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TYPES LEAF MESOPHYLL SPECIES OF CHENOPODIACEAE VENT. CENTRAL ASIA AND THEIR ROLE IN THE MONITORING OF DESERTIFICATION

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ABSTRACT: The structure of the leaves 93 species of the family. Chenopodiaceae from different regions of Central Asia, mainly Kyzylkum, of the presence of Kranz-syndrome was studied. The size of Kranz-cells in 41 species was determined and conducted signs ranging, distingush isolated group of species (63.8% of the total) with the parameters of 21-30 microns. Kranz-types of leaves predominate in the species Salsoloideae (89%), reflecting its higher evolutionary level. In he leaves of species in Chenopodiaceae in Central Asia dominated by succulent adaptation strategy (65% of the total number of species), in connection with the general background of saline deserts.

***Keywords*:** leaf, mesophyll, Kranz-cells, Chenopodiaceae.

INTRODUCTION

The type of mesophyll is specific location assimilation, conductive, sponge or water-bearing tissue relative to the across plane of the organ and each other. Carolin R.C., Jacobs S., Vesk M. (1975) made the first classification of types of mesophyll Chenopodiaceae. Nonkranz-types: Axyroid; Corispermoid; Austrobassioid (close to Corispermoid, but containing water-bearing tissue); Neokochioid (with peripheral vascular bundles); Sympegmoid (similar to Neokochioid, but peripheral banales separated from chlorenchimya). Kranz-types: Atriplicoid, Kochioid, Salsoloid, Kranz-Suaedoid vary by location Kranz-cells in relation to the vascular bundles.

At present Kranz-cells are studied by molecular biology in Russia, Germany, America, in connection with the type of metabolism, taxonomy and phylogeny of the family Chenopodiaceae (Pyankov, Kuzmin, Ku et al, 1998; Voznesenskaya, Franceschi, Artyusheva, 2003; Kadereit, Borsch, Weising, 2003; Akhani, Ghasemkhani, 2007; Freitag, Kadereit, 2013; Freitag et al, 2014). Our study of Kranz-cells connected with ecology plants.

A special feature of Kranz species is the presence Kranz-cells. The anatomists have noted a long her presence in the leaves it calling the cubic form cells. Discovery H.P. Kortschak et al. (1965) and M.D. Hach, C.R. Slack (1966), and special way of the primary carboxylation called C_4 – dicarboxylic acids cycle, led to the rapid development of biochemical and anatomical studies. G. Kadereit et al. (2003) for the analysis of molecular structure Amaranthaceae and Chenopodiaceae leaves identified 7 groups with 17 types of mesophyll, calling them at described species (Atriplex halimus-type, etc.). Freitag H., Stichler W. (2002) was first described new types of mesophyll: Bienertia and Bocszczowia, which palisade cell is functionally divided into kranz-part and palisade-part without partitions.

Studying the structure of the leaf species in specific regions for the presence of Kranz-syndrome is a necessary element of ecological monitoring in connection aridization growing climate and reduction of water resources. Increase in the number of species with Kranz anatomy-leaves are considered as an indicator of intensified xerophilous habitat (Stowe, Teeri, 1978; Toderich et al, 2006).

Materials and methods
The material was collected mainly in the southwestern Kyzylkum in different edaphic conditions (sand, salt marsh, takyr, Red Mountain) – i.e. in its natural habitat types, as well as on the rocky slopes in mountain areas of Uzbekistan (genus *Nanophyton, Raphydophyton, Sympegma* et al.).

To study the anatomical structure used determinantal of the leaves fixed in 70% ethanol, the material collected in the flowering stage to the main stem and the shoots. The cross sections are made from razor at the hands of elder tree pith and enclosed in glycerol – gelatin (Barykina, Chubatova, 2005). The sections were stained with safranin, methylene blue, gentian violet. Measurements were carried out in the middle of the leaves ocular micrometer MOV – 1,5. Average values of indicators were taken from 30-90 indexes. Drawing of sketch preparations were performed using a drawing apparatus RA-6, microphotography digital camera Canon. In determining the CV used method of anatomical ranging B.R. Vasiliev (1988).

Results and discussion
Here is a brief description of types of leaf mesophyll species, size and variation of Kranz cells in family Chenopodiaceae in Central Asia.

Nonkranz-types: Axiroid type. Palisade parenchyma (1-4 series) located on the adaxial side, spongy parenchymal is on the abaxial side. Main and lateral vascular bundles arranged in a central cross-sectional plane. It is found in the leaves of *Spinacia turkestanica* (Fig. 1, a; Table. 1).

Corispermoid-type with palisade parenchyma on both sides of the leaf and spongy parenchymal in the middle part. This type discovered in leaves *Anthochlamys tianshanica, Corispermum lehmannianum, Ceratoides* species (Fig. 1, b). This type is found in picnomorphic and xeromorphic modifications (*Polycnemum perenne*) (Fig. 1, c).

Sympegmoid-type - a original type detected in mesophyll petrophyte species described as centric-type. Two-row palisade parenchyma located on all sides of the treaty bilious or needle-leaved leaves. In the center is the main, in some species sclerotized, vascular bundle and water-bearing parenchyma. Peripheral vascular bundles placed under the palisade parenchyma - separated from the palisade parenchyma cells of several parenchymal cells: *Salsola montana, S. pachyphylla, S. arbusculiformis, Sympegma regelii* - in the succulent modification (Fig. 1, g); *Raphidophiton regelii* - in scleromorphy modification (. Fig. 1, d).

Before to determining the type of leaf photosynthesis *Salsola arbusculiformis* described as kranz-type (Butnik et al., 2001), but studies E.V. Vosnesenskaya et al, (2013), have shown transitional C_3 - CAM type of metabolism.

Ventro-dorsal type. Reduced leaves represents the top of the reduction of assimilative apparatus in the nonkranz group types. Palisade parenchyma is 2-row, on the abaxial side it contact with the vascular bundles or separated water-bearing parenchyma with the adaxial side is water-bearing parenchyma and main vascular bandle (*Salicornia europea, Halostachys belangeriana, Halocnemum strobilaceum*) (Fig. 1, f),

Kranz-types. A special feature of the Kranz-type is of chlorophyll our Kranz-sheath located between the palisade cells and vascular bundles. The walls of the Kranz-cells thickened, riddled with numerous pores and plasmodesmas. K. Esau (1980) noted its similarity to the endoderm. Obligatory sign Kranz-cells are numerous, often elongated, even sinuate chloroplasts. They are able to rapidly accumulate starch, are often deprived gran, and have developed a peripheral reticulum. The chloroplasts of mesophyll and bundle sheath function together in photosynthesis type C_4 (Karpilov, 1970; Magomedov, 1974; Voznesenskaya, 1976). Mitochondrial activity in Kranz-cells 10 times higher than in mesophyll cells (Black, 1971). Their location and structure allows rapid movement of products of photosynthesis, protection photosynthetic cell, to ensure their moisture during the critical xerothermic period.

Kochioid-type. One row of palisade parenchyma and Kranz-cells located on both sides peripheral vascular bundles at flat leaf, which are also located on both sides of the leaf. In the center of the leaf located the water-bearing tissue and central vascular bundle (Fig. 1, g).

Atriplicoid-type. One row of palisade cells and Kranz-cells completely surround the vascular bundles, located in the same central plane. Hypodermis there are (*Atriplex nutellii*) or absent (*A. dimorphostegia*) (Fig. 1, h). Between chlorenchyma and vascular bundles are several water-bearing cells with druses of calcium oxalate.

Salsina-type is characterized by the arrangement of the palisade parenchyma and Kranz-cells throughout of circle terete leaf. The main and lateral vascular bundles arranged in one plane in the center of the water-bearing tissue (*Suaeda arcuata, S. altissima, S. microphylla*) (Fig. 1, i).

Shoberia-type is characterized by large-cells epidermis. Palisade parenchyma and Kranz-cells located on both sides of the leaf and adjacent to the vascular bundles (*Suaeda microsperma, S. acuminata*) (Fig. 1, i).

Salsoloid-type is the most common. One row palisade parenchyma and Kranz-cells are located throughout the circumference of the leaf. Peripheral vascular bundles adjacent to Kranz-cells. The main vascular bundle is located in the center of the leaf among the water-bearing cells. The hypodermis is present or absent (*Salsola orientalis, S. aperta, S. paulsenii, S. richteri*). This type noted in succulent (Fig. 1, k) and scleromorchical modifications (Fig. 1, l).

Flat-leaved-salsoloid type closed to Salsoloid-type leaf but the is flat and in the center of the leaf are 3-5 vascular bundles, except the peripheral bundles. G. Kadereit et al. (2003) identified it as a separate type of *Halothamnus auriculus.* We discovered it in the leaf *Salsola euruphylla* (Fig. 1, m).

Climacoptera-type differs from the type Salsoloid that the peripheral vascular bundles are separated from Kranz-cells by water-bearing cells. In some species in the center of the leaf are 3 vascular bandles (*C. lanata, C. ferganica, C. intricata, C. longistylosa, C. crassa*), which brings him to the Flat-leaved-salsoloid type (Fig. 1 n).

Kranz-ventrodorsal type (for Razdorskiy, 1949 - inverse-dorsal-type). More – or ½ lower part leaf are widening. Palisade and Kranz-cells located on the abaxial side of 1/3 of basis of leaf (types *Climacoptera, Nanophyton erinaceum*). On the adaxial side is water-bearing tissue and xylem part of the main vascular bundle (Fig. 1, m, p). There modification: succulental (species *Haloxylon*) (Fig. 1, o) and scleremorphic (*Nanophyton erinaceum*) (Fig. 1, p).

Borszczowia - Bienertia type discovered from Borszczoviia aralacaspica and *Bienertic cycloptera*. These species have a C4 type of photosynthesis, but they do not have separate Kranz-cells. Its function is performed by sections palisade cells possessing the corresponding structure and metabolism (Fraitag, Stichler, 2002; Voznesenskaya et al, 2003.).

Both of groups types (nonkranz and Kranz) completed the reduction of the leaf (aphyllous) and form a assimilative primary cortex nonkranz-type in subfamily *Chenopodiaceae* and Kranz-type in the subfamily *Salsoloideae*. Presence in aphyllous nonkranz and kranz-types versions considerable about it ancient and convergent origins in different structural groups. Aphyllous - the phenomenon of the progressive substitution organ (for Severtsov, 1945), the result of replacing the of photosynthetic functions of some organs (leaves) at other (shoots with assimilating bark), better adapted to arid conditions. Controversial question is view about reversion Kranz-types to nonkranz-types expressed V.J. Pyankov et al. (1997) and Fisher et al. (1997), although the last authors did not consider it evident.

Hypodermis is in the leaves of 18 species (19.4%). This performs the role of the screen from sun exposure and contains calcium oxalate druses.

Succulent mesophyll type (65% of species) prevails among the studied, species, less find skleromorfny (23.6%) and rarely piknophyllous (10.8%) (*Ceratoides, Corispermum*). The predominance of the type of succulent related to the general saline background Central Asian deserts, which O. Stoker (1928) referred to “dry the ocean”. In spite of the relatively high degree of studied Kranz-cells, we have not seen the data other their quantitative parameters and the variation within a plant during its development in different growing conditions and during the growing season (Butnik, Yusupova, 2012).

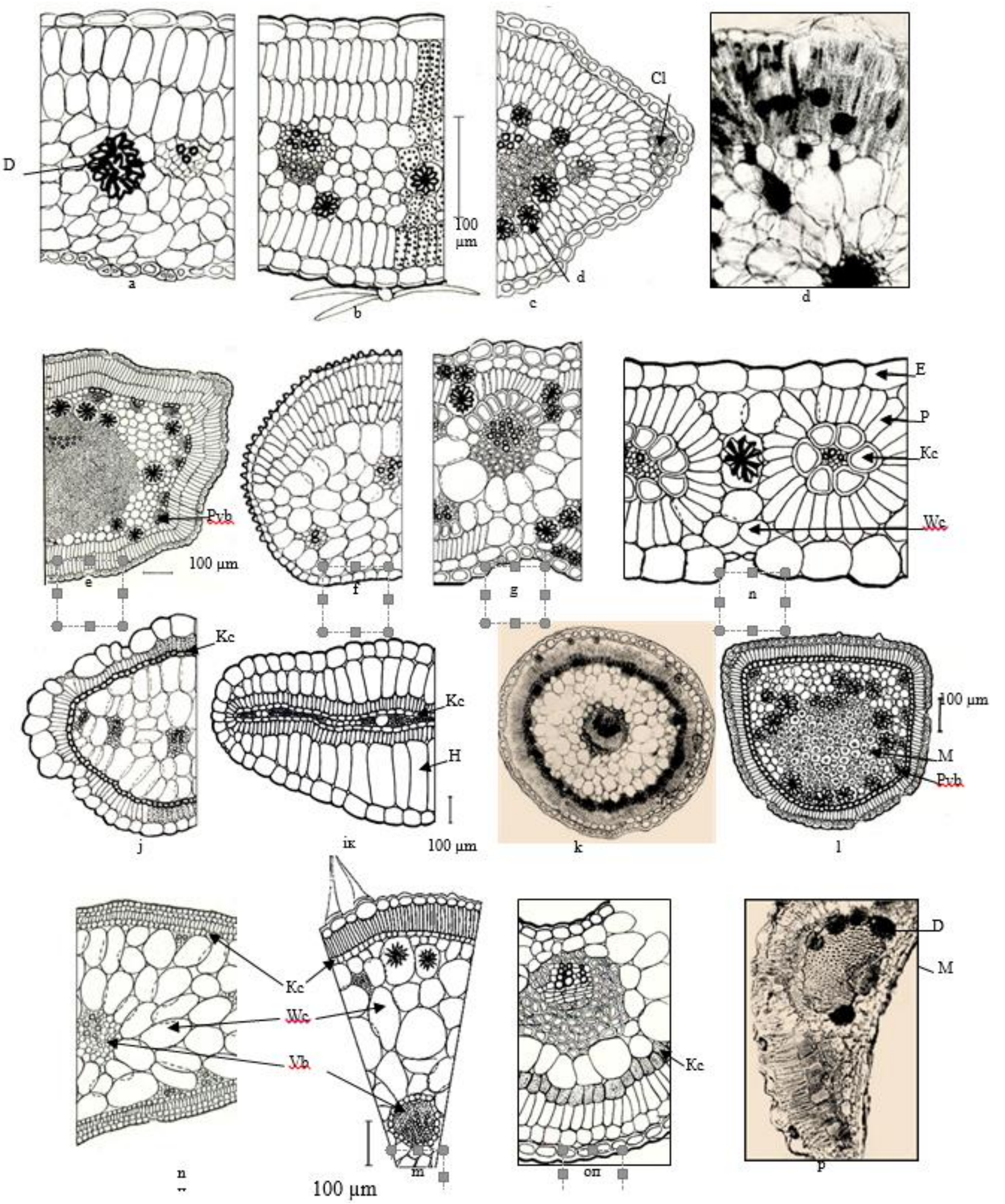

Figure 1. Nonkranz mesophyll types: a - Spinacia turkestanica; b - Ceratoides ewersmaniana; c - Polycnemum perenne; d - Salsola pachyphylla; e - Raphydophyton regelii; f - Halocnemum strobilaceum; Kranz-types of mesophyll: g - Kochia prostrata; h - Atriplex tatarica; j - Suaeda microphylla; i - Suaeda microsperma; k - Salsola rihteri; l - Nanophyton saxatile; m - Salsola euryphylla; n - Climacoptera lanata; o - Haloxylon persicum; p - Nanophyton erinaceum. Legend: Cl – collenchyma, E – epidermis, Kc – Kranz-cells, D – druse, H – hypodermis, M - mestome cells, P – palisade cells, PVb – periferical vascular bundles, Vb - vascular bundles, Wc - water-bearing cell.

Table. 1. Types of leaf mesophyll Sem. Chenopodiaceae

N	Subfamily, species	Gathering place	Type leaf meso-phyll	The presence of hypo-dermis	Type strategy
	Chenopodioideae				
1	Polycnemum perenne Litv.	Ferghana valley	Coz	–	Scl
2	Chenopodium glaucum L.	Kyzylkum (K-K)	Ax	–	P
3	Spinacia turkestanica Iljin	Samarkand region	Ax	–	P
4	Atriplex aucheri Moq.	–“–	A	–	Suc
5	A. dimorphostegia Kar. & Kir.	K-K-Jamal zharsay	A	–	Suc
6	A. tatarica L.	Mirzachul	A	+	Suc
7	Ceratoides ewersmanniana (Stschegl. ex Fosinsk.) Botsh & Ikonn.	K-K-Jamal zharsay	Coz	–	P
8	C. papposa Botsch. & Ikonn.	Botanical Garden (Pamir)	Coz	–	P
9	Ceratocarpus utriculosus Bluk.	K-K	Coz	–	Scl
10	Londesia eriantha Fisch. & Mey.	–“–		+	Scl
11	Kochia prostrata (L.) Schrad.	–“–	Sch K	+	P
12	K. iranica Bornm.	–“–	K	–	P
13	K. scoparia (L.) Schrad.	–“–	K	+	P
14	Bassia hyssopifolia (Pall.) O. Kuntze	K-K, Gijduvan	K		P
15	Corispermum papillosum (O. Kuntze) Iljin	Baygakum	Coz	–	P
16	Agriophyllum latifolium Fisch. & Mey	K-K, Jamand zharsay	Coz	–	Scl
17	A. lateriflorum (Lam.) Moq.	Karakul district	Coz	–	Scl
18	A. minus Fisch. & Mey.	–“–	Coz	–	Scl
19	A. squarrosum (L.) Moq.	–“–	Coz	–	Scl
20	A. paletzkianum Litv.	–“–	Coz	–	Scl
21	Anthochlamys tjanshanica Iljin ex Aell.	Botanical Garden	Coz	–	P
	Salicorniaeae				
22	Halocnemum strobilaceum (Pall.) Bieb.	K-K, saline	VD	–	Suc
23	Salicornia europaea L.	Mirzachul	VD	–	Suc
24	Kalidium caspicum (L.) Ung. – Sternb.	–“–	VD		Suc
25	Halostachys caspica (Bieb.) C.A. Mey.	K-K, saline	VD		Suc
	Salsoloideae				
26	Salsola dendroides Pall.	Mirzachul	S	–	Suc
27	S. dzhungarica Iljin	Alatau	S	–	Suc
28	S. orientalis S.G. Gmell.	K-K	S	–	Suc
29	S. incanescens C.A. Mey.	Tashauz. channel	S	–	Suc
30	S. micranthera Botsch.	K-K	S	?	Suc
31	S. roshevitzii Iljin	Valley region of the Naryn	S	+	Suc
32	S. gemmascens Pall.	K-K	S	–	Suc
33	S. implicata Botsch.	Baygakum, Kyzyl-Urda	S	–	Scl
34	S. aucheri (Moq.) Bunge ex Iljin	Kopetdag	S		Suc
35	S. titovii Botsch.	Kyzylcha	S	–	Suc
36	S. gossipina Bunge	Kopetdag	S		Suc
37	S. vvedenskyi Iljin & M. Pop	Kyzylcha (Dehkanabad) red-mout.	S		Suc
38	S. arbuscula Pall.	K-K, piedmont plain	S	+	Suc
39	S. arbusculiformis Drob.	K-K, mountain Kuldzhuktau	Sp	–	Suc
40	S. chiwensis M. Pop.	Ustyurt	S	+	Suc
41	S. drobovii Botsch.	Alai Range Ferghana Valley	S	–	Suc
42	S. euryphylla Botsch.	Northen.Priarale	Fls	–	Suc
43	S. montana Litv.	Pamir-Alai	Sp	–	Suc
44	S. paletzkiana Litv.	K-K, Jamal Jar-sai	S	+	Suc
45	S. richteri (Moq.) Kar. & Litv.	–“–	S	+	Suc
46	S. pachyphylla Botsch.	Central Tien-Shan	Sp	–	Scl
47	S. foliosa (L.) Schrad.	Baygakum, Kyzyl-Urda, Ustyurt	S	–	Suc
48	S. aperta Pauls.	K-K, Jaman jar-sai	S/Fls	–	Suc
49	S. paulsenii Litv.	–“–	S	–	Scl
50	S. praecox Litv.	–“–	S	–	Suc
51	S. rosaceae L.	–“–	S	–	Suc
52	S. sclerantha C.A. Mey	K-K, foothill plain	S	–	Scl
53	S. australis R. Br		S	–	Scl
54	Climacoptera lanata (Pall.) Botsch.	–“–	Cl	–	Suc
55	C. ferganica (Drob.) Botsch.	–“–	Cl	–	Suc

56	C. intricata (Iljin) Botsch.	Mirzachul	Cl	–	Suc
57	C. longistilosa (Iljin) Botsch.	–“–	Cl	–	Suc
58	C. brachyta (Pall.) Botsch.	K-К	Cl		Suc
59	C. crassa (Bieb.) Botsch.	–“–	Cl	–	Suc
60	C. merculowiczii (Zak.) Botsch.	–“–	Cl	–	Suc
61	C. transxona (Iljin) Botsch.	–“–	Cl		Suc
62	Halothamnus subaphyllus (C.A. Mey.) Botsch.	K-К	S	–	Suc
63	H. glaucus (Bunge) Botsch.	–“–	S	–	Suc
64	H. hispidulus (Bunge) Botsch.	–“–	S	–	Suc
65	Arthrophytum lehmannianum Bunge	K-К, red-mountain	S	+	Scl
66	Hammada leucoclada Iljin	Hodga and Phil	KVD	+	Scl
67	Haloxylon aphyllum (Minkw.) Iljin	K-K Jaman Jar-sai	KVD	+	Suc
68	H. persicum Bunge ex Boiss. & Buhse	–“–	KVD	+	Suc
69	Girgensohnia oppositiflora (Pall.) Fenzl.	–“–	S	+	Scl
70	Anabasis eriopoda (Schrenk.) Benth. ex Volkens.	К-К, red-mountain	S	+	Suc
71	A. brachyata Fisch. & Mey.	–“–	S	+	Suc
72	A. aphylla L.	–“–	S	+	Suc
73	A. salsa (C.A. Mey.) Benth.	–“–	S	+	Suc
74	Nanophyton erinaceum (Pall.) Bunge	К-К, foothill plain	S	–	Scl
75	N. saxatile Botsch.	Ridge Malguzar (Tamerlan. Gate)	S	–	Scl
76	N. botschantzevii Pratov	Western Tien Shan mountain Nurek-ata	S	–	Scl
77	Petrosimonia sibirica (Pall.) Bunge	K-К	S	–	Scl
78	Halimocnemis villosa Kar. & Kir.	–“–	S	–	Scl
79	H. macranthera Bunge	–“–	S	–	Scl
80	H. karelinii Moq.	Baygakum	S	–	Scl
81	H. sclerosperma (Pall.) C.A. Mey	K-К	S	–	Scl
82	Halotis pilifera (Moq.) Bunge	Ferghana Valley	S	–	Scl
83	Gamanthus gamocarpus (Moq.) Bunge	K-К	S	–	Scl
84	Sympegma regelii Bunge	Central Tien-Shan	Sp	–	Scl
85	Raphydophyton regelii (Bunge) Iljin	Karatau	Sp	–	Scl
86	Physandra halimocnemis Botsch.	Almaty	S	–	Scl
87	Ilijinia regelii Korov.	Kugitang red-mountain	S	–	Scl
	Suaedoideae				
88	Suaeda altissima (L.) Pall.	Mirzachul	Sal	–	Suc
89	S. arcuata Bunge	K-K, saline	Sal	–	Suc
90	S. heterophylla (Kar. & Kir.) Bunge	–“–	Cor	–	Suc
91	S. microsperma (C.A. Mey.) Fenzl.	–“–	Sh	+	Suc
82	S. microphylla Pall.	Karakum	Sal	–	Suc
93	S. paradoxa Bunge	Mirzachul	Cor	–	Suc

Legend to the table: A – Atriplicoid-type; Ax – Axiroid-type; Cl – Climacoptera-type; Cor – Corispermoid-type; Fls – Flat-salsoloid-type; S – Salsoloid-type; K – Kochioid-type; KVD – Kranz-ventro-dorsa-type; Sh – Shoberia-type; Sp – Sympegmoid-type; Sal – Salsina-type; P – Picnophyllous-strategy; Scl – Scleromorphic-strategy; Suc – Succulental-strategy.

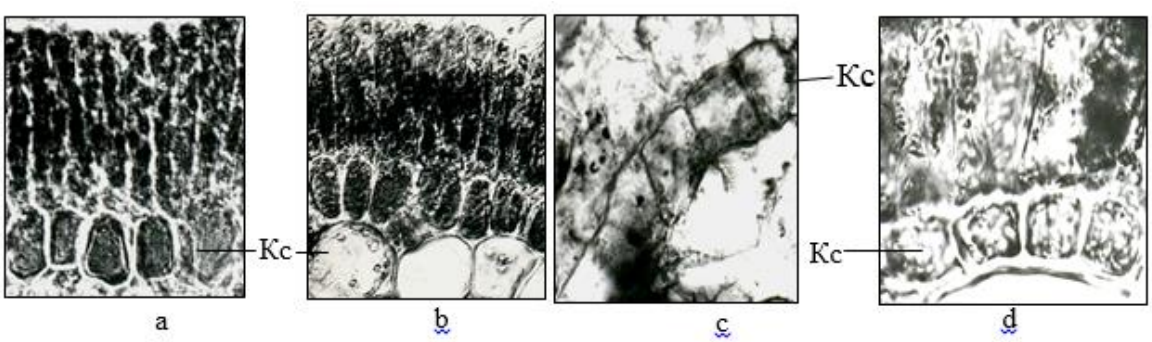

Figure 2. Kranz-cells forms in the leaves: a - *Salsola richteri*, b - *S. paletzkiana*, c - *S. dendroides*, d - *Nanophyton erinaceum*. Kc - Krantz-cell

The largest Kranz-cells are found in the species Suaeda - 47,8-64,4 μm height 61,6-76,6 μm width, small in *Climacoptera lanata, Salsola aperta, Girgensohnia oppositiflora* - 15,8-18,9 μm height, 15,5-18,4 μm width (Table 2). Groupings of size Kranz cells showed the predominance within 21-30 μm of height – from 65.8% of the species and cell width (48.7%) (Table 4.). Proceed from the correlation height and width, Kranz cells vary in shape in a cross section. 43.9% of the species have length and width of the cells are identical, whereby the shape cells was named as cubical (*Salsola orientalis, S. sclerantha, S. aperta* et al.).

Krantz-cells about 20 species (19.5%) extend radially, their height greater than the width (*S. richteri, S. paletzkiana, Nanophyton* genus species) and 36.6% Kranz-cells marked elongated tangential, their height is less than the width (*S. gemascens, Halotis pilifera, Salsola chivensis*). Kranz cells vary considerably in thickness walls: thin at *Salsola dendroides* and thickened at *S. richteri, S. paletzkiana, S. chivensis. Nanophyton erinaceum* (Fig. 2).

Table 2. Size Kranz-cells in the leaf species of the family Chenopodiaceae (μm)

N	Species	n	Height	Width
1	Atriplex tatarica L.	30	29,5±0,8	30,0±0,7
2	Londesia eriantha Fisch. & Mey.	15	23,1±0,5	27,5±0,7
3	Kochia prostrata (L.) Shrad. ssp. grizea	50	26,1±1,0	25,3±0,9
4	K. prostrata ssp. virescens	50	27,9±0,9	24,7±0,8
5	Suaeda altissima (L.) Pall.	90	64,4±1,2	76,6±2,0
6	S. arcuata Bunge	90	52,9±0,9	61,6±1,4
7	S. microsperma Pall.	90	47,8±0,9	62,3±1,8
8	Salsola orientalis S.G. Gmell (halophyllous form)	30	22,0±0,9	21,0±0,8
9	S. orientalis S.G. Gmell (gypsophyllous form)	30	25,0±1,0	24,0±0,9
10	S. dschungarica Iljin	30	25,0±1,0	24,7±1,1
11	S. dendroides Pall.	30	21,0±0,9	32,5±1,0
12	S. gemmascens Pall.	50	23,8±1,0	27,0±1,1
13	S. sclerantha C.A. Mey	50	23,8±0,8	27,0±1,0
14	S. implicata Botsch.	30	20,8±0,8	19,7±0,6
15	S. arbuscula Pall.	50	38,4±0,6	36,5±0,9
16	S. richteri (Moq.) Kar. & Litv.	50	27,9±0,9	16,6±0,5
17	S. paletzkiana Litv.	50	24,7±0,7	14,9±0,6
18	S. foliosa (L.) Schrad.	30	21,7±0,9	29,6±1,2
19	S. aperta Pauls.	50	17,0±0,8	16,8±0,7
20	S. paulsenii Litv.	50	23,8±0,8	35,1±1,1
21	Climacoptera lanata (Pall.) Botsch.	30	15,8±0,1	15,5±0,2
22	Cl. ferganica (Drob.) Botsch.	30	18,3±0,2	19,2±0,3
23	Cl. longistylosa (Iljn) Botsch.	30	19,3±0,4	20,0±0,3
24	Cl. intricata (Iljn) Botsch.	30	27,8±0,3	27,3±0,2
25	Halothamnus subaphyllus (C.A. Mey) Botsch.	50	30,0±0,9	31,0±0,7
26	H. glaucus (M. Bieb.) Botsch.	50	32,5±1,0	33,7±0,9
27	H. hispidulus (Bunge) Botsch.	50	33,0±0,8	34,5±0,9
28	Arthrophytum lehmanianum Bunge	30	23,7±0,8	26,3±0,7
29	Haloxylon aphyllum (Minkw.) Ilin	50	20,0±0,6	26,3±0,7
30	H. persicum Bunge ex Botsch. & Bunge	50	20,0±0,6	21,0±0,7
31	Girgensohnia oppositiflora (Pall.) Fenzl.	30	18,9±0,9	18,4±1,0
32	Anabasis eriopoda (Schrenk.) Benth.	30	23,5±1,1	24,3±1,0
33	A. brachyata Fisch. & Mey.	30	30,3±1,9	30,7±1,2
34	Nanophyton erinaceum (Pall.) Bunge	30	29,1±0,9	17,2±0,9
35	N. botschan tzevii Pratov	30	29,8±1,3	17,7±0,7
36	N. saxatile Botsch.	30	21,0±0,5	13,9±0,8
37	Gamanthus gamocarpus (Moq.) Bunge	50	23,3±0,7	24,0±0,9
38	Halimocnemis macranthera Bunge	30	28,2±1,1	26,6±1,0
39	H. karelinii Moq.	30	22,7±1,0	29,6±1,1
40	H. lalifolia Iljin	30	27,7±1,3	24,9±1,2
41	Halotis pilifera (Moq.) Botsch.	30	18,9±0,9	27,4±1,0

B.R. Vasiliev (1988), analyzing the anatomical signs of plant leaf different geographical areas identified CV less than 33% - low, 33-66% - an average of 66% or more - high. Analysis of variation of signs of plant by year vegetation (*S. richteri, S. paletzkiana*) in nature and culture (*S. paulsenii, S. gemascens, S. foliosa*) and position the leaves on the shoot showed the low CV height cells (10,0-18, 8%) and a somewhat greater width CV (9,2-23,7%).

Based on ranking features and CV, we assume varying sizes Kranz-type cells in the species is low. The middle height of Kranz-lining in all studied species of the family - 27,19 μm, width - 27,30 m μm, this CV - 37,6-44,3%, respectively, ie the variation within the family broader, is average.

Conclusions

Thus, at the Kyzyl-Kum desert plants we described 13 types of mesophyll and 4 modification. G. Kadereit et al. (2003) described a 17 kranz-types, separating the types with the water-bearing and spongy parenchyma, as well as the degree scleriphicated of middle vascular bandle. We believe such detailized in necessary and considered it’s as modifications of the structure. Chloroplasts also contain in water-bearing parenchyma, as in the spongy tissue, but they are fewer, they provide a transition to the CAM type photosynthesis. A significant number of Kranz-types found in the leaf *Salsoloideae* (89,1%), including highly specialized Salsoloid-type (for Kadereit et al., 2006) have *Salsola arbuscula*, *S. richteri, S. paulsenii* and less (30 7%) in the subfamily *Chenopodioideae*. This suggests the formation of most species of *Chenopodioideae* southwestern Kyzylkum in the arid climate and conferming the historical youth and indigenous flora of Central Asia (Kamelin, 1973).

In Kyzylkum desert was described nonkranz-type 4 types with two modifications, kranz-type are - 9 types with the third modification. The presence of Kranz cells increases the possibility of forming a leaf morphotypes that extends their adaptive response. Kranz-types predominate in the subfamily *Salsoloideae* (89%) compared to the subfamily *Chenopodioidae* (35%), which reflects their evolutionary levels.

Kranz-cells in *Chenopodiaceae* are different height. The largest among species (Atriplix and *Suaeda*). The width of the cell is significantly different, as the result that their shape varies from rectangular to cubical. Ranking index of their size it possible to identify a group of species with a high and cell width, 21-30 microns. Variability Kranz-type cells in one species is small range, which is indicative of their genetic stability. Within family variability in size, Kranz cells higher. Varying the size and thickness of shells Kranz cells and their arrangement in the leaves are indicative of their formation difference time.

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