

WESTONIELLA, A NEW GENUS OF THE ASTEREAEE
FROM THE COSTA RICAN PARAMOS.

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During several years exploration of the high mountains of Costa Rica for ecological research, many less accessible areas never visited before by botanists, have been botanically scrutinized by the intrepid, Dr. Arthur S. Weston. He gathered several thousand collections from the Talamanca Cordillera, mostly representatives of the páramos. A part of the Compositae of his collections was turned over to me for identification. I found in it many novelties, which are not only significant for the flora of the Costa Rican paramos, but also because of the various undescribed taxa which represent additions to the already known series of Costa Rican endemics. The most important novelty is a new genus in the Astereae described here as Westoniella, represented by five distinct species which were all collected by Weston in the paramos or subparamos of the Chirripó massif and Buenavista massif. Of these five species, one had been collected before (by Pittier) and published first by Klatt as a Senecio, and transferred later by Greenman, to Erigeron. The other four species are all first records.

Westoniella is mostly characterized by its tubular ray corollas with a narrow proximal part and a more expanded, inflated, distal section representing the limb. The apex is contracted, the margin being almost entire or with five regular or oblique short teeth. A curving of the corolla or the obliqueness of the opening often make it slightly zygomorphic. The color may be roseate, red, lilac or white, contrasting more or less from the disc corollas which are red, maroon or purplish and usually darker than the rays. The rays may be straight, the heads appearing discoid, or more or less bent downwards radiating, like in W. chirripoensis with spreading, showing, white rays. The corollas of both kinds have at the middle part copious obovate-oblong or claviform biseriate glandular trichomes. The styles have fine, long branches with marginal stigmatic bands in the female flowers; they are lanceolate-oblong, rigid, non stigmatic and papillose-hispid abaxially in the functionally male, disc flowers.

The ovaries of ray flowers and achenes are obovoid, somewhat compressed with rounded apex, with 2 marginal costae and frequently with an additional prominent vein at one side. They have sparse or abundant geminate-celled trichomes throughout and few obovoid or pyriform glands near the apex. The sterile linear or oblong

4-5 ripped ovaries of the disc flowers have similar pubescence. The pappus is of one row of strigose bristles.

The genera that most resemble Westoniella in the habit and apparent structure, are Andean genera Diplostephium, Hinterhubera and Blakiella. The new genus differs readily from the three by the particular shape of the tubular ray corollas. These corollas are very different from the tubular ray corollas found in Conyzinae, Baccharidinae, and some Asterinae, which are the result of extreme reduction of the ligular corollas down to a tiny tube. The ray corollas of Westoniella probably represents a more primitive structure than in the Aster type, the latter being a more evolved disposition into the trend of capitulum → functional flower. Hinterhubera differs clearly from Westoniella by the deeply lobate ray flowers and by the several rows of pappus bristles. Blakiella differs by the particular bottle shape of the ray flowers and the beaked, fusiform achenes. (Cuatrecasas 1969, fig. 8-A) Diplostephium, in addition to the ligular character of the rays differs by a double row of pappus bristles. Other genera of Astereae (Laestadia, Solenogyne, Haastia) with tubular ray-flowers have a different structure and are more distantly related to Westoniella. In the present stage of knowledge of the Astereae tribe, Westoniella should be included in the subtribe Asterinae.

This new genus is extremely significant in relation to the capacity of biological differentiation through time and isolation of the paramo-biomas. Its evolutionary process may be seen in parallel connection with those of the Hinterhubera, Diplostephium and Blakiella. The variety of species of Hinterhubera developed in Venezuela and of Westoniella in Costa Rica, within a relatively limited area, show parallel or convergent trends in the vegetative structures.

Dr. Weston is preparing a detailed account of the phytogeographical and ecological aspects of his findings in Costa Rica.

WESTONIELLA Cuatr. gen. nov. Asteracearum

Capitula heterogama, parva (4-10 mm diam), (20-) 50-180 flores ferentia. Involucrum pluriseriatum phyllariis subaequilongis anguste ellipticis membranaceis, vel subpapyraceis. Receptaculum nudum planum vel paulo convexum, alveolatum.

Flores radii feminei, 2-4-seriati magis numerosi illis disci. Corolla sursum rosea, lilacina, rubra vel alba, anguste tubularis, saepe leviter curvata tenuiter zygomorpha parte media glandulifera, limbo quam tubulo latiori plus minusve inflato saltem dilatato, apice plus minusve constricto, regulare breviterque 5-denticulato dentibus aequalibus, vel oblique dentatis adaxiale saepe leviter depresso. Stylus plerumque inclusus interdum corollam paulo excedens, ramis longis anguste linearibus subobtusis marginibus

minute stigmato-papillosis, ceterum glaber. Ovarium obovatum apice obtuso basi subacuta lateraliter compressum crassiuscule costato-marginatum, plerumque nervo vel costa laterali tenui conspicua. Embryo basale affixus. Pappus setis uniseriatis (20-30) subaequilongis subrigidulis strigosis subapice levissime ampliatis, acutis.

Flores disci actinomorphi hermaphrodite contexti masculi fungentes. Corolla statem apice rubra, atrorubra, brunneo-purpurea, limbo inferne stricto, sursum tubuloso-infundibuliformi 5-lobato lobis triangularibus acutis brevibus. Collum antherae longum columnare incrassatum cellulis crebris pluriseriatis inferne subquadratis superne rectangularibus. Antherae basi acute auriculatae, appendice apicali anguste elliptico-triangulata subacuta, cellulis exothecialibus elongatis lateraliter noduliferis. Pollen grana tricolorata copiose spinulosula circa 25 μ diam. Stylus crassiusculus, maturitate corollam excedens basi paulo incrassatus apice breviter bifidus ramulis anguste elliptico-lanceolatis vel anguste elliptico-acuminatis acutis, abaxialiter longe denseque pilosopapillosis, adaxialiter glabris numquam stigmaticis. Ovarium anguste oblongum plerumque exovulatum sterile 5-nervatum plerumque 4-5 costis notatis. Pappus setis uniseriatis strigosis subapice leviter ampliatis, acutis. Nectarium crasse discoideum margine laevi vel marginato-dentatum, margine basim styli cingenti.

Carpopodium plus minusve elongatum subcylindraceum vel subobconicum callosum, cellulis crebris pluriseriatis subquadratis parietibus incrassatis.

Pili gemini rigidi uni vel bi-acuminati in ovariis copiose vel sparsi. Glandulae oblongo-obovoideae cellulis biseriatis in parte media corollae saepe copiosae, glandulae obovoideae ad apicem ovariorum achaeniorumque praesentes.

Frutices parvi saepe prostrati vel caespitosi, vel suffrutices usque ad 1.5 m alti, caulibus ramisque glabris vel lanuginosis vel hirtis glandulosisque, denique glabratibus. Folia alterna sessilia basi amplexantia, copiosa, saepe imbricata et valde congesta in ramulis terminalibus. Lamina foliorum subcoriacea marginibus plus minusve revolutis saepe complicata, interdum subplana, plus minusve pilosa abaxialiter saepe lanuginosa et glandulosa. Fig. 1, 2, 3.

Typus generis: Westoniella chirripoensis Cuatr.

KEY TO THE SPECIES OF WESTONIELLA

1. Shrubs 40-150 cm high with erect undivided or branched leafy stems. Heads many, arranged in terminal whitish-woolly corymbose glomerate panicles. Phyllaries with long, thick, white-hyaline trichomes. Ovaries sparingly hairy. Leaves longer

than 15 mm.

2. Leaves linear, apparently entire, margins strongly revolute, 20-35 x 1-1.5 mm, abaxially lanuginose, adaxially glabrous or with long and very slender flexuose white arachnoid hairs. W. kohkemperi
- 2'. Leaves narrow-elliptic, inciso-dentate with long-mucronate teeth, flat with more or less revolute margins, 15-35 x 2.5-6 mm, hirsute and glandular. W. eriocephala
- 1'. Dwarf, densely or loosely matted shrubs, less than 20 cm tall. Heads solitary at tip of leafy branchlets. Ovaries copiously to densely hairy. Leaves less than 10 mm long with fully revolute margins, apiculate.
3. Leaves 3-lobate, seldom 5-lobate, lobes fingerlike triangular ending in claw-like acute, incurved apiculum. Heads sessile; involucre white woolly, hairs very long and slender (0.005-0.010 mm diam). Branchlets woolly. W. triunguifolia
- 3'. Leaves absolutely entire. Branchlets glabrous.
4. Heads shortly pedicellate; involucre greenish below with purplish phyllaria tips, white-woolly, hairs hyaline, flexuose, thick (0.035 - 0.06 mm diam). Ray corollas rather reddish or purplish. Leaves 4-10 mm long loosely imbricate, the blade narrow-elliptic. Loosely matted plant with longer erect branches than the following species. W. barqueroana

- 4'. Heads sessile; involucre more or less purplish, appearing glabrous, with sparing or rare long, slender (0.005 - 0.010 mm diam), arachnoid, inconspicuous hairs. Ray corollas white, spreading. Leaves 4-6 mm long, densely imbricate, blade narrowly elliptic acuminate, appearing rather aciculate. Compact matted, prostrate shrub.

W. chirripoensis

WESTONIELLA CHIRRIPOENSIS, Cuatr. sp. nov.

Fruticulus prostratus ramis brevibus robustiusculis congestis caespitoso-pulvinatis ad 10 cm altus. Ramuli 1-3 cm longi densissime imbricato-foliati glabri vetusti exfoliati crebrissime arguteque semicirculari-cicatricosi.

Folia visu acicularia rigida, in totum 4-6 mm longa, sessilia, basi longe vaginantia. Lamina chartacea crassiuscula visu 2-4 mm longa 0.7-1 mm lata ellipsoideo-lanceolata acute apiculata, marginibus revolutissime plicatis abaxialiter superficiem tegentibus, adaxialiter glabra nitida laevia vel interdum glandulis immersis leviter visibilibus, abaxialiter (infra plicaturam) sparse pilosula et copiose glandulosa. Vagina 2-3 mm longa 1-1.5 mm lata membranacea plana ad ramum adpressa marginibus longe gossypinopilosula, pilis tenuissimis (0.005 - 0.015 mm diam) longissimis flexuosissimis. Capitula solitaria ad extremos ramulorum dense foliosorum subsessilia, visu glabra.

Capitula cylindracea 6-8 mm alta, 4-6 mm diametro, heterogama radiata 50-90 flores ferentia. Involucrum campanulatum 5-6.5 mm altum. Phyllaria 28-42, subaequilonga, 4(-5)-seriata, membranaceo-subpapyracea, firmula, anguste lanceolata, acuminata, acuta, 4-6.5 mm longa 0.8-1.2 mm lata, dorso basi excepto brunneo-violacea nitida marginibus scariosis lilacinis, dorso sparsis glandulis subclavatis 0.05-0.1 mm longis ad margos parvis vel parcissimis pilis longissimis strictis 0.005 - 0.015 mm diam flexuosis, exteriora leviter lacerato ciliata, interiora circa 20 integra. Receptaculum plano-convexum 2-3 mm diam, alveolatum marginibus alveolorum membranaceis dentatis.

Flores radii feminei 37-60 in capitulo, triseriati. Corolla 4-4.7 mm longa, alba, tubulosa inferne tubulo angusto glabro, limbo inferne anguste tubuloso copiose piloso pilis glandulosis crassiusculis (glandulis biseriatis subclavatis) ad circa 0.1 mm longis, superne subite in limbo anguste ellipsoideo inflato 1.6-2.1 mm longo glabro apice constricto instructo, apice 5-dentato dentibus minutis obtuse triangularibus subaequalibus 0.1-0.15 mm interdum adaxiale brevioribus. Stylus 3.8-4 mm, inclusus maturi-

tate ramis exsertis, glaber basi leviter incrassatus apice in 2 ramos membranaceos 0.8-1 mm, lineares subacutos glabros marginibus anguste stigmato-papillosis divisus. Ovarium fertile 1.3-1.5 x 0.4-0.6 mm ellipticum subcompressum apice obtusissimo basi acuta saepe 3 nervatum, costato-marginatum copiose antrorso-pilosum, pilis geminis, rectis, rigidulis, strictis, conspicue bidentatis 0.1-0.3 mm et circa apicem parvis vel raris glandulis obovoideis; carpodio calloso circa 0.2 mm alto cellulis circa 8-seriatis rectangularibus instructo. Pappus circa 4 mm longus circa 20 setis strigosis sursum levissime dilatatis subaequilongis, basi breviter coalitis.

Flores disci pseudohermaphroditi 13-28 in capitulo. Corolla purpurea 4-5 mm longa, tubulo 1.2 - 1.5 mm longo glabro, limbo inferne anguste tubuloso copiose pilosulo pilis glandulosis crassiusculis (cellulis biseriatis) oblongis subclavatis, paulo flexuosis 0.05-0.1 mm longis, superne 1.5 mm longitudine tubuloso-campanulato, glabro vel parcissimis glandulis, lobis triangularibus acutis crasse marginatis marginibus minuti-papillosulis, abaxialiter parvis vel raris glandulis. Antherae 1.2 mm longae basi breviter sagittatae appendice apicali anguste elliptica attenuata seu subulata, acuta circa 0.3 mm. Stylus crassiusculus extremo paulo dilatatus apice subconicus et in duos lobos anguste ellipticos attenuatos acutos 0.5-0.7 mm longos abaxialiter longe densissime antrorse pilosulo-papillosos divisus. Ovaria sterilia linearia 1.5 mm longa 4-5 nervata basi acutata, copiose pilosa pilis geminis antrorsis rigidis 0.2-0.3 mm copiosis vel densis vestita, circa apicem parvis vel raris glandulis obovoideis obsita; carpodio annulato calloso cellulis rectangularibus pluriseriatis conspicuis. Fig. 1-C, 2A-G, 3I-J.

Typus: Costa Rica, South to southwest of Cerro Chirripó, Pico Sureste, rain paramo, 3600-3800 m, tussocks, leaves dark green, ray flowers white, other disc flowers dark red, 9 Dec 1966, Arthur S. Weston 3614 (US, holotype). Other collections: South to southwest of Cerro Chirripó, Cerro Terbi, 3600-3800 m, leaves medium green, most flowers pink-lavender and dark maroon, in some heads white, 5 Sept 1969, Weston 6027 (US). Chirripó massif, along cliffs of Rio Talari, above lower Refugio, 3400 m, common on near vertical cliffs, 14 Feb 1976, Weston 10092 (US, paratype). Buenavista massif, Cerro Sakira, 3400 m, low shrub, "ray" flowers more than 30, white, tubular, slightly irregularly and very shortly 5-lobed, disc flowers dark red ca 12, anthers yellow, 26 Jan 1976, Weston 10055 (UC).

WESTONIELLA BARQUEROANA, Cuatr. sp. nov.

Fruticulus prostratus ad circa 15 cm altus caulibus inferne repentibus radiceferis intricatis cum vaginis foliorum marcescentibus tectis superne ramosis ramis arcuatis et + erectis glabris

copiose vel dense foliosis.

Folia alterna anguste linearia 4-10 mm longa inferne plana tenuia longe vaginantia semiamplectentis, sursum subchartacea rigidula marginibus argute revolutis. Lamina 3.8-8 mm longa complicata visu 0.8-1.2 mm lata viridis apice argute callosio-apiculato, uninervis costa abaxialiter crasse prominenti adaxialiter filiformi impressa, utrinque pilis longis tenuibus albis arachnoideo intricatis in juvenilibus magis copiosis et glandulis capitato pediculatis moderate copiosis. Vagina 1-3 mm longa plana basi dorsale gibboso-incrassata protruda, margine integra amplectenti. Folia juvenilia magis villosa, et sicut infra capitulum foliis tenuioribus copiosiore barbatis numerosis, imbricatis involucrium parziale tegentibus. Capitula brevis pedicellata ad apicem ramulos dense foliatis 3-8 cm longos, solitaria, vel interdum 2-4 capitula ferentes, visu lanugineo-villosa.

Capitula cylindroidea circa 8 mm alto 6 mm lata, heterogama pseudodiscoidea, 80-110 flores ferentia. Involucrium campanulatum circa 7 mm altum. Phyllaria membranacea ad basim subpapyracea numerosa (46-60) 4-5-seriata, subaequilonga, 5-5.5 x 1 mm, subulato-lancolata, acuminata acutaque, sursum lilacina vel brunneo-violacea, marginibus scariosis hyalinis plus minusve lacerato cilatis, trinervata, abaxialiter apice excepto copiose longeque barbata pilis crassis albis multicellularibus cellulis rectangularibus vel botuliformibus, hyalinis 0.035-0.05 mm diam 2-3 mm longis, flexuosis patulis intricatis, in interioribus sparsis. Receptaculum circa 3-3.5 mm diametro, plano-convexum, alveolatum, marginibus alveolorum obtuse denticulatis.

Flores radii feminei 47-73 in capitulo 3-seriati; corolla 4-4.2 mm longa anguste tubulosa deorsum albida sursum (1/4 parte distali) leviter inflata purpurina vel rubescenti apice leviter constricto 5 denticulato dentibus minusculis subaequalibus, parte mediali copiose glandulosa, pilis seu glandulis cellulis biseriatis subclavatis glanduloso-capitatis circa 0.1 mm longis instructa. Stylus inclusus circa 4 mm longis, filiformibus apice bifurcatus ramis 0.7-1 mm, marginibus minute stigmato-papillosis. Achaenia 1.7-2 x 0.7-1 mm, obovata lateraliter compressa apice rotundata basim versus attenuata basi acuta bicostato-marginata, faciebus plano-convexa saepe nervo uno laterali conspicuo, pilis antrorsis acute bidentatis (geminis) 0.07-0.15 mm longis copiosis et parcis glandulis claviformibus 0.05-0.1 mm circa apicem munita; carpodium callosum cylindraceum circa 0.15 mm altum 0.1 mm latum cellulis rectangularibus usque ad 10 series instructum, Fig. 3-S. Pappus albidus circa 4 mm longus setis uniseriatus strictis strigosis subaequalibus, subapice vix leviter ampliatis, acutis, rare 1-2 setis brevissimis.

Flores disci pseudohermaphroditi 30-35 in capitulo. Corolla, 4.5-5 mm longa, tubulo circa 1.8 mm longo viridulo palido glabro; limbo infundibuliformi-campanulato, rubro, dimidia parte inferiore

angustiori copiose pilosula, pilis glandulosis crassis cellulis biseriatis circa 0.07-0.12 mm, sursum glabro, vel parcissimis glandulis, nervis commissuralibus notatis, lobis triangularibus 0.7 mm altis acutis, margine crasse marginatis papillosis extus subapice parvis glandulis patulis 0.05-0.1 mm longis. Antherae 1.3 mm longae breviter sagittatae appendice apicali anguste elliptica triangulata 0.3 mm longa. Stylus 4-5 mm, ramis oblongo-lanceolatis 0.7 mm, extus dense papilloso-pilosus. Ovaria sterilia 1.5 mm, anguste oblonga, 5-nervata, sparsis pilis geminis rigidis antrorsis 0.07-0.15 mm et praecipue subapice parvis vel raris glandulis pyriformibus vel clavatis 0.05 mm, basim angustata podocarpio calloso. Pappus corolla aequilongus setis uniseriatis subaequalibus subapice levisime ampliatis basi coalitis. Fig. 2I-Q, 3P-S.

Typus: Costa Rica: South to southwest of Cerro Chirripó, close to Refugio, Valle de los Conejos, 3600 m alt, low clums in rain paramo, flowers dark red at tips, 9 Dec 1966, Arthur S. Weston 3645 (US, holotype). Other collection: Chirripó massif, 3500 m, Valle de los Conejos, 3500 m, grows at stream edges and on alluvial flats. 29 Jan 1976, Weston 10082 (US).

The name of this new species honors Mr. Humberto Barquero Mora, Costa Rican botanist, who has been the botanist of many of the Kohkemper's exploratory expeditions.

WESTONIELLA TRIUNGUIFOLIA, Cuatr. sp. nov.

Fruticulus parvus prostratus ramis robustiusculis saepe intricatis, congestis, plus minusve caespitoso-pulvinatus ad 10 (-15) cm altus. Ramuli ultimi 2-5 cm longi erecti densissime imbricatifoliati, internodis copiosissime crasseque albo-lanatis pilis longissimis tenuissimis (0.005-0.015 mm diam) floccosis, nodis in vetustis exfoliatis cicatricosis.

Folia coriacea 4-6 (-7) mm longa. Lamina crassiuscula profunde 3 (-5) lobata, 2.2-3 mm longa 1.5-3 mm lata, lobis 1-1.5 mm longis triangulare digitiformibus apice acute unguiformis, apiculo calloso duro acutissimo saepe incurvo; adaxialiter viridis bene bullata sursum glabra deorsum floccose albo-lanata, abaxialiter dense lanata marginibus valde revolutis, costa elevata basi paulo angustata et in vaginam amplectentem producta. Vagina submembranacea 2-2.5 mm longa apice 1.2-1.6 mm lata basim versus usque 2-2.5 mm lata ampliata, adaxialiter tantum ad apicem lanata, abaxialiter undique copiose albo lanata.

Capitula cylindracea 7-8 mm alta 4-4.5 mm diametentia 37-50 flores ferentia, heterogama brevi-radiata. Involucrum tubulosum basi rotundatum 7-8 mm altum. Phyllaria 30-34 circa 5-seriata exteriora 1/2-2/3 altitudinem interiorum attingentia, reliqua gradatim intermedia; interiora fertilia 6-7 x 0.8-1.2 mm, linearia acuta subscariosa rigidula, costa crassiuscula immersa signata, ceteris venis obsoletis, dorso costa apiceque lilacina vel

brunnescentia marginibus late scariosa hyalinaque sursum lacerato-ciliolata dorso parvis pilis et copiosis glandulis; exteriora 4.5-3.5 x 1-1.4 mm, anguste elliptica inferne paleacea sursum scariosa basi incrassata costa et ad apicem violaceo-brunnea crassiuscula rigida argute acuteque apiculata, abaxialiter copiose arachnoideo-lanuginea pilis tenuissimis (0.005-0.015 mm crassis) longissimis intricatisque, dorso copiosis glandulis globoso-pediculatis sparsis; intermedia gradatium instructis. Receptaculum plano-convexum alveolatum margine rotundato, marginibus alveolorum membranaceis dentatis, 2-2.2 mm diam.

Flores radii feminei 26-37 in capitulo, 2-seriati; corolla pallide lilacina, 3.8-5.2 mm longa, tubularis, tubo 1.8-3 mm longo 0.2-0.3 mm crasso, basi excepta copiose pilosulo pilis antrorsis glandulosis cellulis biseriatis circa 0.07-0.12 mm longis, limbo glabro tubuloso plus minusve dilatato-inflato circa 0.45-0.8 mm crasso subapice plus minusve constricto, apice oblique truncato, inaequaliter denticulato, zygomorpho, dentibus abaxialiter 3 (-4) minutis obtusis, adaxialiter 2 antrorsis inferis dispositis. Stylus inclusus vel maturitate paulo exsertus, 3.5-3.8 mm longus, tenuis, ramis flexibilibus linearibus obtusis 0.7-0.8 mm marginibus apiceque late stigmatici-papillosis. Ovarium fertile, maturitate 1.4-1.8 x 0.4-0.6 mm, ellipticum apice obtuso basi paulo attenuata subcompressum costato-marginatum interdum nervo tenui uno latere, densiuscule villosum et ad apicem glanduliferum, pilis rigidulis antrorsis acutis biseriatis (geminis) bicuspidatis 0.1-0.25 mm, glandulis globoso-obovatis crassis, 0.05-0.09 mm, sub apicem interspersis. Carpodium crassiusculum circa 0.15 mm altum basi subrotundatum, cellulis quadratis seriatis saepe 5-seriatis. Pappus albus setis uniseriatis strictis scabrosis acutis apicem non ampliatis 3.5-4.5 mm longis, cellulis 3-5 seriatis.

Flores disci hermaphroditi 9-15 in capitulo; corolla tubulosa 4.2-5.3 mm longa, tubo 1.5-2.5 mm angusto glabro, vel ad apicem parvis pilis strictissimis ad 1 mm longis et sparsis glandulis limbo campanulato-tubuloso sursum magis ampliato, atrorubro nervis 5 tenuibus suturalibus, sparse piloso pilis tenuissimis 0.5-0.8 mm sparsis et glandulis subclavatis 0.07-0.12 mm, lobis anguste triangularibus acutis, marginatis, 0.5-0.7 mm longis, apice intus papillosis, abaxialiter sparsis pilis obtusis 0.15-0.2 mm et parvis glandulis subclavatis. Antherae 1.5 mm basi sagittatae appendice apicali anguste elliptica attenuata 0.4 mm longa, collo crassiusculo cylindraceo circa 0.25 mm longo cellulis quadrato-rectangularibus multiseriatis conspicuissimis. Grana pollinis tricolporata spinulosa circa 26- μ diametro. Stylus 4 mm longus basi in discum crassum 5 lobatum 0.15-2 mm altum leviter immersa, ramis oblongo-lanceolatis acutis 0.8-1 mm longis, adaxialiter laevis, abaxialiter margineque densiuscule papilloso-pilosis pilis obtusissimis 0.05-0.07 mm longis, haud stigmatiferis. Ovarium anguste ellipticum vel oblongum exovulatum vel ovulatum sed apparenter sterile, 1-1.5

mm longum densiuscule antrorso-pilosum pilis geminis strictis bicuspidatis 0.1-0.2 mm, et ad apicem glandulis globoso-obovatis, crassis, 0.05-0.08 mm longis. Pappus albus setis uniseriatis 3.5-5.5 mm longis vel interdum parvis brevioribus interspersis, cellulis 5-6 seriatis acutis apicem haud dilatatis. Fig. 1F; 2H; 3D, N-O.

Typus: Costa Rica, Chirripó massif, Rio Talari, below big pool above lower Refugio, 3450 m, on rock face, 26 Jan 1976, Arthur S. Weston 10076 (US, holotype). Other collections: Cerro Chirripó, south to southwest, 3600-3800 m, rain paramo, dense tuft, 9 Dec 1966, Weston 3632 (US); id. Cerro Terbi, 3600-3800 m, 5 Sept 1969, Weston 6028 (US); South fork of Rio Talari below Sabana Chirripó, small sabana on banks of river, 24 Feb 1976, Weston 10123 (US). Cerro Buenavista group south of Pan-American Highway, Cerro Frío, 3350-3500 m, rain paramo much of it probably occasionally grazed by horses and cattle, low shrub ca 8 cm high, phyllaries maroon lavender outer flowers tubular, pink-lavender, regular stamen yellow, 28 Aug 1969, Weston 5978 (US); id. Cerro Buvis, 3350-m, low shrub ca 8 cm high, phyllaries maroon-lavender, outer flowers tubular pink-lavender, inner dark maroon-lavender, stamen yellow, 28 Aug 1969, Weston 5969 (UC, US); id, between Cerro Buvis summit and lower slopes of Cerro Frío, 3350-3500 m, low, compact shrub with short, erect branches, leaves ascending dark green and glabrous above, tomentose beneath, 14 Aug 1969, Weston 5847 (US).

WESTONIELLA KOHKEMPERI, Cuatr. sp. nov.

Frutex usque ad 1.5 m altus, caulibus simplicibus vel sursum paucè ramosis inferne glabratis paulo striatis cicatricoso-tuberculatis cum reliquis vaginorum foliorum ornatus, sursum dense foliosis internodiis 2-5 mm longis prupurascentibus plus minusve arachnoideo-lanugineis, pilis tenuissimis flexuoso-intricatis.

Folia alterna chartacea stricte linearia 20-35 mm longa 1-1.5 mm lata, ascendentia, leviter curvata, sessilia, lamina replicata marginibus plicato-revolutis abaxialiter superficiem tegentibus, raris dentibus mucroniformibus saepe occultis, apice argute calloso-apiculata, basi late aperta auriculato-amplexentia, utrinque tantum costa notata, et araneoso-lanuginea pilis tenuissimis albis flexuosis intricatis et glandulis capitato-pediculatis basi conica, adaxialiter sparsis abaxialiter valde copiosis; costa adaxialiter impressa subnitida sparse glandulosa, abaxialiter infra plicaturam costa crasse elevata superficie copiose lanuginea et glandulosa. Folia suprema juvenilia in ramis sterilibus sicut infra inflorescentias magis copiose seu dense albo-barbata pilis 5 mm strictissimis flexuosis lanatis.

Capitula 15-20 at terminationem caulis in panicula corymbiformi congesta 4-7 cm lata, spisse albo-villoso-barbata, pilis

longis cellulis ad 0.06 mm crassis 0.1 mm longis, hyalinis, visu gossypina. Pedicelli 1-5 mm longi teneri longe villosi et foliato-bracteati, bracteis numerosis subimbricatis barbatis involucrum inferne tegentem.

Capitula late cylindrica 7-9 mm alto 8-10 mm lata heterogama subradiata, 112-176 flores ferentia. Involucrum campanulatum circa 6.5-7 mm altum. Phyllaria 46-60, 4-5-seriata membranacea, subaequilonga, lineari-lanceolata vel subulato-lanceolata acuminata acuta, interiora fertilia 26-30, margine scariosa interdum leviter lacerato-denticulata, 6-7 x 0.6 - 1.2 mm, 4-6 nervis plus minusve conspicuis, inferne pallida subpapyracea, rigidulaque sursum et costa violacea, adaxiale glabra, abaxiale copiose seu dense longeque albopiloso-barbata, pilis multicellularibus (ad 5 mm) cellulis botuliformibus vel rectangularibus hyalinis 0.035-0.05 mm diametro ascendentibus vel transverse-patulis intricatis et glandulis sparsis etiam instructa; exteriora 6-5 x 1 mm brunneo-violascentia magis firmula. Receptaculum 4-5 mm diametro plano-convexum profunde alveolatum marginibus alveolorum membranaceis obtuse dentatis.

Flores radii feminei 100-130 in capitulo 3-4-seriati; corolla 4.5-5 mm longa anguste tubulosa, tubulo stricto subcapillari 3-3.5 mm longo inferne glabro 1/2-1/3 superiore pilosulo, pilis glandulosis crassiusculis (cellulis biseriatis) oblongo-subobovatis circa 0.1 mm longis, limbo tubuloso-ampliato leviter inflato, subbotuliformi, rubescenti apice leviter constricto minute 5-denticulato dentibus aequalibus vel adaxialibus paulo brevioribus 0.02-0.05 mm basi limbi parvis glandulis cetero glabro. Stylus circa 4 mm, inclusus vel corollam aequans raro longior, ramis strictis linearibus subobtusis marginibus argute papilloso-stigmaticis ad 1 mm longis. Achaenia 2.2-2.5 x 1.2-1.5 mm, obovoidea subcompressa apice obtusissima, basi attenuata acutata margine crassiuscula marginata, undique 1 (-2) nervo prominulo, puberula tantum sparsis pilis geminis rigidis antrorsis acutis 0.05-0.15 mm et parvis glandulis obovoideis subapicalibus obsita; carpodio calloso 0.2 mm longo latoque cellulis 7-10 seriatis rectangularibus instructo. Pappus albido-stramineus 4.8-5.3 mm longus setis uniseriatis 26-30, subaequilongis, basi coalitis, strigulosis subapice levissime dilatatis, acutis.

Flores disci pseudohermaphroditi 34-46 in capitulo. Corolla 4.5-5.3 mm longa, tubulo circa 1.5-1.8 mm longo angusto albido glabro; limbo circa dimidia parte inferiori anguste tubulosa copiose pilosula pilis glandularibus (cellulis biseriatis) oblongis crassiusculis 0.4-0.1 mm longis, parte superiore ampliata tubulosa circa 2 mm longa atrorubra basi parvis glandulis cetera glabra vel subglabra lobis maturitate leviter recurvis triangularibus acutis circa 0.6-0.7 mm longis, abaxialiter parvis pilis glandulosis munitis et parvis vel parvissimis pilis pluricellularibus crassiusculis hyalinis obtusis antrorsis 0.2-1 mm. Antherae 1.5-1.8 mm

longae basi minute obtusiuscule auriculatae appendice apicali anguste elliptica acutata 0.35 mm longa. Stylus extremo purpureus ramis circa 1 mm longis oblongo-lanceolatis abaxialiter copiosis-sime piloso-papillosis. Ovarium anguste oblongum 1.7-2 mm longum, sterile, 4-5 nervis vel costis conspicuis, pilis geminis sparsis et glandulis sparsissimis munitis, basi podocarpo annulari calloso. Pappus 5-5.4 mm longus setis uniseriatis subaequalibus strigosis subapice leviter dilatatis, basi breviter coalitis. Fig. 1A, E; 3E-H.

Typus: Costa Rica, South to Southwest of Cerro Chirripó, Pico Sureste, 3600-3800 m, rain paramo, 1.5 m height, erect, 1 or 2 unbranched stems, heads terminal, flowers dark red tipped, occasional, usually associated with other shrubs, 9 Dec 1966, Arthur S. Weston 3612 (US, holotype); id Valle de los Conejos, 3600 m, plant 1/2 to over 1 m, leaves very variable in size, 26 Jan 1976, Weston 10078 (US); id. Cerro Terbi, rain paramo 3600-3800 m, stemmed shrub 1 m high, 5 Sept 1969, Weston 6026 (US, paratype); id. Cerro Truncado, 3700 m, 17 Feb 1976, (specimen mixed with n^o 10093), Weston 10093A (US). Buenavista massif, Cerro Sakira, 3400 m, 80 cm tall, stem single or sparsely branched to a few cm below summit, terminated by a tight cluster of heads, disk flowers green below with maroon-red lobes, anthers yellow, ray flowers tubular pink, 26 Jan 1976, Weston 10056 (CR, UC).

The name W. kohkemperi honors Mr. Mainrad Kohkemper Meza, Costa Rica's foremost and best known mountaineer, who has climbed most of the major peaks in Costa Rica and has published more, and most usefull to biologist-explorers, on the remote highest parts of the Cordillera Talamanca than anyone else.

WESTONIELLA ERIOCEPHALA (Klatt) Cuatr. comb. nov.

Senecio eriocephalus Klatt, Bull. Soc. Bot. Belg. 31:212.1892.

Erigeron adenophorus Greenman, Proc. Amer. Acad. 39 (5): 94. 1903.

Suffrutex ad 80 cm altus, caulibus sparse ramosis inferne exfoliatis, striolatis, glabris, basis vaginorum foliorum remanentibus adnatis, sursum erectis foliatis internodiis 2-6 mm longis copiosis glandulis capitato-stipitatis circa 0.5 mm longis patulisque vestitis.

Folia alterna crassiuscule herbacea sessilia, lamina subplana 15-35 x 2.5-6 mm, anguste-elliptica apice attenuata subacutata, margine plus minusve revoluta argute inciso-dentata dentibus remotis mucronatis antrorsis mucronibus callosis 0.3-0.5 mm longis, basi auriculata amplectenti, costa utrinque notata nervis remotis ascendentibus venulis reticulatis; adaxialiter copiose hirsutula pilis patulis hyalinis 1 mm longis et dense glandulifera, abaxialiter tantum costa marginibusque pilifera, sed undique glandulifera.

Capitula ad extremos ramorum glomerata in paniculis congestis terminalibus, 3-6 cm latis, copiose albo-lanato-barbatis. Ramuli pedicellique copiose hirsuti et glandulosi. Bractee subtendentes 5-10 mm longae, viridulae, dense longeque albo-villoso-barbatae pilis longis crassis 0.035 - 0.05 mm diam hyalinis, flexuosis.

Capitula cylindracea 8-9 mm alta 5-7 mm diametentia circa 123-140 flores ferentia, heterogama subradiata. Involucrum campanulatum 7-8 mm altum circa 42-46 phyllariis subaequilongis circa 4-seriatis membranaceis, 5-5 x 1-1.2 mm anguste elliptico-lanceolatis subacutis, margine scariosis praecipue sursum leviter laceratodentatis vel lacerato-ciliatis, 3-5 nervatis, interioribus sursum lilacinis, parce villosis et sparse glandulosis exterioribus pallide viridulis copiose longe pilosis pilis ad 4 mm, hyalinis cellulis numerosis cylindricis vel botuliformibus ad 0.06 mm diam terminali obtussissima, flexuosis vel patulis intricatisque (fig. 1-D) et sparsis glandulis intermixtis. Receptaculum plano-convexum alveolatum, 3-4 mm diametro.

Flores radii feminei 50-90 in capitulo, 3-seriatis, corolla 4.3-5.5 mm longa rosea (?) anguste tubulosa parte media sparse vel copiose glandulosa glandulis 0.1-0.15 mm longis crassiusculis oblongis, subclavatis, cellulis biseriatis, terminalibus ellipsoideis, inferne et superne glabra, 1/3 vel 2/5 superiori parte inflato-dilatata, apice oblique truncato plus minusve constricto, plerumque abaxialiter 2-3 sinuato-denticulato adaxialiter levissime sinuato 2-dentato. Stylus inclusus ramis linearibus acutiusculis 0.7-1 mm marginibus dense minuteque papillato-stigmaticis. Ovarium ellipticum 2 x 0.7 mm, costato-marginatum lateraliter compressum, utrinque nervo saepe conspicuo et pilis geminis antrorsis circa 0.05 mm parvis vel raris munitum. Carpopodium cylindraceum callosum, cellulis subquadratis parietibus incrassatis 5-7-seriatis. Pappus 4.5-6 mm longus circa 20 setis subaequilongis uniseriatis strigosus sursum paulo ampliatis apice acutis, basi coalitis.

Flores disci pseudohermaphroditi 24-55 in capitulo. Corolla 4.5-5 mm longa, tubulosa, parte media sparsis glandulis, tubulo 1.8 mm longo deorsum glabro, limbo rubescenti vel purpureo tubuloso sursum gradatim dilatato, inferne sparsis glandulis sursum glabro, lobis triangularibus 0.6 mm altis crasse marginatis marginibus minute papillosis, extus 0-3 glandulis subapice munitis. Antherae 1.5 mm, basi minute sagittatae appendice apicali anguste elliptico-triangulari subacuta 0.35 mm, collo cylindrico-incrassato cellulis seriatis quadratis et elongato-quadratis parietibus incrassatis. Stylus crassus ramis crassiusculis anguste oblongis acutatis circa 0.8 mm longis extus dense longeque papilloso-hirtis. Ovarium sterile anguste ellipsoidei-oblongum, vacuum, 5-costatis parvis pilis geminis rigidulis antrorsis circa 0.05 mm. Pappus 5-6 mm longus setis strigosis, uniseriatis basi coalitis apice acutis. Fig. 1B, D, Fig. 3D-H.

Typus: Costa Rica, Entre le Rancho del Jaboncillo et le sommet du Cerro de Buena Vista, roches 3100 m, 19 Jan 1891, Henri Pittier 3425 (US, isotype). Other collections: Chirripó massif, Cerro Truncado, 3700 m, common, 17 Feb 1976, Weston 10093 (US). Southwest of Cerro Chirripó, rain paramo, 3600 m, 9 Dec 1966, Weston 3638A (US).

Illustration. The excellent photograph by Hans Weber, made at the summit of Chirripó Grande, published in his "Die Paramos of Costa Rica", Abb. 71, 1958, undoubtedly represents Westoniella eriocephala.

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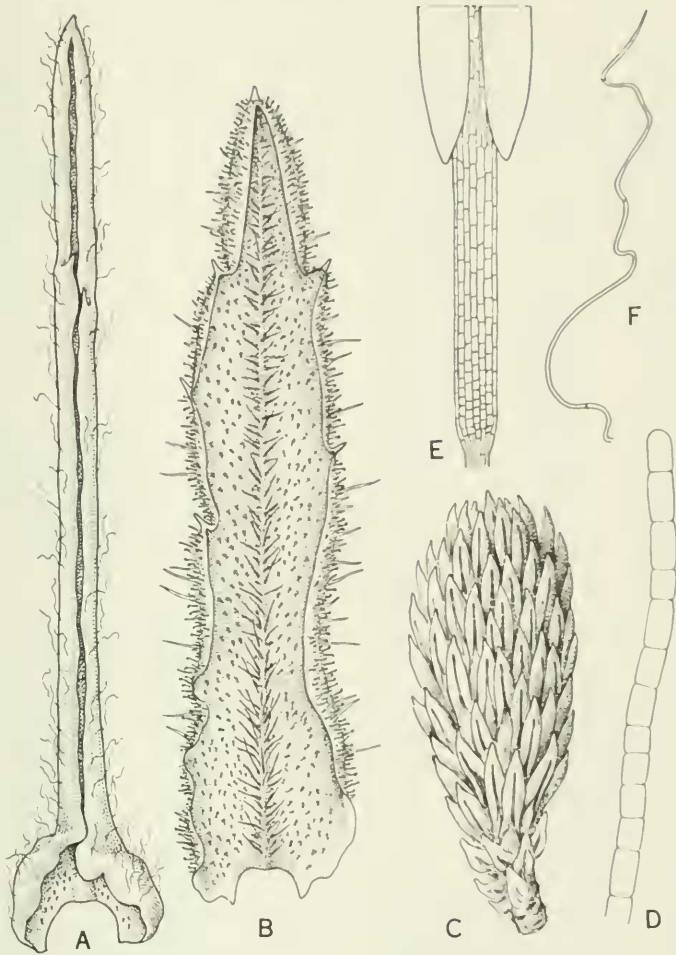


Fig. 1: A, Westoniella kohkemperi, leaf, abaxial side, x 4 (Weston 3612); B, W. eriocephala, leaf, abaxial side, x 4 (Weston 3638A); C, W. chirripoensis, terminal leafy branchlet, x 4 (Weston 3614); D, W. eriocephala, fragment of trichoma from the phyllaries, x 60 (Weston 3638A); E, W. kohkemperi, anther's collar, x 150 (Weston 3612); F, W. triunguifolia, fragment of trichoma from a leaf base, x 100 (Weston 10123).

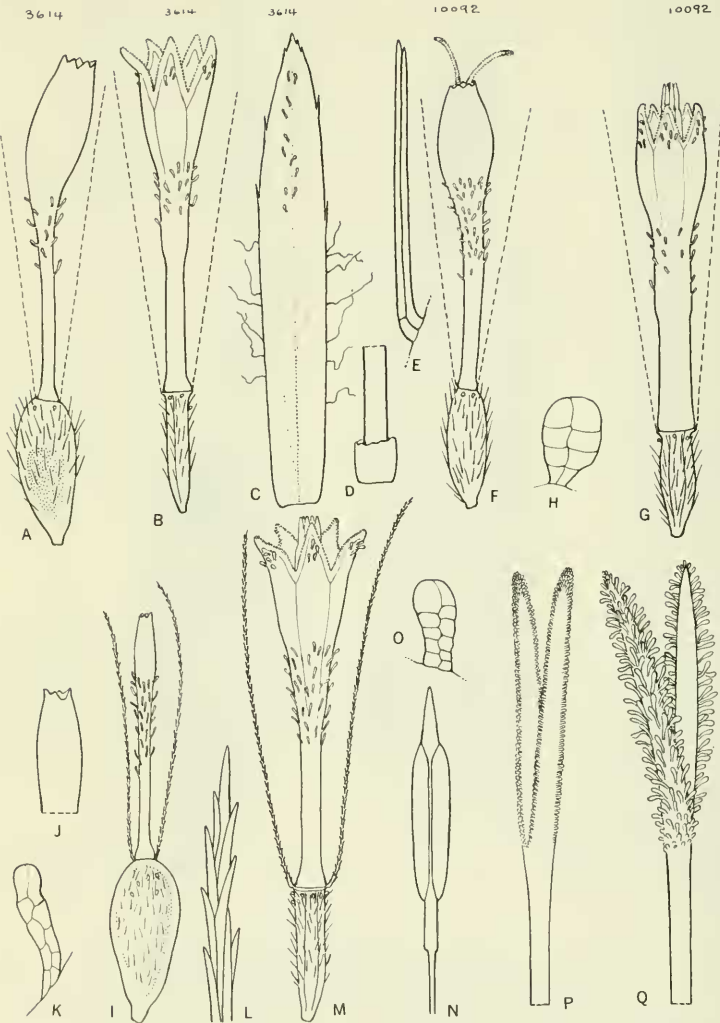


Fig. 2: A-G, *Westoniella chirripoensis* (from Weston 3614 and 10092): A and F, ray flowers, x 10; B and G disc flowers (G a younger one); C, phyllary x 10; D, nectarial disc of disc flower x 20; E, geminate-celled trichoma of ovary, x 200; H, *W. triunguifolia*, gland from the phyllaries x 250 (Weston 5978); I-Q, *W. barqueroana* (from Weston 3645) I, ray flower x 10, distal section of a corolla x 20 (J), glandular trichoma of the same x 150 (K) and fragment of pappus bristle (L) x 175; M, disc flower x 10; N, anther x 20; O gland from the ovary x 250; P, stylar branches of ray flower x 50; Q, stylar branches of disc flower x 50.

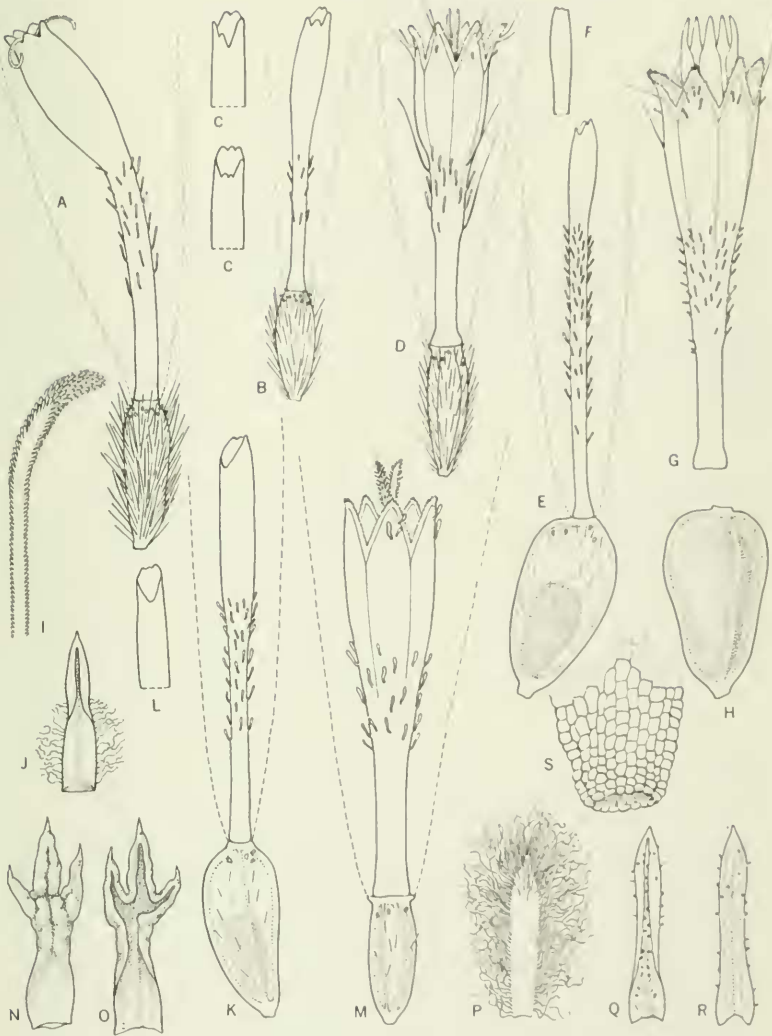


Fig. 3: A-D, *Westoniella triunguifolia*; A, ray flower x 10 (Weston 5978); B, ray flower and C, variants x 10 (Weston 10076); D, disc flower x 10 (W. 10076); E-H, *W. kohkemperii*, ray and disc flower and achene x 10 (Weston 3612); I and J, *W. chirripoensis*, end of style branch x 50 and leaf x 4; K-M, *W. eriocephala* ray and disk flowers x 10; N and O, *W. triunguifolia*, leaf, and adaxial and abaxial sides with the woolly vestiture removed, x 4 (Weston 5847); P-S, *W. barqueroana*, P, phyllary x 4; Q and R, leaf x 4; S, carpopodium x 200.