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Morphological and cytological studies on various species of Gramineae collected in Pakistan, Afghanistan, and Iran[1)]

Sadao SAKAMOTO and Mikio MURAMATSU

National Institute of Genetics, Misima and Kihara Institute for Biological Research, Yokohama, Japan.

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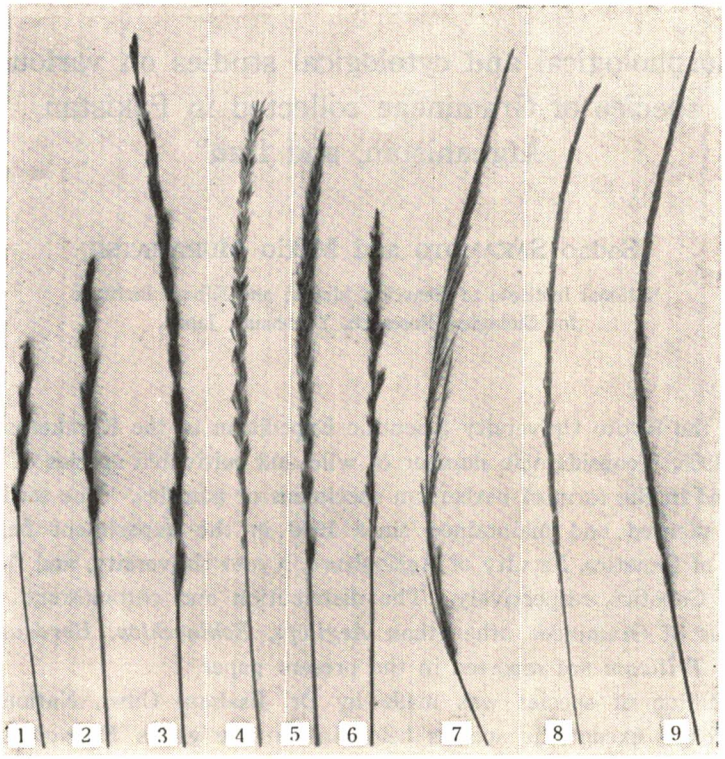


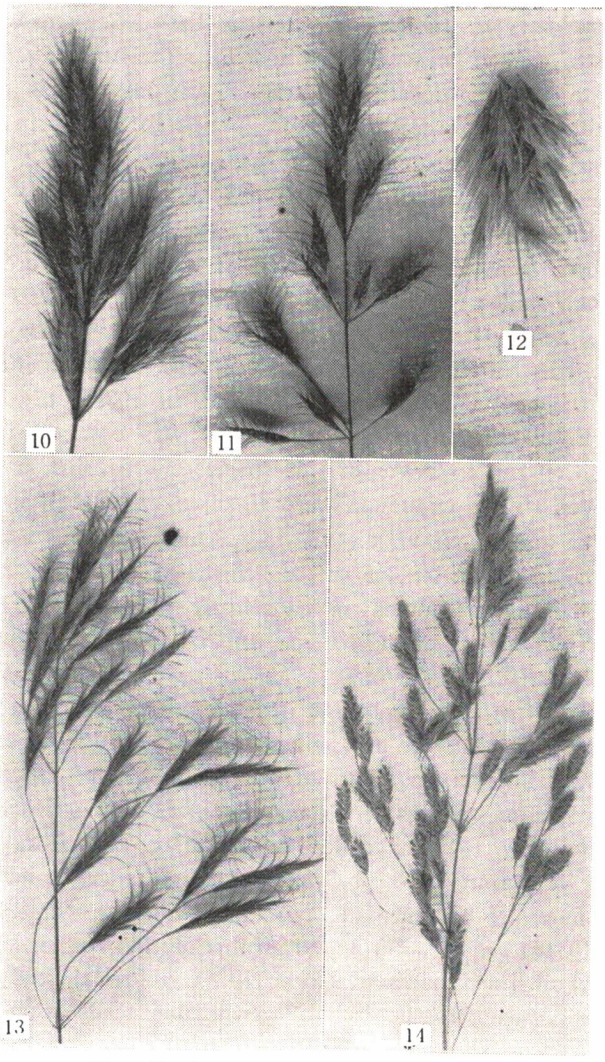
Figs. 1~9. Spikes of *Agropyron*, *Elymus*, *Festuca* and *Henrardia* ×0.38

1~3. *Agropyron trichophorum* (Nos. 7023, 7023 and 7024)
4. *A.* sp., probably *A. repens* or *A. intermedium* (No. 7003)
5. *Elymus dahuricus* (No. 7066)
6. *Festuca elatior* (No. 7182)
7. *F. Myuros* (No. 7183)
8. *Henrardia persica* var. *persica* (No. 7333)
9. *H. persica* var. *glaberrima* (No. 7334)

waxy and pubescent, and one was non-waxy and non-pubescent. This indicates genetic heterogeneity of the orignal clone of this strain. The two strains were examined cytologically, and both were hexaploid (2n=42; Fig. 68), in conformance with the observation of STEBBINS and PUN (1953). *A.* sp. collected in Afghanistan and Iran was an intermediate type between *A. intermedium* and *A. repens*, as shown in Fig. 4. Cytological observation indicated the octoploid condition (2n=56), as in *A. intermedium* (?). From the morphology of spike and spikelets, and the chromosome number of these plants, it is possible that the species is *A. campestre* GREN. *et* GODR., which occurs in France and is octoploid (SIMONET 1935*, CAUDERON 1958).

Alopecurus mysuroides HUDS.: This species was collected in Isfahan–Damaneh,

Iran (Fig. 18). It seemed to be a cross-pollinated species, for it is protogynous and has large anthers. Flowering progressed from top to bottom of a spike. One of the seven pairs of chromosomes had a satellite, while the rest has median or submedian centromeres (Fig. 69). The chromosome number, 2n=14, was also reported by CHURCH (1929*) and KATTERMANN (1930*).



Figs. 10~14. Spikes of *Bromus* ×0.38

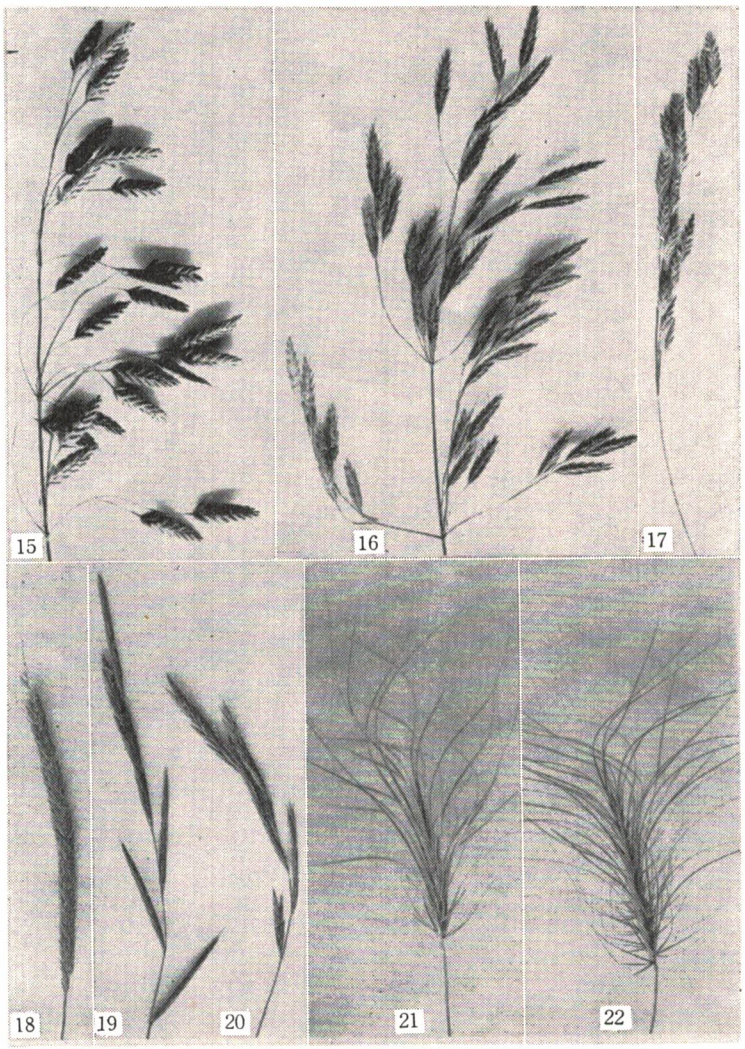
10 and 11. *Bromus Danthoniae* (Nos. 7161 and 7165)
12. *B. madritensis* (No. 7152)
13. *B. macrostachys* (No. 7144)
14. *B. racemosus* (No. 7138)

Brachypodium sylvaticum (HUDS.) P. BEAUV.: Three strains were collected in Iran (Figs. 19 and 20). Plants were non-waxy and glabrous except for the nodes of the stem. The somatic chromosome number was 18 (Fig. 70). The same chromosome number was observed by AVDULOV (1931) and others. The chromosomes were very small compared with other groups of Gramineae.

Bromus: Seven species of this genus, *B. brizaeformis* FISCH. *et* MEYER, *B. Commutatus* SCHRADER, *B. Danthoniae* (DESF.) TRIN., *B. macrostachys* DESF., *B. madritensis* LINN., *B. racemosus* HUDS. and *B. secalinus* LINN., were identified. Fig. 85 shows the collection localities of the 21 strains of this genus that were examined. Spikelet characteristics of seven species are shown in Figs. 23~31.

B. brizaeformis was collected only in Astara, Iran (Fig. 15). It was found to be a diploid species (2n=14), as observed also by AVDULOV (1931). All chromosomes had median or submedian centromeres (Fig. 71). *B. Commutatus* was collected in Gorgan and Tabriz, Iran (Fig. 16). Spikelets of this species were awned, and the awns curved when spikes were ripe. Nodes were slightly pubescent. Purple color developed in the stem at maturity. It was a diploid species (2n=14). This species was also collected in Nuristan by KITAMURA (1960). Diploid (FELFÖLDY 1947**), tetraploid (KNOWLES 1944*) and octoploid (NIELSEN 1939*) of this species have been reported. *B. Danthoniae* (Figs. 10 and 11) was obtained in various places along the expedition route. Awns of this species curved, and mature stems were purple. The seven strains examined were all diploid (2n=14), as also reported by SCHULZ-SCHAEFFER and MARKARIAN (1957**). *B. macrostachys* was found in Pul-i-Khumri, Afghanistan. Spikelets of this species were larger than those of other species, and awns of outer glumes curved sharply when spikes ripe (Figs. 13 and 29). It was a tetraploid species (2n=28). Diploid (STÄHLIN 1929*) and tetraploid (AVDULOV 1931, CUGNAC and SIMONET 1941*) of this species have been reported previously. *B. madritensis* was collected in Isfahan, Iran. Morphology of the spike and spikelet of this species were decidedly different from the other *Bromus* species (Figs. 12 and 27). The present material was a diploid (2n=14). However, tetraploid (AVDULOV 1931 and others) and hexaploid (STÄHLIN 1929*) have been reported. *B. racemosus* (Fig. 14) was collected in Pahlavi-Sari, Iran. Morphologically this species was very similar to *B. Commutatus*. It was a diploid (2n=14, Fig. 72), whose chromosomes had median or submedian centromeres. MAUDE (1940*) and KNOWLES (1944*) reported tetraploid strains of this species. *B. secalinus* was found in Pul-i-Khumri, Afghanistan (Fig. 17). Cytological study of this species could not be made, owing to the lack of germinable seeds from the original specimen.

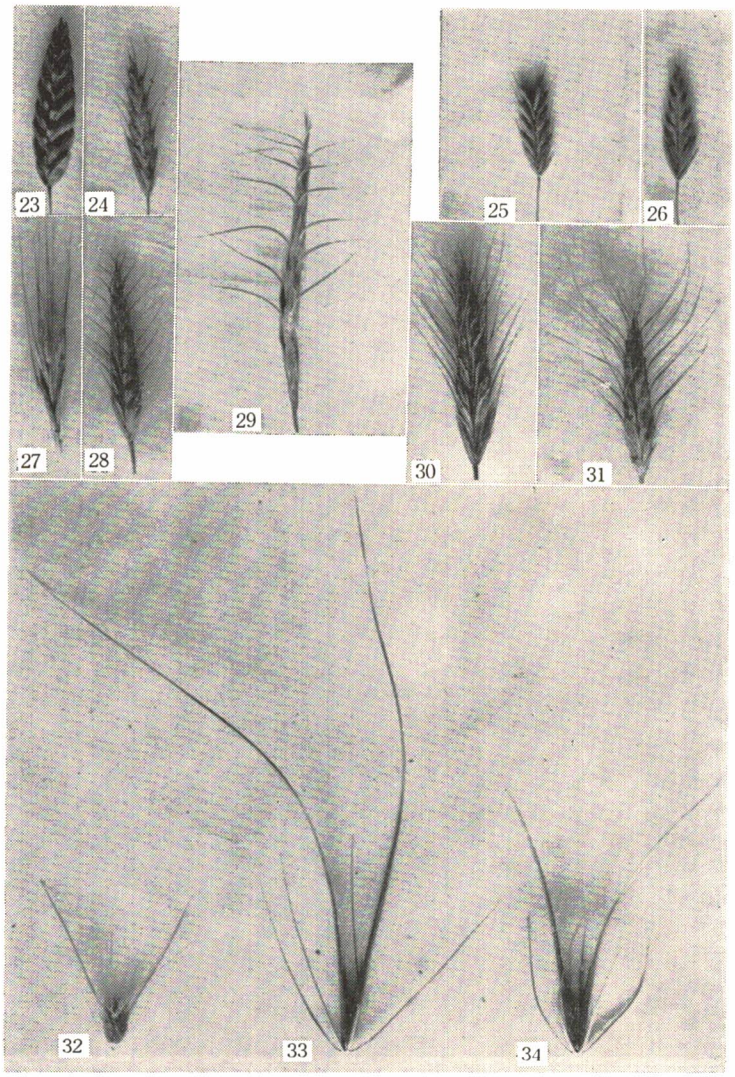
Cynosurus echinatus LINN.: Only one strain of this species was collected in Astara-Ardabil, Iran (Fig. 54). The somatic chromosome number determined in root-tips was 2n=16 (Fig. 73). Six pairs of chromosomes had terminal or subterminal centromeres, one pair had a median centromere, and the eighth, a smaller



Figs. 15~22. Spikes of *Bromus*, *Alopecurus*, *Brachypodium* and *Taeniatherum* ×0.38

15. *Bromus brizaeformis* (No. 7121)
16. *B. Commutatus* (No. 7134)
17. *B. secalinus* (No. 7132)
18. *Alopecurus mysuroides* (No. 7006)
19 and 20. *Brachypodium sylvaticum* (Nos. 7111 and 7112)
21. *Taeniatherum asperum* (No. 7065)
22. *T. crinitum* (No. 7064)

pair (shown by arrows in Fig. 73) evidently also had a median centromere. STÄHLIN (1929*) and AVDULOV (1931) found 2n=14 for this species, and the other

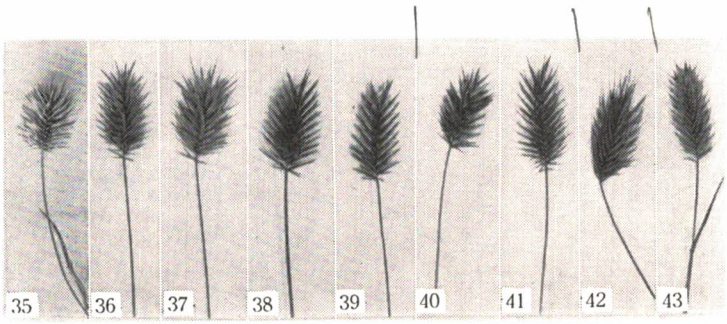


Figs. 23～34. Spikelets of *Bromus*, *Heteranthelium* and *Taeniatherum* ×0.83

23. *Bromus brizaeformis* (No. 7121)
24. *B. Commutatus* (No. 7134)
25. *B. racemosus* (No. 7138)
26. *B. secalinus* (No. 7132)
27. *B. madritensis* (No. 7152)
28. *B. Danthoniae* (No. 7161)
29. *B. macrostachys* (No. 7144)
30 and 31. *B. Danthoniae* (Nos. 7165 and 7166)
32. *Heteranthelium piliferum* (No. 7055)
33. *Taeniatherum asperum* (No. 7065)
34. *T. crinitum* (No. 7064)

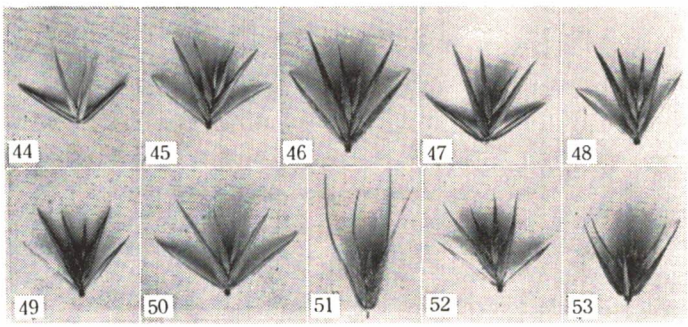
two species of *Cynosurus* that have been studied cytologically, *C. balansae* Coss. *et* DUR. (AVDULOV 1931) and *C. cristatus* LINN. (STÄHLIN 1929*, ADVULOV 1931), also are 2n=14. Therefore, the basic number of this genus is seven (DARLINGTON and WYLIE 1955). Two possibilities for explaining the chromosome constitution of the present material may be advanced: (1) that one pair (the smaller pair with median centromere) is supernumerary, or (2) that there is a second basic number in this genus, x=8. It is desirable to collect other strains of this species for cytological comparison with the present material.

Dactylis glomerata LINN.: This species (Fig. 55) was collected from three different localities in Iran. It was a tetraploid (2n=28), as previously found by CHURCH (1929*) and others.



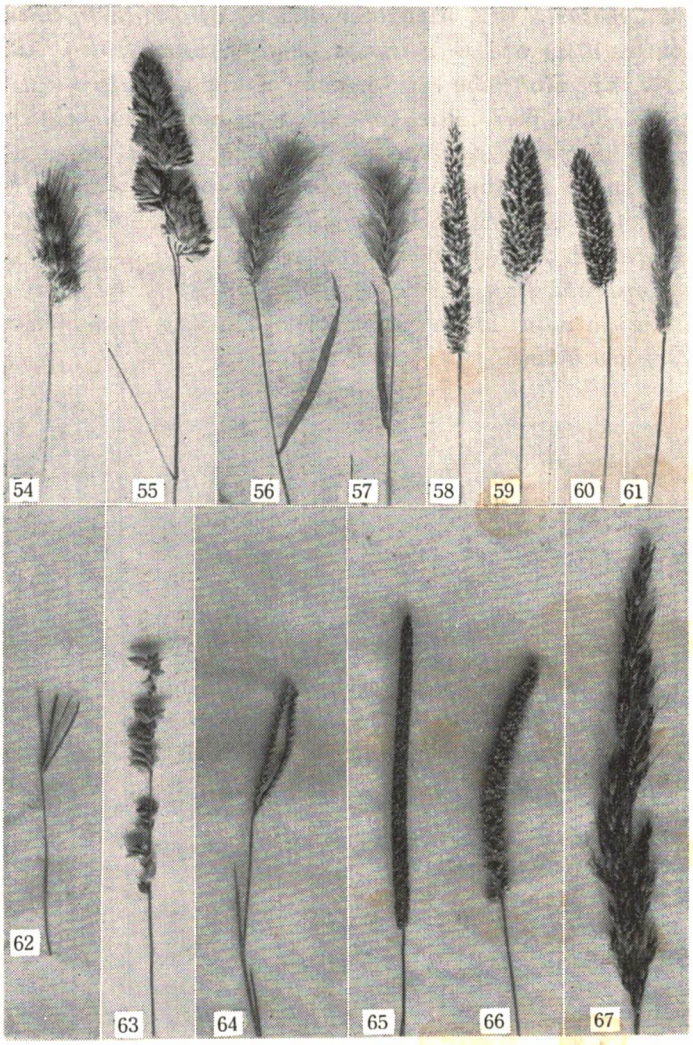
Figs. 35~43. Spikes of *Eremopyrum* ×0.38

35~39. *Eremopyrum buonapartis* var. *buonapartis* (Nos. 7035, 7036, 7038, 7042 and 7043)
40 and 41. *E. buonapartis* var. *sublanuginosum* (Nos. 7032 and 7034)
42. *E. distans* (No. 7041)
43. *E. orientale* (No. 7037)



Figs. 44~53. Spikelets of *Eremopyrum* ×1.0

44~48. *Eremopyrum buonapartis* var. *buonapartis* (Nos 7035, 7036, 7038, 7042 and 7043)
49 and 50. *E. buonapartis* var. *sublanuginosum* (Nos 7032 and 7034)
51. *E. distans* (No. 7041)
52 and 53. *E. orientale* (Nos. 7031 and 7037)



Figs. 54~67. Spikes of twelve species of Gramineae ×0.38

54. *Cynosurus echinatus* (No. 7221)
55. *Dactylis glomerata* (No. 7212)
56 and 57. *Heteranthelium piliferum* (Nos. 7051 and 7052)
58. *Koeleria phleoides* (No. 7192)
59 and 60. *Phalaris minor* (Nos. 7271 and 7273)
61. *Polypogon monospeliensis* (No. 7251)
62. *Cynodon dactylon* (No. 7321)
63. *Eragrostis* sp. (No. 7202)
64. *Paspalum distichum* (No. 7291)
65. *Phleum paniculatum* (No. 7244)
66. *Setaria verticillata* (No. 7281)
67. *Sorghum halepense* (No. 7311)

Elymus dahuricus TURCZ.: One strain (Fig. 5) collected at Hopar, Afghanistan was hexaploid (2n=42, Fig. 74). Tetraploid (BROWN 1948**) and hexaploid (AVDULOV 1931, MATSUMURA *et al.* 1956) have been found.

× *Eremopyrum*: Two varieties of *E. buonapartis* (SPRENG.) NEVSKI, var. *buonapartis* and var. *sublanuginosum* (DROB.) MELDERIS (=*E. hirsutum* NEVSKI), *E. distans* (C. KOCH) NEVSKI, and *E. orientale* (LINN.) JAUB. *et* SPACH. were collected along the expedition route (Fig. 85). Size and shape of these species are very similar (Figs. 35~43), but the spikelets (Figs. 44~53) distinguish them.

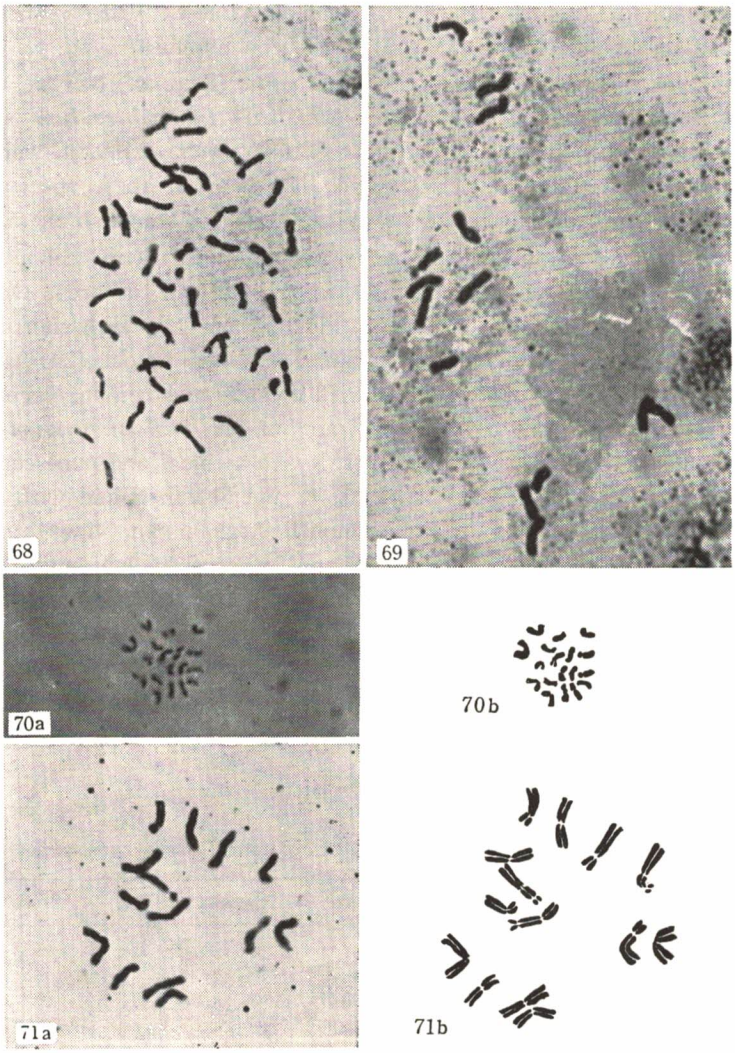
Seven of the 12 strains of *Eremopyrum* examined were found to be *E. buonapartis* var. *buonapartis*. It was distributed widely in the area. Of the seven strains of var. *buonapartis*, one (No. 7035, Figs. 35 and 44), with short-awned and non-pubescent spikelets, cellected in Isfahan, Iran, was diploid (2n=14, Fig. 77). The rest, all strains of var. *buonapartis* with awnless and non-pubescent spikelets, were tetraploid (2n=28, Fig. 80). Two strains of var. *sublanuginosum* (Nos. 7032 and 7034, Figs. 40, 49 and 41, 50 respectively) with awnless and pubescent spikelets were tetraploid. *E. distans* (No. 7041, Figs. 42 and 51), a diploid with awned and hairy spikelets, was collected in Pul-i-Khumri, Afghanistan. Two strains of *E. orientale* (Nos. 7031 and 7037, Figs. 43, 52 and 53 respectively) with short-awned and pubescent spikelets found in Quetta-Chaman, Pakistan and in Ardabil-Tabriz, Iran, were tetraploid (Figs. 78 and 79). This species was collected together with *E. buonapartis* var. *sublanuginosum* in Quetta-Chaman, Pakistan.

The somatic chromosome numbers of five *Eremopyrum* species were determined by SARKAR (1958). The present results differed in several points from his report, as shown in the following table (Table 1):

Table 1. Somatic chromosome numbers of four *Eremopyrum* species

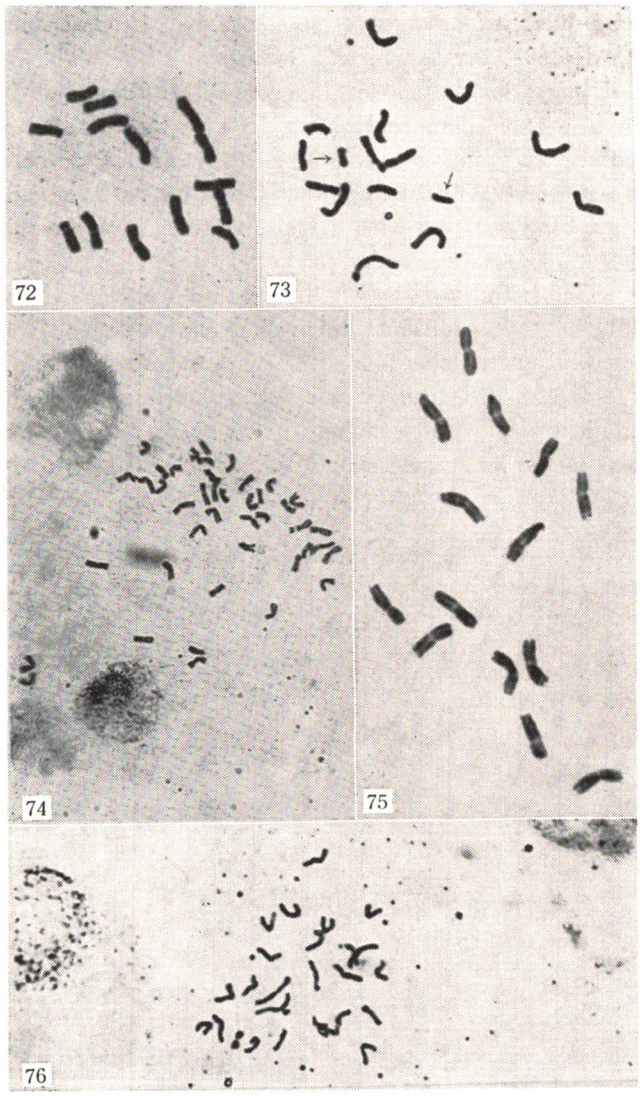
Species	SARKAR (1958)	Present results
E. buonapartis var. *buonapartis*	28	14 and 28
〃 var. *sublanuginosum* (=*E. hirsutum*)	14	28
E. distans	28	14
E. orientale	28	28

The karyotype of a diploid strain of *E. buonapartis* var. *buonapartis* (Fig. 77) comprises two pairs of chromosomes with submedian centromeres plus five pairs with terminal or subterminal centromeres. One of the chromosomes with submedian centromeres is a satellited chromosome. The satellite is not formed by a secondary constriction but rather by an attachment of a small trabant to the main body of the chromosome.



Figs. 68~71. Somatic chromosomes of *Agropyron*, *Alopecurus*, *Brachypodium* and *Bromus*

68. *Agropyron trichophorum* (No. 7023) ×770
69. *Alopecurus mysuroides* (No. 7006) ×770
70a. *Brachypodium sylvaticum* (No. 7111) ×2,300
70b. Drawing of Fig. 70a
71a. *Bromus brizaeformis* (No. 7121) ×770
71b. Drawing of Fig. 71a



Figs. 72~76. Somatic chromosomes of *Bromus*, *Cynosurus*, *Elymus*, *Heteranthelium* and *Koeleria*

72. *Bromus racemosus* (.No. 7136) ×770
73. *Cynosurus echinatus* (No. 7221) ×770
74. *Elymus dahuricus* (No. 7066) ×385
75. *Heteranthelium piliferum* (No. 7055) ×1,030
76. *Koeleria phleoides* (No. 7192) ×770

The karyotypes of two diploid species of *Eremopyrum* have been studied. In *E. triticeum*, all the chromosomes have terminal or subterminal centromeres (SARKAR 1955 and 1958, MATSUMURA and SAKAMOTO 1955). The karyotype of the other species, *E. hirsutum*, resembles that of *E. triticeum* but has one pair of chromosomes with a submedian centromere (SARKAR 1955 and 1958). Thus, the karyotypes of these two diploid species are rather similar to that of the diploid *E. buonapartis* var. *buonapartis*, except that the latter has two pairs of submedian chromosomes, including one pair with a trabant attached to the short arm (shown by arrows in Fig. 77a).

E. distans, which is fairly easily distinguished morphologically from the others (Figs. 42 and 51) has one additional submedian chromosome. It has three pairs with submedian centromeres plus four pairs with terminal or subterminal centromeres (Fig. 81). One of the chromosomes with subterminal centromere has a very small characteristic trabant quite similar to that of *E. buonapartis* var. *buonapartis* but attached to the long arm (shown by arrows in Fig. 81).

Figs. 77~79. Somatic chromosomes of *Eremopyrum*

77a. *Eremopyrum buonapartis* var. *buonapartis* (No. 7035) ×770
77b. Drawing of Fig. 77a
78. *E. orientale* (No. 7031) ×770
79. Drawing of two different kinds of trabant chromosomes in *E. orientale* (No. 7031)

The karyotypes of two tetraploid strains, one of *E. orientale* (No. 7031) and one of *E. buonapartis* var. *buonapartis* (No. 7038), are shown in Figs. 78 and 80, respectively.

At least nine pairs of chromosomes with terminal or subterminal centromere were observed in the present study. Five pairs, including one fairly large pair and two pairs with very small trabants, could be classified as median or submedian. The trabant is very similar to those found in diploid species and is so small that sometimes it escaped from observation. In *E. orientale*, one pair of trabant chromosome resembles that of the diploid *E. buonapartis* var. *buonapartis* in having the trabant on the short arm (a in Fig. 79), and the other pair is very much like that of *E. distans* in having it on the long arm (b in Fig. 79). In Fig. 80 of tetraploid *E. buonapartis* var. *buonapartis* only one of each of these two kinds of trabant chromosomes can be seen, as indicated by the arrows in the figure. Similar figures were observed in *E. orientale* (Fig. 78).

SARKAR (1958) assumed that the tetraploid *Eremopyrum* originated as an amphidiploid between a diploid species of *Eremopyrum* and a diploid crested

Fig. 80. Somatic chromosomes of *Eremopyrum buonapartis* var. *buonapartis* (No. 7038) ×770

Fig. 81. Drawing of somatic chromosomes of *E. distans* (No. 7041) ×770

Agropyron. From the present study, however, it is more reasonable to assume that the tetraploid species are derivatives from amphidiploids between diploid species of this genus such as the diploid *E. buonapartis* var. *buonapartis* and *E. distans*. In particular, this idea receives support from the presence of the characteristic trabant-chromosomes in the tetraploid species.

Festuca: Two species, *F. elatior* LINN. and *F. Myuros* LINN., were collected in Iran (Figs. 6 and 7). Cytological examination of two strains of *F. elatior* showed that one strain (No. 7182) was diploid (2n=14) and another strain (No. 7181) was hexaploid (2n=42) in spite of the morphological similarity between the two strains. Diploid and hexaploid of this species were observed by STÄHLIN (1929*) and others. *F. Myuros* could not be examined cytologically.

Henrardia persica (BOISS.) C. E. HUBBARD: This species was collected in Iran. Also, seeds of three strains (Nos. 7339–7341) were given by the Department of Agriculture of Iran, Tehran, to the members of the expedition. All strains were classified into two varieties, var. *persica* with dense hairs on the spikes (Fig. 8)

Fig. 82. Somatic chromosomes of *Henrardia persica* var. *persica* (No. 7339) ×770
Fig. 83. Drawing of somatic chromosomes of *Taeniatherum asperum* (No. 7065) ×770
Fig. 84. Drawing of somatic chromosomes of *Taeniatherum crinitum* (No. 7064) ×770

and var. *glaberrima* (HAUSSKN.) C. E. HUBBARD with glabrous spikes (Fig. 9). Both varieties were found sympatrically in a place between Ardabil and Tabriz, Iran. Cytological obsevations of both varieties showed 2n=14, with the centromeres characteristically terminal and one pair has a secondary constriction almost at the end of the long arm (Fig. 82). The basic chromosome number of this genus is x=7.

Heteranthelium piliferum (BANKS *et* SOLAND.) HOCHST.: This species was found in Tehran and Mahabad, Iran, and in Pul-i-Khumri, Afghanistan (Figs. 56 and 57). The chromosome number was 2n=14, consisting of one pair with a clear satellite and six pairs with median or submedian centromeres (Fig. 75). A very similar karyotype was observed by CHENNAVEERAIAH and SARKAR (1959).

Koeleria phleoides (VILL.) PERS.: This species was collected in Pul-i-Khumri, Afghanistan (Fig. 58). The somatic chromosome number was 26, with all chromosomes having median or submedian centromeres (Fig. 76). AVDULOV (1931) observed the same chromosome number in this species.

Phalaris minor RETZ.: Three strains were collected in Afghanistan (Figs. 59 and 60). Actively growing root-tips of this species contained an unknown brownish red pigment. Chromosome number found in the root-tips was 28, as also reported by AVDULOV (1931) and others.

Polypogon monospeliensis DESF.: This species was collected in Kandahar, Afghanistan (Fig. 61). The chromosome number of this species was 2n=28, as found by AVDULOV (1931).

Taeniatherum: Two species, *T. asperum* (SIMONK.) NEVSKI and *T. crinitum* (SCHREB.) NEVSKI, were collected, the former in Pakistan and Afghanistan, and the latter in Iran (Figs. 21 and 22). Both species had 2n=14 in root-tips (Figs. 83 and 84). The same chromosome number of *T. asperum*, described as *Elymus asper* (SIMONK.) HAND.-MAZ., was found in Argentina by HUNZIKER (1954).

Others: *Cynodon dactylon* (LINN.) PERS. (Fig. 62), *Eragrostis* sp. (Fig. 63), *Paspalum distichum* LINN. (Fig. 64), *Phleum paniculatum* HUDS. (Fig. 65), *Setaria verticillata* (LINN.) P. BEAUV. (Fig. 66) and *Sorghum halepense* (LINN.) PERS. (Fig. 67) were collected during the expedition, but no cytological study of these species was made because of the lack of germinable seeds from the original materials.

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Fig. 85. Locality map of the species of *Bromus*

● *E. buonapartis* var. *buonapartis*
○ *E. buonapartis* var. *sublanuginosum*
◑ *E. orientale*
⊕ *E. distans*
▲ *B. Danthoniae*
△ *B. racemosus*
◭ *B. Commutatus*
◭ *B. macrostachys*

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and *Eremopyrum* collected in Pakistan, Afghanistan and Iran

▲ *B. madritensis*

▲ *B. brizaeformis*

▲ *B. secalinus*

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Appended Table 1. Species, collection No., source and chromosome number of Gramineae collected in Pakistan, Afghanistan and Iran

Species	Collection No.	Source	Chromosome number (2n)	Figure No.		
				Spike	Spikelet	Chromosome
Agropyron intermedium (HOST) P. BEAUV. (?)	7011	Tehran – Kraj, Iran	—			
〃	7012	Tehran – Sari, 〃	—			
〃	7013	〃 〃	—			
〃	7014	Tabriz – Ardabil, 〃	56			
A. trichophorum (LINK) RICHT.	7021	Tehran – Sari, 〃	—			
〃	7022	〃 〃	—			
〃	7023	〃 〃	42	1, 2		68
〃	7024	Laman – Herat, Afghanistan	42	3		
A. sp. probably *A. repens* (LINN.) P. BEAUV. or *A. intermedium*	7001	Kandahar – Ghazni, 〃	—			
〃	7002	〃 〃	—			
〃	7003	〃 〃	—	4		
〃	7004	〃 〃	—			
〃	7005	〃 〃	—			
〃	7007	〃 〃	56			
〃	7008	Tehran – Sari, Iran	—			
Alopecurus mysuroides HUDS.	7006	Isfahan – Damaneh, 〃	14	18		69
〃	7261	〃 〃	—			
Brachypodium sylvaticum (HUDS.) P. BEAUV.	7111	Sari – Gorgan, 〃	18	19		70a, b

Appended Table 1. (continued)

〃	7112	Pahlavi – Ardabil, 〃	—	20		
〃	7113	〃 〃	—			
Bromus brizaeformis FISCH. *et* MEYER	7121	Astara, 〃	14	15	23	71a, b
B. Commutatus SCHRADER	7133	Sari, 〃	14			
〃	7134	Sari – Gorgan, 〃	14	16	24	
〃	7141	Mahabad – Khoy, 〃	14			
B. Danthoniae (DESF.) TRIN.	7161	Chaman, Pakistan	14	10	28	
〃	7163	Isfahan, Iran	14			
〃	7165	Tehran, 〃	14	11	30	
〃	7166	Tabriz, 〃	14		31	
〃	7167	Mahabad – Rezaiyeh, 〃	14			
〃	7170	Pul-i-Khumri, Afghanistan	14			
〃	7171	Tashkurghan – Aq Chah, 〃	14			
B. macrostachys DESF.	7144	Pul-i-Khumri, 〃	28	13	29	
〃	7145	〃 〃	28			
B. madritensis LINN.	7151	Isfahan, Iran	—			
〃	7152	〃 〃	14	12	27	
B. racemosus HUDS.	7136	Pahlavi – Astara, 〃	14			72
〃	7137	〃 〃	14			
〃	7138	〃 〃	14	14	25	
〃	7139	〃 〃	14			

Appended Table 1. (continued)

B. *racemosus* HUDS.	7140	Pahlavi – Astara,	Iran	14			
B. secalinus LINN.	7132	Pul-i-Khumri,	Afghanistan	—	17	26	
Cynodon dactylon (LINN.) PERS.	7321	Ramsar – Rasht,	Iran	—	62		
Cynosurus echinatus LINN.	7221	Astara – Ardabil,	〃	16	54		73
Dactylis glomerata LINN.	7211	Behshahr,	〃	28			
〃	7212	Sari – Behshahr,	〃	—	55		
〃	7213	Ardabil – Sarab,	〃	—			
Elymus dahuricus TURCZ.	7066	Hopar,	Afghanistan	42	5		74
Eragrostis sp.	7202	Kandahar – Ghazni,	〃	—	63		
Eremopyrum buonapartis (SPRENG.) NEVSKI var. *buonapartis*	7033	Chaman,	Pakistan	28			
〃	7035	Isfahan,	Iran	14	35	44	77a, b
〃	7036	Isfahan – Damaneh,	〃	28	36	45	
〃	7038	Tabriz – Ardabil,	〃	28	37	46	80
〃	7042	Mashhad,	〃	28	38	47	
〃	7043	Kandahar,	Afghanistan	28	39	48	
〃	7044	Kandahar – Ghazni,	〃	—			
E. buonapartis (SPRENG.) NEVSKI var. *sublanuginosum* (DROB.) MELDERIS	7032	Quetta – Chaman,	Pakistan	28	40	49	
〃	7034	Kabul – Jalalabad,	Afghanistan	28	41	50	
E. distans (C. KOCH) NEVSKI	7041	Pul-i-Khumri,	〃	14	42	51	81
E. orientale (LINN.) JAUB. *et* SPACH.	7031	Quetta – Chaman,	Pakistan	28		52	78, 79
〃	7037	Ardabil – Tabriz,	Iran	28	43	53	

Appended Table 1. (continued)

Festuca elatior LINN.	7181	Isfahan,	Iran	42			
〃	7182	Tehran – Sari,	〃	14	6		
F. Myuros LINN.	7183	Pahlavi – Astara,	〃	—	7		
Henrardia persica (BOISS.) C. E. HUBBARD var. *persica*	7331	Tehran – Ghazvin,	〃	14			
〃	7333	Ardabil – Tabriz,	〃	14	8		
〃	7338	Tabriz,	〃	—			
〃	7339	Dept. Agr., Tehran,	〃	14			82
〃	7340	〃	〃	—			
〃	7341	〃	〃	—			
H. persica (BOISS.) C. E. HUBBARD var. *glaberrima* (HAUSSKN.) C. E. HUBBARD	7334	Ardabil – Tabriz,	〃	14	9		
〃	7335	〃	〃	14			
〃	7336	〃	〃	—			
〃	7337	〃	〃	—			
Heteranthelium piliferum (BANKS *et* SOLAND.) HOCHST.	7051	Tehran,	〃	14	56		
〃	7052	Mahabad,	〃	14	57		
〃	7053	〃	〃	—			
〃	7054	〃	〃	—			
〃	7055	Pul-i-Khumri,	Afghanistan	14		32	75
Koeleria phleoides (VILL.) PERS.	7191	〃	〃	—			
〃	7192	〃	〃	26	58		76
〃	7232	Pahlavi – Astara,	Iran	—			

Appended Table 1. (continued)

Paspalum distichum LINN.	7291	Rasht – Pahlavi, Iran	—	64		
Phalaris minor RETZ.	7271	Pul-i-Khumri, Afghanistan	28	59		
〃	7272	Tashkurgan – Aq Chah, 〃	—			
〃	7273	Kandahar, 〃	28	60		
Phleum paniculatum HUDS.	7241	Behshahr – Gorgan, Iran	—			
〃	7242	Tehran – Sari, 〃	—			
〃	7243	Astara, 〃	—			
〃	7244	〃 〃	—	65		
〃	7245	Astara – Ardabil, 〃	—			
Polypogon monospeliensis (LINN.) DESF.	7251	Kandahar, Afghanistan	28	61		
Setaria verticillata (LINN.) P. BEAUV.	7281	Sari – Gorgan, Iran	—	66		
Sorghum halepense (LINN.) PERS.	7311	Kabul – Charikar, Afghanistan	—	67		
Taeniatherum asperum NEVSKI	7061	Hazar Ghanj, Pakistan	—			
〃	7062	〃 〃	—			
〃	7063	〃 〃	—			
〃	7065	Pul-i-Khumri, Afghanistan	14	21	33	83
T. crinitum (SCHREB.) NEVSKI	7064	Karaj, Iran	14	22	34	84