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

By

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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 1960 a, 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.

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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.

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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	Present		Earlier count	Authority
		Source	count		
<i>Gymnospermae</i>					
<i>Pinaceae</i>					
1. <i>Picea Smeibiana</i> Boiss.	GS 3415	Wild	24	—	—
<i>Ginkgoaceae</i>					
1. <i>Ginkgo biloba</i> L.	GS 3501	Cult.	24	24	LEE 1954

Name	Voucher No.		Source	Present count		Earlier count		Authority
	GS = Gurcharan SINGH RN = Ravinder NATH			2n	2n	2n	2n	
<i>Angiospermae, Dicotyledonae</i>								
<i>Magnoliaceae</i>								
1. <i>Magnolia grandiflora</i> L.	GS 3540		Cult.	114	114		114	JANAKI AMMAL 1953
2. — <i>liliflora</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		16	MADAHAR 1967
3. — <i>obtusiloba</i> DON.	GS 3307		Wild	14, 16	—		—	—
4. <i>Cimicifuga foetida</i> L.	GS 240a		Wild	32	16		16	NAKAJIMA 1933
5. <i>Delphinium denudatum</i> WALL.	GS 1441		Wild	16	—		—	—
6. — <i>ajacis</i> L.	RN 20		Cult.	16	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		14	YASUI 1936
2. — <i>dabium</i> L.	GS 3640		Wild	28	28		28	ERNST 1965 LJUNGDAHL 1922
3. — <i>macrostomum</i> BOISS.	GS 3370		Wild	14	—		—	—
4. — <i>nudicaule</i> L.	RN 22		Cult.	28, 29, 41	14		14	FABERGÉ 1944 HORN 1938
5. — <i>rhoeas</i> L.	GS 3470		Cult.	14	14		14	LAWRENCE 1930
6. — <i>somniferum</i> L.	GS 3351		Cult.	22	22		22 (44)	FURUSATO 1940
<i>Cruciferae</i>								
1. <i>Iberis amara</i> L.	RN 23		Cult.	14	14, 16		14, 16	JARETZKY 1932 ENE 1968

Name	Voucher No. GS = Gurcharan SINGH RN = Ravinder NATH	Source	Present count		Earlier count		Authority
			2n	2n	2n	2n	
<i>Polygonaceae</i>							
1. <i>Polygonum affine</i> D. DON	GS 342a	Wild	24	—	—	—	—
<i>Geraniaceae</i>							
1. <i>Pelargonium zonale</i> AIR.	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 trilobifolium</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 = Gurcharan SINGH RN = Ravinder NATH	Source	Present		Earlier		Authority
			count	2n	count	2n	
<i>Compositae</i>							
1. <i>Arctium lappa</i> L.	GS 3474	Wild	36		32		SUGIURA 1936
2. <i>Carduus onopordeoides</i> FTSCH. 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		16		KHIDIR & KNOWLES 1970
5. <i>Cirsium waltichii</i> DC.	GS 3930	Wild	68		—		PODDUBNAJA 1931
6. <i>Cosmos bipinnatus</i> CAV.	RN 10	Cult.	24		24		SUGIURA 1936
7. — <i>sulphureus</i> CAV.	RN 11	Cult.	24		24		SUGIURA 1936
8. <i>Cynara scolymus</i> L.	RN 12	Cult.	34		34		JANAKI AMMAL (unpubl.)
9. <i>Dahlia pinnata</i> CAV.	RN 13	Cult.	36		—		—
10. <i>Inula racemosa</i> HOOK.	GS 3936	Wild	20		20		TONGIORGI 1935
11. <i>Lactuca serriola</i> L.	GS 386	Wild	18		18		THOMPSON & al. 1941
12. <i>Onopordum acanthium</i> L.	GS 526a	Wild	34		34		PODDUBNAJA 1931
13. <i>Pterotheca falconeri</i> HOOK.	GS 3584	Wild	10		6		MEHRA & al. 1965
14. <i>Silybum marianum</i> GAERTN.	GS 3910	Wild	34		10		SHETTY 1967
15. <i>Tanacetum longifolium</i> WALL.	GS 3932	Wild	18		34		HEISER & WHITAKER 1948
16. <i>Tragopogon pratense</i> L.	GS 3580	Wild	24		—		—
17. <i>Zinnia elegans</i> JACQ.	RN 14	Cult.	24		12		WINGE 1926
18. — <i>linearis</i> BENTH.	RN 15	Cult.	24		24		ISHIKAWA 9161
<i>Gentianaceae</i>							
1. <i>Jaeschkea gentianoides</i> KURZ	GS 3942	Wild	18		—		—
2. <i>Swertia petiolata</i> ROYLE	GS 990b	Wild	26		—		—

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

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

Name	Voucher No. GS = Gurcharan SINGH RN = Ravinder NATH	Source	Present count		Earlier count		Authority
			2n	2n	2n	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>gagooides</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>siipitata</i> MERKL.	GS 413c	Wild	72	72	KOUL & KHAN 1969		
28. <i>Kriphofia uvaria</i> HOOK.	RN 29	Cult.	12	12, 13	WEBBER 1932		
29. <i>Lolium 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	HIGSIT 1942		
				18, 30	DARK 1939		
				18, 20, 28	SOUMALAINEN 1947		
33. — <i>verticillatum</i> ALL.	GS 3631	Wild	30	27, 28	BERG 1933		
				30, 84	DARK 1939		
				28, 60, 86-91	THERMAN 1953		
34. <i>Tulipa atchisonii</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 count		Earlier count		Authority
			2n		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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