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Research Article

Life Forms Of Some Species Of The Genus Acanthophyllum

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Annotation: This Article Is Devoted To The Study Of Life Forms Of Some Species Of The Genus Acanthophyllum, Their Analysis And Development Of The Concept Of Their Evolution. As Observations, As Well As Literature Data, Have Shown, Common Features For All Studied Taxa Are Confinement To Arid And Dry Places Of The Foothills, Middle Mountains, Less Often High Mountains And To Sandy Steppes, Extremely High Photophilous, Demanding For Good Aeration Of The Substrate, Lack Of Protective Kidney Scales; Some Of The Buds In Most Cases (Upper Nodes) Start To Grow, The Rest Overwinter, Most Of The Latter Remain Dormant Or Die.

All Representatives Of The Studied Taxa Are Characterized By Sizes Within 15-60 Cm With A Strong Degree Of Lignification - Sclerification Of Stems And Leaves And One Active Growth - Early Spring And Spring.

The Species Studied By Us, By The Type Of Branching And The Shape Of Plants, Species Of Sek. Turbinaria Is A Bushy Shrub; This Is Also Confirmed By The Normal Arboreal Type Of Structures Of The Conducting System (Especially Xylem) - The Stem And The Root.

Key Words: Species, Genus, Section, Taxon, Life Form, Thistles, Acanthophyllum, Turbinaria, Morphology, Anatomy, Evolution, Sclerification, Conducting System, Shrubs, Thorny Leaves, Bracts, Inflorescences, Flowers, Petals.

A Large Place In The Studies Of Ig Serebryakov [5,6,7,8], Who Has Devoted More Than 50 Years To The Study Of Life Forms Of Plants, Is Given To Their Analysis And Development Of The Concept Of Their Evolution. One Of The Ways To Solve This Problem, Ig Serebryakov Considered The Study Of Life Forms In Closely Related Species [8]. At The Same Time, The Most Complete And Widespread Coverage Of All Plant Traits Was Assumed, Which Can Be Used To Identify Morphogenetic Series Of Life Forms Within A Taxon And A More Reasoned Interpretation Of Them In Evolutionary Terms. In This Regard, It Is Of Certain Interest To Study The Morphology, As Well As The Anatomical Structure Of The Annual And Perennial Stem And Root Of Perennial Plants Of The Species Of The Studied Genera, Since The Information Obtained In This Case Can Be Used In Morpho- And Phylogenetic Constructions [4,9,10,12,13,14,17] And To Develop A Satisfactory System Of Studied Taxa.

To Judge The Ways Of Evolutionary Transformation Of Shoot Systems, It Is Very Important To Understand What Ancestral Life Form Served As The Basis For This. It Is Natural To Assume That It Had To Combine The Main Common Features Of All Directions Of Development. To Do This, It Is Necessary To Identify The Most Constant And Fundamentally Important For Genera Traits And Properties That Appear In All Studied Species, Regardless Of Later Specialization.

As Observations, As Well As Literature Data, Show, Such Common Features For All Studied Taxa Are Confinement To Arid And Dry Places Of The Foothills, Middle Mountains, Less Often High Mountains And Sandy Steppes, Extremely High Photophilous, Demanding For Good Aeration Of The Substrate, Lack Of Protective Kidney Scales; Some Of The Buds In Most Cases (Upper Nodes) Start To Grow, The Rest Overwinter, Most Of The Latter Remain Dormant Or Die.

All Representatives Of The Studied Taxa Are Characterized By Sizes Within 15-60 Cm With A Strong Degree Of Lignification - Sclerification Of Stems And Leaves And One Active Growth - Early Spring And Spring.

In The Anatomical Structure, The Species Kughitangia, Acanthophyllum Have In Common A Strong Sclerification Of The Conducting System Of The Leaf And Annual Stem, A Thin Furrowed Cuticle On The Surface Of The Epidermis, The Formation Of A Single-Row Phellogen Of A Ring Structure, A Weak Development Of The Crustal Parenchyma (1-3 Layers), A Strong Development Of Perivascular Fibers, Destruction And The Transformation Of This Tissue Into A Cork In The Future, An Obligatory Continuous Ring Of The Conductive System Of The Stem In The First Year Of The Growing Season.

Genus Acanthophyllum (Together With P. Kughitangia)

To Understand The Peculiarities Of The Evolution Of The Life Forms Of The Studied Taxa, It Is Also Very Important That Their Greatest Diversity Is Clearly Associated Not With Their Ancient Center Of Origin (Mediterranean Regions), But With The Secondary One - With Mountainous Turkmenistan, Since Of The 27 Studied Acanthophyllum Species (Together With P.Kughitangia) 14 Of Them Are Found In Mountainous Turkmenistan. Only The Monotypic Genus Drypis, Considered By Some Botanists [1,14,15,16,17] As A Possible Original Genus That Gave Rise To The Modern Genus Acanthophyllum, Is Widespread In The Mediterranean Countries (Italy, Greece, Yugoslavia). As D.Kh. Yukhananov Suggests [14,17], The Original Forms Of The Genus Acanthophyllum Were Associated With Arid Low-Mountain Regions Of The Ancient Mediterranean, In Particular, On The Territory Of Turkey, Iran, Etc. Following The Opinions Of These Authors, Mountainous Turkmenistan Can Be Considered As A Secondary Center Of Species Diversity Of The Genus Acanthophyllum. With Distance From Mountainous Turkmenistan, Their Spectrum Becomes More Or Less Impoverished. At The Same Time, Depending On The Prevailing Environmental Conditions In One Or Another Migration Direction, Only A Few Of Them Receive Progressive Development: A.Pulchrum, A.Aculeatum A.Serawschanicum, A.Jarmolehkii, A.Adenophorum, A.Brevibracteatum - In The Pamir-Alai, In Kyzylkum, Karakum - A. Bogsczowii, A.Elatius, A.Korolkovii, A.Stenostegium, A.Pungens, Etc., Although The Formation Of Forms In The Secondary Centers Of Species Diversity Introduces Certain Complications Into This General Trend.

All Of The Above Suggests That The Ancestral Forms Of The Genus Acanthophyllum Were Low-Mountain, Petrophilic Plants That Underwent A Long Autochthonous (In Central Asia) Evolution Under The Sign Of Adaptation To The Substrate.

Primary Xerophytism, Due To The Specificity Of These Habitats, Was Consolidated Both By A Gradual Cooling And An Increase In The Dryness Of The Climate, Which Began In The Mediterranean Region In The Miocene.

In The Place Of The Steppe, As Ee Gogina Writes [19], The Uplift Of The Alpine-Himalayan Mountain Belt That Took Place In The Second Half Of The Tertiary Period Significantly Increased The Possibilities For The Distribution Of Petrophilic Elsmeites Of Tree Flora, Which Was Originally Limited By The Coast Of Tethys.

If The Initial Stages Of The Evolution Of Life Forms Of Thistles Were Predominantly In The Nature Of Adaptation To The Substrate, Then The Further Transformation Of Their Original Hereditary Basis Was Undoubtedly Influenced By The General Climatic Differences Of The Territories Being Developed. So, In The Southern Part Of The Range Of Thistles (Mountainous Turkmenistan, Kashkadarya, Surkhandarya, Bukhara Regions), Forms Adapted To Tolerate Very High Temperatures, Strong Insolation And Dry Conditions Clearly Prevail, While The Southeastern, Eastern High-Mountainous (2500-3600 Meters) Species Pamir-¬Alaya, Tien Shan Represent A Cryo-Xerophilic Line Of Development. We Are Inclined To Assume That Conservatism And A Similar Ecological Type Have Narrowed The Possibilities Of Thistles In The Development Of Well-Watered Places, Characterized By A More Intense Level Of Competitive Relations.

Consideration Of The Main Life Forms Most Characteristic Of The Genera Under Study Should Start With Drypis Spinosa, Which In The Works Of Boissier [15] And Other Authors [14,15,16,17,18] Is Recognized As The Ancestor Of The Genus Acanthophyllum.

The Genus Drypis Is Monotypic, Consists Of One Species - D.Spinosa L., Represented By Two Subspecies:

1.Ssp.Spinosa Blink.Ex Wettst; 2.Ssp.Jacquiniana Blinker. Ex Wettst:

Drypis Is Distributed In Low And Middle Mountains In The Mediterranean Countries - Italy, Greece, Albania, Yugoslavia, Hungary. According To Domac [18], They Grow Well In Limestones.

D.Spinosa. The Botanical Description Of The Species Is Given According To R. Domac [18] With The Addition Of Digital Data From Our Own Study.

Genus Drypis - Perennial Grasses, With Thorny Leaves, Bracts, Almost Capitate Inflorescences, Small Flowers, Expanded Petals; Stamens - 5, Stigmas - 3, Capsule With 1 Seed.

D.Spinosa - Stems 6-30 Cm Long, Rigid, Branched, Glabrous, Tetrahedral; Leaves Are Acicular, Acicular, Grooved From Above (8-15 Mm In Length, 1-1.5 Mm In Width), Slightly Convex From Above; Inflorescences Are

Capitate, Dichasia, Calyx Is 5-Toothed, 5-7 Mm In Length, The Length Of The Denticles Is% Of The Length Of The Calyx. Petals 6-8 Mm In Length, Bluish Anthers; Capsule Ovate-Elliptic.

Distributed In Open Rocky Places In Southern Europe, Central Italy, Greece, Yugoslavia, Albania.

D.Spinosa Ssp.Spinosa Is Distributed In The Middle Mountains At An Altitude Of 800-2000 Meters Above Sea Level Subspecies Jacquiniana - In The Low Mountains (Up To 800 M Above Sea Level) In North-Eastern Italy, In Yugoslavia, Hungary. The Subspecies Jacquiniana Is Characterized By Smaller Bracts (8 Mm In Length Versus 10 Mm In Length, 3 Mm In Width In Ssp.Spinosa), Calyces (5 Mm In Length Versus 7 Mm), Petals (6 Mm In Length Versus 8 Mm In Ssp.Spinosa), The Presence Of A Pedunculate -Head Glandular Hairs On The Surface Of The Calyx (They Are Absent In Ssp.Spinosa), As Well As A Weakly Grooved Stem (Versus Deeply Grooved In Ssp.Spinosa), The Formation Of A Typical Phellogen And The Formation Of A Plug, The Absence Of Perivascular Fibers And The Presence Of Bast Fibers.

Bk Shishkin [2] Classifies Most Species Of P.Acanthophyllum As Semi-Shrubs, Ai Vvedensky [3], On Bondarenko [20] - To Perennials, Which In Itself Does Not Say Anything Concrete About Life Forms. Yu.Kh. Yukhananov [17] Believes That All Species Of Acanthophyllum Are Semi-Shrubs With A Cushion-Like, Less Often Bush-Like Growth Form Of 20-40 Cm In Height, Rarely More. D.Yu.Tursunov [22], M.Musaeva, K.Z.Zakirov [21] A.Elatius, A.Korolkovii Are Considered Perennial Hypoxic Grasses, And A.Borsczowii - Epixil Perennial Grasses And Shrubs. The Rest Of The Species Of The Genus Are Considered Semi-Shrubs.

As You Can See, Among Botanists-Researchers Of This Genus There Is No Consensus Regarding The Life Form Of Thistles. There Is Almost No Information On The Phylogenetic Relationships Of The Studied Taxa. Only Boissier [17] Indicates, As Noted, The Genus Drypis As A Possible Parent For The Genus Acanthophyllum.

In Our Opinion, Such An Approach Regarding The Evolution Of The Genus Without Taking Into Account The Morphology Of Branching, The Lifespan Of Skeletal Organs And The Anatomy Of The Stem And Root Is Erroneous, Because Half Of The Species Of The Genus Cannot Be A Relic Of The Primary, Since Among The Species Of Each Section There Are Both Relatively Primitive And Progressive. In This Regard, We Made An Attempt To Identify Signs That Characterize Both Life Forms And The Evolutionary Advancement Of Species, Based On The Data Of The Morphology And Anatomy Of The Aboveground And Underground Organs, Mainly One- And Perennial Stems, As Well As Geographic Distribution.

Most Researchers Of The Genus Do Not Provide Any Compelling Evidence In Favor Of Their Views Regarding This Or That Life Form To Which These Or Those Species Belong.

Trees, Shrubs And Shrubs Ig Serebryakov [8] Combines In One Department - Woody Plants, Which Emphasizes Their Genetic Affinity. Plants Of This Division Always Bear Lignified Perennial Skeletal Axes, Which Rise Considerably Above The Soil Level.

I.K. Pachosky [18] Suggested Taking Into Account Not Only The Height Of The Bud Position, According To Raunkuer (Raunkiaer, 1907), When Compiling An Ecological Characteristic, But Also The Length Of Stem Death. We Agree With I.G. Zoz (1956) That The Idea Of I.K. Pachosky Deserves High Praise. However, These Authors Are Mistaken In Assuming That Branches Do Not Die Off In Trees And Shrubs. The Dying Off Of Branches In A Number Of Northern Breeds Was Noted By I.G. Serebryakov [8]. The Dying Off Of The Tops Of Desert Trees And Shrubs Introduced In Central Asia Was Described By L.I. Shubin [17] And S.A. Nikitin [14,17]. Separate Examples Of The Increase In The Death Of Branches With The Age Of The Tree Were Given By V.O. Nazaryan [18]. The Dying Off Of Branches Is Of Great Biological Importance: It Is Accompanied By The Awakening Of Dormant Buds And Leads To The Rejuvenation Of The Plant. In The Woody Plants Of The Karakum And Kyzylkum Desert, The Mass Abscission Of Annual Shoots In The Summer And Especially Autumn Periods Attracts Attention. The Fall Of Shoots In The Desert, As In Other Geographical Areas, Is Mainly Associated With The Ripening Of Fruits [14,17]. Fruiting In Desert Plants Is Very Abundant, Therefore, The Abscission Of Generative Shoots Is Especially Large And Noticeable. In Addition, Here, Under The Influence Of Water Deficit, The Tops Of Vegetative Shoots Also Fall Off.

The Study Of This Process In Mesophytes Showed That The Intensive Laying Of Leaf Organs In The Bud Occurs After The Growth Of The Shoot Stops. This Suggests That The Small Number Of Members In The Bud Of Plants In The Arid Zone Is Associated With The Prolonged Growth Of Their Shoots, Which In Turn Is Due To The Powerful Development Of The Root System. In Some Species With A Less Developed Root System, Shoot Growth Stops At The Beginning Of Summer And Occurs Due To Their Water Deficit, Which Is Also Observed In The Genera Studied By Us.

As N.T. Nechaeva, V.K. Vasilevskaya And K.G. Antonov [4], The Growth Of Shoots Begins In Early Spring, Sometimes Even In Winter, And Almost The Entire Shoot, With The Exception Of The Lowest Very Shortened Internodes, Is Formed In The Process Of Open Growth. Because Of This, A Non-Specialized Generative Shoot Is Formed In All Karakum Woody And Semi-Woody Plants (Including The Objects Of Our Study Growing Here). Therefore, It Is Impossible To Use This Feature To Distinguish Large Units In The Ecological Classification Of Plants. The Development Of Poorly Specialized Inflorescences, As A Continuation Of The Vegetative Shoot, Is Of Great Adaptive Value.

Turbinaria Section

1. A. Mueronatum. Bushy Plant 45-B0 Cm In Height, Pubescent With Sparse Bristly Short Simple Hairs; Leaves 7-12 Mm Long, 1 Mm Wide; The Main Shoot - The "Stem" Rises 3-5 Cm Above The Soil Surface, The Stems Of The First Order Are Few (2-3), 3-4 Cm In Length, Strong Branching Begins From The Middle Of The Bush - From 3-5 Nodes On Top Of The Stems Of The Second Order; A Third, Sometimes Almost Half Of The Perennial (4-6-Year-Old) Stems Of The 1st Order Gradually Die Off, The Other Part Remains And Annually At 3-4 Nodes Of Them Lateral Shoots Of The 4th Order Are Formed, 10-12 Of 4-8 Cm In Length. In The Axils Of The Leaves Of The Upper 3-4 Nodes, Lateral Branches Are Formed In The Form Of A Bunch Of Green Leaves, Which In The Next Growing Year Turn Into Shoots Of The V Order In The Number Of 24-28; Most Annual Shoots Are 12-16 Cm Long, Consist Of 8-11 Nodes And End With Lateral (2-4 Nodes From Above) And Apical Inflorescences. The Lowest Flower Shoots Consist Of 2-3 Nodes With 2-3 Inflorescences (One Inflorescence At Each Node). Thus, The Upper Part Of The Stems With Inflorescences Has A Conical Shape. The Next Internodes From Node To Node Become Shorter And Shorter, And The Top Ends With An Inflorescence; Shorter 3-6 Mm In Length - Lateral Annual Shoots Without Inflorescences. Part Of The Shoots Of The 2nd Year Of Vegetation Remains Short (4-B Cm Height), Vegetative.

The Maternal Stem Of This Species Is 18-20 Years Old.

The Described Type Of Branching Creates A More Or Less Bushy Form; It Should Be Noted That Dead Branches Are Often Preserved.

Considering The Morphological Structure And Branching, The Continuous Circular Structure Of The Conducting System Of A One- And Perennial Stem, A Xylem With A Highly Developed Mechanical Tissue - Libriform, The Formation Of 1-2 Rows Of Phelloderm In A Perennial Stem, As Well As The Normal Structure Of The Conducting System Of A One- And Perennial Root With A Radial By The Location Of The Vessels, This Species Is Referred To As The Life Form Of Shrubs.

The Species Is Common In The Kopetdag On Rocky Slopes At An Altitude Of 1600-2000 (2500) M, In Northern Iran And Turkey.

2. A. Mierocephalum. The Structure Of The Bush, The Anatomical Structure Of Vegetative Organs Are The Same As In A. Mucronatum, But Differ From The Latter In Whitish Bare Stems Up To 40 Cm In Height, Leaves Are Larger -1-1.5 Cm In Length, 1 Mm In Width, Glabrous. It Should Be Noted That The Age Of The Main - The Maternal Stem, As Well As The Root In The Studied Plants Reaches 15-18 Years, The Second Order Shoots - 10-12 (15), The Third Order - 8-10, The Fourth Order - 4-6 And. V - 1-2 Years. In A.Microcephalum, As A Rule, The Shoots Of The Third And Higher Orders, Less Often Of The Second Order, Are Successively Replaced; The Life Span Of The Latter Is Almost Equal To That Of The Maternal Axis.

A Similar Phenomenon In Desert Shrubs Was Noted By E.P. Korovin (1958). On This Basis, A. Microcephalum Could Be Attributed To The Life Form Of Shrubs, But Their Height Is Less Than The Height Indicated By Is Serebryakov [8] For Plants Of This Life Form - Up To 80 Cm In Height. Therefore, This Species, Like A. Mucronatum, Should Be Included In The Life Form Of Mountain Dwarf Shrubs.

According To I.S. Serebryakov [8], Shrubs Have A Number Of Common Features With Shrubs: They Vegetate For A Long Time Like Most Shrubs And Differ From Them Only In Size - They Do Not Exceed A Height Of 15-50 Cm, Pass Into The Generative Phase At The 3-5th Year Of Life, Have A Well-Pronounced The Main Root, The Length Of The Annually Dying Part Of The Branches Is Not More, And Often Much Less Than The Length Of Numerous Branches.

Listed By I.S. Serebryakova Features Of Shrubs Are Possessed By Species Of Sek. Turbinaria - A. Mucronatum And A. Microcephalum.

3 A.Sordidum. At The Base, Strong Branching With Numerous Simple, Straw-Yellowish Branches 25-35 Cm In Height, Spherical, Although, According To B.K. Shishkin, The Height Does Not Exceed 15 Cm.

The Shape Of The Bush And The Branching Of This Species Differ Sharply From Those Of The Previous Species: On The Main (Maternal) Stem, The Root Of The Described Plant Is 8-10 Cm Long, About 1 Cm Wide,

Light Brown, Brown In Color. Shoots Of The 1st Order In The Number Of 3-4, 1.5-2.5 (3) Cm In Length, 0.4-0.5 Cm In Width, Extremely Close 4-5 Nodes, Also Brown In Color, Shoots Of The Ii Order In The Number Of 5- 6 Light Red, 2.5-3 Cm In Length, Close Knots, From The Upper Knots Of Which 2-3 Shoots Grow, Iii Order In The Number Of 20-25, Each 6-8 Cm In Length, With 6-9 Knots, Ash-Colored, From The Axils Of The Upper Nodes Of Which The Iv Order Shoots Grow About 12-15 Cm In Length, 1.5-2 Mm In Width, Including 70-80, Straw-Yellow With 10-15 Nodes, Each Of Which Ends By The End Of The Growing Season Development By Apical (Terminal) Or Two Lateral And One Apical Inflorescences.

The Structure Of The Conducting System Of One- And Perennial Stems Is Solid Annular, The Root Is Normal. Thus, The Anatomical Structure Of The Axial Organs Of This Species Is Similar To That Of A. Mucronatum.

Long-Term Observation And Anatomical Structure Have Shown That The Iv Order (Annual) Shoots Completely Die And Fall Off In The Next Growing Year Along With The Iii Order Shoots, And The Ii Order Die After 8-12 Years, The I Order - Together With The Plant After 12-15 Years.

Based On The Data Obtained By Us From The Study Of Morphology And Anatomy, This Species Should Be Attributed To The Life Form Of Cushion Half-Shrubs. The Three Species Considered Above Combine The Annular Structure Of The Conductive System Of The Stem, The Strong Development Of Wood Fibers, And The Absence Of Parenchyma In The Wood. The Last Two Signs, Apparently, Are Caused By Extreme Dryness And Strong Insolation In The Places Of Their Distribution (Mountainous Turkmenistan).

Descent Glandular In Combination With Sparse Short Simple Hairs, A Continuous Annular Structure Of The Conducting System Of One-Perennial Stems, The Formation Of Fella And Phelloderm, And The Normal Structure Of The Xylem And Phloem Of The Root Of A. Turbinaria.

Pleiosperma Section

4. A. Glandulosum. The Branching Type Is The Same As In A. Sordidum, But Differs In Shorter (4-5 Cm In Length) And More Numerous (75-85) Annual (Iv Order) Shoots. Hence - A Highly Branched, Low Up To 20-30 Cm In Height, Cushion (Hemispherical) Plant. The Stem, Leaves And Organs Of The Flower Are Pubescent, Like The Three Previous Species, With Pedunculate Glandular And Simple 1-3-Cell Hairs Of Various Sizes, Lengths, Density And Ratios Depending On The Place Of Geographical Distribution, Although B.K. Shishkin [2], D.Yu. Tursunov [22], M. Musaeva And K.Z. Zakirov [21] Note Prolapse Only With Glandular Hairs. Flowers In Terminal Multi-Flowered Capitate Inflorescences, That Is, Each Annual Shoot, Ends With Only One Large Apical Inflorescence 1.5-2.5 Cm In Diameter, Which Sharply Differs From The Three Previous Species. According To M. Musaeva And K.Z. Zakirov [21], Who Studied The Ontogenesis Of 10 Species Of The Genus Thistle At The Tashkent Experimental Site Of The Institute Of Botany Of The Academy Of Sciences Of The Republic Of Uzbekistan, Plants Of This Species Enter The Generative Phase In Culture In The 3rd Year Of Life.

Under Natural Conditions - In The Kopetdag, As Our Observation Shows, As Well As The Anatomical Structure Of The Stems, They Enter The Generative Phase In The 3-4th Year Of The Growing Season. It Seems To Us That This Difference In The Entry Into The Generative Phase Between Plants In Culture And Natural Conditions Is Due To Differences In Ecological Conditions.

The Plants Studied By Us From The Southern Slopes Of The Kopetdag Mountains (Near The City Of Ashgabat) At An Altitude Of 1400-1700 M Above Sea Level. M. Have A Few (2-4) Shoots Of The I Order Of 2-2.5 Cm In Length, With 4-5 Close Knots, A Dark Brown Tint, On Some Shoots Thin Needle-Like Leaves About 2 Cm In Length Are Well Preserved, Shoots Of The Ii Order Among 9-11, -6 Cm In Length, Consisting Of 3-4 Nodes With Preserved Leaves, Shoots Of The Iii Order Grow From The Leaf Axils 2-3 Nodes From Above, Including 25-30, The Length Of Which Is Within 5-7 Cm, With 5 -6 Nodes, Bright Yellow, The Shoots Of The Iv Order Are Laid In The Same Way As The Shoots Of The Iii Order, On The Last 3-5 Apical Nodes, Including 75-85 With 5-6 (7) Nodes, Yellow With More Or Less Green (Especially Apical) Leaves 3-4 (4.5-5) Cm Long. The Formation Of Shoots Of The Iv Order Shorter Than Shoots Of The Ii-Iii Orders, Apparently, Indicates An Acceleration Of The Aging Rate Of The Plant Of This Species, Which Is Also Confirmed By The Strong Shortening Of Internodes, As Well As The Absence Of Axillary Buds Touched In Growth.

In Many 8-10-Year-Old Plants, One Can Observe The Death Of Shoots Of The Iii-Iv Orders And The Emergence Of Annual Shoots From The Buds Laid On The Shoots Of The I Or Ii Orders.

The Study Of The Anatomical Structure Of The Latter Showed That They Are 8-10 Years Old. The Death Of The Bush Occurs In The 10-12th Year Of The Growing Season.

The Type Of Branching, Death Of The Upper Part Of Annual Shoots And Mass Death Together With Shoots Of The Third Order In The 2nd Year Of Their Vegetation, As Well As The Noted Signs Of The Anatomical Structure Of The Stem, Speak In Favor Of The Belonging Of This Species To Cushion Half-Shrubs.

5. A. Albidum. A Low Plant Of 25-35 Cm In Height Is Cushion-Shaped. Observation In Natural Conditions Of The Adyrs Of The Fergana Region (Mndon, Chimion) Showed That Plants Of This Species Grow On The Western Slopes Of The North-Western Side Of The Adyrs In Loose Rocky-Fine Earthy Places. Despite This, The Roots Occupy The Surface Layer No Deeper Than 14-18 Cm - An Adaptive Feature For The Use Of Precipitation, Since The Stony Loose Soil Does Not Retain Moisture - It Goes To The Bottom.

Plants Move To The Generative Phase In The 3rd, Less Often In The 4th Year Of The Growing Season.

Branching, As In The Last Two Species, Up To The 4th Order.

In Plants Of The 3rd Year Of Vegetation, Shoots Of The 1st Order Are Short, 3-4, 1-1.5 Cm In Length, With 2-4 Nodes, Leafless, Reddish-Brown Shade, On The Upper Nodes The Same Short Shoots Of The 2nd Order Are Laid In Number 10-12, 8-10 Cm In Length, But With Leaves, In The 4th Year Of Vegetation On The Upper Nodes Of The Shoots Of The Iii Order, Shoots Of The Iv Order Appear In The Number Of 60-70, The Length Of Which Does Not Exceed 6 Cm, More Often - About 5-5 , 5, With 7-9 Nodes, In The Axils Of The Leaves Of Which There Are Lateral Buds; Buds Of The Upper 3-4 Nodes Started To Grow And Consist Of 2-4 Small Leaves, The Lower Ones Hardly Start To Grow. At This Age, The Plant Has An Almost Bushy Shape. Branching, Like In The Last 2 Species, Reaches The 4th Order At The 4th-6th Year Of Life, And Then The Mass Death Of The Shoots Of The Iv Order Begins, Together With The Shoots Of The Iii Order. In The Next Growing Year, Annual Shoots Are Formed In The Nodes Of The Upper Half Of The Second Order Shoots, Which Also Die A Year Later Along With The Annual Ones. In Adyrs Mindon Found Stunted 10-Year-Old Plants With A Bunch (3-5) Of Short Shoots At The Top Of The Shoots Of The First Order. These Plants Die At 10-12 (13-14) Years Of Age.

In All Other Respects, The Morphological And Anatomical Structure Of This Plant Is Identical With That Of A. G1apdulosum, The Only Exception Is The Pubescence Of The Plant Organs, Consisting Only Of Simple Hairs.

6. A. Lilacinum. Plants From The Central Kopetdag (Sulukli) And Turkestan Ridge (Guralash Reserve) 15-20 Cm In Height, Cushion-Shaped. Branching Up To Iii Order.

The Study Of Numerous Herbarium Specimens Showed That The Plants Of This Species Are Juvenile Compared To The Previous Ones - The Life Expectancy Does Not Exceed 7-9 Years, The Main Stem Is A Stem-Root Of 3-5 Cm_ Length, Under The Soil A Slightly Purple Hue, The Stems Are Pubescent With Relatively Rare Simple And Ferruginous Capitate Hairs. The Leaf Organs Of The Flower Are Pubescent, As Noted, With Simple And Glandular Hairs Of Various Morphology, Density And Size, Depending On The Place Of Growth, Although In "Flora Of The Ussr" (T. B. 1936, P. 787) Pubescent With Short Rough Hairs Are Noted. The Lateral Branches Of The Ii Order Are Plagiotropic, Dark Brown In Color, The Lateral Branches Of The I Order Are 3 - 4, 1.5–2 (3) Long, 0.3–0.4 Cm Wide, Reddish In Color, With 3–5 Spacing , On The Upper Nodes Of The 1st Order, Shoots Of The Ii Order Are Laid In The Number Of 4-6, 8-12 Cm In Length, In The Axils Of The Leaves Of Almost All Nodes, Shoots Of The Iii Order Are Laid In The Number Of 50-60, B-10 Cm In Length, With 5-10 Nodes, Many Of Them End With One Large Apical Lilac Inflorescence. In These Shoots, 3-5 Upper Nodes Of The Buds In The Leaf Axils Started Growing In The Form Of A Bunch Of Green Small Leaves About 0.5 Cm In Length. However, 1/4 - 1/5 Of The Annual Shoots Are Poorly Developed, 3-5 Cm In Length With 5-8 Nodes, Remain In The Vegetative Phase And, Without Entering The Generative Phase, Die The Next Growing Year.

Otherwise, The Structure Of The Conducting System Is One - And The Perennial Stem Is The Same As In The Previous Species.

The Above Signs Of Branching, Morphology And Anatomy Make It Possible To Classify This Species As Juvenile (8-9) Cushion-Like Plagiotropic Semi-Shrubs With More Or Less Orthotropic Annual Shoots.

Small Growth And Trellis Growth Are Due To Low Temperatures, Strong Insolation And Drought, Which Intensifies Towards The South-West Of The Turkestan Ridge, Where This Species Lives At An Altitude Of 3000-3400 M Above Sea Level. And In The Kopetdag - The Driest Mountain Range In Central Asia.

7. A. Schugnanieum. The Height Of Plants From The Western Slope Of The Shunan Ridge At 3400 M In Height (Valley Of The Pyanj River) And Their Shoots, As Well As The Nature Of Branching Are The Same As In A. Lilacinum, Differ Only In The Formation Of Shoots Of The Iv Order, With Single Apical, Smaller, About 1.1 Cm In Diameter With Pale Pink Inflorescences. According To Bk Shishkin [2], The Plants Are Covered With Rough Hairs, And According To Our Data, The Calyx Is Covered With Thick Simple Bristly Hairs, The Leaves Are Sparse Capitate Glandular.

The Axillary Buds Of The Iv Order Shoots, In Contrast To A. Lilacinum, Do Not Start Growing At All, While In The Apical Nodes Of The Iii Order Shoots, On The Contrary, The Buds Started To Grow, They Will Replace The Iv Order Shoots After Their Mass Death In The Next Growing Year Than Slightly Different From A. Liiacipum.

In All Other Respects, The Structure Of The Conducting System Is Similar To That Of A. Glandulosum, Except For The Pubescence Of The Stem Only With Simple Hairs And The Preservation Of A More Or Less Wide Pith.

Thus, The Above Signs Of The Morphological And Anatomical Structure Confirm That This Species Belongs To The Life Form Of Cushion Half-Shrubs.

The Species Is Distributed On The Western Rocky Slopes Of The Shugnan Ridge At An Altitude Of 3000-3400 M Above Sea Level In Xeric Mountain Conditions With Veined Insolation And Low Temperatures, Which Contributed To The Formation Of A Low-Growing Trellis Cushion-Shaped Bush With A Compact Arrangement Of Annual Shoots.

8. A. Rungens. It Is A Very Polymorphic Species, In Culture It Passes To The Generative Phase In The 1st Year Of Vegetation [18], According To Our Observations In Natural Conditions It Blooms In The 3-4th Year. Bush Shape - From Bushy To Globular, 22-35 Cm In Height. In 12-Year-Old Plants From The Northern Slopes Of The Kavak-Tau Ridge Of The Central Tien Shan At An Altitude Of 1000 M Above Sea Level. Soil Mixed With Sand, 1-1.5 Cm Wide, With Transverse Wrinkles, The Lower Part Of The Root Branches Into 3-4 Roots With Lateral Horizontal Branches. Branching Up To The 4th Order, Lateral Branches Of The 1st Order In Number 3-4, 2-2.5 Cm In Length, 0.4 -0.7 Cm In Width, With 3-4 Shortened Internodes, Brown-Red Shade; Shoots Of The Ii Order Are Few, 6-9, 4-5 Cm In Length, With 3-4 Nodes, Shoots Of The Iii Order Are Laid On The Upper Nodes Of The Shoots Of The Ii Order, Including 15-20, Long -14-17 Cm, With 10-12 Nodes , On Which Shoots Of Order 1v Are Formed Along The Entire Length With Different Distances, The Lowest Of Them Are Long, The Shoots Of The Middle Part Are About 10-12 Cm In Length, The Upper Ones Are More Numerous, Short, 6-9 Cm In Length. Therefore, The Shoots Of The Iii-Iv Orders, Which Form The Shape Of The Bush, Differ Little In Height, And Therefore The Type Of Plant Has A Hemispherical (Cushion) Shape. In This Plant, Part Of The Iii Order Shoots Died And Fell Off (Together With The Iv Order Shoots).

Plants From The Vicinity Of Ak-Kul, As Well As From The Southern Slope Of Kara-Tau (Western Tien Shan), Are Taller (30-35 Cm) And More Or Less Bushy. The Branching Pattern Is The Same As That Of Plants From The Central Tien Shan With A Higher (Up To 35 Cm) Growth And Cushion Shape, But Differs From Them In More Or Less Long Shoots And The Last Order, And Therefore A Bushy Form Is Formed. In Addition, All Shoots Of Iii-Iv Orders Are Thin, Axillary Buds Do Not Start Growing, While In Plants From The Central Tien Shan, Buds Of 3-6 Nodes From Above Start Growing. These Buds Die In The 2nd Year Of The Growing Season. The Average Leaves Are Longer Than Those Of Plants From The Central Tien Shan (3.8-4 Cm Versus 2-3 Cm In The Former).

Taking Into Account The Death Of The Tops Of Annual (Iv Order) Shoots And Their Mass Death In The 2nd Year Of The Growing Season, This Species Is Attributed To The Life Form Of Cushion Semi-Shrubs. However, Plants From The Vicinity Of Akkul And The Southern Slopes Of Karatau (Western Tien Shan) In Terms Of Height, Bush-Like Shape And The Absence Of An Internal Conducting System Can Be Considered A Less Advanced And Basic Species, While Plants From The Central Tien Shan Are Of Lower Growth And The Formation Of An Internal Conducting System - More Advanced And A Subspecies Of The Main Species - Acanthophyllum Pungens Ssp.Karatavicum - Ssp.Nov.

9.A. Subglabrum. The Plant Is 20-25 Cm Tall, Weakly Cushion-Shaped. Stem-Root 4 Cm In Length, Up To 1.2 Cm In Width, Shoots Of The I Order In Number 3-4, 2-3 Cm In Length, With 3-4 Nodes, Shoots Of The Ii Order In Number 4-5, 8-10 Cm In Length, 2-3 Mm Wide, With 9-10 Nodes, The Lower Part Of The Shoots Is Thicker Than The Upper Ones, Shoots Of The 111th Order In Number 20-25, 6-11 Cm In Length, The Shoots Of The Iv Order Are Numerous (70-80), Each Of Them Ends With An Apical Inflorescence.

The Study Of The Morphology And Anatomical Structure Of The Stem Of Numerous Herbarium Specimens From The Herbarium Of The Botanical Institute Of The Academy Of Sciences, As Well As Observation In Kashkadarya Showed That Among The Shoots Of Iii-Iv Orders, As In The Previous Last 6 Species, There Are No Stems Older Than 2 Years; Of These Orders In The 3rd Year Of Their Growing Season Die And Fall Off, New Shoots Are Laid Again And Grow From The Axillary Buds Of Shoots I - 11 Orders. The Leaves Are Pubescent

With Short 1-3-Cell Bristly Simple Hairs, The Calyxes Are Covered With Long Multicellular Thick-Walled Simple Hairs, The Anatomical Structure Of Perennial Stems Is Similar To That Of A.Pungens Plants From The Western Tien Shan.

The Species Undoubtedly Belongs To The Life Form Of Dwarf Shrubs.

Distributed On Fine Earth-Gravelly, Gravelly Slopes In The Foothills And In The Lower Belt Of The Kopetdag Mountains, South-Western Pamir-Alai, Western Tien Shan, As Well As In Southern Kyzyl Kum.

Thus, The Species Studied By Us, By The Type Of Branching And The Shape Of Plants, Species Of Sek. Turbinaria Is A Bushy Shrub; This Is Also Confirmed By The Normal Arboreal Type Of Structures Of The Conducting System (Especially Xylem) - The Stem And The Root.

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