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медицине и науках о Земле:  
теоретические и прикладные аспекты**

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**AMARANTHACEAE FAMILY SOME OF PLANTS BOTANIST CLASSIFICATION:  
HALOTHAMNUS SUBAPHYLLUS, HALOXYLON APHYLLUM, CERATOIDES  
EWERSMANNIANA AND KOCHIA PROSTRATA**

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**Abstract.** This in the article Amaranthaceae to the family belonging desert – steppe flora four important representative *Halothamnus subaphyllus*, *Haloxylon aphyllum*, *Ceratoides ewersmanniana* and *Kochia prostrata* ( current) in the classification wide widespread name *Bassia prostrata* (botanical) classification, morphological signs, ecological adaptations, reproduction biology and practical importance in terms of scientific-analytical in a way is illuminated . The last phylogenetic research and APG IV system based on before separately family as considered Chenopodiaceae Amaranthaceae in the composition interpretation Amaranthaceae sl) this in the group terminology and in naming of changes main source that is displayed.

**Key words:** Amaranthaceae sl, Chenopodiaceae, APG IV, taxonomy, nomenclature, C4 photosynthesis, xerophyte, halophyte , saxaul, salinity, sand reinforcement.

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**Amaranthaceae sl and the “migration” of the name Chenopodiaceae**

Plants in systematics molecular phylogeny wide application as a result one a number of “traditional” families again seeing. The APG IV system (2016) phylogenetically classifies angiosperms (flowering plants) evidence based on in order even now the most many used from standards one is, then Chenopodiaceae many representatives Amaranthaceae in the composition, that is **Amaranthaceae sl** within interpretation will be done .

This is a change . theoretical in terms of this means : many desert and salt shaker "Shore" Marr "type of flora plants ( Salsoloideae , Camphorosmoideae and others ) now one large family concept inside is considered. With this together, practical floristic and geobotanical. The term "Chenopodiaceae" is still used in the literature meeting natural : nomenclatural changes scientific in the community one instantly , all in languages and all in the manuals one kind at speed absorbed It won't go away .

Why exactly? these 4 types were chosen?

Selected types Central Asia and to him/her ignition of the regions desert – steppe "base" functionality in ecosystems groups represents .

*Halothamnus subaphyllus* — Halophyte-xerophyte half bush, seed yield and fodder value with separates .

*Haloxylon aphyllum* — “black” saxaul "name" with famous to be, the ecosystem formation (phytogenic field) and the sand in strengthening important .

*Ceratoides ewersmanniana* — “teresque (en)” type desert bushes in the block taxonomic complications with interesting model.

*Kochia prostrata* (*Bassia prostrata* ) — meadow degradation in recovery wide used , C4 type many annual half bush

The following mermaid timeline is APG systems through family in the concept change simplifying shows .

1990 Chenopodiaceae in traditional floristic schools family as wide used. 2000 Molecular phylogeny of Chenopodiaceae and Amaranthaceae closeness strong shows [1]. In 2015, the global taxonomic Chenopodiaceae family in bases **Amaranthaceae sensu lato ( sl )** to the composition input approach wide spread out started [2]. 2016 APG IV Chenopodiaceae multiple p in cases Amaranthaceae sl in the composition is interpreted. Chenopodiaceae → Amaranthaceae sl interpretation (short) chronology.

Table 1

**Halothamnus subaphyllus, Haloxylon aphyllum, Ceratoides ewersmanniana and Kochia (Bassia) prostrata types taxonomic classification**

| <b>Taxonomic degree</b>                  | <i>Halothamnus subaphyllus</i> | <i>Haloxylon aphyllum</i> | <i>Ceratoides ewersmanniana</i>      | <i>Kochia prostrate</i>                            |
|------------------------------------------|--------------------------------|---------------------------|--------------------------------------|----------------------------------------------------|
| Biological classification level (Regnum) | Plants                         | Plants                    | Plants                               | Plants                                             |
| Division (Divisio)                       | Magnoliophyta (Angiospermae)   | Magnoliophyta             | Magnoliophyta                        | Magnoliophyta                                      |
| Class (Classis)                          | Magnoliopsida                  | Magnoliopsida             | Magnoliopsida                        | Magnoliopsida                                      |
| Order (Ordo)                             | Caryophyllales                 | Caryophyllales            | Caryophyllales                       | Caryophyllales                                     |
| Family (Familia)                         | Amaranthaceae                  | Amaranthaceae             | Amaranthaceae                        | Amaranthaceae                                      |
| Tribe (Tribus)                           | Camphoraceae                   | Salsoleae                 | Camphoraceae                         | Camphoraceae                                       |
| Genus                                    | Halothamnus                    | Haloxylon                 | Krascheninnikovia (syn . Ceratoides) | Bassia (syn . Kochia)                              |
| Species                                  | <i>Halothamnus subaphyllus</i> | <i>Haloxylon aphyllum</i> | <i>Ceratoides ewersmanniana</i>      | <i>Bassia prostrata</i><br><i>Kochia prostrate</i> |

Types according to analysis

**Halothamnus subaphyllus**

**Classification and nomenclature.** Based on Kew/WCVP in modern global databases **Halothamnus subaphyllus** as an independent species acceptance is done; its natural area Iran – Central Asia – North Afghanistan in the direction of is displayed.

**Morphology:** This species is usually half bush or bush desert The level of “defoliation” in the zones increase possible : lower leaves relatively developed, up As the leaves rise , strong shrinks ; generative in parts winged fruit formation Salsoleae to the group typical diagnostic from signs is considered . Halothamnus of the sex fruity perianth 5 wings , wing under and hardened " tube " product to be and at the bottom like pits ( hollows ) characters gender in diagnostics is used .

**Anatomy and photosynthesis.** Desert in the conditions from adaptations one for C4 photosynthesis is a transition . Rudov and co-authors composed Southwest Asian C4 plants on the list *Halothamnus subaphyllus* salsoloid typical structure with C4 (NADP-ME) as is given in [6].

**Distribution:** Natural ecological under the circumstances learned species range at work Central Asia desert zone various blocks cover especially the Aral - Caspian lowland , Western Balkhash , Karakum and Kyzylkum such as in the regions sandy , muddy and gravel , often salt shaker or plastered on substrates meeting is emphasized .

**Ecology and adaptations.** This species is classified as a “ halophyte-xerophyte ”. described : salinity and to drought endurance together manifestation Under climate stress far vegetation period provision from factors one strong root system : provided in the data roots soil to the profile up to 3–6 m depending on deepening possibility record is being done .

**Reproduction Biology.** Introduction under the circumstances held in research of flowering often late May - June in the middle beginning , oneself fertilization feature and to age related seed productivity sharp increase shows : average 15.5 g/ bush in the 1st year around , and in the 2–3rd years average 236 g/ bush and per hectare hundreds kilogram seed potential record done .

**Practical importance.** Source *Halothamnus subaphyllus* sheep , goat , camel such as to the livestock good feed to be , protein amount height such as aspects is emphasized ; also , pastures reclamation to do and sandy fields in stabilization promising that record is being done .

**Protection Status:** According to IUCN open global assessment is article within primary page as not confirmed; practical wide range with area and introduction for promising fodder bush as seen , but local in landscapes pasture pressure and salinity dynamics population to the structure impact to do possible .

**Research spaces.** Central Asia various ecotypes (sandy vs. brackish vs. gypsum ) soils phenology , pollination and of seed dormancy strategies systematic comparison enough not ; also , genetic diversity and population structure according to open information limited .

### **Haloxylon aphyllum**

**Classification and nomenclature:** “ *Haloxylon aphyllum* ” problem . Central Asia in floristry *Haloxylon aphyllum* or “ black ” saxaul “ often ” as a separate species However , Kew / POWO data according to *Haloxylon aphyllum* often *Haloxylon ammodendron* synonym as is shown [5]. With this together , some modern authors this merge “ complete ” clear “not” and additional research also emphasizes the need .

Practical in the article simplicity For this we use “ *Haloxylon* ” *aphyllum* ” pasture and forest - reclamation in practice used as an indicator type analysis we do , but taxonomic In terms of *Haloxylon ammodendron* complex within visibility probability high that it is open record we will .

**Morphology.** “Black saxaul “tree-like” bush , bark dark gray , body thick and strong branched ; by seed growth , reaching 4–6 m at 5–6 years of age such as descriptions China from the flora taken in the description *Haloxylon* in the group up to 1–9 m height , body diameter , branching and of leaves extremely contraction (short , conical) leaves) diagnostic characters is shown [8].

**Anatomy and photosynthesis.** Desert to the conditions adaptations in the center of the “ leaves ” decrease and assimilation function green to the branches “ migration ” stands for : BioWeb of Conferences article black saxaul C4 photosynthesis type affiliation It is emphasized [8] that C4 from water use efficiency high that with Rudov and co-authors on the list and *Haloxylon ammodendron* C4 salsoloid as an anatomical type shown [6].

**Distribution:** According to Kew /POWO *Haloxylon ammodendron* natural spread Iran , Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Mongolia and China one row territories cover “*Haloxylonaphyllum*” complex inside Central Asia deserts with related without wide to the language is obtained [5].

**Ecology: ecosystem forming type.** Black saxaul natural to live places as sandy of the hills low places , old river bald , bald and bald soils , earth under waters relatively close to be in the areas encounter possible . Shamsutdinov ZS 2016 and others on the side ecological in research Karnabcho' l in the desert black saxaul's “ phytogenic ” within the “area” light , air and soil humidity , temperature , humus and salts of the regime noticeable change showed [9]. this situation *Haloxylon* geobotanical in terms of edificator role strengthens .

**Reproduction biology.** Black saxaul vegetation end of March April at the beginning beginning, flowering generative branches development with together Duration , flowering 10–20 days around continue It takes 2–4 years to reach maturity and fruiting . entrance such as evidence introduction in their experiences record done .

**Practical importance of** the pasture protection doer ecstasy as black saxaul when planted , the neighbor natural up to 100 m in pastures in the distance fodder 20–30% increase in productivity , export inside and small herbs yield 2–3 times increase shown . With this together, Haloxylon plantations far within the period soil properties improve , biological soil shell to the formation help to give such as the results are also desert forest reclamation in experience record done .

**Protection status.** Primary IUCN page with directly confirmation this at work technician restrictions because of done did not exceed . Available secondary The species is " missing " in resources to leave as a " low risk " species display occurs , but scientific affairs some in the regions population renewal , fertilization and anthropogenic pressure issues sharp problem as record [4].

#### **Ceratoides ewersmanniana**

**In naming The main issue.** “ *Ceratoides ewersmanniana* ” term classic floristic in literature meeting possible , but based on Kew/POWO *Ceratoides ewersmanniana* name other taxonomic views within synonymized situation as to the language is taken ; that with together , " alternative" in taxonomy *Krascheninnikovia ewersmanniana* name acceptance done There are cases . The most important modern conclusion that is Heklau and Roeser morphological , morphometric and ITS-based phylogenetic analyses as a result *Krascheninnikovia* within previously as a separate species illustrated many “ Eurasia "types" one wide species *Krascheninnikovia ceratoides* inside strong variability as to see offer [11]. This list includes *Krascheninnikovia ewersmanniana* there is also Hence, “ *Ceratoides ewersmanniana* in use scientific in the text two parallel display approach the most right method.

**Morphology and diagnostics.** Heklau and Roser at work this group in representatives in particular star-shaped feathers important morphological sign as This symbol is highlighted . *Krascheninnikovia Axyris* and *Ceratocarpus* with close who puts phylogenetic results with harmony

**Photosynthesis type (C3).** *Krascheninnikovia* ( *Ceratoides* ) group desert steppe under the circumstances live , their photosynthesis way be C3 will be displayed for example , wood anatomy and ecological adaptations analysis done the source says " *Krascheninnikovia* (C3-photosynthesis type)". record occurs ) [12]. This aspect him/her *Halothamnus* and *Haloxylon* such as many C4 *Salsoloideae* from representatives functional in terms of differentiates .

**Distribution:** China and Central To Asia relevant genomic in research *Krascheninnikovia ewersmanniana* about information given , regional spread and phylogenetic place discussion In addition, " cold winter desert" plants according to international in the manuals Eurotia / *Ceratoides ewersmanniana* selection and introduction in terms of promising fodder bush as to the language is taken .

**Ecology and adaptations .** This group representatives cold winter desert and half desert in the zones , wind erosion strong was open in the fields lives dry one seed of fruit hairy bracteoles wind with to spread assistance possibility phylogeographic in analyses discussion will be done .

**Reproduction biology.** Wide- ranging , windy with to spread adapted diasporas interpopulation gene flow impact to be able possible , but at the " ewersmanniana "level as a separate species reproductive insulation signs strict indicating evidence enough not being that's it taxonomic revision from logic come comes out .

**Practical importance.** Toderich and co-authors in the materials Eurotia / *Ceratoides ewersmanniana* pasture degradation restoration , salted and dry from the fields effective use point from the point of view as a promising species [16] This type of group "Phyto-ameliorative" role at the level with other types with separated stands .

**Protection status and research** The largest taxonomic “gap” of the border itself: practical botany for Common name (*Ceratoides ewersmanniana*) with modern phylogenetic classification

(*Krascheninnikovia ceratoides* sl) between coordinated , regional flora and genetic markers based on consensus is still required .

*Kochia prostrata* (*Bassia prostrata* )

**Classification and nomenclature.** Kew/POWO global “taxonomic” "base" *Kochia prostrata* often synonym as seen and accepted Made up name *Bassia prostrata* that displayed . Distributed regions and Central and Eastern Europe , Mediterranean Sea from the regions Western and North To China stretching record The *Bassia*–*Kochia* complex again classifications , in general , molecular phylogeny and morphological again seeing performances with related is , *Bassia* and *Camphoraceae* in the group plants in taxonomy some types wrong grouped to be possible , therefore for phylogenetic (genetic) research this problem determination and to correct focused.

**Morphology** . *Bassia prostrata* many annual half bush as Height , type of branching , leaves linear and lanceolate to be , to be hairy level such as characters within the species , as well as geographically populations also variable according to to be shows .

**Anatomy and photosynthesis** . *Bassia prostrata* is a C4 photosynthetic species . one how many independent in directions First , Rudov and co-authors *Bassia prostrata* on the list cochlear typical leaf anatomy and NADP-ME subtype with given [6]. Secondly , the leaf micromorphology and ecological anatomy according to C4 cochineal in analyses anatomy subtypes one as “ *Bassia prostrata* type” Third , the transcriptome Analysis of the C4 cycle in *Bassia prostrata* main genes high expression and NADP-ME type shows.

**Distribution and ecology** . Species temperature in Kew/POWO data in biomes wide with area half bush as is displayed. Central Asia – Kazakhstan steppes and half desert in its regions it is often to drought resistant fodder element as to the language is taken.

**Reproduction biology.** This kind of reproductive strategies (seed 's fertility , age of sprouts to stress endurance ) pasture in recovery important [15]. nutrition value and chemical of the content soil-climate to the conditions connection according to research existence his/her agroecological management for importance shows .

**Practical importance.** “Forage , xerophyte as "bush" *Bassia prostrata* pastures improve and degraded rangelands " shrub " in restoration harvest doer "plant " structure creation , fodder base expansion , arid in the regions winter pasture resource strengthen for This direction is used . according to special agronomic ecological research there is .

**Protection status and research spaces.** It is a species with a wide range . from a global " threat" for according to, local at the level pasture pressure , invasiveness risk and selection of genetic material (seed population) compatibility issues current .

#### Comparator analysis

The following in the table four types of “identity for comfortable character + ecological "role" principle according to The table is compared interpretation in doing this in mind catch need: *Ceratoides ewersmanniana* name some in classifications *Krascheninnikovia ceratoides* sl within synonymization possible; that because this in line some sign and the areal description *ewersmanniana* with the concept given.

Table 2

#### ***Halothamnus subaphyllus*, *Haloxylon aphyllum*, *Ceratoides ewersmanniana* and *Kochia prostrata* types bioecological features**

| Indicator                | <i>Halothamnus subaphyllus</i> | <i>Haloxylon aphyllum</i>                                         | <i>Ceratoides ewersmanniana</i>                            | <i>Kochia prostrate</i>                                                                  |
|--------------------------|--------------------------------|-------------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Current taxonomic status | Reception done type.           | "H. aphyllum " is often H. ammodendron synonym as given; disputed | Broad synonymization approach available (K.ceratoides sl). | <i>Kochia prostrata</i> synonym ; acceptance The given name is <i>Bassia prostrata</i> . |
| Vital form               | Half bush / shrub .            | Tree-like bush / low tree                                         | Bush/ half bush ; hairy structures with .                  | Many annual half bush                                                                    |
| Photosynthesis type      | C4 (salsoloid ; NADP-ME).      | C4 (salsoloid ; NADP-ME) complex .                                | C3.                                                        | C4 (cochleoid ; NADP-ME).                                                                |

| Indicator             | <i>Halothamnus subaphyllus</i>               | <i>Haloxylon aphyllum</i>                                                                  | <i>Ceratoides ewersmanniana</i>                                                                         | <i>Kochia prostrata</i>                                                                      |
|-----------------------|----------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Home ecotop           | Sandy , muddy , saline , gypsum substrates . | Sand hill depressions , old barren , barren land ; land under water close to be possible . | Cold winter desert , semi-desert desert , semi-desert arid steppe landscape ; wind spread .             | Steppe – half desert grasslands ; arid conditions .                                          |
| Root strategy         | Up to 3–6 m deepening possible.              | Up to 14–16 m deepening record " reached " the water "going " strategy .                   | Dry white to the conditions suitable root - leaf (hairy) complex ; although C3 water to stress adapts . | Dry white to the conditions suitable ; C4 cochlear anatomy with from water use effect high . |
| Ecological importance | Fodder ; salted pastures reclamation .       | Edificator ; soil – microclimate change , sand reinforcement .                             | Pasture restoration resource ; taxonomic consensus necessary .                                          | Pastures restore " pasture " fodder "o' wire " , bait quality .                              |

Analysis results *Halothamnus subaphyllus*, *Haloxylon aphyllum* , *Ceratoides ewersmanniana* and *Kochia prostrata* (*Bassia prostrata*) species Amaranthaceae sl within not only taxonomic, perhaps ecologically functional also separate scientific importance has that it is showed . This types desert and half desert in ecosystems drought, salinity and of the substrate inconvenient physicochemical to the characteristics adapted stable vital strategies manifestation Especially in C4 photosynthesis of species high from water use effectiveness, *Haloxylon* of edification role, *Bassia prostrata* of pasture in recovery importance and *Ceratoides ewersmanniana* of phytomeliorative potential their practical value increases. With this together, some in taxa nomenclature and phylogenetic of uncertainties be careful remaining this groups according to integrative taxonomic, molecular-genetic and bioecological research further deepening the necessity shows.

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