

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

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

Name	Voucher No. GS = Gureharan SINGH RN = Ravinder NATH	Source	Present		Earlier		Authority
			count	2n	count	2n	
<i>Angiospermae, Dicotyledones</i>							
<i>Magnoliaceae</i>							
1. <i>Magnolia grandiflora</i> L.	GS 3540	Cult.	114		114		JANAKI AMMAL 1953
2. — <i>biliiflora</i> DESR.	RN 18	Cult.	76		76		— do —
<i>Ranunculaceae</i>							
1. <i>Aconitum laeve</i> ROYLE	RN 19	Wild	16		—		—
2. <i>Anemone biflora</i> DC.	GS 310a	Wild	16		16		MADAHAR 1967
3. — <i>obtusiloba</i> DON.	GS 3307	Wild	14, 16		—		—
4. <i>Cimicifuga foetida</i> L.	GS 240a	Wild	32		16		NAKAJIMA 1933
5. <i>Delphinium denudatum</i> WALL.	GS 1441	Wild	16		—		—
6. — <i>ajacis</i> L.	RN 20	Cult.	16		16		GREGORY 1941
7. <i>Ranunculus hirtellus</i> ROYLE	GS 774a	Wild	14		—		—
<i>Papaveraceae</i>							
1. <i>Papaver bracteatum</i> LINDL.	RN 21	Cult.	41		14		YASUI 1936
2. — <i>dubium</i> L.	GS 3640	Wild	28		42		ERNST 1965
					28		LJUNGDAHL 1922
3. — <i>macrostomum</i> BOISS.	GS 3370	Wild	14		42		LÖVE & LÖVE 1944
					—		—
4. — <i>nudicaule</i> L.	RN 22	Cult.	28, 29, 41		14		FABERGÉ 1944
					28		HORN 1938
5. — <i>rhoeas</i> L.	GS 3470	Cult.	14		14		LAWRENCE 1930
					22		(44) FURUSATO 1940
<i>Cruciferae</i>							
1. <i>Iberis amara</i> L.	RN 23	Cult.	14		14, 16		JARETZKY 1932
					14, 15		ENE 1968

Name	Voucher No. GS = Gurcharan SINGH RN = Ravinder NATH	Source	Present		Earlier		Authority
			count	2n	count	2n	
<i>Polygonaceae</i>							
1. <i>Polygonum affine</i> D. DON	GS 342a	Wild	24		—		—
<i>Geraniaceae</i>							
1. <i>Pelargonium zonale</i> AIT.	RN 24	Cult.	18	17, 18, 35, 36	GAUGER 1937		
<i>Balsaminaceae</i>							
1. <i>Impatiens balsamina</i> L.	RN 25	Cult.	14	14	WARBURG 1938 14, 14+2B RAGHUVANSHI & JOSHI 1968		
2. — <i>brachycentra</i> KAR. & KIR.	GS 170b	Wild	14	14	KHOSHOO 1966		
3. — <i>Thomsoni</i> HOOK.	GS 928a	Wild	14	14, 20	KHOSHOO 1966		
<i>Papilionaceae</i>							
1. <i>Desmodium tiliiifolium</i> G. DON	GS 3416	Wild	22	22	BIR & SIDHU 1966		
2. <i>Lathyrus odoratus</i> L.	RN 26	Cult.	14	14	SIMONET 1932		
<i>Platanaceae</i>							
1. <i>Platanus orientalis</i> L.	GS 3451	Cult.	42		—		—
<i>Cannabaceae</i>							
1. <i>Cannabis sativa</i> L.	GS 3840	Wild	20	20	MADYEDEVA 1935 (40) FURUSATO 1940		
<i>Umbelliferae</i>							
1. <i>Eryngium coeruleum</i> BIEB.	GS 4160	Wild	16	16	BILL & CONSTANCE 1966		
<i>Caprifoliaceae</i>							
1. <i>Sambucus ebulus</i> L.	GS 491b	Wild	36	32	BATTAGLIA 1946		
				36	POUCQUES 1949		

Name	Voucher No. GS = Gureharan SINGH RN = Ravinder NATH	Source	Present		Earlier		Authority
			count	2n	count	2n	
<i>Compositae</i>							
1. <i>Arcium lappa</i> L.	GS 3474	Wild	36		32		SUGIURA 1936
2. <i>Carduus onopordeoides</i> FISCH. ex BIEB.	GS 3824	Wild	40		36		NAKAJIMA 1936
3. <i>Carthamus turkistanicus</i> POPOV	GS 3917	Wild	64		—		—
4. <i>Centaurea iberica</i> STEV.	GS 3504	Wild	20		64		KHIDIR & KNOWLES 1970
5. <i>Cirsium wallichii</i> DC.	GS 3930	Wild	68		16		PODDUBNAJA 1931
6. <i>Cosmos bipinnatus</i> CAV.	RN 10	Cult.	24		—		—
7. — <i>sulphureus</i> CAV.	RN 11	Cult.	24		24		SUGIURA 1936
8. <i>Cynara scolymus</i> L.	RN 12	Cult.	34		24		SUGIURA 1936
9. <i>Dahlia pinnata</i> CAV.	RN 13	Cult.	36		34		JANAKI AMMAL (unpubl.)
10. <i>Inula racemosa</i> HOOK.	GS 3936	Wild	20		—		—
11. <i>Lactuca serriola</i> L.	GS 38b	Wild	18		20		TONGIORGI 1935
12. <i>Onopordum acanthium</i> L.	GS 526a	Wild	34		18		THOMPSON & al. 1941
13. <i>Pterotheca falconeri</i> HOOK.	GS 3584	Wild	10		34		PODDUBNAJA 1931
14. <i>Silybum marianum</i> GAERTN.	GS 3910	Wild	34		6		MEHRA & al. 1965
15. <i>Tanacetum longifolium</i> WALL.	GS 3932	Wild	18		10		SHETTY 1967
16. <i>Tragopogon pratense</i> L.	GS 3580	Wild	24		34		HEISER & WHITAKER 1948
17. <i>Zinnia elegans</i> JACQ.	RN 14	Cult.	24		—		—
18. — <i>linearis</i> BENTH.	RN 15	Cult.	24		12		WINGE 1926
<i>Gentianaceae</i>							
1. <i>Jaeschkea gentianoides</i> KURZ	GS 3942	Wild	18		24		ISHIKAWA 9161
2. <i>Swertia petiolata</i> ROYLE	GS 990b	Wild	26		24		MEHRA & al. 1965

Name	Voucher No. GS = Gurcharan SINGH RN = Ravinder NATH	Source	Present		Earlier	Authority
			count	2n	count	
<i>Plantaginaceae</i>						
1. <i>Plantago depressa</i> Willd.	GS 3592	Wild	12	12	12	RAHN 1966
2. — <i>lanceolata</i> L.	GS 391a	Wild	12	12	12	NAKAJIMA 1930
				12, 13		BOCHER & al. 1953
				24, 96		MACCULLAGH 1934
3. — <i>major</i> L.	GS 3989	Wild	12	12	12	TURESSON 1938
<i>Polemoniaceae</i>						
1. <i>Phlox drummondii</i> Hook.	RN 16	Cult.	14	14	(28)	MEYER 1944
2. <i>Polemonium caeruleum</i> L.	GS 3593	Wild	18	18	18	CRIESINGER 1937
<i>Solanaceae</i>						
1. <i>Petunia hybrida</i> VILM.	RN 17	Cult.	14	14	14	BAQUAR 1967
				(21, 28, 35)		DERMEN 1931
2. <i>Solanum nigrum</i> L.	GS 311a	Wild	56	56	24, 48, 72	Bhaduri 1933
					24, 72	STEBBINS & PADDOCK 1949
				(96, 144)		JÖRGENSEN 1928
<i>Convolvulaceae</i>						
1. <i>Convolvulus arvensis</i> L.	GS 3997	Wild	48	48	50	WOLCOTT 1937
					48	KHOSHOO & SACHDEVA 1961
<i>Angiospermae, Monocotyledones</i>						
<i>Commelinaceae</i>						
1. <i>Tradescantia fluminensis</i> VELL.	GS 3993	Cult.	24	24	36	HEITZ 1967

Name	Voucher No. GS = Gureharan SINGH RN = Ravinder NATH	Source	Present		Earlier	Authority
			count	2n	count	
<i>Liliaceae</i>						
1. <i>Agapanthus umbellatus</i> L'HER.	RN 1	Cult.	30		30	DARLINGTON 1933
2. <i>Allium ampeloprasum</i> L. (LEEK)	RN 2	Cult.	32		32	VED BRAT 1965
3. — <i>ampeloprasum</i> L. (great headed garlic)	RN 3	Cult.	48		—	—
4. — <i>atropurpureum</i> WALDST. & KIT.	GS 3594	Cult.	16		16	KOUL 1966
5. — <i>cepa</i> L. var. <i>cepa</i>	RN 4	Cult.	16		16, 32	LEVAN 1935
6. — — var. <i>aggregatum</i>	RN 5	Cult.	16		—	—
7. — — var. <i>viviparum</i>	RN 6	Cult.	24		16	FUKUSHIMA & al. 1964
8. — <i>chinense</i> G. DON	RN 7	Cult.	32		16, 24	SINGH & al. 1967
9. — <i>consanguineum</i> KUNTH	GS 4002	Wild	16		24, 32	VED BRAT 1965
10. — <i>Govanianum</i> WALL.	GS 3598	Wild	16		—	—
11. — <i>rubellum</i> BIEB.	GS 4010	Wild	16, 24, 32		—	—
12. — <i>sativum</i> L.	RN 8	Cult.	16		16	LEVAN 1931
13. — <i>tuberosum</i> ROXB.	RN 9	Cult.	32		24	KHOSHOO & SHARMA 1959
14. — <i>Thomsoni</i> BAKER	RN 36	Wild	32		16	LEVAN 1935
15. <i>Asparagus filicinus</i> HAM.	GS 4030	Wild	20		16	OHNO 1964
16. — <i>officinalis</i> L.	GS 4016	Wild	20		32	LA COUR 1945
17. <i>Chlorophyllum capense</i> KUNTZ	RN 27	Cult.	28		—	—
18. — <i>elatium</i> R.Br. var. <i>variegatum</i>	RN 28	Cult.	28		20	NAGAO 1938
					20, 40	ZILM 1966
					28	KOUL & SOPORY 1970
					28	SATO 1942

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			count	2n	count	2n	
19. <i>Eremurus himalaicus</i> BAKER	GS 4131	Wild	14		14		BURSTROM 1929
20. <i>Fritillaria imperialis</i> L.	GS 4060	Wild	24		24+0-12B		DARLINGTON 1936
21. — <i>roylei</i> HOOK.	GS 3610	Wild	24		—		—
22. <i>Gagea dschungarica</i> REGL.	GS 418b	Wild	48, 60		48, 60		KOUL & KHAN 1969
23. — <i>elegans</i> WALL.	GS 4180	Wild	72, 96, 132		72, 96, 132		KOUL & KHAN 1969
24. — <i>gagoides</i> VVED.	GS 4174	Wild	48		48		KOUL & KHAN 1969
25. — <i>kashimirensis</i> TURRILL	GS 4117	Wild	24		24		KOUL & KHAN 1969
26. — <i>reticulata</i> SCHULTES	RN 37	Wild	24		24		KOUL & KHAN 1969
27. — <i>stipitata</i> MERKL.	GS 413c	Wild	72		72		KOUL & KHAN 1969
28. <i>Kniphofia uvaria</i> HOOK.	RN 29	Cult.	12		12, 13		WEBBER 1932
29. <i>Lilium martagon</i> L.	RN 31	Cult.	24		24+0-3B		FERNANDES 1950
30. — <i>tigrinum</i> KER	RN 30	Cult.	24		24		SATO 1932
					36+0-1B		SANSOME & LA COUR 1934
31. <i>Muscari armeniacum</i> LEIGHT.	RN 32	Cult.	36		18		GREEVES 1931
					36		HAQUE 1952
32. <i>Polygonatum multiflorum</i> ALL.	GS 3614	Wild	22		18, 24		EIGSTI 1942
					18, 30		DARK 1939
33. — <i>verticillatum</i> ALL.	GS 3631	Wild	30		18, 20, 28		SOMMALAINEN 1947
					27, 28		BERG 1933
					30, 84		DARK 1939
					28, 60, 86-91		THERMAN 1953
34. <i>Tulipa aitchisonii</i> HALL	BW 1	Wild	24		—		—
35. — <i>stellata</i> HOOK.	BW 2	Wild	24		—		—
	BW 3	Wild	48		—		—

Name	Voucher No. GS = Gurcharan SINGH RN = Ravinder NATH	Source	Present		Earlier		Authority
			count	2n	count	2n	
<i>Amaryllidaceae:</i>							
1. <i>Hemerocallis flava</i> L.	BW 4	Cult.	22		22		DARK 1932
2. — <i>fulva</i> L.	GS 4190	Wild	33		22, 33		SATO 1942
3. <i>Sternbergia fischeriana</i> (HERB.) ROEM.	AK 1	Wild	22		22		KOUL & KHAN 1969
<i>Iridaceae:</i>							
1. <i>Iris ensata</i> THUNB.	GS 3711	Wild	40		40		SOKOLOVSKAYA 1966
2. — <i>germanica</i> L.	GS 4208	Cult.	48		44		SIMONET 1934
<i>Agavaceae:</i>							
1. <i>Hosta plantaginea</i> ASCHERS.	RN 35	Cult.	60		60		YASUI 1935
2. — <i>ventricosa</i> STEARN	RN 33	Cult.	60		60		YASUI 1935
3. <i>Yucca gloriosa</i> L.	RN 34	Cult.	60		—		—
<i>Gramineae:</i>							
1. <i>Sorghum halepense</i> 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.

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Zeitschrift/Journal: [Phyton, Annales Rei Botanicae, Horn](#)

Jahr/Year: 1973

Band/Volume: [15_1_2](#)

Autor(en)/Author(s): Koul Awtar Kishen

Artikel/Article: [Cytotaxonomical conspectus of the flora of Kashmir \(1\)
Chromosome numbers of some common plants. 57-66](#)