimicrobial spectrum of the pigment antibiotic MT-10

Test organism	Minimum inhibitory concentration (μg/ml)
Staphylococcus aureus	1
Streptococcus pyogenes	2
Bacillus subtilis	0.5
Pseudomonas aeruginosa	50
Candida albicans	90
Candida parapsilopsis	50
Candida tropicalis	80
Trichophyton mentagrophytes	40
Epidermophyton floccosum	35.0
Curvularia lunata	12.5
Alternaria solani	15.0
Fusarium oxysporum	75.0
Helminthosporium oryzae	20.0
Aspergillus niger	125.0
Aspergillus oryzae	35.0

Table II. Physicochemical properties and toxicity of the antibiotic MT-10 and actinomycin D

	Antibiotic MT-10	Actinomycin D
Melting point (°C)	204	240
Specific rotation	$[\alpha]_D^{23} = -205$ to 215° (C = 0.25% in ethanol)	$[\alpha]_D^{23} = -261$ to 268° (C = 0.25% in ethanol)
λ_{max} (nm in ethanol)	420.0 442.0	420.0 440.0
Toxicity in mice LD_{50} (mg/kg/body wt.)	0.56	0.76

at 3380–3230 cm^{-1} indicating the presence of hydroxyl groups. The regions at 1730 cm^{-1} and 1640 cm^{-1} are suggestive of the presence of δ-lactone or esters and unsaturated ketone or quinonoid systems respectively. The antibiotic is stable at room temperature. The microanalytical results shows C −56.37%, H−7.40% and N −10.80%. The mol. wt. is 402 (Rast's method) and the probable molecular formula is suggested as $C_{19}H_{31}N_3O_6$. The antimicrobial spectrum of the purified substance was determined by cup assay method and its minimum inhibitory concentration is shown in Table I. The toxicity test of the antibiotic was carried out on mice in which LD_{50} is 560 μg/kg of body weight.

Table III. Comparative in vitro activity of the antibiotic MT-10 and actinomycin D

Test organism	Zone of inhibition in mm	
	Antibiotic MT-10 (100 μg/ml)	Actinomycin D (100 μg/ml)
Bacillus subtilis	30.5	26.5
Staphylococcus aureus	24.0	20.0
Escherichia coli	–	–
Pseudomonas aeruginosa	22.0	20.5
Candida albicans	22.0	15.0
Candida parapsilopsis	28.5	22.0
Candida tropicalis	19.5	13.5
Saccharomyces cerevisiae	16.0	–
Microsporum canis	13.0	–
Curvularia lunata	22.5	12.5
Alternaria solani	24.0	13.5
Fusarium oxysporum	15.0	–
Aspergillus niger	14.0	–
Aspergillus oryzae	18.5	–

–, indicates absence of activity.

The orange yellow colour of the product, UV- and IR-absorption spectrum, high negative optical rotation, high toxicity and also its solubility indicate its relationship to those of actinomycin group of antibiotics. A comparison was therefore made with actinomycin D (Table II). Regarding solubility in different solvents, both antibiotic MT-10 and actinomycin D behave similarly, except in water where the latter is partially soluble. Comparative assays for antimicrobial activities are given in Table III. It was observed that the inhibitory activity of the antibiotic differs from the actinomycin D to some extent. The activity of the antibiotic MT-10 against *Saccharomyces cerevisiae, Microsporum cannis, Fusarium oxysporum, Aspergillus niger* and *Aspergillus oryzae* is significant, whereas with actinomycin D no such activity exists. *E. coli* is, however, resistant to both the antibiotics.

Zusammenfassung. Aus einer Mutante von *Streptomyces indicus* CHAKRABARTY sp. nov. wurde das neue Antibiotikum MT-10 (orange-gelbe Kristalle) isoliert. Die antibakterielle und antifungische Aktivität wurde untersucht und festgestellt, dass MT-10 mit Actinomycin D verwandt ist.

S. L. CHAKRABARTY and P. NANDI

Department of Microbiology,
Bose Institute, Calcutta 9 (India), 23 July 1970.

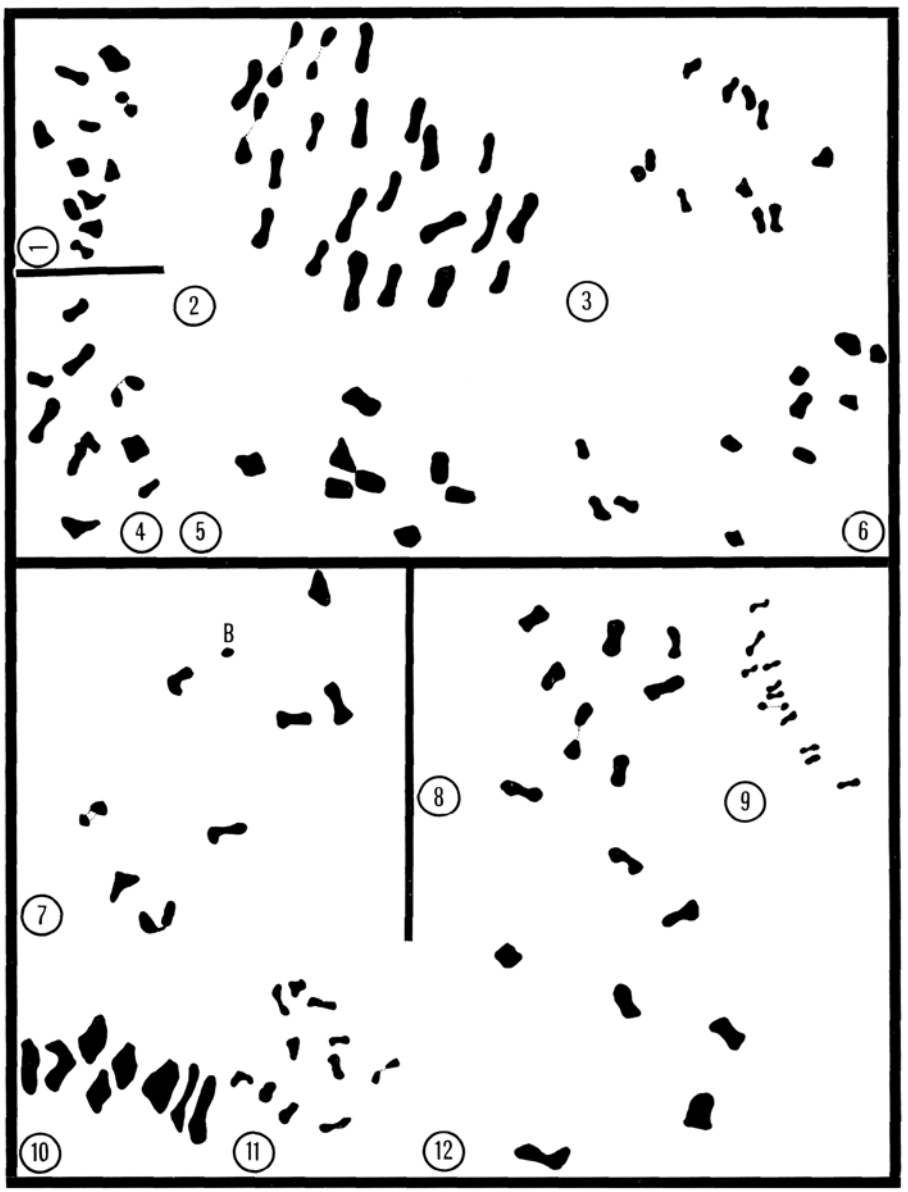
Chromosome Studies in *Salvia* (Labiatae): West-Himalayan Species

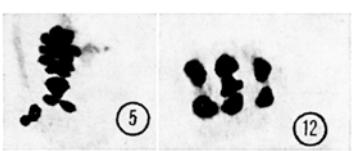
The genus *Salvia* has received attention from numerous authors who have been interested in economic utilization of various taxa, but less attention has been given to naturally occurring species in Himalayan flora. MUKERJEE[1] has reported 24 species from the Indian subcontinent of which 9 species are met in the Western Himalayas. Cytologically, the genus *Salvia* has been fairly worked out. Earlier reports include the work of DELASTING[2], EPLING et al.[3], MEHRA and GILL[4], SCHEEL[5], STEWART[6] and YAKOVLEVA[7]. The present study was undertaken to investigate the cytological nature of the West-Himalayan species of *Salvia.*

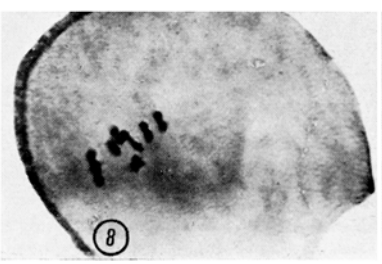
Chromosome numbers for 20 Taxa of *Salvia* from the West Himalayas are summarized in the Table. The

[1] S. K. MUKERJEE, A revision of the Labiatae of Indian Empire. Rec. bot. Surv. India *14*, 228 (1940).
[2] N. DELASTING, Revue Cytol. Biol. vég. *15*, 195 (1954).
[3] C. EPLING, H. LEWIS and P. H. RAVEN, Section Audibertia Aliso *5*, 217 (1962).
[4] P. N. MEHRA and L. S. GILL, Taxon *17*, 419 (1968).
[5] M. SCHEEL, Bot. Arch. *32*, 148 (1931).
[6] W. S. STEWART, Am. J. Bot. *26*, 730 (1939).
[7] S. V. YAKOVLEVA, Trudy prikl. Bot. Genet. Selek *11 d*, 207 (1933).

materials studied were collected by the author during many botannical excursions in the West Himalayas from 1963 to 1966. The chromosome counts were made from flower buds fixed in Farmer's fluid (3 parts absolute alcohol to 1 part glacial acetic acid) for a maximum of 24 h, after which they were transferred to 70% alcohol. The anthers were subsequently squashed in 2% aceto-carmine. Collections cited are deposited at the Herbarium







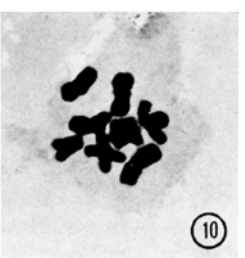


Fig. 1. *Salvia castanea* ($n = 11$) first metaphase.
Fig. 2. *S. coccinea* var. Crimson King ($n = 22$) first metaphase.
Fig. 3. *S. coccinea* var. Pink Pearl ($n = 11$) first metaphase.
Fig. 4. *S. farinacea* ($n = 10$) first metaphase.
Fig. 5. *S. hains* ($n = 8$) first metaphase; with photomicrograph.
Fig. 6. *S. lanata* ($n = 11$) first metaphase.
Fig. 7. *S. plebeia* ($n = 8 + 1B$) first metaphase.
Fig. 8. *S. splendens* ($n = 8$) first metaphase; with photomicrograph.
Fig. 9. *S. pseudococcinia* ($n = 11$) first metaphase.
Fig. 10. *S. moorcroftiana* ($n = 8$) first metaphase; with photomicrograph.
Fig. 11. *S. leucantha* ($n = 11$) first metaphase.
Fig. 12. *S. involucrata* ($n = 7$) first metaphase; with photomicrograph.

Chromosome number in the genus *Salvia*

Taxon	Voucher	Origin	*n* Number
**Salvia castanea* Diels	Gill U.S.P.L. 480.65	Suni	11
	Gill 1646	Solan	11
**S. coccinea* Fuss. var. Crimson King	Gill 3205	Chandigarh	22
S. coccinea Fuss. Pink Pearl	Gill 7458	Sutton Seed Calcutta	11
S. farinacea Benth		Sutton Seed Calcutta	10
S. glutinosa L.	Gill 7394	Khurpatal	8
	Gill 7482	Gulmarg	8
**S. hains* Royle ex Benth	Gill 7484	Khilanmarg	8
**S. involucrata* cav.	Gill 3202	Kasauli	7
S. lanata Roxb.	Gill 7382	Nainital	11
	Gill 1644	Solan	11
**S. leucantha* cav.	Gill 3192	Kasauli	11
	Gill 7388	Nainital	11
**S. moorcroftiana* Wall. ex. Bth.	Gill 7583	Solan	8
	Gill U.S.P.L. 480.36	Sirinagar	8
S. officinalis L.	Gill 3196	Rupar	7
S. plebeia R. Br.	Gill 3207	Chandigarh	8
	Gill 1645	Jeolikot	8 + 1B
**S. pseudococcinia* Jacq.	Gill 7401	Khurpatal	11
S. splendens Kev. Gawt.		Sutton Seed Calcutta	8

of Panjab University, Chandigarh, India. Counts for species indicated by an asterisk are being reported for the first time.

A perusal of literature reveals that the frequency of polyploidy in the genus *Salvia* is about 21.7%. All the presently investigated taxa except *S. coccinea* var. Crimson King, are at diploid level. EPLING et al.[3], studied *Salvia* species from California and established a new base number of $x = 15$. The commonest base numbers in *Salvia* are 6, 7 and 8. However, base numbers of 9, 10 and 11 are also not uncommon. From the literature it appears that the genus *Salvia* is highly polybasic and having base numbers $x = 6$, 7, 8, 9, 10, 11, 13, 15, 17 and 19. The basic numbers of 6, 7 and 8 may be considered as primary base numbers and the higher numbers seem to be of secondary origin.

Résumé. Détermination de nombres chromosomiques dans des Sauges *(Salvia)* encore non étudiés du Himalaya.

L. S. GILL

Department of Biology, University of Waterloo, Waterloo (Ontario, Canada), 15 May 1970.

Adequate Stimulus of the Insect Tympanic Organ

The most important characteristics of sound stimuli that excite the insect tympanal organ have been considered variously to be amplitude modulation[1], rise time of song pulses[2], and starting and terminal transients of pulses[3]. There is little evidence that the tympanal organ analyses sounds in terms of their frequency[4,5] but only the pulse structure of the stridulations is reflected in the discharge along the auditory nerve. HASKELL[6] showed that the ear of the grasshopper *Chorthippus brunneus* responded in an inconsistent fashion to the species song played from a tape loop and detected only the general features of the amplitude modulation pattern.

Orthopteran songs, which are usually produced by a series of tooth strikes that set the wings vibrating, consist almost entirely of very brief transients with wide frequency ranges. Nevertheless, we know of no experiment on the insect ear in which provision has been made for reproduction of transients over the full frequency range met with in the species song. We have found that a normal response cannot be elicited in the auditory nerve of the tettigoniid *Metrioptera brachyptera* unless ultrasonic elements of the song transients are adequately reproduced.

The tympanal organ of *M. brachyptera* responded very well to the song of a live conspecific singing in a cage close by (Figure 1a). The song was then recorded at 15 i.p.s. (38 cm/s) on a good audiofrequency tape recorder (Akai X-300) and played back to the preparation through a moving coil loudspeaker. A synchronous response in the nerve was barely detectable, even at an intensity of 85 dB (monitored on the 'A' scale of a Bruel and Kjaer sound level meter operating up to 20 kHz) compared with 45 dB from the live insect (Figure 1b). The insect song, on subsequent analysis, was found to have its main energy in the range 15–85 kHz.

Similarly, the calling song of the grasshopper, *Chorthippus parallelus*, evoked a powerful synchronous response in the tympanal organ of *M. brachyptera* when produced by a caged insect (Figure 2), but a comparatively poor response was obtained to an audio-frequency

[1] R. J. PUMPHREY, Biol. Rev. *15*, 107 (1940).
[2] M. C. BUSNEL and D. BURKHARDT, Symp. zool. Soc. Lond. *7*, 13 (1962).
[3] P. E. HOWSE, Symp. zool. Soc. Lond. *23*, 167 (1968).
[4] Y. KATSUKI and N. SUGA, J. exp. Biol. *37*, 279 (1960).
[5] G. A. HORRIDGE, Proc. R. Soc. Lond. B *155*, 218 (1961).
[6] P. T. HASKELL, J. exp. Biol. *33*, 737 (1956).