Phyton (Austria)	Vol. 15	Fasc. 1—2	57—66	30. 8. 1973

Cytotaxonomical conspectus of the flora of Kashmir (1) Chromosome numbers of some common plants

By

Awtar Kishen Koul & Ravinder Nath Gohil *)

Introduction

The valley of Kashmir is perched among the Himalayas at an average height of about 1,600 m above sea level. The approximately 134 km long and 38 km broad valley is cut off from the outer world on the north-east and west by the high mountainous ranges. On the west it is cut off by rocky barriers 80—128 km in width. The mountains range in height from 5,500 m on the north-east to over 2,800 m in the south, where Banihal pass affords the only exit from the valley.

The floristic studies conducted so far in the valley are limited to listing the plants growing in this region (Blatter 1927—29, Rao 1960a, b and Javed 1971). The most important and interesting aspect of analysing the vegetation with a view to determine the contribution of surrounding Eurasian, Trans Himalayan, Chinese and rest of the Indian flora to the indigenous element remains to be determined.

Since a head way has been made in the floristic studies of the valley, it seems worthwhile to ponder about the possible origin of the valley's flora, in much the same way as Löve & Löve 1955, have done for the Icelandic flora. The cytotaxonomical studies on the plants of Kashmir represents the first step of the project aimed at understanding the origin of the valley's flora.

The present paper is the first in this series and it puts on record chromosome counts for 101 species belonging to 26 families. References to earlier counts have been drawn from Darlington & Wylie 1955, Ornduff 1967, 1968, 1969 and Moore 1970. Chromosome numbers of 23 species and one genus (*Jaeschkea gentianoides* Kurz) have been reported for the first time.

---

*) A. K. Koul, Lecturer, & R. N. Gohil, Senior Research Fellow, P. G. Botany Department, Kashmir University, Srinagar, Kashmir, India.

Materials and methods

Collections were made from within and around the valley and both the cultivated and wild taxa were included in the present study. Chromosome counts have been made at pollen mother cell meiosis from anthers fixed in 1 : 3 acetic alcohol and squashed in 1% aceto-orcein. The voucher specimens of the plants studied have been deposited in the Kashmir University herbarium.

The authors feel grateful to Prof. P. KACHROO for providing the necessary facilities. Thanks are also due to Dr. T. N. KHOSHOO for lending us some literature and to Mr. Gurcharan SINGH for his help in the identification of some species.

Observations

In the following list RN and GS are abbreviations for Ravinder NATH and Gurcharan SINGH, names of the two research fellows working against the project. BW and AK are abbreviations for Bashir WAFAI and Awtar KISHEN.

Name	Voucher No. GS = Gurcharan SINGH RN = Ravinder NATH	Source	Present count 2n	Earlier count 2n	Authority
Gymnospermae					
Pinaceae					
1. *Picea Smithiana* BOISS.	GS 3415	Wild	24	—	—
Ginkgoaceae					
1. *Ginkgo biloba* L.	GS 3501	Cult.	24	24	LEE 1954

Name	Voucher No. GS = Gurcharan Singh RN = Ravinder Nath	Source	Present count 2n	Earlier count 2n	Authority
Angiospermae, Dicotyledones					
Magnoliaceae					
1. *Magnolia grandiflora* L.	GS 3540	Cult.	114	114	Janaki Ammal 1953
2. — *liliiflora* Desr.	RN 18	Cult.	76	76	— do —
Ranunculaceae					
1. *Aconitum laeve* Royle	RN 19	Wild	16	—	—
2. *Anemone biflora* DC.	GS 310a	Wild	16	16	Madahar 1967
3. — *obtusiloba* Don.	GS 3307	Wild	14, 16	—	—
4. *Cimicifuga foetida* L.	GS 240a	Wild	32	16	Nakajima 1933
5. *Delphinium denudatum* Wall.	GS 1441	Wild	16	—	—
6. — *ajacis* L.	RN 20	Cult.	16	16	Gregory 1941
7. *Ranunculus hirtellus* Royle	GS 774a	Wild	14	—	—
Papaveraceae					
1. *Papaver bracteatum* Lindl.	RN 21	Cult.	41	14	Yasui 1936
				42	Ernst 1965
2. — *dubium* L.	GS 3640	Wild	28	28	Ljungdahl 1922
				42	Löve & Löve 1944
3. — *macrostomum* Boiss.	GS 3370	Wild	14	—	—
4. — *nudicaule* L.	RN 22	Cult.	28, 29, 41	14	Fabergé 1944
				28	Horn 1938
5. — *rhoeas* L.	GS 3470	Cult.	14	14	Lawrence 1930
6. — *somniferum* L.	GS 3351	Cult.	22	22 (44)	Furusato 1940
Cruciferae					
1. *Iberis amara* L.	RN 23	Cult.	14	14, 16	Jaretzkyy 1932
				14, 15	Ene 1968

Name	Voucher No. GS = Gurcharan Singh RN = Ravinder Nath	Source	Present count 2n	Earlier count 2n	Authority
Polygonaceae					
1. *Polygonum affine* D. Don	GS 342a	Wild	24	—	—
Geraniaceae					
1. *Pelargonium zonale* Ait.	RN 24	Cult.	18	17, 18, 35, 36	Gauger 1937
Balsaminaceae					
1. *Impatiens balsamina* L.	RN 25	Cult.	14	14	Warburg 1938
				14, 14+2B	Raghuvanshi & Joshi 1968
2. — *brachycentra* Kar. & Kir.	GS 170b	Wild	14	14	Khoshoo 1966
3. — *Thomsoni* Hook.	GS 928a	Wild	14	14, 20	Khoshoo 1966
Papilionaceae					
1. *Desmodium tiliifolium* G. Don	GS 3416	Wild	22	22	Bir & Sidhu 1966
2. *Lathyrus odoratus* L.	RN 26	Cult.	14	14	Simonet 1932
Platanaceae					
1. *Platanus orientalis* L.	GS 3451	Cult.	42	—	—
Cannabinaceae					
1. *Cannabis sativa* L.	GS 3840	Wild	20	20	Madvedeva 1935
				(40)	Furusato 1940
Umbelliferae					
1. *Eryngium coeruleum* Bieb.	GS 4160	Wild	16	16	Bill & Constance 1966
Caprifoliaceae					
1. *Sambucus ebulus* L.	GS 491b	Wild	36	32	Battaglia 1946
				36	Poucques 1949

Name	Voucher No. GS = Gurcharan Singh RN = Ravinder Nath	Source	Present count 2n	Earlier count 2n	Authority
Compositae					
1. *Arctium lappa* L.	GS 3474	Wild	36	32	Sugiura 1936
				36	Nakajima 1936
2. *Carduus onopordeoides* Fisch. ex Bieb.	GS 3824	Wild	40	—	—
3. *Carthamus turkistanicus* Popov	GS 3917	Wild	64	64	Khidir & Knowles 1970
4. *Centaurea iberica* Stev.	GS 3504	Wild	20	16	Poddubnaja 1931
5. *Cirsium wallichii* DC.	GS 3930	Wild	68	—	—
6. *Cosmos bipinnatus* Cav.	RN 10	Cult.	24	24	Sugiura 1936
7. — *sulphureus* Cav.	RN 11	Cult.	24	24	Sugiura 1936
8. *Cynara scolymus* L.	RN 12	Cult.	34	34	Janaki Ammal (unpubl.)
9. *Dahlia pinnata* Cav.	RN 13	Cult.	36	—	—
10. *Inula racemosa* Hook.	GS 3936	Wild	20	20	Tongiorgi 1935
11. *Lactuca serriola* L.	GS 38b	Wild	18	18	Thompson & al. 1941
12. *Onopordum acanthium* L.	GS 526a	Wild	34	34	Poddubnaja 1931
13. *Pterotheca falconeri* Hook.	GS 3584	Wild	10	6	Mehra & al. 1965
				10	Shetty 1967
14. *Silybum marianum* Gaertn.	GS 3910	Wild	34	34	Heiser & Whitaker 1948
15. *Tanacetum longifolium* Wall.	GS 3932	Wild	18	—	—
16. *Tragopogon pratense* L.	GS 3580	Wild	24	12	Winge 1926
17. *Zinnia elegans* Jacq.	RN 14	Cult.	24	24	Ishikawa 9161
18. — *linearis* Benth.	RN 15	Cult.	24	24	Mehra & al. 1965
Gentianaceae					
1. *Jaeschkea gentianoides* Kurz	GS 3942	Wild	18	—	—
2. *Swertia petiolata* Royle	GS 990b	Wild	26	—	—

Name	Voucher No. GS = Gurcharan Singh RN = Ravinder Nath	Source	Present count 2n	Earlier count 2n	Authority
Plantaginaceae					
1. *Plantago depressa* Willd.	GS 3592	Wild	12	12	Rahn 1966
2. — *lanceolata* L.	GS 391a	Wild	12	12	Nakajima 1930
				12, 13	Bocher & al. 1953
				24, 96	MacCullagh 1934
3. — *major* L.	GS 3989	Wild	12	12	Turesson 1938
Polemoniaceae					
1. *Phlox drummondii* Hook.	RN 16	Cult.	14	14 (28)	Meyer 1944
2. *Polemonium caeruleum* L.	GS 3593	Wild	18	18	Criesinger 1937
Solanaceae					
1. *Petunia hybrida* Vilm.	RN 17	Cult.	14	14	Baquar 1967
				(21, 28, 35)	Dermen 1931
2. *Solanum nigrum* L.	GS 311a	Wild	56	24, 48, 72	Bhaduri 1933
				24, 72	Stebbins & Paddock 1949
				(96, 144)	Jörgensen 1928
Convolvulaceae					
1. *Convolvulus arvensis* L.	GS 3997	Wild	48	50	Wolcott 1937
				48	Khoshoo & Sachdeva 1961
Angiospermae, Monocotyledones					
Commelinaceae					
1. *Tradescantia fluminensis* Vell.	GS 3993	Cult.	24	36	Heitz 1967

Name	Voucher No. GS = Gurcharan Singh RN = Ravinder Nath	Source	Present count 2n	Earlier count 2n	Authority
Liliaceae					
1. *Agapanthus umbellatus* L'Her.	RN 1	Cult.	30	30	Darlington 1933
2. *Allium ampeloprasum* L. (Leek)	RN 2	Cult.	32	32	Ved Brat 1965
3. — *ampeloprasum* L. (great headed garlic)	RN 3	Cult.	48	—	—
4. — *atropurpureum* Waldst. & Kit.	GS 3594	Cult.	16	16	Koul 1966
5. — *cepa* L. var. *cepa*	RN 4	Cult.	16	16, 32	Levan 1935
6. — — var. *aggregatum*	RN 5	Cult.	16	—	—
7. — — var. *viviparum*	RN 6	Cult.	24	16	Fukushima & al. 1964
				16, 24	Singh & al. 1967
8. — *chinense* G. Don	RN 7	Cult.	32	24, 32	Ved Brat 1965
9. — *consanguineum* Kunth	GS 4002	Wild	16	—	—
10. — *Govanianum* Wall.	GS 3598	Wild	16	—	—
11. — *rubellum* Bieb.	GS 4010	Wild	16, 24, 32	16	Levan 1931
				24	Khoshoo & Sharma 1959
12. — *sativum* L.	RN 8	Cult.	16	16	Levan 1935
13. — *tuberosum* Roxb.	RN 9	Cult.	32	16	Ohno 1964
				32	La Cour 1945
14. — *Thomsoni* Baker	RN 36	Wild	32	—	—
15. *Asparagus filicinus* Ham.	GS 4030	Wild	20	—	—
16. — *officinalis* L.	GS 4016	Wild	20	20	Nagao 1938
				20, 40	Zilm 1966
17. *Chlorophytum capense* Kuntz	RN 27	Cult.	28	28	Koul & Sopory 1970
18. — *elatum* R.Br. var. *variegatum*	RN 28	Cult.	28	28	Sato 1942

Name	Voucher No. GS = Gurcharan Singh RN = Ravinder Nath	Source	Present count 2n	Earlier count 2n	Authority
19. *Eremurus himalaicus* Baker	GS 4131	Wild	14	14	Burstrom 1929
20. *Fritillaria imperialis* L.	GS 4060	Wild	24	24+0—12B	Darlington 1936
21. — *roylei* Hook.	GS 3610	Wild	24	—	—
22. *Gagea dschungarica* Rgl.	GS 418b	Wild	48, 60	48, 60	Koul & Khan 1969
23. — *elegans* Wall.	GS 4180	Wild	72, 96, 132	72, 96, 132	Koul & Khan 1969
24. — *gageoides* Vved.	GS 4174	Wild	48	48	Koul & Khan 1969
25. — *kashmirensis* Turrill	GS 4117	Wild	24	24	Koul & Khan 1969
26. — *reticulata* Schultes	RN 37	Wild	24	24	Koul & Khan 1969
27. — *stipitata* Merkl.	GS 413c	Wild	72	72	Koul & Khan 1969
28. *Kniphofia uvaria* Hook.	RN 29	Cult.	12	12,13	Webber 1932
29. *Lilium martagon* L.	RN 31	Cult.	24	24+0—3B	Fernandes 1950
30. — *tigrinum* Ker	RN 30	Cult.	24	24	Sato 1932
				36+0—1B	Sansome & La Cour 1934
31. *Muscari armeniacum* Leight.	RN 32	Cult.	36	18	Greeves 1931
				36	Haque 1952
32. *Polygonatum multiflorum* All.	GS 3614	Wild	22	18, 24	Eigsti 1942
				18, 30	Dark 1939
				18, 20, 28	Soumalainen 1947
33. — *verticillatum* All.	GS 3631	Wild	30	27, 28	Berg 1933
				30, 84	Dark 1939
				28, 60, 86—91	Therman 1953
34. *Tulipa aitchisonii* Hall	BW 1	Wild	24	—	—
35. — *stellata* Hook.	BW 2	Wild	24	—	—
	BW 3	Wild	48	—	—

Name	Voucher No. GS = Gurcharan Singh RN = Ravinder Nath	Source	Present count 2n	Earlier count 2n	Authority
Amaryllidaceae:					
1. *Hemerocallis flava* L.	BW 4	Cult.	22	22	Dark 1932
2. — *fulva* L.	GS 4190	Wild	33	22, 33	Sato 1942
3. *Sternbergia fischeriana* (Herb.) Roem.	AK 1	Wild	22	22	Koul & Khan 1969
Iridaceae:					
1. *Iris ensata* Thunb.	GS 3711	Wild	40	40	Sokolovskaya 1966
2. — *germanica* L.	GS 4208	Cult.	48	44	Simonet 1934
Agavaceae:					
1. *Hosta plantaginea* Aschers.	RN 35	Cult.	60	60	Yasui 1935
2. — *ventricosa* Stearn	RN 33	Cult.	60	60	Yasui 1935
3. *Yucca gloriosa* L.	RN 34	Cult.	60	—	—
Gramineae:					
1. *Sorghum halepense* L.	GS 4210	Wild	40	20, 40	Janaki Ammal (unpubl.)
				40	Huskins & Smith 1934

Summary

The paper puts on record chromosome counts for 101 species belonging to 26 families. Chromosome numbers of 23 species and one genus (*Jaeschkea gentianoides* KURZ) have been reported for the first time.

Zusammenfassung

Für die Flora von Kashmir wurden von 101 Spermatophyten aus 26 Familien die 2n-Chromosomenzahlen festgestellt und mit früheren Angaben verglichen. Die Zahlen für 23 Arten und für eine Art aus der noch nicht daraufhin untersuchten Gattung *Jaeschkea* (*J. gentianoides* KURZ) wurden zum erstenmal ermittelt.

Literature cited

BLATTER E. 1927—1929. Beautiful flowers of Kashmir. I et II. — Westminster.

DARLINGTON C. D. & WYLIE A. P. 1955. Chromosome atlas of flowering plants. — London.

JAVED G. N. 1971. Flora of Srinagar — a phytogeographic and taxonomic study of flowering plants of Srinagar. Thesis submitted for the award of Ph. D. Degree to Kashmir University — Srinagar.

LÖVE A. & LÖVE D. 1955. Cytotaxonomical conspectus of the Icelandic flora. — Acta Horti Gotoburg. 20 (4): 65—291.

MOORE R. J. 1970. Index to plant chromosome numbers for 1968. — IBPTN, Utrecht.

ORNDUFF R. 1967. Index to plant chromosome numbers for 1965. — IBPTN, Utrecht.

— 1968. Index to plant chromosome numbers for 1966. IBPTN, Utrecht.

— 1969. Index to plant chromosome numbers for 1967. IBPTN, Utrecht.

RAO T. A. 1960a. A botanical tour to Kashmir. — Rec. Bot. Surv. Ind. 18: 1—67.

— 1960b. A further contribution to the flora of Jammu & Kashmir State. — Bull. Bot. Surv. Ind. 2 (3—4): 387—423.