tschuktschorum (Regel) Ikonn., *Fimbripetalum radians* (L.) Ikonn., *Honckenya oblongifolia* Torr. et Gray, *Minuartia arctica* (Stev. ex Ser.) Graebn., *Minuartia macrocarpa* (Pursh) Ostenf., *Minuartia biflora* (L.) Schinz et Thell., *Minuartia verna* (L.) Hiern, *Minuartia stricta* (Sw.) Hiern, *Minuartia sibirica* (Regel et Til.) N.S. Pavlova, *Moehringia lateriflora* (L.) Fenzl, *Pseudostellaria sylvatica* (Maxim.) Pax, *Pseudostellaria rigida* (Kom.) Pax, *Stellaria bungeana* Fenzl, *Stellaria graminea* L., *Stellaria media* (L.) Vill., *Stellaria eschscholtziana* Fenzl, *Stellaria fischeriana* Ser., *Stellaria ruscifolia* Pall. ex Schlecht., *Stellaria discolor* Turcz., *Stellaria humifusa* Rottb., *Stellaria cherleriae* (Fisch. ex Ser.) F. Williams, *Stellaria longifolia* Muehl. ex Willd., *Stellaria uliginosa* Murr., *Stellaria calycantha* (Ledeb.) Bong., *Stellaria filicaulis Makino* and *Stellaria dichotoma* L.

In the subfamily *Caryophylloideae,* ecdysteroids have not been revealed in the species of the tribe *Diantheae* Pax: *Dianthus chinensis* L., *Dianthus repens* Willd., *Dianthus barbatus* L., *Dianthus superbus* L., *Gypsophila pacifica* Kom., *Gypsophila violacea* (Ledeb.) Fenzl, *Gypsophila patrinii* Ser., *Gypsophila davurica* Turcz. ex Fenzl, *Psammophiliella muralis* (L.) Ikonn. As well as in the species of the tribe *Lychnideae* A. Br.: *Oberna behen* (L.) Ikonn., *Saponaria officinalis* L., *Melandrium album* (Mill.) Garcke, *Melandrium olgae* Maxim., *Melandrium apricum* (Turcz. ex Fisch. et Mey.) Rohrb., *Agrostemma githago* L., *Lychnis ajanensis* (Regel et Til.) Regel and *Silene acaulis* (L.) Jacq.

Screening the plants growing in the East Asian have confirmed the data on the absence of ecdysteroids in the species of *Arenaria, Cerastium, Gypsophila, Honckenia, Minuartia, Scleranthus, Spergularia, Agrostemma* published previously by other researchers.[11-13,15]

In a number of genera ecdysteroid-negative as well as ecdysteroid-positive species. Ecdysteroids are detected in *Dianthus deltoides* and *Saponaria bellidifolia*,[13] but no ecdysteroids have been found in the East Asian representatives of *Dianthus* and *Saponaria*, which shows their patchy distribution within the genus.

We have not detected any ecdysteroids in *O. behen*, which confirms some other researchers' data[11,12] on the lack of ecdysteroids in this species; nevertheless, ecdysteroids have been revealed in the individuals of this species growing in the European part of the Russian Federation.[22]

Ecdysteroid-containing species have been detected in the subfamilies *Alsinoideae* and *Caryophylloideae*. However, among 34 studied species of 9 genera of the tribe *Alsineae* of the subfamily *Alsinoideae*, there is only one ecdysteroid-containing representative-*Sagina maxima* A. Gray. Ecdysteroids 1, 3, and 4 have not been found [Table 2].

Ecdysteroids have been detected in 10 species of the genera *Lychnis, Silene* and *Melandrium* of the tribe *Lychnideae*, the subfamily *Caryophylloideae* [Table 2].

Lychnis is represented with five species in the Russian Far East. We analyzed all five species of which four species have turned out to be ecdysteroid-containing ones: *Lychnis wilfordii* (Regel) Maxim., *Lychnis cognata* Maxim., *Lychnis fulgens* Fisch. ex Curt. and *Lychnis sibirica* L. In *Lychnis ajanensis* (Regel et Til.) Regel ecdysteroids have not been revealed. This species was described as *Melandrium biflorum β. ajanense* Regel et Til.[23] Later Regel and Tiling raised taxon to the species.[24] V. N. Voroshilov transferred *L. ajanensis* to *Silene* genus (*Silene ajanensis* (Regel et Tiling) Worosh).[25]

In all four species the predominant compound is 2.

It is the 1st time that 1 has been found in *L. cognata* and *L. fulgens,* 3 in *L. cognata,* 4 in *L. fulgens*.

Table 1: Chromatographic (HPLC) and spectral (UV, MS) characteristics of ecdysteroids 1-4

Compounds	Rt (min)*	λ_{max}, nm (lg ε)	Ion, m/z (relative intensity, %)*
1	10.07	246 (4.09)	$[M+H]^+$, 497.3064 (4.5); $[M+H-H_2O]^+$, 479.2936 (22); $[M+H-2H_2O]^+$, 461.2841 (100); $[M+H-3H_2O]^+$, 443.2774 (31); $[M+H-4H_2O]^+$, 425.2676 (4); $[M+H-5H_2O]^+$, 407.2499 (0.5); $[M+H-C_4H_{10}O-2H_2O]^+$, 387.2130 (21); $[M+H-C_6H_{14}O_2]^+$, 379.2118 (2.5); [M+H-C4H10O-3H2O]$^+$, 369.1982 (0.9); $[M+H-C_6H_{14}O_3]^+$, 363.2136 (9.5); $[M+H-C_6H_{14}O_3-H_2O]^+$, 345.2010 (5); $[M+H-C_6H_{14}O_3-2H_2O]^+$, 327.1915 (1.8); $[M+H-C_8H_{16}O_3-H_2O]^+$, 319.1881 (17); $[M+H-C_8H_{18}O_3-H_2O]^+$, 317.1706 (1.5)
2	10.92	246 (4.23)	$[M+H]^+$, 481.3091 (74); $[M+H-H_2O]^+$, 463.2995 (32); $[M+H-2H_2O]^+$, 445.2909 (100); $[M+H-3H_2O]^+$, 427.2823 (31); $[M+H-4H_2O]^+$, 409.2713 (4); $[M+H-5H_2O]^+$, 391.2564 (1); [M+H-C4H10O-2H2O]$^+$, 371.2187 (15); $[M+H-C_6H_{14}O_3]^+$, 347.2185 (19.5); $[M+H-C_6H_{14}O_3-H_2O]^+$, 329.208 (6); $[M+H-C_8H_{16}O_3-H_2O]^+$, 303.1942 (10); $[M+H-C_8H_{18}O_3-H_2O]^+$, 301.1794 (2)
3	12.04	246 (4.12)	$[M+H]^+$, 465.3154 (10); $[M+H-H_2O]^+$, 447.3049 (100); $[M+H-2H_2O]^+$, 429.2994 (60); $[M+H-3H_2O]^+$, 411.2887 (3.5); $[M+H-4H_2O]^+$, 393.2769 (0.1); $[M+H-C_6H_{14}O_3]^+$, 331.2239 (10.5)
4	12.42	246 (4.09)	$[M+H]^+$, 465.3146 (100); $[M+H-H_2O]^+$, 447.3049 (30.5); $[M+H-2H_2O]^+$, 429.2994 (80); $[M+H-3H_2O]^+$, 411.2887 (24); $[M+H-4H_2O]^+$, 393.2769 (2); $[M+H-C_4H_{10}O-2H_2O]^+$, 355.2231 (23); $[M+H-C_6H_{14}O_2]^+$, 347.2203 (2); $[M+H-C_6H_{14}O_3]^+$, 331.2237 (11.5); $[M+H-C_6H_{14}O_3]^+$, 329.2088 (2); $[M+H-C_6H_{14}O_3-H_2O]^+$, 313.2137 (5.5); $[M+H-C_8H_{16}O_3-H_2O]^+$, 287.1985 (12); $[M+H-C_8H_{18}O_3-H_2O]^+$, 285.1824 (2)

*UV signal. HPLC: High-performance liquid chromatography; UV: Ultraviolet

Table 2: Contents of integristerone A (1), 20-hydroxyecdysone (2), ecdysone (3) and 2-deoxy-20-hydroxyecdysone (4) in the *Caryophyllaceae* aerial parts

Subfamilies/ tribes/species	Contents (μg/mg dry weight) of ecdysteroids			
Alsinoideae/ Alsineae	1	2	3	4
//Sagina maxima	ND	1.03±0.05	ND	ND
Caryophylloideae/ Lychnideae				
//Lychnis wilfordii	0.12±0.01	1.52±0.07	ND	ND
//Lychnis cognata	0.011±0.001*	0.75±0.04	0.12±0.01*	ND
//Lychnis fulgens	0.011±0.001*	1.15±0.06	0.12±0.01	0.10±0.01*
//Lychnis sibirica	ND	0.30±0.01	ND	ND
//Silene repens	0.24±0.01*	0.84±0.02	ND	ND
//Silene foliosa	0.08±0.01*	3.85±0.24	ND	ND
//Silene stenophylla	0.50±0.02*	4.76±0.20	ND	0.50±0.02*
//Silene jenisseensis	0.012±0.001*	1.60±0.08	ND	0.17±0.01*
//Melandrium sachalinense	0.67±0.03*	2.30±0.10*	ND	ND
//M. firmum	ND	0.11±0.01*	ND	ND

ND: Not detected (<0.01). *Identified for the 1st time

The previous data[13,26] on the presence of 1, 2 in *L. wilfordii* and 2 in *Lychnis cognate* have been confirmed.

Earlier 2, 3 and polypodine B were identified in the Far Eastern *L. fulgens*.[27] The results of our research have also detected 2 and 3 in this taxon.

The genus *Silene* is represented with nine species in the Russian Far East. We have investigated five species, of which 4 have turned out to be ecdysteroid-containing: *Silene foliosa, Silene stenophylla, Silene jenisseensis* (the section *Chloranthae* (Rohrb.) Schischk.) and *Silene repens* (the section *Spergulifoliae)*. In *S. acaulis* (the section *Nanosilene* Otth.), ecdysteroids have not been detected, although there is some information on the presence of ecdysteroids in this species, in a number of papers.[12,13,28]

It is the 1st time that 1 has been revealed in *S. repens* Patrin, *S. foliosa* Maxim., *S. stenophylla* Ledeb. and *S. jenisseensis* Willd., maximum content of which reaches 0.49 μg/mg in the aerial part in *S. stenophylla* during its blooming period. In the aerial part of *S. stenophylla* and *S. jenisseensis,* 3 have been detected for the 1st time.

The predominant component in all the investigated East Asian species of the genus *Silene* is 2, its content in the aerial part if the investigated species varies from 0.83 μg/mg in *S. repens* to 4.7 μg/mg in *S. stenophylla.*

The genus *Melandrium* is represented with seven species in the Russian Far East. Five species have been analyzed, of which two species turned out to be ecdysteroid-containing. It is the 1st time that 2 has been found in *Melandrium firmum* (Siebold et Zucc.) Rohrb. and *M. sachalinense* (Fr. Schmidt) Schischk., in the latter 1 has been detected as well.

CONCLUSION

Ecdysteroid-containing species have been detected in two subfamilies of the *Caryophyllaceae*: *Paronychioideae* and *Caryophylloideae*. Most species containing ecdysteroids are representatives of the tribe *Lychnideae* of the subfamily *Caryophylloideae*. In the tribe *Diantheae* (the subfamily *Caryophylloideae*), no sources of ecdysteroids have been found. It can be asserted that ecdysteroid-containing taxa are confined to the tribe *Lychnideae*, however, the distribution of ecdysteroids in the genera of the tribe *Lychnideae* is patchy. Along with genera containing ecdysteroids there are ecdysteroid-negative taxa.

The analysis of ecdysteroid content in the species of *Silene, Lychnis* and *Melandrium* revealed that a genus may include species containing ecdysteroids as well as ones in which they have not been identified. In the genus *Silene,* ecdysteroids have been revealed in the species, which belong to the sections *Chloranthae* and *Spergulifoliae*. The plants of these sections are the ones in which finding of new ecdysteroid sources can be prognosed. Data on the quantity of ecdysteroids are available as for several species of *Caryophyllaceae* of particular interest. According to our results the ecdysteroid content is 4-5 μg/mg in aerial part of *Silene* species.

Most perspective sources of ecdysteroid are species of the *Silene*. Perspective sources of ecdysteroids are species from *Silene*.

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