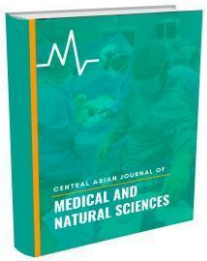

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Article

To The Study of Sepal Trichomes in The Genera of The Tribe Caryophylleae of The Family Caryophyllaceae

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Abstract: This article presents the results of studies of sepals of species of the genera Acanthophyllum, Kughitangia, Allochrusa, Drypis and Gypsophila. In species common in the south - mountainous Turkmenistan, Surkhandarya and the southwestern spur of the Pamir-Alay - glandular trichomes predominate over simple ones; in the direction from south to northeast, glandular ones are gradually replaced by simple ones, the number of the latter increases with increasing altitude above sea level.

Keywords: Genus Acanthophyllum, Genus Kughitangia, Genus Allochrusa, Genus Drypis, Genus Gypsophila, Sepals, Trichomes, Types of Trichomes, Ptosis, Epidermal Cells, Diagnostic Features

1. Introduction

The study of trichomes on plant sepals is of great scientific and practical importance, especially in such areas as taxonomy, ecology, plant physiology, pharmacognosy and agronomy. The main areas of significance of such studies are presented below. First of all, as a diagnostic feature: the shape, length, density, presence or absence of hairs on the sepals are often used as morphological features to distinguish species, genera and even intraspecific taxa [1]. For example, in representatives of the genus Achillea (yarrow) or Taraxacum (dandelion), the nature of the hairiness of the sepals is an important feature in the identification keys. The hairs of the sepals play a protective function: they reduce water evaporation (important for xerophytes), protect against overheating, ultraviolet radiation, dust and dirt, and create a microclimate around the flower. They can serve as a barrier for insect pests or, conversely, direct pollinators to nectaries. Trichomes also have pharmacognostic significance, i.e. in the identification and standardization of medicinal plant raw materials, the hairs of the sepals (and other parts) are examined under a microscope: to control the authenticity of the raw material (for example, St. John's wort, sage, etc.), to exclude impurities, the type and structure of the hairs is an important feature in pharmacopoeial descriptions of plants. Hairs participate in the regulation of the water regime of the plant. Glandular trichomes have the function of secreting essential oils, resins and other substances important for the protection or attraction of pollinators.

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Trichomes are of practical importance in agronomy and breeding, i.e. in cultivated plants (e.g. tomato, soybean, cotton) the type of hairs can affect resistance to pests and diseases. Knowledge of hair morphology is used in breeding for drought resistance and other stress-resistant properties. The genera Acanthophyllum, Kughitangia, Allochrusa and Drypis are united by the following botanical, systematic and morphological characteristics: All these genera are included in: • Family: Caryophyllaceae (Carnation) • Subfamily: Caryophylloideae (according to most classifications) • Tribe: Caryophylleae or close to it (depending on the authors of the taxonomy) This family includes mainly herbaceous plants, often xerophytic or adapted to dry conditions. Morphologically, all genera are herbaceous perennials (less often subshrubs), often with a well-developed root system (sometimes root crops, as in Allochrusa). The leaves are opposite, entire, without stipules. Flowers: regular (actinomorphic), pentamerous, usually with 5 petals. Flowers are bisexual, often collected in inflorescences. The calyx is tubular or bell-shaped, often with teeth. The fruit is a capsule that opens with teeth, with numerous small seeds. All these genera are predominantly Central Asian endemics or subendemics. They grow in arid and semi-arid conditions: slopes, gravelly soils, rocky screes. Some of them (for example, Acanthophyllum and Kughitangia) prefer mountainous and foothill regions, including Turkmenistan, Uzbekistan, Tajikistan, Afghanistan and Iran [2], [3].

2. Materials and Methods

The number of hairs per 1 mm2, their structure, the number and size of stomata were determined according to S.F. Zakharevich [4]. The anatomical indices of the mesophyll were studied using the method of D.A. Trankovsky [5].

3. Results and Discussion

The shape of the sepals of all the studied species of the genera Acanthophyllum, Kughitangia, Allochrusa and Drypis is tubular and cylindrical, cylindrical-bell-shaped, with triangular spiny (except for the genus Allochrusa), 5 teeth slightly bent outward. In the genus Aconthophyllum, the greatest length (8-10 mm) of sepals is characteristic of 5 species - A. adenophorum, A. krascheninnikovii. A. brevibracteatum, A. acealutum, A. pulchrum from the sec. Oligosperma, very short (length 4-6 mm) - visible sec. Masgostegia, extremely short (3- 4 mm) A. macrosephalum from the sec. Turbinaria. The length of the sepals of other species of the genus Aconthophullum, as well as representatives of the genus Kughitangia is within 6-7 mm [6]. Genera Allochrusa and Drypis have extremely short (3-4 mm long) sepals. In species of genus Gypsophila the calyx is bell-shaped or cylindrical, inversely conical - tubular, or broadly bell-shaped, five-toothed or deeply five-partite. Representatives of genus Drypis have small-celled epidermis with sinuous cell walls, in Turbinaria - small-celled with slightly sinuous cell walls, in all other taxa the outer epidermis with sinuous, strongly sinuous, sinuous-wavy cell walls, the inner epidermis - with wavy and strongly wavy. The longest (6-7 mm long) calyxes are characteristic of *G.herniarioides, G.fedstchenkoana* and *G.floribunda*, in other species the shortest (2-3.5 mm long). In the genus Acanthophyllum the thinnest sepals (152-178 μm) are found in 4 species: *A. adenophorum, A. borsczowii* from the sec. Oligosperma, *A. glandulosum* from the sec. Pleisperma and A. korolkovii from the sec. Macrostegia, the thinnest (104 μm) are found in *A. elatis*. In other species of the genus and the genus Kughitangia their thickness is within the range (120-148 μm). Species of the genus Allochrusa are characterized by very thin (130-170 μm) sepals, the genus Drypis has the thinnest: in herbarium specimens from Italy and Hungary they are extremely thin (80-90 μm), and in those from Greece and Albania they are very thin (106-113 μm). Some thickening of the sepals of this genus from Greece and Albania can apparently be explained by the comparatively greater drier air than in Italy and Hungary. As can be seen from the data, the difference in sepal thickness is less between subspecies than between plants from different countries. The thickness of the calyx of G. herniariodes, G.

floribunda and G. fedchenkoana is 110-120 μm, while in others it is the thinnest (80-90 μm). Consequently, in these two genera the small size of the sepals correlates with their small thickness. The calyxes of the taxa under study are hypostomatous - the stomata are formed only on the abaxial side, anomocytic, rarely - diacytic and anisocytic. The mesophyll is not differentiated, less often very weakly differentiated, the cells are densely located, the vein has a more or less developed sclerenchyma.

Genus Acanthophyllum C.A.Meu Sec. Oligosperma

1. *A. pungens*

The types and morphology of the calyx hairs were studied in plants growing in four geographical points of its range - from the slopes of the gorge of the Baysun Mountains to the Dzungarian Alatau of Eastern Kazakhstan [7]. All the studied plants are characterized by a calyx with dense pubescence of simple hairs. In plants from the Baysun Mountains, the calyx is pubescent with long and extremely long (230-850 μm), slightly curly, thick-walled and wide (20-40 μm) hairs, while in plants from the Kaljar Valley of the Balkhash-Alakul Depression, the hairs are of medium length and very long (150-600 μm), also slightly curly and thick-walled. In plants from the southwestern spurs of the Dzungarian Alatau, the calyx is pubescent with hairs as long as those in plants from the Baysun Mountains, but different from the latter in their thin walls and constricted shape. Thus, with movement from the south to the northeast and especially to the mountains of Eastern Kazakhstan, the walls of the hairs become thinner, and the hairs themselves are constricted. On the other hand, mountain conditions (strong radiation and other factors) cause the formation of dense pubescence with long simple hairs.

2. *A. lilacinum*

The calyx of plants from the Central Kopetdag (Sulukli) is pubescent with various types and morphologies of hairs: medium-length and long (200-400 μm) simple, relatively thick-walled hairs, short (100-130 μm) thick-walled club-shaped, glandular, long (100-340 μm) funnel-shaped, glandular, and also stalked-capitate glandular hairs. In plants from the reserve on the Turkestan ridge, the calyxes are pubescent with very thin-walled, dense simple hairs of various lengths and morphologies: more or less constricted, short, cylindrical and conical, as well as awl-shaped or needle-shaped terminal cells. In most hairs, the basal cell is bladder-like-expanded. All this speaks in favor of greater plasticity of the signs of ptosis of this species.

3. *A. subglabrum*

Calyx ptosis was studied only in plants from Babatag (Western Pamir-Alai), where the calyx is covered with very dense (150-200 per 1 mm2), long (300-500 μm), extremely thick-walled (3-3.5 μm) constricted simple hairs pressed to the calyx towards the apex.

4. *A. tenuifolium*

Calyx ptosis was studied in plants from the vicinity of the city of Maily-sai, as well as from the village of Koi-kulak on the left bank of the river. Maily-sai (central Tien Shan). The hairs are simple, numerous (200-230 per 1 mm2), thick-walled, of medium length (150-300 μm), 2-5-celled with a wide diameter, cylindrical and conical in shape. There are individual 2-celled hairs of a spear-shaped form, as well as with a lateral branch.

5. *A. stenostegium*

The calyxes of plants from the vicinity of Iolatan (Karakum) and Shafrikan (Kyzylkum) are pubescent with long and very long (300-700 μm), thin-walled, multicellular, twice or thrice constricted simple hairs from comparatively sparse to medium density (70-120 per 1 mm2).

6. *A. adenophorum*

Calyx ptosis was studied in plants from two points of its range - the Besh-Archa Mountains (Babatag - Uzbekistan) and the environs of Shaartuz (Babatag - Southern

Tajikistan). The calyx of plants from both places of growth is comparatively densely pubescent: only stalked-capitate and glandular - in plants from the Besh-Archa Mountains and comparatively long (200-250 μm), narrow, curly club-shaped glandular mixed with rare simple - from Southern Tajikistan. As can be seen from the given description, the range of variability for this trait is the same as in A. pungens and A. liliacinum [8].

7. *A. kraschenninikovii*

In plants from the wormwood desert of Talimarjan, the calyxes are pubescent with long (250-500 μm), comparatively dense (100-125 per 1 mm2), thin-walled cylindrical hairs, as well as constricted simple hairs, the width of which reaches 20-40 μm. Plants from the right bank of the Amu Darya are pubescent with hairs as dense as in the previous plants, but less wide (15-30 μm), not constricted. '

8. *A. brevibracteatum.*

In plants from the Bukhara region (near the Sartish River) and the Turkestan ridge, the calyxes are pubescent with dense 2-4-celled simple hairs 150-350 μm long. Thus, the sign of ptosis of the calyx of this species is less plastic than in A. pungens, A. lilacinum and A. adenophorum.

9. *A. aculeatum*

The calyxes of plants from the dry Zirabulak adyrs are pubescent with sparse (40-50 per 1 mm2) hairs in groups of 4-5 short (30-70 μm), unicellular, simple bristly hairs. In plants from the Aktau Mountains (altitude 2000 m), the calyxes are pubescent with very dense (250-300 per 1 mm2), medium-length (200-350 μm) and wide (20-40 μm), thick-walled (3-3.5 μm), pressed to the calyx towards its apex simple hairs (similar to the calyx of A. subglabrum).

10. *A. pulchrum*

In plants from the eastern edge of the Zeravshan Range (Kushtol village), the calyxes are drooping with dense (150-180 per 1 mm2) 1-2-celled cone-shaped thick-walled simple hairs 200-500 μm long in combination with comparatively rare stalked-capitate glandular hairs. There are forked-bifurcated, slightly curly 1-2-celled thick-walled (3 μm) cone-shaped simple hairs, which sharply distinguishes them from the previous species.

11. *A. elatius*

The calyx of plants from the hilly sands of the Karakum Desert (Kara-Kala) is pubescent with short (30-70 μm), bristly, thick-walled simple hairs with a spatulate tip, the number of which does not exceed 70-85 per 1 mm2. In plants from the Vakhsh-Pyanj interfluve (residual sandy uplands), the calyxes are pubescent with short (30-70 μm) and comparatively sparse (40-50 per 1 mm2) 1-cell conical simple hairs. The calyxes of plants from the vicinity of Lake Yaskhak (Karakum) have sparse thick bristly, less often 2-celled outgrowths (papillae). However, the edges of the calyx teeth are pubescent with comparatively dense 1-2-celled simple hairs (40-80 μm long) of cylindrical and wedge-shaped shape. Consequently, the type and morphology of the calyx hairs of this species are stable features, not affected by external conditions.

12. *A. borsczowii*

In plants from the wormwood-bojalyk steppe in the vicinity of the Sarysu River (Eastern Kazakhstan), the calyxes are pubescent with 1-2-cell thick-walled, bristly simple hairs of medium density (100-110 per 1 mm2), width (20-26 μm) and length (100-170 μm); In plants from Kyzylkum, they are pubescent with sparse (30-50 per 1 mm2) 1-cell, bristly simple hairs. In plants from Muyunkum, they are pubescent with 1-cell papillae, the number of which per 1 mm2 is within 50-60. Thus, the plants of Kyzylkum and Muyunkum have almost naked calyxes. Hence: the type of hairs in this species is stable, its length and frequency of occurrence are variable and depend on the conditions of the growing place.

13. *A. leiostegium*

The calyxes of plants from the vicinity of Khodjand are very densely (160-200 per 1 mm2) pubescent with medium-length (150-200 μm) 2-3-cell simple hairs. In plants from the Amu Darya delta, the calyxes are pubescent only along the edges of the teeth with the same hairs as in the previous plant. In the plant from the Karatau ridge, the calyxes are densely pubescent with various lengths (100-250 μm) and widths (20-40 μm) thick-walled simple cone-shaped hairs. It should be noted that there are individual hairs with a lateral branch of the basal cell, which sharply distinguishes it from the studied species of the genus Acantophyllum. In the cup droop of this species, as in the previous one, there is an increase in the density of hairs in the direction from the south to the northeast, especially in the mountains of this direction.

Section Pleiosperma.

14. *A. sordidum*

In plants from the Central (Sulukli) and Western (Firuza) Kopetdag, the calyxes are very densely pubescent with long (up to 600 μm) 3-5-celled stalked-capitate glandular hairs: in plants from Sulukli, the long glandular hairs have short lateral branches (1 each), which can be either simple outgrowths or glandular. Hairs with simple branches often bend sharply by 90°. The hairs in the calyx of plants from Firuza are in most cases forked, bifurcated at the apex or in the middle. Along the edges of the teeth, the hairs are simple, conical, and have a branch in the calyx.

15. *A. glandulosum*

The calyxes of plants from Kopetdag and Chapandag have the same pubescence as *A. sordidum*, but are characterized by the presence of a slightly larger number of simple hairs and the absence of branches, which sharply differs from the last three species.

16. *A. schugnanicum*

In plants from the southwestern slope of the Shugnan Range (2500 m above sea level), the calyxes are very densely pubescent with 1-cell, wedge-shaped simple hairs up to 70 μm long. In plants from the left bank of the Shakhdarya River (Shugnan Range), they are longer (80-130 μm long) than in the first, 1-2-cell dense simple hairs, some of which have small lateral outgrowths, which reveals the variability of the size of the simple hairs of this species even within the Shugnan Range.

Section Masrostegia

17. *A. korolkovii*

In plants from the right bank of the Amu Darya River, the calyx is densely pubescent with long (200-250 μm), 2-4-celled stalked-capitate glandular hairs with thick walls (3-3.5 μm). In plants from the vicinity of Repetek (Karakum), the calyxes are pubescent with 2-celled stalked-capitate and funnel-shaped glandular hairs 55-100 μm long with thick walls (2.5-3 μm) in combination with more sparse bristly 1-celled short simple hairs. The calyxes of plants from Muyunkum are pubescent only with comparatively small (50-70 μm) stalked-capitate glandular hairs. Thus, in the direction from south to northeast, the number and size of glandular hairs in the calyx of plants decreases.

18. *A. serawschanicum*

The calyxes of plants from the Gissar Range are more or less densely pubescent with long (100-250 μm), 2-4-celled stalked-capitate glandular hairs in combination with comparatively rare 2-3-celled cone-shaped simple hairs of the same length. In plants from the Zarafshan River basin (Zerafshan Range), the calyxes are densely pubescent with very long (250-480 μm), 2-5-celled simple hairs with thick walls. Many of them are constricted, some are loop-shaped and curved. Among the simple hairs, there are individual club-shaped glandular hairs. The calyxes of plants from the Zeravshan Range are densely pubescent with simple, thick-walled (2 μm) hairs of varying length (80-300 μm) in

combination with more sparse stalked-capitate glandular hairs. From sandy places of the Zarafshan River basin (Samarkand), the calyxes of plants are pubescent only with simple, long (300-700 μm), thin-walled, constricted, intertwined hairs, most of which have narrow, needle-shaped terminal cells. Consequently, in plants of this species, in the direction from south to northeast along the Pamir-Alay, the glandular hairs are gradually replaced by simple ones. The drooping of the calyx of this species with different types of hairs apparently indicates, as in A. pungens, the polymorphism of this species, caused by the great diversity of climatic and edaphic conditions in the named mountains.

19. *A. jarmolenkii*

In plants from the Baysun Mountains (Ketmen-Chaptn, 3450 m above sea level) the calyx is densely pubescent with short (60-100 μm), but wider (16-30 μm), very thick-walled (3 μm), stalked-capitate glandular hairs in combination with very rare unicellular wedge-shaped simple hairs; in plants from the Khodja-gur-gur-ata Mountains - with longer (180-200 μm), 3-5-celled large stalked-capitate glandular hairs, some of which have lateral capitate outgrowths. Among the latter, rare papillae are found.

Genus Kughitangia Ovez

1. *K. popovii*

In plants from the mountains of Kukhitang (mountainous Turkmenistan) the calyx is pubescent with comparatively short (100-110 μm) simple and very short (16-20 μm) stalked-capitate glandular hairs (Madumarov, Dariev, 1991).

2. *K. knorringiana*

The calyxes of plants from Ak-tau are completely naked (Madumarov, Dariev, 1991), although in the "Flora of the USSR" (T.6.1936.P.794-797) the presence of glandular hairs is noted.

Genus Allochrusa Bunge

The calyx of the species of the genus Allochrusa is pubescent only in *A. paniculata* with simple, short (up to 90 μm) hairs, while in *A. gypsophiloides* it is completely naked. Genus Drypis L. In most herbarium specimens of the genus drypis from various geographical points of its range, the calyxes are naked. Only in *D. ssp. spinosa* a from the midlands of Greece (altitude 2000 m) and in *D. ssp. jaquiniana* from the foothills of Albania (altitude 800 m) are the edges of the teeth of the calyx pubescent with sparse trichomes, in ssp. jaquiniana - only with simple thin-walled 1-2-celled, in ssp. spinoso - with club-shaped glandular 3-4-celled hairs, which significantly distinguishes them from each other.

Genus Gypsophila L.

In the overwhelming majority of species of the genus Gypsophila the calyx is completely naked, with the exception of 4 species - *G. herniariodes, G. capituliflora, G. dschungarica G. aulitetatensis*. In the first from the Turkestan ridge the calyx is densely (170-200 per 1 mm2) pubescent with stalk-capitate glandular hairs in combination with two-cell simple ones. In the lower part of the calyx there are more simple hairs, in the middle and upper - more glandular. The calyx of plants from the northern slopes of the Trans-Alay ridge is uniform, pubescent with 2-4 (1) -cell simple hairs of medium density (130-160 per 1 mm2) in combination with comparatively rare 3-4-cell club-shaped glandular hairs. In *G. capituliflora, G. dschungarica* and *G. aulitetatensis* the calyx is naked, however the ridges of the teeth in the first are pubescent with 1-2-celled stalked-capitate glandular hairs, in *G.dshungarica* - with 1-3-celled finely capitate glandular hairs, in the others - with 1-3-celled club-shaped glandular hairs. Thus, as evidenced by the obtained data, the genus Acantophyllum has thin sepals with a more or less large-celled epidermis. According to the types of trichomes of the calyx, the plant species are divided into 3 groups: pubescent only with simple 1-ray 1- and multicellular of varying morphology, density and length; simple in combination with stalked-capitate glandular hairs in

various proportions, different length and morphology; mainly glandular (with some exceptions) of varying morphology and length. The first group includes species of the Oligosperma section, except for the plants *A. lilacinum* from Kopetdag and *A. pulchrum* - Dashti-Jum district of southern Tajikistan. The first species has sepals pubescent simple mixed with capitate glandular of medium density, the second - only rare glandular. The cups of A.pungens from the southern rocky slopes of the southwest of the Dzungarian Alatau (altitude 3400 m), *A.stenostegium* (sec. Oligosperma) from the vicinity of Iolatan, *A.kraschenninnikovii* (sec. Oligosperma) - from Tamdy in the Bukhara region and the right bank of the Amu Darya, as well as *A.serawschanicum* (sec. Macrostegia) - from the Zarafshan River basin (altitude 500 m) are pubescent with long 200-800 μm, 3-9-celled thin-walled simple, more or less intertwined hairs of medium density.

The second group includes *A. serawschanicum* (sec. Macrostegia) from the Zeravshan and Gusar ranges (altitude 2500 m), *A. lilacinum* (sec. Oligosperma) from the Central Kopetdag (altitude 1500 m), *A. glandulosum* (sec. Pleiosperma) from the top of Chapandag (1000-1700 m altitude), *A. korolkovii* (sec. Macrostegia) from the vicinity of Repetek and also *A. jarmolenkii* from this section (sec. Macrostegia) from the top of Mount Ketmen-Chapty, in which the calyxes are pubescent with simple hairs in combination with glandular ones. Plants of these species differ from each other in morphology, length, density, and also the ratio of hair types. The third group is formed by plants of *A. adenophorum* (sec. Oligosperma) from the mountains of Besarcha (Babatag), A. jarmolenkii (sec. Macrostegia) from Khodja-gur-gur-ata and Ketmen-Chapty (Gissar Range), A. sordidum (sec. Macrostegia) from Kopetdag, the calyxes of which are pubescent (with rare exceptions) mainly with large stalked-capitate glandular hairs. These species and their samples, taken from different places of their range, differ in size and degree of branching of trichomes. *A. albidum, A. aculeatum, A. brevibracteatum*, attributed by O.N. Bondarenko (1971) [9] to the synonym A. pungens, A. leiostegium - to the synonym A. subglabrum, are well distinguished from each other by morphology, size, density of trichomes, number of simple hairs (210-215 versus 150), epidermal cells of the outer side of the calyx (1000-1080 versus 900 per 1 mm2), although these features are often ecological. The following pattern in the ptosis of the calyx of the genus Acanthophyllum and Kughitange should be noted in species distributed in the south of Central Asia (Kopetdag, Bol'shiye Balkhan, Badkhyz, Surkhandarya, etc.) and the southern spur of the Pamir-Alay: glandular hairs make up the bulk or half of the trichomes. In the direction from south to north and north-east and east, a gradual replacement of glandular hairs with simple ones is observed, the density of which increases with increasing altitude above sea level.

The genera Allochrusa and Drypis are characterized by short, very thin and the thinnest sepals with small-celled epidermis (1300-1500 per 1 mm2) and a large number of stomata (150-250). However, the genus Allochrusa differs from the genus Drypis by the absence of glandular hairs on the surface and along the edges of the calyx teeth. The latter is similar to the genera Acantophyllum and Kyghitangia by the spiny teeth of the calyx and the presence of trichomes along the edges of the teeth. The species of the genera Allochrusa and Drypis are characterized by exclusively small-celled outer and inner epidermis of the sepals (1300-1500 per 1 mm2) and a large number of stomata of the outer epidermis (150-250 per 1 mm2). The two species of the genus Allochrusa (A. panicula, A. gypsophiloides) studied are extremely similar in most sepal features, which confirms their genetic relationship; however, the second species differs from the first by the absence of ptosis. In species of sec. Turbinaria, Pleiosperma and Macrostegia, the sepals are pubescent from moderately dense to exceptionally dense with simple and glandular hairs, in Oligosperma - only with simple hairs, with the exception of A. lilacium and A. pulchrum, which are also pubescent with both types of hairs. Sec. Oligosperma differs from the other three sections of the genus by the absence of glandular hairs on the sepals. The presence of these hairs brings together representatives of the sections Turbinaria,

Pleiosperma and Macrostegia. The species *A. lilacium, A. adenophorum, A. brevibracteatum* and *A. acealutum* differ from other species of the section Oligosperma by the densest pubescence (200-230 per 1 mm2), *A. elatius, A. borsczowii* - by sparse (50, 38 per 1 mm2) pubescence of the sepals with simple hairs. In other species, the pubescence ranges from medium to dense (100-160), in *A. glandulosum* from the section Pleiosperma - dense (150 per 1 mm2; cm). It should be noted that *A. microcephalum* from the section Turbinaria, considered by O.N. Bondarenko (1971) as a synonym of *A. mucronatum*, has a great similarity with *A. coloratum* from the section. Macrostegia, than with the first, extremely dense pubescence of both simple (430 per 1 mmg) and glandular (380, 330 respectively) hairs. However, *A. colorotum* differs noticeably from the first species by the presence of branched glandular hairs.

4. Conclusion

According to our data, such controversial species as *A. albidum, A. aculeatum, A. brevibracteatum, A. pungens. A. leiostegium, A. subglabrum* differ well from each other in morphology, size and frequency of trichomes, the number of epidermal cells on the outer side of the calyx, although these features are more adaptive than diagnostic.

In species common in the south of mountainous Turkmenistan, Surkhandarya (Uzbekistan) and the southwestern spur of the Pamir-Alay, glandular trichomes predominate over simple ones; in the direction from the south to the northeast, glandular ones are gradually replaced by simple ones, the number of the latter increases with increasing altitude above sea level.

REFERENCES

[1] Y. A. Zlobin, *Population Ecology of Plants: Current State, Growth Points*, Sumy: University Book, 2009, 263 p., ISBN: 978-966-680-456-6.

[2] T. A. Madumarov and A. S. Dariev, "On the systematic position of two species of the genus Kughitangia Ovcz.," *Rep. Acad. Sci. Repub. Uzbekistan*, no. 10, pp. 50–52, 1991.

[3] T. A. Madumarov, *Morphological and Anatomical Structure of Representatives of Saponin-bearing Genera of the Family Caryophyllaceae Juss: Abstract of the Dissertation of the Candidate of Biological Sciences*, Tashkent, 2005, 18 p.

[4] S. F. Zakharevich, "On the method of describing the epidermis of a leaf," *Bull. LSU. Ser. Biol.*, no. 4, pp. 12–16, 1954.

[5] D. A. Trankovsky, *Practicum on Plant Anatomy*, Moscow: Vysshaya Shkola Publ., 1979, 221 p.

[6] B. K. Shishkin, "Thornberry Acanthophyllum C.A. Mey.," in *Flora of the USSR*, vol. 6, M. Tsok-tsok., 1936, pp. 780–801.

[7] T. A. Madumarov, "Life forms of Acanthophyllum C.A. Mey.," *Bull. Moscow State Univ.*, no. 9, pp. 110–119, 2003.

[8] M. Musayeva and K. Z. Zakirov, *Materials of Classification of Boilers with Acanthophyllum*, Tashkent: Fan Publ., 1987, p. 84.

[9] O. N. Bondarenko, *Acanthophyllum C.A. Mey. - Thornberry. Asiatic and Plant Determinant*, vol. 2, Tashkent: Fan Publ., 1971, p. 294.